LEVEL I — SIMULATION EXAM 8 (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 receives a box of addressable smoke detectors from the supply house. Before installing any detector, what should the technician verify about these devices?

A. That the detectors are listed as compatible with the specific fire alarm panel installed in the building

B. That the detectors have been pre-programmed with addresses at the factory before shipment

C. That the detectors include built-in notification appliance synchronization circuitry

D. That the detectors are the same physical size as the bases already mounted on the ceiling

2. A fire alarm technician is installing fire alarm cable in a building with poured concrete floors and steel stud walls with drywall on both sides. The cable must pass from one room to the next through the steel stud wall. What protection is required where the cable penetrates the metal stud?

A. A firestop material rated for the full assembly rating of the wall construction

B. A conduit sleeve through the stud opening with at least 2 inches of clearance around the cable

C. No protection is required because low-voltage fire alarm cable is inherently damage-resistant

D. A listed bushing or grommet to prevent the sharp metal edges from damaging the cable insulation

3. A fire alarm system is installed in a building that has a qualifying emergency generator with automatic start and transfer. The generator has a 72-hour fuel supply. Per NFPA 72, what is the minimum secondary battery standby duration for this installation?

A. 24 hours because the generator does not affect the battery requirement under any condition

B. 12 hours as a compromise between the full 24-hour requirement and the generator backup

C. 8 hours because generators with more than 48-hour fuel supply qualify for extended reduction

D. 4 hours because the generator meets the NFPA 72 reliability criteria for reduced battery duration

4. A fire alarm technician is connecting a fire alarm panel to its dedicated branch circuit. The electrician has installed a 20-amp single-pole breaker. The technician notices there is no lock-on device on the breaker. The electrician says lock-on devices are only required in high-rise buildings. Is the electrician correct?

A. Yes, lock-on devices are a high-rise requirement that does not apply to standard buildings

B. No, lock-on devices are required on all fire alarm panel dedicated branch circuit breakers

C. Yes, lock-on devices are only required when the panel serves more than 100 devices

D. No, but only because this particular panel draws more than 10 amps from the branch circuit

5. A fire alarm technician is installing an addressable manual pull station. The device has an SLC connection and a built-in isolator module. What is the function of the isolator module?

A. It prevents a short circuit fault on the SLC from disabling devices on both sides of the fault

B. It converts the pull station's mechanical contact into a digital signal for panel communication

C. It provides a separate power source for the pull station independent of the SLC voltage

D. It monitors the pull station's tamper switch and reports unauthorized access to the panel

6. A fire alarm technician is installing smoke detectors in a hotel. The guest room doors have door closers that keep them shut. The corridor outside the rooms has a smooth flat ceiling at 8 feet. The technician is placing corridor smoke detectors. What is the maximum spacing between detectors in this corridor per the default listed spacing?

A. 15 feet because hotel corridors have a reduced spacing requirement for sleeping occupancies

B. 20 feet because corridor detectors must be spaced closer than room detectors per NFPA 72

C. 30 feet based on the default listed spacing for spot-type smoke detectors on smooth ceilings

D. 41 feet using the 0.7 multiplier applied to the corridor width rather than the spacing

7. A fire alarm technician discovers during installation that the building's HVAC contractor has installed a return air grille in the corridor ceiling directly where a smoke detector was planned per the shop drawings. The grille opening is 2 feet by 2 feet. What should the technician do?

A. Mount the detector on the return air grille frame because smoke will be drawn past it

B. Install the detector inside the return air opening above the grille for maximum smoke capture

C. Relocate the detector away from the return air grille and document the change for the as-builts

D. Install a duct detector in the return air opening instead of a standard ceiling smoke detector

8. A fire alarm technician has finished installing all wiring for a new system. Before energizing the panel, the technician performs megger testing on all circuits. On IDC Zone 3, the megger reads 2.5 MΩ between one conductor and ground. All other circuits read above 200 MΩ. What does the Zone 3 reading indicate?

