LEVEL I — SIMULATION EXAM 4 (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 measures the voltage at the last horn/strobe on a 24 VDC notification appliance circuit and reads 15.4 VDC. The device is listed for operation between 16 and 33 VDC. What does this measurement indicate?

A. The voltage is acceptable because the device will still produce adequate output

B. The voltage is within the normal tolerance range for end-of-circuit devices

C. The device needs recalibration to operate at a lower voltage threshold

D. The voltage is below the device's minimum listed operating range and the circuit must be corrected

2. A fire alarm technician is installing cable through a ceiling space that contains both a supply air duct and a dedicated return air duct. The ceiling space itself is not used for air return. A coworker insists that FPLP cable is required. Is the coworker correct?

A. Yes, any ceiling space containing HVAC ductwork is automatically classified as a plenum

B. No, the space is not a plenum because it has dedicated return ductwork and is not used for air return

C. Yes, proximity to supply ductwork requires plenum-rated cable within 5 feet of any duct

D. No, but only if the ceiling tiles are non-combustible and provide a fire-rated barrier

3. A technician installs a smoke detector in a hotel corridor and connects it to the signaling line circuit. The detector is assigned address 142. When the technician tests the detector, the panel displays "Address 142 — Storage Room B-12." The detector is physically located in the third-floor corridor. What error has occurred?

A. The location descriptor programmed for address 142 is incorrect and must be updated

B. The detector has been assigned the wrong address and must be physically reprogrammed

C. The SLC wiring has been crossed with another circuit creating a false address reading

D. The panel's SLC communication board is malfunctioning and displaying random locations

4. A fire alarm system requires a battery calculation for secondary power. The system's total standby current is 0.8 amps and the total alarm current is 5.5 amps. Using the standard requirement of 24 hours standby and 5 minutes alarm with a 20% safety factor, what is the minimum battery capacity?

A. 19.2 Ah based on standby calculation only without the alarm current component

B. 23.6 Ah based on incorrect safety factor application at the wrong calculation step

C. 23.59 Ah after applying all current values, durations, and the 20% safety factor

D. 25.5 Ah based on rounding up both current values before performing the calculation

5. A fire alarm technician is installing visible notification appliances in a corridor that is 200 feet long and 8 feet wide. Per NFPA 72, strobes must be within 15 feet of each corridor end and spaced no more than 100 feet apart. What is the minimum number of visible appliances required?

A. Two strobes — one within 15 feet of each end of the corridor

B. Four strobes spaced at 50-foot intervals throughout the corridor length

C. Five strobes to ensure no point in the corridor is more than 40 feet from a device

D. Three strobes — one near each end and one at the midpoint to meet both requirements

6. A fire alarm technician is running fire alarm conduit through a building and reaches a point where the conduit must cross over a steam pipe. The steam pipe surface temperature regularly exceeds 150°F. What concern should the technician address?

A. The heat from the steam pipe may damage conductor insulation and the conduit should be rerouted or protected

B. No concern exists because metallic conduit provides adequate thermal protection for conductors

C. The conduit must be wrapped with thermal insulation tape at the crossing point only

D. Fire alarm conduit is rated for temperatures up to 200°F and no action is required

7. A fire alarm technician is connecting a tamper switch on an OS&Y gate valve. The valve is in the fully open position. How should the tamper switch be adjusted?

A. Set the switch to activate after the valve is fully closed to prevent nuisance signals

B. Set the switch to activate within two revolutions of the valve wheel from fully open

C. Set the switch to activate after five revolutions to allow for normal valve maintenance

D. Set the switch to activate only when water flow stops completely through the valve

8. A conventional fire alarm system has 10 zones. During commissioning, the technician discovers that Zone 7 shows a trouble condition immediately upon system startup, but all wiring on Zone 7 has been verified as correctly installed. The technician checks and confirms the EOLR is present at the last device. What should the technician check next?

A. Whether the Zone 7 devices are generating excessive standby current draw

B. Whether the panel has a firmware bug that causes false trouble on specific zone numbers

C. Whether the installed EOLR value matches the value required by the panel manufacturer

D. Whether the Zone 7 conductors are the same gauge as the conductors on all other zones

9. During installation of fire alarm devices on a construction site, the fire alarm technician observes an electrician working on a live 480 VAC motor control center without lockout/tagout devices applied. What action should the fire alarm technician take?

A. Continue with fire alarm work since the hazard does not directly involve fire alarm circuits

B. Assist the electrician by holding a flashlight and watching for signs of electrical arc flash

C. Report the unsafe condition to the site safety officer or site superintendent immediately

D. Disconnect the fire alarm panel's primary power as a precautionary safety measure

10. A technician is installing a smoke detector in a room with a ceiling fan. Per NFPA 72, what consideration applies to detector placement relative to the ceiling fan?

A. The detector should not be placed directly in the airflow path of the ceiling fan blades

B. The detector must be mounted on the ceiling fan housing for closest proximity to the ceiling

C. Ceiling fans have no effect on smoke detector placement or performance requirements

D. The detector must be relocated to the wall when any ceiling fan is present in the room

11. A fire alarm technician is installing fire alarm cable and finds that a 200-foot horizontal run on a single floor passes through a 2-hour fire-rated wall at one point. What is required at the wall penetration?

A. The cable must transition to a higher-rated cable type on each side of the fire wall

B. The cable must be enclosed in metallic conduit for 6 feet on each side of the wall

C. A pull box must be installed on each side of the fire wall for future maintenance access

D. The penetration must be sealed with an approved firestop to maintain the wall's fire rating

12. A fire alarm technician is connecting the secondary battery supply to a fire alarm panel. The panel requires 24 VDC nominal. Two 12-volt batteries rated at 18 Ah each are available. If connected in series, what voltage and capacity will the battery set provide?

A. 12 VDC at 36 Ah because series connection adds capacity while voltage stays the same

B. 24 VDC at 18 Ah because series connection adds voltage while capacity stays the same

C. 24 VDC at 36 Ah because series connection adds both voltage and capacity together

D. 12 VDC at 18 Ah because the batteries cancel each other out in series configuration

13. A technician is installing a spot-type smoke detector on a ceiling with exposed bar joists that are 8 inches deep and spaced 4 feet apart. How does this ceiling construction affect detector placement?

A. The 8-inch joist depth has no effect because bar joists are open web and allow air flow

B. Detectors may need to be placed in individual joist bays depending on joist depth and spacing

C. Detectors must be mounted on the bottom chord of the bar joists instead of the deck above

D. The detector spacing must be doubled because the joists accelerate smoke travel along the ceiling

14. A fire alarm system uses a DACT to communicate with the supervising station. The DACT is programmed to dial the monitoring station upon any alarm event. During a test, the DACT attempts to dial but cannot connect. The technician hears a fast busy signal on the telephone line. What is the most likely cause?

A. The telephone line serving the DACT is out of service or has a fault preventing connection

B. The DACT is programmed with an incorrect telephone number for the monitoring station

C. The fire alarm panel is generating too many signals simultaneously for the DACT to process

D. The supervising station's receiving equipment is offline and rejecting incoming calls

15. A fire alarm technician needs to determine whether a specific ceiling space qualifies as a plenum for cable type selection purposes. Which of the following conditions would classify the space as a plenum?

A. The presence of any HVAC ductwork within the ceiling space regardless of configuration

B. The ceiling space contains more than 10 data cables from the telecommunications contractor

C. The ceiling space is used for environmental air return without dedicated return ductwork

D. The ceiling space is above a suspended acoustic tile grid in a commercial building

16. Per NFPA 72, what is the maximum room coverage area for a single wall-mounted 15 candela visible notification appliance?

A. 28 feet by 28 feet measured from the appliance to the farthest wall in the room

B. 30 feet by 30 feet which matches the standard smoke detector spacing dimension

C. 24 feet by 24 feet based on the minimum candela rating available from manufacturers

D. 20 feet by 20 feet per NFPA 72 Table 18.5.5.5.1(a) for wall-mounted appliances

17. A fire alarm technician discovers that a newly installed addressable smoke detector is not responding to the panel's polling. The technician verifies that the SLC wiring is continuous through the device location. What should the technician check next?

A. Whether the detector's address has been set correctly and matches the panel's programming

B. Whether the panel's SLC output voltage exceeds the detector's maximum rated input

C. Whether the detector base is compatible with a different manufacturer's detector head

D. Whether the fire alarm panel needs a firmware update to recognize the new device model

18. A fire alarm technician is calculating voltage drop for a NAC circuit. The circuit operates at 24 VDC, carries 3.2 amps of alarm current, and uses 12 AWG copper conductors. The round-trip wire distance is 400 feet. Using the NEC Chapter 9 Table 8 resistance of 1.98 ohms per 1,000 feet for 12 AWG, what is the voltage drop?

A. 1.98 volts which is the resistance per thousand feet expressed directly as voltage

B. 2.53 volts calculated using the round-trip distance and total alarm current

C. 6.34 volts calculated by multiplying current by the full 400-foot wire resistance

D. 7.60 volts calculated using an incorrect formula that squares the current value

19. On a construction site, a fire alarm technician is working from a 6-foot stepladder. The technician needs to reach a junction box that is slightly beyond comfortable arm's reach. What is the safe course of action?

A. Stand on the top cap of the stepladder to gain the additional height needed

B. Lean the stepladder against the wall at an angle for additional reach capacity

C. Have a coworker hold the ladder steady while the technician stretches to reach

D. Reposition the stepladder closer to the junction box before continuing work

20. A fire alarm technician is installing a Class A signaling line circuit in a new building. The SLC leaves the panel through the east riser, loops through all devices on all floors, and returns to the panel through the same east riser. Does this routing comply with Class A requirements?

A. No, the SLC could still be Class A if the panel supports loop communication from both ends

B. Yes, Class A only requires that the circuit form a loop regardless of the routing path

C. No, the outgoing and return paths should be routed through separate risers for true redundancy

D. Yes, because Class A designation refers to the circuit classification, not the physical routing

21. A fire alarm technician is using Ohm's Law to calculate the current through a circuit. The circuit has 24 VDC applied across a total resistance of 4,800 ohms. What is the current?

A. 5 milliamps flowing through the circuit under these conditions

B. 115,200 amps which is the product of voltage multiplied by resistance

C. 200 milliamps flowing through the circuit based on the power formula

D. 0.5 amps flowing through the circuit based on standard Ohm's Law

22. A fire alarm system's primary power circuit breaker is found in the OFF position during a routine visit. The system is running on battery power. The technician turns the breaker back on and the system returns to normal AC power operation. What additional action should the technician take?

A. Investigate why the breaker was turned off and verify the lock-on device is installed

B. Perform a complete acceptance test of all devices since the system was on battery

C. Replace the batteries immediately because any discharge event degrades battery life

D. No additional action is needed since the system is now operating normally on AC power

23. A fire alarm technician is installing an addressable monitor module to connect a conventional waterflow switch to an addressable fire alarm system. What is the function of the monitor module in this application?

A. It provides 24 VDC power to the waterflow switch for its internal electronics

B. It amplifies the waterflow switch signal for reliable transmission to the panel

C. It converts the waterflow signal to a digital format compatible with the SLC protocol

D. It accepts the conventional contact closure from the switch and reports it as an addressed point

24. A fire alarm technician is preparing to pull cable through conduit. The cable manufacturer's data sheet specifies a maximum pulling tension of 50 pounds. During the pull, the technician notices significant resistance. What should the technician do?

A. Continue pulling slowly to work through the resistance point in the conduit

B. Stop pulling and investigate the cause of excessive resistance before continuing

C. Apply additional pulling lubricant and increase pulling force to overcome the resistance

D. Cut the cable at the point of resistance and install a junction box at that location

25. When installing a fire alarm system in a new building, the technician notices that the architectural drawings show a room labeled "Mechanical/Electrical Room — Unoccupied." The room contains the building's main electrical switchgear and an air handling unit. What type of fire alarm detection is typically required in this space?

A. Smoke detection is always required in every room regardless of occupancy classification

B. No detection is required because the room is designated as unoccupied space

C. Heat detection is typically appropriate because the environment may cause smoke detector nuisance alarms

D. Flame detection is required in all rooms containing electrical switchgear equipment

26. A fire alarm technician is installing a smoke detector in a room with a ceiling height of 28 feet. The room is a warehouse with no HVAC system. What concern should the technician raise about this installation?

A. The detector must be a fixed-temperature heat detector instead of a smoke detector

B. The detector spacing must be reduced by 50% to compensate for the ceiling height

C. No spacing adjustment is needed because NFPA 72 does not require smoke detector spacing reduction

D. Spot-type smoke detectors may not be effective at this height and alternative detection should be considered

27. A fire alarm system drawing shows a dashed line connecting devices on the floor plan. The drawing legend indicates that dashed lines represent fire alarm circuits. A solid line on the same drawing connects notification appliances. What type of information is the technician reading?

A. The circuit routing showing the physical pathway for SLC and NAC wiring on the floor

B. The electrical load calculation for each circuit expressed as a graphical line weight

C. The signal priority hierarchy showing which circuits are activated first during an alarm

D. The testing sequence showing the order in which devices should be functionally tested

28. A fire alarm technician is installing notification appliances in a manufacturing facility with an average ambient noise level of 85 dB during normal operations. Per NFPA 72, what minimum sound output must the audible notification appliances produce in this space?

A. 90 dB to exceed the ambient noise level by the standard 5 dB requirement

B. 85 dB to match the ambient noise level during normal manufacturing operations

C. 100 dB to achieve the required 15 dB above the average ambient noise level

D. 75 dB which is the universal minimum for all audible notification in any occupancy

29. A fire alarm technician is installing a smoke detector near an air supply diffuser on the ceiling. NFPA 72 cautions against placing detectors in the direct airflow from supply diffusers. What is the reason for this restriction?

A. Supply air increases the detector's sensitivity causing nuisance alarms from filtered particles

B. High-velocity supply air can dilute smoke and push it away from the detector before it activates

C. The temperature of conditioned supply air causes thermal shock to the detector's sensing element

D. Supply diffuser vibration is transmitted through the ceiling and causes intermittent trouble signals

30. A fire alarm technician is terminating wires at a fire alarm panel. The panel has screw-type terminal blocks. The technician notices that a coworker has connected two conductors under a single terminal screw that is rated for one conductor only. What is the concern?

A. The double connection increases the circuit resistance beyond the panel's supervision threshold

B. The terminal will generate a voltage drop that affects all devices downstream of the connection

C. The connection creates a fire hazard from overheating at the over-capacity terminal point

D. The terminal may not securely hold both conductors leading to a loose connection and circuit faults

31. A fire alarm panel has a NAC output rated at 3.0 amps. The technician needs to calculate whether the following devices can be supported on a single NAC: 6 horn/strobes at 0.310 amps each and 4 strobes at 0.195 amps each. What is the total load and does it exceed the rating?

A. Total load is 2.50 amps which exceeds the 3.0 amp output when the safety margin is applied

B. Total load is 3.12 amps which exceeds the 3.0 amp output capacity of the NAC

C. Total load is 2.64 amps which is within the 3.0 amp output capacity of the NAC

D. Total load is 1.86 amps which is within the 3.0 amp output but leaves excessive margin

32. A fire alarm technician is installing conduit supports for EMT conduit carrying fire alarm circuits. Per NEC requirements, what is the maximum support interval for 3/4-inch EMT conduit?

A. 10 feet between supports with the conduit secured within 3 feet of each box or fitting

B. 4 feet between supports with the conduit secured within 2 feet of each box or fitting

C. 6 feet between supports with no requirement for securing near boxes or fittings

D. 8 feet between supports with the conduit secured within 4 feet of each box or fitting

33. A fire alarm technician is installing devices in an existing building undergoing renovation. The existing fire alarm system is a conventional panel with 12 zones. During demolition, the contractor damaged fire alarm wiring on Zone 9 and Zone 10. The fire alarm system remains in service for the occupied portions of the building. What must be done regarding the damaged zones?

A. The entire fire alarm system must be shut down until the damaged zones are fully repaired

B. The damaged zones must be reported as impaired and compensatory measures implemented

C. The remaining functioning zones provide adequate coverage and no action is required

D. Only the supervising station needs to be notified; the building owner notification is optional

34. A fire alarm technician is using a multimeter to measure voltage on an SLC circuit at a device location in an addressable system. The meter reads 27.5 VDC. The panel's SLC operating voltage range is 24–32 VDC. What does this reading indicate?

A. The voltage is high and indicates the panel's power supply needs adjustment

B. The voltage exceeds the SLC operating range and the device may be damaged

C. The reading is unreliable because SLC circuits use pulsed digital communication

D. The voltage is within the panel's specified operating range and appears normal

35. Two fire alarm technicians are debating whether a rate-of-rise heat detector can detect a slow-developing fire that gradually raises the room temperature from 72°F to 140°F over two hours. Which technician is correct?