A. The reading is normal because fire alarm circuits operate at low voltage with lower insulation requirements

B. The insulation on one conductor of Zone 3 is compromised and the circuit has a developing ground fault

C. The reading indicates a short circuit between the two conductors on Zone 3

D. The megger is applying too much test voltage and the reading is unreliable for fire alarm cables

9. A fire alarm technician is installing a fire alarm system in a multi-tenant office building. Each tenant space requires its own fire alarm zone for the smoke detectors. Tenant Suite 201 is 4,500 square feet with a smooth flat ceiling at 9 feet. How many spot-type smoke detectors are needed at minimum based on the default 30-foot spacing?

A. Four detectors based on ceiling area and 30-foot spacing grids

B. Two detectors because the total area is under 5,000 square feet

C. Six detectors to provide complete coverage with additional margin

D. The number depends on room dimensions and layout, not just total area

10. A fire alarm technician measures the voltage at a notification appliance at the far end of a NAC circuit during alarm activation. The meter reads 19.2 VDC. The appliances are listed for 16 to 33 VDC. Is this voltage acceptable?

A. Yes, 19.2 VDC is above the minimum listed operating voltage and the circuit is acceptable

B. No, the voltage must be at least 20.4 VDC which is 85% of the nominal 24 VDC source

C. Yes, but only if the voltage does not drop below 19.0 VDC when all appliances are operating

D. No, any voltage below 20 VDC during alarm indicates the conductors are undersized

11. A fire alarm technician is installing cable supports for a horizontal cable run in a ceiling space. The run is 120 feet long using multi-conductor fire alarm cable. The technician spaces cable supports every 5 feet. A coworker says the supports are too close together and are wasting time. What is the correct assessment?

A. The coworker is correct because fire alarm cable only needs support at junction boxes

B. The support interval depends on the cable type and applicable NEC article requirements

C. The technician is correct because all fire alarm cables require 4-foot maximum support spacing

D. Neither is correct because cable support intervals are determined by the AHJ, not the NEC

12. A fire alarm technician is installing a fire alarm panel in a new building. The panel will be wall-mounted in the main electrical room. The room also contains the building's main electrical switchgear, a 200-amp sub-panel, and a building automation system controller. What clearance requirement applies to the fire alarm panel installation?

A. The panel must maintain NEC-required working clearances for electrical equipment access

B. The panel must be in a separate room from the main electrical switchgear for safety

C. No clearance requirements apply because the fire alarm panel operates at low voltage only

D. The panel must be at least 10 feet from any equipment operating above 120 VAC

13. A fire alarm technician is installing a photoelectric smoke detector in a cold storage facility that maintains a temperature of 35°F. The detector manufacturer's specifications list an operating temperature range of 32°F to 120°F. Is this detector suitable for this environment?

A. No, smoke detectors cannot function in environments below 40°F under any conditions

B. Yes, but only if the detector is enclosed in a heated protective housing assembly

C. No, the cold temperature will cause condensation inside the detector triggering nuisance alarms

D. Yes, 35°F is within the manufacturer's listed operating temperature range for this detector

14. A fire alarm technician is installing a fire alarm system with 120 addressable devices on a single SLC loop. The panel manufacturer specifies a maximum loop length of 6,500 feet for the SLC wiring. The technician calculates the total SLC wire length at 5,800 feet. Is there a concern?

A. No, the wire length is within the maximum and the installation can proceed as designed

B. Yes, the wire length should not exceed 80% of the maximum to allow for future expansion

C. No concern about length, but the technician should verify the total device current does not exceed the SLC rating

D. Yes, the maximum loop length must be reduced by 10% for every 50 devices above 100

15. A fire alarm technician is installing devices in a building and reaches a room that the architect has labeled "Telephone Equipment Room" on the floor plan. The room contains racks of telecommunications equipment and an uninterruptible power supply. What type of detection is typically most appropriate for this space?

A. Heat detection because telecommunications equipment generates excessive electromagnetic interference

B. Smoke detection because early warning is critical for protecting high-value electronic equipment

C. Flame detection because electrical equipment fires produce visible flame before producing smoke

D. No detection is required because telecommunications rooms are classified as unoccupied utility spaces

16. A fire alarm technician is running conduit along the underside of a metal deck. The conduit must cross over a sprinkler branch line pipe. The technician plans to offset the conduit using two 45-degree bends to cross over the pipe. Each 45-degree bend adds approximately 4 inches of conduit length. How many total degrees do these two bends consume from the 360-degree maximum?