A. The detector will not activate because the temperature rise rate is far below the trigger threshold

B. The detector will activate because any temperature increase from the rate-of-rise sensing element

C. Both technicians are wrong because rate-of-rise detectors only measure absolute temperature

D. The detector will activate at 135°F regardless of the rise rate due to its fixed threshold

36. A fire alarm technician is installing a speaker for a voice evacuation system. In addition to meeting the required sound pressure level, what other performance criterion must be achieved?

A. Speech intelligibility must be adequate for occupants to clearly understand voice messages

B. The speaker must produce a minimum of 95 dB at 10 feet during voice announcement mode

C. The speaker must be capable of producing frequencies between 20 Hz and 20,000 Hz

D. The speaker's power handling capacity must exceed the amplifier output by 50 percent

37. A fire alarm system's battery charger maintains the batteries at a float voltage of 27.4 VDC. If primary AC power is lost and the batteries must power the system, what happens to the battery voltage over time as the batteries discharge?

A. The voltage remains constant at 27.4 VDC until the batteries are completely discharged

B. The voltage increases slightly as the batteries transition from float charge to active discharge

C. The voltage gradually decreases from the float voltage as the stored energy is consumed

D. The voltage immediately drops to 24.0 VDC and then remains stable throughout the discharge

38. A fire alarm technician is installing a pull station in a school building. The project specifications call for dual-action pull stations. What characteristic distinguishes a dual-action pull station from a single-action pull station?

A. A dual-action station requires a key to reset after activation while single-action does not

B. A dual-action station generates two separate alarm signals simultaneously to different zones

C. A dual-action station includes both a pull lever and a push button for two activation methods

D. A dual-action station requires two motions to activate compared to a single motion for standard units

39. A fire alarm technician needs to install fire alarm cable through an existing 1-inch EMT conduit that already contains four 14 AWG THHN power conductors from the electrical contractor. What is the technician's correct course of action?

A. Calculate the conduit fill and install fire alarm conductors if capacity permits

B. Install the fire alarm conductors in a separate dedicated conduit per NEC Article 760

C. Request the electrical contractor remove their conductors to make room for fire alarm cable

D. Use fire alarm cable rated for the highest voltage present in the shared conduit

40. A fire alarm technician is installing devices in a parking garage. The garage has an open-air design with large ventilation openings on two sides. Which type of detection device would be most appropriate for this environment?

A. Heat detectors because the open-air environment makes smoke detectors impractical

B. Photoelectric smoke detectors with weather-resistant housings for outdoor-rated operation

C. Duct smoke detectors installed in the garage's ventilation openings to capture smoke

D. Aspirating smoke detection systems with sampling tubes throughout the parking levels

41. A fire alarm technician is connecting a door holder release relay to the fire alarm system. The magnetic door holder keeps a fire-rated door open during normal operation. When should the door holder release and allow the door to close?

A. Only when the building's HVAC system is shut down to conserve conditioned air

B. Only when the pull station nearest to the door is manually activated by an occupant

C. When the fire alarm system activates or when a local smoke detector near the door activates

D. Only during scheduled fire drills conducted by the building's fire safety coordinator

42. A fire alarm technician is calculating the power consumed by a fire alarm control unit. The panel operates on 120 VAC primary power and draws 2.5 amps during alarm conditions. Using the power formula $P = V \times I$, what is the AC power consumption during alarm?

A. 48 watts based on the panel's internal 24 VDC operating voltage times the current

B. 122.5 watts based on adding the voltage and current values together as a combined total

C. 30 watts based on the current squared times a standard resistance factor

D. 300 watts based on the primary AC voltage multiplied by the alarm current draw

43. A fire alarm technician discovers during installation that a structural column prevents mounting a smoke detector at the location shown on the approved shop drawings. The nearest suitable ceiling location is 4 feet from the planned position. What is the correct procedure?

A. Document the conflict, notify the supervisor, and obtain approval before relocating the device

B. Install the detector on the structural column at the same height as the planned ceiling location

C. Move the detector to the new location immediately and update the as-built drawings later

D. Leave the location empty and install an additional detector at the next available ceiling point

44. A fire alarm technician is installing fire alarm cable in a building with steel bar joist construction. The technician wants to attach the cable to the bar joists using plastic cable ties. Is this an acceptable support method?

A. Yes, plastic cable ties are the preferred support for fire alarm cable on bar joists

B. It depends on the cable type and the listing — some installations permit cable ties as supports

C. No, fire alarm cable can only be supported by metallic conduit clamps on bar joists

D. Yes, but only if the cable ties are spaced at intervals not exceeding 24 inches

45. A fire alarm technician is installing a horn/strobe in a restroom. The room is 10 feet by 12 feet with a standard 9-foot ceiling. Per NFPA 72, what candela rating is required for a single wall-mounted strobe in this room?

A. 30 candela based on the room dimensions exceeding 20 feet in one direction

B. No visible notification is required in individual restrooms unless ADA accessible

C. 15 candela which covers rooms up to 20 feet by 20 feet with a single wall-mounted appliance

D. 75 candela as the minimum for any room with plumbing fixtures and high humidity

46. A fire alarm technician is verifying the cable substitution hierarchy before purchasing materials for a project. Which of the following statements about cable substitution is correct?

A. FPLP cable can be used in any location where FPL or FPLR cable is specified

B. FPL cable can substitute for FPLP in plenum spaces when installed in metallic conduit

C. FPLR cable can substitute for FPLP in plenum spaces because both are fire-rated cables

D. Any cable type may be used in any location as long as the conductor gauge is correct

DOMAIN 1.2 — MAINTENANCE (Questions 47–82)

47. A fire alarm technician is called to a building where the panel displays "TROUBLE — GROUND FAULT — SLC 1." The technician disconnects SLC 1 at the panel and the ground fault clears. Using the divide-and-conquer method, the technician reconnects the first half of the SLC and the ground fault returns. What is the next step?

A. Replace all devices in the first half of the SLC because one of them has a shorted component

B. Reconnect the second half and disconnect the first half to confirm the fault location

C. Measure the voltage at every device in the first half to identify the one with the lowest reading

D. Divide the first half again — disconnect at its midpoint and test each quarter individually

48. During annual testing, a fire alarm technician activates a smoke detector on the fourth floor. The panel correctly identifies the device. The notification appliances activate on floors 3, 4, and 5 per the sequence of operations. However, the elevator recall function does not activate. The sequence of operations requires elevator recall for any smoke detector alarm. What type of deficiency is this?

A. An initiating device deficiency because the smoke detector signal is not strong enough

B. A programming deficiency because the elevator recall output is not linked to that device

C. A notification deficiency because the horn/strobes must activate before elevator recall occurs

D. A wiring deficiency because the elevator recall relay must be on the same circuit as the detector

49. A fire alarm technician discovers during a routine inspection that the building's emergency generator is out of service for repairs. The fire alarm panel's secondary battery duration was reduced to 4 hours based on the presence of the generator. What is the impact of the generator being out of service?

A. The secondary battery duration no longer meets NFPA 72 requirements until the generator is restored

B. The panel automatically extends its battery monitoring to compensate for the missing generator

C. No impact exists because the 4-hour battery duration is a permanent system specification

D. The panel must be reprogrammed to display a trouble signal for the generator outage

50. A fire alarm technician is performing semiannual smoke detector testing in a 20-story high-rise building. The building has 1,200 smoke detectors. The technician plans to test 600 detectors during this visit and the remaining 600 during the next semiannual visit. Does this approach comply with NFPA 72?

A. No, NFPA 72 requires all detectors to be tested during each semiannual testing period

B. Yes, as long as a different 50% is tested each visit and all detectors are tested annually

C. Yes, NFPA 72 permits testing 50% of detectors per visit as the standard testing protocol

D. No, NFPA 72 requires at least 75% of all detectors to be tested during each semiannual visit

51. A fire alarm system's event history log shows that a specific addressable heat detector has generated seven alarm activations in the past three months. Each alarm occurred during afternoon hours and the panel was manually reset each time. No fire was found during any of the events. What is the most probable cause?

A. The heat detector has a manufacturing defect and must be returned to the factory for analysis

B. The panel's SLC polling rate is too fast causing the detector to misinterpret polling as a signal

C. Someone is deliberately activating the device as a prank during peak afternoon hours

D. Afternoon solar heat gain through a nearby window or skylight is raising the temperature near the detector

52. Per NFPA 72 Table 14.4.3.2, manual fire alarm stations must be functionally tested at what frequency?

A. Semiannually using physical activation to verify proper signal transmission

B. Annually by physically activating each station and verifying panel response

C. Quarterly using a magnetic test tool to simulate activation without physical operation

D. Monthly by visually inspecting the device for damage without physical activation

53. A fire alarm technician measures the battery voltage on a 24 VDC fire alarm system. With the charger connected and the system in normal standby, the batteries read 23.1 VDC. What does this reading suggest?

A. The battery charger may not be functioning properly and the batteries are not receiving adequate charge

B. The voltage is within normal range for a 24 VDC system under standby load conditions

C. The batteries are overcharged and the charger must be adjusted to reduce output voltage

D. The panel is drawing excessive standby current and the SLC loading must be investigated

54. A fire alarm technician arrives at a building to perform annual testing. The building manager mentions that three smoke detectors on the seventh floor were replaced by their maintenance staff last week using detectors from a different manufacturer than the rest of the system. What concern should the technician raise?

A. The detectors may not be compatible with the fire alarm panel's SLC communication protocol

B. Different manufacturer detectors always have a different address range that causes conflicts

C. The replacement detectors must be listed for use with the specific panel installed in the building

D. Both A and C are valid concerns that must be verified before testing can proceed

55. A fire alarm system displays "SUPERVISORY — VALVE TAMPER — ZONE 12." The building manager states that a plumber was working on the sprinkler system earlier in the day. What is the most likely explanation?

A. The plumber accidentally damaged the tamper switch wiring during the plumbing work

B. The plumber closed or partially closed a sprinkler control valve and it was not fully reopened

C. The fire alarm panel has a programming error that links plumbing valves to Zone 12

D. The sprinkler system has a leak that is causing the tamper switch to generate a false signal

56. During periodic testing, the fire alarm technician tests the primary-to-secondary power transfer by disconnecting AC power. The panel transfers to battery power successfully, but the AC power trouble signal does not appear on the panel display until 4 hours after the disconnection. Is this code-compliant?

A. Yes, NFPA 72 permits any delay up to 6 hours for AC power loss trouble annunciation

B. Yes, the 4-hour delay is within an acceptable tolerance of the 3-hour permitted maximum

C. No, but the delay is minor and can be documented as an acceptable deviation from code

D. No, NFPA 72 permits a maximum delay of 3 hours and the 4-hour delay exceeds this limit

57. A fire alarm technician is inspecting a fire alarm system and finds that the panel's event log contains 47 trouble signals for "DEVICE DIRTY" on various smoke detectors throughout the building. The building is five years old. What does this indicate?

A. The system is overdue for smoke detector cleaning and the dirty devices need maintenance

B. The panel's sensitivity thresholds are set too tight and should be adjusted by the programmer

C. The detectors are at end of life and all 47 devices must be replaced with new units immediately

D. The trouble signals are normal for a five-year-old system and do not require corrective action

58. A fire alarm technician is performing a battery load test. The test procedure calls for applying the system's full alarm current load to the batteries for a specific duration and measuring the voltage under load. The batteries start at 26.2 VDC and after the test duration read 24.6 VDC. Do the batteries pass?

A. Yes, the batteries maintained voltage well above the minimum operating threshold under load

B. No, any voltage drop during a load test indicates the batteries have insufficient capacity

C. Yes, but only if the voltage recovers to above 26.0 VDC within 15 minutes after the test

D. No, the batteries must maintain their starting voltage throughout the entire test duration

59. A fire alarm technician discovers that visible notification appliances in a building lobby are not synchronized — three strobes flash at different times. The building has high foot traffic and the lobby is visible from the main corridor. What code requirement does this violate?

A. The candela output requirement because unsynchronized strobes produce reduced total light

B. The synchronization requirement that all visible appliances in the same field of view flash together

C. The flash rate requirement that limits all strobes to exactly one flash per second minimum

D. The mounting height requirement because improperly mounted strobes cannot be synchronized

60. A fire alarm technician is testing the HVAC shutdown function during annual testing. The technician activates a duct smoke detector. The panel displays the correct alarm. However, the technician observes that the air handling unit continues to run. The technician checks the control module output and confirms the relay has closed. Where is the fault most likely located?

A. In the duct smoke detector because it is not generating the correct signal type

B. In the panel programming because the HVAC shutdown is not linked to the duct detector zone

C. In the fire alarm panel's SLC communication board affecting the control module command

D. In the wiring or interface between the control module output and the AHU's control circuit

61. During inspection, a fire alarm technician finds that the building's fire alarm panel is located inside a locked janitor's closet. Building maintenance reports that only two people have keys. What code concern does this present?

A. The panel location is acceptable if it meets code but accessibility for service must be verified

B. No concern exists because fire alarm panels should be in secure locked locations

C. The panel must be relocated to a publicly accessible location with 24-hour open access

D. The panel location violates code because panels cannot be in rooms used for storage

62. A fire alarm technician receives a trouble signal that reads "NAC 3 — OPEN." The technician measures the resistance at the NAC 3 panel terminals and reads infinite ohms. What has been confirmed?

A. The NAC 3 circuit has a break in the conductor path that prevents current flow

B. The end-of-line resistor value has drifted above the panel's supervision range

C. The NAC 3 output circuit board at the panel has failed and needs replacement

D. The notification appliances on NAC 3 are drawing excessive current in standby

63. A fire alarm technician is testing a waterflow switch during semiannual inspection. The technician opens the inspector's test valve and waits. After 45 seconds, the panel displays an alarm for the waterflow zone. After closing the test valve and waiting for flow to stop, the alarm clears after 3 minutes. Is this test result acceptable?

A. No, the alarm should have activated within 30 seconds of opening the test valve

B. No, the alarm should not have cleared automatically — it must require manual panel reset

C. Yes, the 45-second response time and automatic restoration are both acceptable behaviors

D. Yes, the alarm activated within the 90-second requirement and the system is functioning properly

64. During annual testing of a voice evacuation system, the fire alarm technician activates the system and listens to the voice message from a speaker on the third floor. The message is audible but the words are heavily distorted and unintelligible. What must be documented?

A. The speaker passed the test because it produced audible output at an adequate volume level

B. The speaker failed the intelligibility requirement and must be investigated and corrected

C. The distortion is caused by the fire alarm panel and all speakers will have the same issue

D. The speaker needs a volume adjustment which can be made at the amplifier output stage

65. A fire alarm technician is reviewing maintenance records for a fire alarm system and discovers that no inspection or testing has been performed for 18 months. The system is in a building that has been continuously occupied during this period. What is the significance of this finding?

A. The system is out of compliance with NFPA 72 and testing must be performed immediately

B. The 18-month gap is within the acceptable range since testing is required only every 2 years

C. The building owner is exempt from testing requirements if the system has had no alarms

D. Only the supervising station is affected and only their testing schedule must be updated

66. A fire alarm technician is testing notification appliances and discovers that a horn in a mechanical room produces a barely audible tone compared to identical horns on the same circuit. All other horns on the circuit produce normal output. What is the most likely cause?

A. The circuit voltage at that specific horn location is critically low due to wire resistance

B. The horn has a wiring polarity error that causes it to operate at reduced output

C. The horn has an internal component failure that is reducing its sound output capability

D. The mechanical room ambient noise is masking the horn output during testing

67. A fire alarm system trouble log shows "BATTERY CHARGER FAULT" as an active trouble condition. The technician measures the battery voltage and reads 22.8 VDC with the charger connected. What is the implication?

A. The batteries are within normal voltage range and the charger fault is a false alarm

B. The batteries are fully charged and the panel's charger monitoring circuit is defective

C. The charger is maintaining adequate voltage despite the fault indication on the panel

D. The batteries are not receiving proper charge and will eventually fail if the charger is not repaired

68. Per NFPA 72, what frequency is required for visual inspection of fire alarm system initiating devices such as smoke detectors and heat detectors?

A. Monthly visual inspection of all initiating devices throughout the protected premises

B. Semiannual visual inspection of all initiating devices throughout the protected premises

C. Annual visual inspection of all initiating devices throughout the protected premises

D. Quarterly visual inspection of all initiating devices throughout the protected premises

69. A fire alarm technician is conducting annual testing and discovers that a smoke detector in an addressable system has an analog sensitivity reading that exceeds the manufacturer's maximum acceptable threshold. The detector was last cleaned 18 months ago. What action is required?

A. The detector must be cleaned or replaced and retested to verify it returns to acceptable range

B. The sensitivity reading can be reset to factory default using the panel's programming interface

C. The detector can remain in service if it responds normally during functional testing with smoke

D. No action is needed until the detector generates a trouble signal at the fire alarm panel

70. During a fire alarm inspection, the technician discovers that the building owner has mounted a large decorative wall hanging directly below a wall-mounted horn/strobe device, covering the bottom half of the strobe lens. What must be documented?