A. 90 degrees total — two 45-degree bends are counted individually toward the maximum

B. 45 degrees total because offset bends in the same plane count as a single bend

C. 0 degrees because bends less than 90 degrees are exempt from the maximum count

D. 180 degrees because each 45-degree bend is rounded up to 90 degrees for calculation

17. A fire alarm technician is installing a fire alarm panel and needs to connect the panel's chassis to the building's grounding electrode system. The NEC requires this equipment grounding connection for what primary purpose?

A. To enable the panel's ground fault detection circuitry to identify faults on field circuits

B. To provide a reference voltage for the SLC communication protocol signals

C. To reduce electromagnetic interference from building power systems on fire alarm circuits

D. To provide a low-impedance fault current path for personnel and equipment protection

18. A fire alarm technician is installing visible notification appliances in a corridor that has a suspended ceiling at 8 feet. The wall-mounted strobes will be mounted with the lens at 92 inches above the finished floor. The remaining distance to the ceiling is 4 inches. Per NFPA 72, does this mounting height comply?

A. No, the strobe must be at least 6 inches below the ceiling to avoid the dead air space

B. Yes, 92 inches is within the 80 to 96 inch range and at least 4 inches from the ceiling works

C. No, the strobe must be exactly at 80 inches for standardized visible coverage calculations

D. Yes, but only if the corridor width is less than 20 feet for the selected candela rating

19. A fire alarm technician needs to calculate the total ampere-hour requirement for a fire alarm system battery. The system's total standby current is 0.62 amps. What is the standby energy requirement for the standard 24-hour standby period, before adding alarm energy and the safety factor?

A. 1.488 Ah calculated by multiplying standby current by a 2.4-hour adjusted period

B. 62 Ah calculated by multiplying the standby current by 100 hours for maximum capacity

C. 14.88 Ah calculated by multiplying 0.62 amps by 24 hours

D. 24.62 Ah calculated by adding the standby current to the standby hours

20. A fire alarm technician is installing a conventional fire alarm system in a small building. The system has 6 zones. The technician connects all devices on Zone 1 and installs a 4.7 kΩ EOLR at the last device. Upon startup, the panel shows Zone 1 in normal status. The technician then removes one smoke detector head from its base on Zone 1. The panel should respond with what indication?

A. A trouble signal because removing the detector head opens the IDC circuit at that device

B. An alarm signal because removing a detector mimics the electrical change of a device activation

C. No change because the detector base maintains the circuit path even without the head

D. A supervisory signal because device removal is classified as a maintenance condition

21. A fire alarm technician is installing cable in a ceiling space and discovers that the space contains a fire sprinkler system with exposed piping. Some of the sprinkler heads are pendant-type, hanging below the ceiling grid. The technician must route cable past the sprinkler heads. What clearance consideration applies?

A. Fire alarm cable must maintain a minimum of 24 inches from all sprinkler heads

B. No minimum clearance is specified but cable must not interfere with sprinkler discharge patterns

C. Cable must not be routed within the sprinkler head's discharge pattern or obstruct the deflector

D. Fire alarm conduit must maintain 6 inches from sprinkler piping per the NEC

22. A fire alarm technician is installing fire alarm cable in a cable tray shared with power-limited security system cables. Both cable types are rated FPLP. Per NEC Article 760, is this shared cable tray installation acceptable?

A. No, fire alarm cables must always be in a dedicated cable tray separate from all other systems

B. Yes, power-limited fire alarm cables may share cable trays with other power-limited cables

C. No, because security system cables carry higher current than fire alarm signaling circuits

D. Yes, but only if the cable tray has a physical divider separating the two cable types

23. A fire alarm technician is installing an addressable system with both smoke detectors and monitor modules for waterflow switches. The panel has a single SLC loop. The technician programs address 045 for a smoke detector and address 046 for a waterflow switch monitor module. In the panel programming, what must be different about how these two addresses are configured?