A. The strobe lens obstruction does not affect performance because the top half remains visible

B. The decorative hanging enhances aesthetics and may remain if the horn output is unaffected

C. The obstruction reduces the strobe's effective candela output and must be removed or the device relocated

D. The building owner may apply for a variance from the AHJ to keep the decorative item

71. A fire alarm system has been generating a "COMMUNICATION FAILURE" trouble signal intermittently for two weeks. The supervising station reports they receive signals normally most of the time but occasionally experience 10-minute gaps. The system uses a cellular communicator. What is the most likely cause?

A. The panel's communication module has a firmware defect causing periodic signal interruptions

B. The fire alarm system is generating too many signals for the cellular network to process

C. The cellular communicator is programmed with an incorrect APN for the carrier network

D. Intermittent cellular signal loss at the building location is causing periodic communication gaps

72. During testing, the fire alarm technician activates a smoke detector and observes that the panel displays "ALARM — SUPERVISORY" instead of "ALARM — FIRE." What does this indicate?

A. The detector has a dual-mode operation and the technician selected supervisory mode

B. The device is programmed as a supervisory point instead of an alarm point in the panel

C. The SLC communication error is causing the panel to misidentify the signal type

D. This is normal for smoke detectors that have been in service for more than five years

73. A fire alarm technician is reviewing NFPA 72 requirements for testing emergency control functions. How frequently must elevator recall, HVAC shutdown, and door release interfaces be tested?

A. Annually as part of the comprehensive system functional test per Table 14.4.3.2

B. Semiannually to coincide with the smoke detector functional testing schedule

C. Monthly because emergency control functions are classified as critical life safety systems

D. Only during initial acceptance testing with no periodic retesting required by code

74. A fire alarm system installed three years ago has never had a sensitivity test performed on any of its smoke detectors. Per NFPA 72, how many sensitivity tests should have been completed by now?

A. Three tests — one for each year since installation as part of annual testing requirements

B. One test — the initial sensitivity test required within one year of installation

C. No tests are due because sensitivity testing begins at year five for new installations

D. Two tests — one within the first year and one at the three-year mark per the alternate year schedule

75. A fire alarm technician discovers during inspection that a smoke detector installed in a warehouse has been covered with a plastic bag and secured with a rubber band by warehouse staff to prevent nuisance alarms from forklift exhaust. What must be documented?

A. The bag is an acceptable temporary measure if it is removed during non-operational hours

B. The detector should be relocated to a position away from the forklift traffic pattern

C. The covered detector is a critical deficiency that renders the detection point inoperable

D. The plastic bag can remain if it is replaced with a manufacturer-approved protective cap

76. A fire alarm system has two SLC loops. SLC 1 has 125 devices and SLC 2 has 130 devices. The panel manufacturer's maximum capacity per SLC loop is 159 devices. During a renovation, 40 new devices need to be added. What is the most appropriate approach?

A. Distribute devices between both loops to keep each within rated capacity

B. Add all 40 devices to SLC 1 since it currently has the fewest devices

C. Install a new SLC loop card in the panel and assign all new devices to SLC 3

D. The system cannot accommodate any new devices without a complete panel replacement

77. During testing, a fire alarm technician activates a pull station near Exit Door 1 on the first floor. The panel correctly displays the alarm. All notification appliances activate throughout the building. The supervising station confirms receipt of the alarm signal. However, the elevator recall function does not activate. The sequence of operations requires elevator recall for all pull station alarms. What is the most probable cause?

A. The panel programming does not include elevator recall in the response to pull station alarms

B. The pull station is generating a supervisory signal that does not trigger elevator recall

C. The elevator recall relay is on the same NAC circuit as the notification appliances

D. The pull station wiring is incorrect and does not carry enough current for recall activation

78. A fire alarm technician discovers that the as-built drawings for a fire alarm system do not show eight addressable devices that are physically installed and connected to SLC 2. The system was modified six months ago to add these devices. What documentation deficiency exists?

A. The panel programming records are the primary documentation and drawings are optional

B. The device address schedule does not need updating unless the devices are in alarm zones

C. The as-built drawings must be updated to accurately reflect all installed devices and their locations

D. The drawings only need updating when the total device count exceeds the panel's rated capacity

79. A fire alarm technician is troubleshooting a NAC circuit that shows an intermittent trouble condition. The trouble appears approximately once per week, always during business hours, and clears itself within minutes. What diagnostic approach should the technician use?

A. Replace all notification appliances on the circuit to eliminate any device-related cause

B. Wait for the trouble to occur and immediately measure voltage at the panel terminals

C. Install a data logger on the NAC circuit to record voltage and current over several days

D. Inspect the circuit for connections that could be affected by building vibration or activity during business hours

80. A fire alarm system generates a trouble signal indicating "DEVICE REMOVED — ADDRESS 088." The technician visits the location and finds the smoke detector head is sitting on a desk near its mounting base. What action should be taken?

A. Program the panel to bypass Address 088 until a qualified maintenance contractor arrives

B. Reinstall the detector head in its base, verify communication with the panel, and clear the trouble

C. Replace the detector head with a new unit because the removed detector may have been damaged

D. Document the finding and notify the AHJ that the building owner has tampered with the system

81. Per NFPA 72, what document must be maintained for the life of the fire alarm system and made available to the AHJ upon request?

A. Records of all inspections, testing, and maintenance performed on the system

B. The original project bid documents and contractor payment records

C. The building owner's fire safety training certificates for all building staff

D. The fire alarm system manufacturer's annual product update bulletins

82. A fire alarm technician is testing the audible notification in a sleeping room in a hotel. The technician measures 74 dB at the pillow location with the notification appliance activated. The technician's sound level meter has a stated accuracy of ±2 dB. What should be documented?

A. The reading passes because the meter accuracy allows for a true value up to 76 dB

B. The reading is inconclusive and must be retested with a more accurate sound level meter

C. The reading passes because 74 dB exceeds the sleeping area minimum of 70 dB at the pillow

D. The reading of 74 dB does not meet the 75 dB minimum and the deficiency must be documented

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

83. A fire alarm shop drawing includes a "NAC Loading Calculation" sheet. What information does this calculation verify?

A. That the voltage at the panel's NAC terminals matches the manufacturer's specification

B. That each NAC circuit has been assigned the correct zone identification number

C. That the total current draw of all appliances on each NAC does not exceed the output rating

D. That the NAC conductor size is the largest available gauge for maximum current capacity

84. A fire alarm technician is reviewing a riser diagram and sees a symbol labeled "FACP" at the bottom of the diagram with two lines extending upward through five floor levels. Each floor shows device symbols connected along the lines. What do the two lines extending upward most likely represent?

A. The dedicated AC power circuit and the battery backup circuit to each floor

B. Two signaling line circuit loops serving the devices on floors one through five

C. The primary and backup communication pathways to the supervising station

D. The conduit size specifications for the vertical riser from the panel to each floor

85. A voltage drop calculation for a notification appliance circuit shows that using 14 AWG conductors will result in 17.2 VDC at the farthest device, while using 12 AWG conductors will result in 20.8 VDC. The devices are listed for 16–33 VDC. Which conductor size should be selected and why?

A. 14 AWG because 17.2 VDC is above the 16 VDC minimum listed voltage

B. Either size is acceptable since both produce voltage above the minimum listed range

C. 14 AWG because it is less expensive and the voltage exceeds the minimum by 1.2 volts

D. 12 AWG because it provides a better voltage margin for future device additions and aging

LEVEL I — SIMULATION EXAM 4: ANSWER KEY AND EXPLANATIONS

1. D — At 15.4 VDC, the voltage at the last device is below the minimum listed operating voltage of 16 VDC. Notification appliances operating below their listed voltage range may produce insufficient sound output, fail to flash at the correct candela, or fail to operate entirely. The circuit must be corrected by using larger conductors, shortening the run, reducing the device count, or adding a booster power supply.

2. B — A ceiling space with dedicated return ductwork that is not itself used as an air return path is not classified as a plenum. The plenum designation applies only when the ceiling space actively serves as the return air path — meaning air circulates through the open space above the grid rather than through dedicated ductwork. FPL, FPLR, or FPLP cable are all acceptable in this non-plenum ceiling space.

3. A — The detector hardware is correctly transmitting address 142, and the panel is correctly receiving that address. The error is in the location descriptor programmed into the panel for address 142 — it reads "Storage Room B-12" instead of the correct third-floor corridor location. The panel programming must be updated to reflect the detector's actual installed location.

4. C — Standby energy = 0.8 × 24 = 19.2 Ah. Alarm energy = 5.5 × 0.083 = 0.457 Ah. Subtotal = 19.657 Ah. With 20% safety factor: 19.657 × 1.20 = 23.59 Ah. The minimum battery capacity is 23.59 ampere-hours. Select the next available standard battery size above this calculated minimum to ensure code compliance.

5. D — Two strobes within 15 feet of each end would be spaced approximately 170 feet apart, exceeding the 100-foot maximum. Three strobes are needed: one within 15 feet of each end plus one at the midpoint. This satisfies both the 15-foot end-distance rule and keeps the spacing between any two adjacent strobes within the 100-foot maximum.

6. A — Sustained high temperatures from the steam pipe can degrade conductor insulation over time, causing insulation failure, ground faults, or short circuits. The conduit should be rerouted to avoid the heat source, or thermal protection such as an insulating sleeve or separation spacer should be installed at the crossing point to prevent heat damage to the fire alarm conductors.

7. B — NFPA 72 requires tamper switches to generate a supervisory signal no more than two revolutions of the valve wheel from the normal fully open position. The switch must be adjusted so that even a partial closure — which could significantly reduce water flow — is detected and reported before the valve is closed far enough to impair the sprinkler system's effectiveness.

8. C — If all wiring is verified correct and the EOLR is physically present, the most likely cause of a trouble condition is an EOLR value mismatch. Each panel manufacturer specifies a particular EOLR value for its circuits, and installing a resistor of a different value causes the panel to read an unexpected resistance. The technician must verify that the installed EOLR matches the panel manufacturer's specified value.

9. C — Observing any worker performing electrical work without proper lockout/tagout is an OSHA safety violation that creates an imminent danger condition. The fire alarm technician has a professional and legal obligation to report the unsafe condition to the site safety officer or superintendent immediately. Working on energized 480 VAC equipment without LOTO can result in electrocution or fatal arc flash.

10. A — Ceiling fans create airflow patterns that can disrupt the natural convection of smoke toward the ceiling and push smoke away from detectors placed in the direct airflow path. NFPA 72 recommends that smoke detectors not be placed in the direct discharge airstream of ceiling fans, HVAC diffusers, or other high-velocity air sources that could prevent smoke from reaching the sensing chamber.

11. D — Any penetration through a fire-rated wall must be sealed with an approved firestop material or device to maintain the wall's rated fire resistance. An unsealed conduit penetration creates an opening through which fire and smoke can pass, compromising the building's compartmentalization and violating the building code. Firestopping is required regardless of the cable type or conduit material.

12. B — 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 18 Ah capacity. Parallel connection would maintain 12 VDC and double the capacity to 36 Ah, which does not meet the panel's 24 VDC voltage requirement.

13. B — Bar joists with 8-inch depth can create pockets that trap smoke and prevent it from traveling freely along the ceiling to reach detectors at standard spacing. Depending on the joist depth and spacing, NFPA 72 may require detectors to be placed in individual joist bays rather than at smooth-ceiling spacing. The technician should evaluate the specific joist configuration against NFPA 72 Section 17.7.3.2.4.

14. A — A fast busy signal on a telephone line indicates the line is out of service, has a fault, or the call cannot be completed by the telephone network. The DACT requires a functioning telephone line to dial the monitoring station. Common causes include a disconnected line, a telephone company service interruption, or a damaged cable between the building and the telephone network. The line status must be investigated and restored.

15. C — A ceiling space qualifies as a plenum when it is used for environmental air return without dedicated return ductwork — meaning the open space above the ceiling grid serves as the return air path. Simply containing ductwork, data cables, or being above a suspended grid does not

automatically make a space a plenum. The determining factor is whether the space itself functions as part of the air handling system.

16. D — Per NFPA 72 Table 18.5.5.5.1(a), a single wall-mounted 15 candela visible notification appliance covers a maximum room size of 20 feet by 20 feet. Rooms larger than this dimension require a higher candela rating or multiple appliances to provide adequate visible coverage throughout the space.

17. A — When an addressable device is installed and wired correctly but does not respond to polling, the most common cause is an incorrect address setting. Each device must be programmed with a unique address that matches the panel's device database. If the address is set wrong — or duplicates another device's address — the panel cannot communicate with the device and reports a communication failure.

18. B — V_drop = I × R_wire. Wire resistance = 400 feet × (1.98 / 1000) = 0.792 ohms. V_drop = 3.2 × 0.792 = 2.53 volts. Voltage at the farthest device = 24 − 2.53 = 21.47 VDC, which is well above the 16 VDC minimum listed voltage. The 12 AWG conductors provide excellent voltage drop performance for this circuit length and current.

19. D — Stretching beyond comfortable reach from a ladder creates an unstable center of gravity that dramatically increases the risk of the ladder tipping or the worker falling. The safe action is to descend the ladder, reposition it closer to the work point, and then climb back up. OSHA ladder safety practices emphasize maintaining the body's center of gravity between the ladder rails at all times.

20. C — True Class A redundancy requires that the outgoing and return paths follow physically separate routes so that a single event — such as a fire in one riser — cannot destroy both paths simultaneously. If both the outgoing and return paths share the same riser, a fire or physical damage in that riser eliminates both communication paths. Routing through separate risers provides genuine pathway diversity.

21. A — Using Ohm's Law: I = V / R = 24 / 4,800 = 0.005 amps = 5 milliamps. This low current level is typical of signaling line circuits in addressable systems, where individual devices draw only a few milliamps each during standby. Understanding milliamp-level calculations is important for SLC loading and battery standby current calculations.

22. A — A breaker found in the OFF position means the fire alarm system was running on battery power without primary AC backup — a serious condition that degrades battery life and leaves the system vulnerable. The technician must investigate why the breaker was off, verify that the lock-on device is installed and functioning to prevent recurrence, and document the finding in the service report.

23. D — A monitor module accepts a conventional contact closure — such as the dry contacts from a waterflow switch — and reports the device's status to the fire alarm panel as an individually

addressed point on the SLC. This allows conventional devices to be integrated into an addressable system with point-level identification. The monitor module bridges the gap between conventional hardware and addressable architecture.

24. B — Excessive resistance during a cable pull indicates a potential problem — a conduit obstruction, a sharp bend, a collapsed section, or insufficient pulling lubricant. Continuing to pull against high resistance risks damaging the conductor insulation, stretching the conductors, or breaking individual wire strands. The technician must stop, investigate the cause, and resolve it before continuing the pull.

25. C — Mechanical and electrical rooms often contain equipment that generates heat, dust, steam, or exhaust that would cause smoke detectors to produce nuisance alarms. Heat detection is typically more appropriate for these environments because heat detectors are not affected by the airborne contaminants that trigger smoke detector false alarms. The specific detection type should be verified against the project specifications and applicable codes.

26. D — At ceiling heights approaching and exceeding 30 feet, spot-type smoke detectors may not be effective because smoke cools and decelerates as it rises, potentially stratifying before reaching the ceiling-mounted detector. Alternative detection methods — such as aspirating systems, beam detectors, or video-based detection — should be considered for very high ceiling applications. NFPA 72 Section 17.7.4 addresses stratification concerns.

27. A — Dashed and solid lines on fire alarm floor plans represent circuit routing — the physical pathway showing how conductors are routed from the panel to each device. Different line styles distinguish different circuit types (SLC, IDC, NAC) on the drawing. The legend defines what each line style represents for the specific drawing set being reviewed.

28. C — NFPA 72 Section 18.4.4.1 requires audible notification appliances to produce a sound level at least 15 dB above the average ambient noise level in the space. With an 85 dB average ambient, the minimum required notification level is 85 + 15 = 100 dB. Manufacturing environments with high ambient noise often require high-output notification appliances or supplemental visible notification.

29. B — High-velocity supply air from a diffuser can dilute smoke concentrations below the detector's activation threshold and physically push smoke away from the detector before it enters the sensing chamber. This delays or prevents detection, creating a gap in the building's fire alarm coverage. Detectors should be placed away from direct airflow paths where smoke can accumulate naturally.

30. D — Terminal blocks rated for a single conductor cannot securely hold two conductors under one screw. The second conductor may not make full contact with the terminal, or the clamping force may be insufficient to hold both conductors firmly. Over time, one or both conductors can work loose, creating an intermittent high-resistance connection that generates trouble signals or prevents reliable signal transmission.

31. C — Horn/strobe load: 6 × 0.310 = 1.860 amps. Strobe load: 4 × 0.195 = 0.780 amps. Total = 1.860 + 0.780 = 2.640 amps. The 2.64-amp total is within the 3.0-amp NAC output capacity, leaving 0.36 amps of margin. The circuit loading is acceptable but the margin is modest — future device additions would need to be carefully evaluated.