A. Address 045 must be on a separate polling group from address 046 for signal prioritization

B. Both addresses must use identical programming because the panel treats all addresses equally

C. Address 046 must have a longer polling interval than address 045 for waterflow verification

D. Address 045 must be configured as an alarm point and address 046 must also be an alarm point

24. A fire alarm technician is installing conduit for a fire alarm system in a building with a concrete slab on grade. The conduit will run under the slab from the electrical room to a remote annunciator location 75 feet away. What type of conduit is typically used for underground installations beneath concrete slabs?

A. PVC Schedule 40 conduit which is moisture-resistant and appropriate for underground use

B. EMT conduit because it is the standard for all fire alarm installations regardless of location

C. Flexible metal conduit because it can navigate around subsurface obstructions

D. Rigid aluminum conduit because aluminum resists corrosion in underground applications

25. A fire alarm technician is installing a fire alarm system in a building with an unfinished basement. The basement has exposed concrete walls and an exposed concrete ceiling (underside of the first floor slab). The basement will be used for storage. Smoke detectors are specified for the basement. What mounting surface should be used for the detectors?

A. The detectors should be mounted directly on the concrete ceiling using appropriate anchors

B. The detectors must be mounted on the concrete walls within 12 inches of the ceiling

C. Temporary mounting brackets must be used because concrete ceilings require special bases

D. The detectors cannot be mounted until the ceiling is finished with drywall or acoustic tile

26. A fire alarm technician is installing a fire alarm system and encounters a room that has both a standard ceiling-mounted smoke detector and a separate ceiling-mounted heat detector. The smoke detector is on the SLC as an alarm point. The heat detector is connected through a monitor module as a separate alarm point. What is the advantage of having both detection types in the same room?

A. The two detectors create a cross-zone configuration that requires both to activate before alarm

B. Having two detectors doubles the polling rate on the SLC improving panel response time

C. The redundant detection allows the panel to compare both readings for alarm verification

D. The smoke detector provides early warning while the heat detector responds to fires that develop rapidly with minimal smoke

27. A fire alarm technician measures the AC voltage at the fire alarm panel's incoming power terminals and reads 108 VAC. The panel manufacturer specifies an acceptable input range of 110 to 127 VAC. What does this reading indicate?

A. The voltage is acceptable because 108 VAC is close to the minimum and will function normally

B. The voltage is acceptable because all panels can tolerate voltages as low as 100 VAC

C. The voltage is below the panel manufacturer's minimum specification and must be investigated

D. The reading is irrelevant because the panel converts AC to DC internally at any input voltage

28. A fire alarm technician is installing a Class B NAC circuit with 14 horn/strobes. The circuit starts at the panel and runs through a corridor, serving 7 devices in each of two parallel corridors. The technician wires the circuit by running from the panel to the first corridor, through all 7 devices, then jumping to the second corridor and continuing through the remaining 7 devices with the EOLR at the last device. Is this wiring topology acceptable for a Class B circuit?

A. No, each corridor must have its own NAC circuit with a separate EOLR for proper supervision

B. Yes, a Class B circuit may be wired in any topology as long as it starts at the panel and ends with the EOLR

C. No, Class B circuits must have equal numbers of devices on each branch for balanced loading

D. Yes, but only if the total current draw does not exceed 50% of the NAC output rated capacity

29. A fire alarm technician is installing a fire alarm system in a building and needs to mount a remote annunciator at the main entrance. The annunciator will display zone status information for arriving firefighters. Per code, at what height should the annunciator be mounted?

A. At a height determined by the panel manufacturer's installation instructions only

B. Between 42 and 48 inches above the floor matching the pull station mounting height

C. At eye level for a standing adult which is typically between 54 and 66 inches above floor

D. Per the AHJ's requirements and at a height accessible and readable by emergency responders

30. A fire alarm technician needs to verify that a newly installed 24 VDC NAC circuit can deliver adequate voltage to the farthest notification appliance. The circuit uses 12 AWG copper conductors with a round-trip distance of 800 feet. The total alarm current is 1.8 amps. Per NEC Chapter 9 Table 8, the resistance of 12 AWG copper is 1.98 ohms per 1,000 feet. What voltage will the farthest appliance receive?