32. A — NEC Section 358.30 requires 3/4-inch EMT conduit to be supported at intervals not exceeding 10 feet and secured within 3 feet of each outlet box, junction box, cabinet, or fitting. These support requirements ensure the conduit maintains its alignment, does not sag between supports, and remains securely attached to the building structure throughout its length.

33. B — Damaged fire alarm zones in an occupied building that remains in service constitute a system impairment per NFPA 72 Section 14.2.2. The building owner, the AHJ, and the supervising station must be notified. Compensatory measures — such as a fire watch in the unprotected areas — must be implemented until the damaged zones are repaired and restored to full operation.

34. D — A reading of 27.5 VDC falls within the panel manufacturer's specified SLC operating range of 24–32 VDC and indicates normal circuit operation. SLC voltages are typically higher than the nominal 24 VDC because the panel applies a regulated voltage to the loop that accounts for device current draw and line losses. The reading confirms the SLC is receiving adequate power.

35. B — A rate-of-rise heat detector activates when the temperature increases at a rate exceeding a set threshold — typically 12–15°F per minute. A gradual temperature rise from 72°F to 140°F over two hours represents a rate of approximately 0.57°F per minute, which is far below the trigger threshold. The rate-of-rise element will not activate for such a slow temperature change. Only a combination detector with a fixed-temperature element would activate at the 135°F threshold.

36. A — Voice evacuation speakers must deliver messages that are not only loud enough but also intelligible — occupants must be able to clearly understand the words being spoken. NFPA 72 Section 18.4.10 and Chapter 24 require speech intelligibility verification. A system that is loud but unintelligible fails to serve its life safety purpose because occupants cannot follow evacuation instructions.

37. C — When batteries transition from float charge to active discharge (no charger connected), the terminal voltage gradually decreases as the stored chemical energy is consumed. The rate of decrease depends on the discharge current and the battery's capacity. Healthy batteries maintain voltage above the minimum operating threshold throughout the required standby and alarm duration before significant voltage depression occurs.

38. D — A dual-action pull station requires two distinct physical motions to activate — such as lifting a protective cover and then pulling the handle — compared to a single-action station that requires only one motion. Dual-action stations are used in environments where accidental or malicious false activations are a concern, such as schools, detention facilities, and public spaces.

39. B — NEC Section 760.136 prohibits power-limited fire alarm conductors from sharing raceways with electric light, power, and Class 1 circuits. The existing 120 VAC conductors in the conduit are power circuits, and fire alarm conductors cannot be added to the same raceway. The fire alarm cable must be installed in a separate dedicated conduit regardless of available fill capacity.

40. A — Open-air parking garages expose detectors to vehicle exhaust, wind, humidity, temperature extremes, and airborne contaminants that make smoke detectors impractical due to constant nuisance alarms. Heat detectors are the appropriate detection technology for this environment because they respond only to elevated temperatures and are not affected by the airborne particles and gases that trigger smoke detector false alarms.

41. C — Magnetic door holders must release fire-rated doors to close when the fire alarm system activates or when a local smoke detector installed near the door detects smoke. This ensures that fire doors compartmentalize the building during any fire event, not just when a specific device is activated. NFPA 72 Section 21.9 addresses door release as an emergency control function that operates automatically during alarm conditions.

42. D — Using the power formula $P = V \times I$ with the primary AC voltage: $P = 120$ VAC $\times$ 2.5 amps = 300 watts. This is the AC power drawn from the building's electrical system during alarm conditions. The panel converts this AC power internally to the DC voltages used by the fire alarm circuits. Power calculations at the AC input side are important for circuit sizing and building electrical load calculations.

43. A — When a physical obstruction prevents installing a device at the approved shop drawing location, the technician must document the conflict, notify the supervisor, and obtain approval before relocating the device. Moving a device without authorization may violate the approved design, affect detector spacing compliance, or require engineering review. Changes must be approved and documented in the as-built drawings.

44. B — Cable support methods depend on the cable type, the manufacturer's listing, and the NEC requirements for the specific installation. Some fire alarm cable types and installations permit plastic cable ties as supports on bar joists, while others require more robust support methods. The technician should verify the cable manufacturer's installation instructions and the applicable NEC requirements before selecting the support method.

45. C — Per NFPA 72 Table 18.5.5.5.1(a), a 15 candela wall-mounted visible notification appliance covers rooms up to 20 feet by 20 feet. A 10-by-12-foot restroom falls well within this maximum coverage area. The 15 candela rating is adequate for this room size, and no higher candela rating is required based on the room dimensions alone.

46. A — FPLP cable has the highest fire rating in the fire alarm cable hierarchy and can substitute downward for any lower-rated cable type. FPLP can be used wherever FPL or FPLR is specified. However, the substitution cannot go in the other direction — FPL cannot substitute for FPLR or FPLP, and FPLR cannot substitute for FPLP.

47. D — The divide-and-conquer method calls for progressively halving the suspect section to isolate the fault location. Since reconnecting the first half of SLC 1 caused the ground fault to return, the fault is confirmed in the first half. The next step is to divide that first half at its midpoint and test each quarter independently. This reduces the search area by half with each step.

48. B — The smoke detector activated correctly and the panel processed the alarm, but the elevator recall output was not triggered. The notification appliances activated correctly for their programmed zones, confirming the panel's output capability. The most likely cause is a programming deficiency — the elevator recall output is not linked to that detector or its zone in the panel's programming matrix.

49. A — The 4-hour battery duration reduction from 24 hours is permitted only when a qualifying emergency generator is operational. With the generator out of service, the reduced battery capacity no longer meets the default NFPA 72 requirement of 24 hours standby. This constitutes a system impairment that must be reported to the building owner, AHJ, and supervising station until the generator is restored.

50. A — NFPA 72 Table 14.4.3.2 requires smoke detectors to be functionally tested semiannually, meaning all detectors must be tested within each semiannual testing period. Testing only half the detectors per visit does not meet the semiannual requirement unless a specific alternative testing method permitted by NFPA 72 is being followed and documented. The default requirement is 100% testing each period.

51. D — Seven afternoon alarm activations with no fire found strongly suggests an environmental cause correlated with afternoon conditions. Solar heat gain through windows or skylights during peak afternoon sun exposure can raise the ambient temperature near the detector above its activation threshold. The pattern of afternoon-only activations eliminates random device failure and points to a recurring thermal condition.

52. B — NFPA 72 Table 14.4.3.2 requires manual fire alarm stations to be functionally tested annually. Testing involves physically activating each station — pulling the handle — and verifying that the panel receives the correct alarm signal, notification appliances activate, and the signal is transmitted to the supervising station. The station is then reset with the appropriate key or tool.

53. A — A float charge voltage of 23.1 VDC is below the expected range for a 24 VDC system with the charger connected. Healthy sealed lead-acid batteries on a functioning charger should read approximately 27.0–27.6 VDC at float. A reading of 23.1 VDC suggests the charger output is insufficient, the charger has failed, or the charger circuit has a fault preventing adequate charge delivery to the batteries.

54. D — Both concerns are valid and must be addressed. Smoke detectors from a different manufacturer may not be compatible with the fire alarm panel's SLC communication protocol (concern A), and all detectors must be listed for use with the specific panel model installed

(concern C). Using unlisted or incompatible detectors is a code violation that can result in communication failures, false readings, and unreliable detection.

55. B — The supervisory signal for a valve tamper switch indicates the sprinkler control valve has been moved from its fully open position. A plumber working on the sprinkler system would have closed or partially closed a control valve to perform the work. The most likely explanation is that the valve was not returned to its fully open position after the plumbing work was completed. The valve must be reopened and the supervisory signal verified to restore.

56. D — NFPA 72 Section 10.6.9 permits a maximum delay of 3 hours before annunciating an AC power failure trouble signal. A 4-hour delay exceeds this maximum by one hour and is not code-compliant. The panel's AC power loss detection timing must be investigated and corrected to ensure the trouble signal appears within the permitted 3-hour window.

57. A — Multiple "Device Dirty" trouble signals indicate that smoke detectors throughout the building have accumulated enough contamination in their sensing chambers to drift toward their sensitivity limits. This is a maintenance condition that requires detector cleaning per the manufacturer's procedures. Analog addressable panels generate these alerts proactively so that dirty detectors can be serviced before they cause nuisance alarms or detection failures.

58. A — The batteries started at 26.2 VDC and maintained 24.6 VDC under full alarm load — a drop of only 1.6 volts. The ending voltage of 24.6 VDC is well above the minimum operating voltage for 24 VDC fire alarm equipment (typically around 20.4 VDC). This performance indicates the batteries have adequate capacity to sustain the required load and pass the load test.

59. B — NFPA 72 Section 18.5.5.5.7 requires all visible notification appliances within the same field of view to flash in synchronization. Three strobes flashing at different times in a building lobby visible from the main corridor violates this requirement and creates a disorienting, potentially harmful visual effect for building occupants, particularly those with photosensitive conditions.

60. D — The duct detector activated correctly, the panel processed the alarm and sent the command, and the control module relay closed as commanded. The fault lies downstream of the control module — in the wiring between the module's relay output contacts and the air handling unit's control circuit, or in the AHU controller's response to the relay input. The interface pathway must be traced and the connection verified.

61. A — Fire alarm panels must be accessible for service, maintenance, and emergency operations. While a locked room may be acceptable if authorized personnel have access, the technician should verify that the panel location meets NEC and AHJ accessibility requirements and that service technicians, the fire department, and authorized building personnel can reach the panel when needed. Limited key access may impair response time.

62. A — An infinite resistance reading at the NAC terminals confirms an open circuit — a break in the conductor path that prevents current from flowing through the circuit. The EOLR is no longer

measurable because the break prevents the meter from seeing through to the resistor. The open must be located using the divide-and-conquer method and repaired.

63. D — The waterflow switch activated within 45 seconds of sustained flow, which is well within the 90-second maximum required by NFPA 72. The alarm restoration after flow stops is normal operating behavior for a waterflow alarm — the switch returns to its normal state when water flow ceases. Both the activation timing and the restoration behavior indicate the waterflow switch is functioning correctly.

64. B — When the voice message is audible but the words are distorted and unintelligible, the speaker has failed the intelligibility requirement of NFPA 72. Speech intelligibility is a mandatory performance criterion — occupants must be able to understand the words being spoken. The cause of the distortion — whether from a damaged speaker, incorrect wiring, acoustic issues, or amplifier problems — must be investigated and corrected.

65. A — NFPA 72 Chapter 14 requires periodic inspection and testing at the frequencies specified in Tables 14.3.1 and 14.4.3.2. An 18-month gap means multiple required testing cycles have been missed — semiannual smoke detector testing, annual device testing, and annual comprehensive system testing. The system is out of compliance and all required testing must be performed immediately.

66. C — When all other horns on the same circuit produce normal output, the circuit voltage is reaching the devices adequately. A single horn producing significantly reduced output compared to identical horns on the same circuit most likely has an internal component failure — a damaged diaphragm, a failing solenoid, or a broken internal connection. The device should be replaced and the new unit tested to verify normal output.

67. D — A "Battery Charger Fault" trouble with a battery voltage of 22.8 VDC — below the expected float charge range of 27.0–27.6 VDC — confirms that the batteries are not receiving proper charge. Without a functioning charger, the batteries will continue to discharge under standby load until they can no longer sustain the system. The charger must be repaired or replaced immediately to prevent system failure during a power outage.

68. B — NFPA 72 Table 14.3.1 requires semiannual visual inspection of initiating devices including smoke detectors and heat detectors. Visual inspection verifies that devices are in place, undamaged, unobstructed, and in a condition that suggests they will function properly. This is an observational examination — not a functional test — and is performed at every semiannual inspection visit.

69. A — A detector with a sensitivity reading exceeding the manufacturer's maximum acceptable threshold is outside its listed operating range and must be corrected. The detector may be cleaned per the manufacturer's procedures and retested. If cleaning does not restore the sensitivity to within the acceptable range, the detector must be replaced. A detector outside its listed range cannot be relied upon for accurate detection.

70. C — Any object that obstructs the strobe lens — even partially — reduces the effective candela output below the rated value, potentially creating areas of the room where the flash is not visible. NFPA 72 requires visible notification appliances to be unobstructed. The wall hanging must be removed or the device relocated to a position where no obstruction impairs its output.

71. D — Intermittent 10-minute communication gaps from a cellular communicator are consistent with periodic cellular signal loss at the building location. Cellular signal strength can fluctuate due to network congestion, weather conditions, building construction, and carrier infrastructure changes. The cellular antenna may need to be relocated, an external antenna installed, or the communication pathway supplemented with a backup technology.

72. B — When a smoke detector displays "ALARM — SUPERVISORY" instead of "ALARM — FIRE," the device is programmed as a supervisory point in the panel's configuration rather than as an alarm point. This is a programming error — the device type or zone classification for that address must be corrected in the panel programming to ensure the detector generates a fire alarm signal with the appropriate system responses.

73. A — NFPA 72 Table 14.4.3.2 requires emergency control functions — including elevator recall, HVAC shutdown, and door release — to be functionally tested annually. Each interface must be physically verified during testing: the elevator must actually recall, the AHU must actually shut down, and the doors must actually release and close. Annual testing ensures these critical life safety interfaces remain operational.

74. B — NFPA 72 Table 14.4.3.2 requires the first smoke detector sensitivity test within one year of installation, then every alternate year thereafter. For a three-year-old system, one test should have been completed — the initial test within year one. The next test would be due at year three, meaning the system is now approaching or at its second test deadline.

75. C — A smoke detector covered with a plastic bag is effectively disabled — smoke cannot reach the sensing chamber and the detector cannot perform its detection function. This is a critical deficiency that renders the detection point inoperable and must be documented as such. The bag must be removed immediately and the underlying cause of nuisance alarms addressed through proper means such as detector relocation or technology change.

76. B — Adding all 40 new devices to SLC 1 would bring its total to 165 devices, exceeding the manufacturer's maximum capacity of 159 devices per loop. Distributing the devices between both loops keeps each within capacity: SLC 1 at 145 devices and SLC 2 at 150 devices (for a 20/20 split), or another distribution that keeps both loops under 159.

77. A — The panel correctly processed the pull station alarm, activated all notification, and transmitted the signal to the supervising station — confirming all panel outputs are functional. The elevator recall function not activating specifically for this pull station alarm indicates that the panel programming does not include the elevator recall output in the response matrix for pull station alarm inputs. The programming must be corrected.

78. C — As-built drawings are code-required documentation per NFPA 72 that must accurately reflect the current installed configuration of the fire alarm system. Eight devices installed but not shown on the drawings create a documentation gap that impairs future maintenance, troubleshooting, and system modifications. The drawings must be updated to include all device locations, addresses, and circuit assignments.

79. D — Intermittent troubles occurring only during business hours suggest a connection or condition that is affected by building activity — vibration from foot traffic, door slamming, HVAC cycling, or equipment operation that causes a marginal connection to make and break contact. Physical inspection of terminations, device bases, and junction boxes along the NAC circuit during active building hours is the most targeted diagnostic approach.

80. B — The detector head has been removed from its base — likely by building maintenance or cleaning staff — causing the panel to report a device removal trouble. The correct action is to reinstall the detector head in its base, verify it communicates properly with the panel, and confirm the trouble signal clears. Document the finding and remind building management that detector heads must not be removed without proper authorization.

81. A — NFPA 72 Section 14.6 requires that records of all inspections, testing, and maintenance be maintained for the life of the fire alarm system and made available to the AHJ upon request. These records demonstrate ongoing code compliance, create a maintenance history for troubleshooting, and provide documentation for AHJ review during annual fire inspections or compliance audits.

82. D — A reading of 74 dB at the pillow does not meet the 75 dB minimum required by NFPA 72 Section 18.4.5.1 for sleeping areas. Even considering the meter's ±2 dB accuracy, the measured value falls below the code requirement. The deficiency must be documented and corrective action taken — such as increasing the appliance output, adding a closer appliance, or repositioning the existing device.

83. C — A NAC loading calculation verifies that the total alarm current draw of all notification appliances connected to each NAC circuit does not exceed the rated output capacity of the NAC power source. This calculation prevents circuit overloading that could cause appliances to produce insufficient output, trip overcurrent protection, or overload the panel's power supply during alarm conditions.

84. B — The two lines extending upward from the FACP through five floor levels most likely represent two signaling line circuit loops that distribute fire alarm communication to devices on each floor. Riser diagrams show the vertical organization of circuits — how they route between floors, which devices connect to which loops, and how the system's circuit architecture is structured from a building-level perspective.

85. D — While both conductor sizes produce voltage above the 16 VDC minimum, 12 AWG provides a significantly better voltage margin (20.8 VDC vs. 17.2 VDC). The 1.2-volt margin with 14 AWG is dangerously thin — any future device additions, aging wire connections, or temperature-related

resistance increases could push the voltage below the minimum. The 12 AWG option provides a robust 4.8-volt margin that accommodates real-world conditions.