A. 24.0 VDC because 12 AWG conductors have negligible resistance at this distance

B. 19.15 VDC which is below the minimum listed voltage for most notification appliances

C. 21.15 VDC which is above the minimum listed voltage and provides an adequate margin

D. 22.58 VDC which is the maximum voltage achievable with 12 AWG at this circuit length

31. A fire alarm technician is installing a fire alarm system in a daycare center. The building has small classrooms, a kitchen, a nap room for children, and administrative offices. The nap room is used for children sleeping during the day. What audible notification requirement applies to the nap room?

A. The 75 dB at the pillow sleeping area requirement applies because children sleep in this room

B. The standard 15 dB above ambient requirement applies because it is not a residential sleeping area

C. No audible notification is required in nap rooms because staff are responsible for waking children

D. A reduced 65 dB at the pillow requirement applies because children have more sensitive hearing

32. A fire alarm technician is installing an addressable system and needs to connect a conventional tamper switch from a sprinkler valve to the panel. The technician installs a monitor module at the valve location and connects the tamper switch's normally closed contacts to the module's input terminals. How should this monitor module be programmed in the panel?

A. As an alarm input because all sprinkler-related signals require immediate alarm response

B. As a supervisory input because tamper switch activations are supervisory conditions

C. As a trouble input because valve position changes indicate a system maintenance issue

D. As a waterflow input because the tamper switch is on the same sprinkler system

33. A fire alarm technician discovers that an existing building has no fire alarm system, but a new tenant is moving in and the building code now requires one. The building has old plaster walls and plaster ceilings with no suspended ceiling or accessible ceiling space. What installation challenge does this present?

A. All wiring can be concealed inside the plaster walls using standard fishing techniques

B. The building must have a suspended ceiling installed before fire alarm devices can be mounted

C. Wireless fire alarm devices must be used because conventional wiring is impossible in plaster

D. Surface-mounted conduit and device boxes are likely required because concealed routing is difficult

34. A fire alarm technician is wiring a conventional fire alarm system and installs smoke detectors on an IDC. After connecting the first three detectors, the technician tests the circuit at the panel and gets a normal reading showing the EOLR value. The technician then connects three more detectors and the panel reading changes to show a different resistance value. What is the most likely cause?

A. The additional detectors are drawing current that changes the circuit's total resistance reading

B. One of the three newly connected detectors has a wiring error creating a partial short

C. The additional wire length added by connecting more devices has increased the total resistance

D. The three new detectors are a different model that uses a different base resistance value

34. Continuing — A fire alarm technician is wiring a conventional system and notices that the panel's IDC resistance reading changed after adding three new detectors. All detectors are the same model. What is the most probable explanation?

A. The EOLR has been bypassed by the wiring of one of the new detectors

B. The panel is auto-calibrating to the additional devices on the circuit

C. Each detector adds a small amount of resistance that cumulatively changes the reading

D. One of the new detectors has a wiring error that is affecting the circuit resistance

35. A fire alarm technician is installing a fire alarm panel and discovers that the nearest electrical outlet for plugging in test equipment is 40 feet from the panel location. The technician brings a 100-foot extension cord. Per OSHA construction site requirements, what protection must the extension cord circuit have?

A. GFCI protection is required on all temporary power circuits used on construction sites

B. No additional protection is needed because the extension cord is less than 150 feet long

C. A fire extinguisher must be placed within 10 feet of any extension cord in use on site

D. The extension cord must be a hospital-grade cord with an isolated ground conductor

36. A fire alarm technician is installing a fire alarm system in a building with a large open atrium. The atrium extends from the ground floor through the fourth floor with a glass skylight roof at 65 feet. Standard spot-type smoke detectors are specified for the atrium ceiling. What concern should the technician raise about this specification?

A. Glass skylights prevent detector mounting because glass cannot support device weight

B. The atrium requires flame detectors instead of smoke detectors per NFPA 72

C. Spot detectors at 65 feet are impractical for maintenance and require special access equipment

D. Smoke may stratify well below the 65-foot ceiling making spot detectors at that height ineffective

37. A fire alarm technician is installing a duct smoke detector on a supply air duct. The duct is 48 inches wide. The manufacturer's installation guide specifies that the sampling tube must span the full width of the duct. The technician has a sampling tube that is 36 inches long. Can this tube be used?

A. Yes, a 36-inch tube covers 75% of the duct width which exceeds the minimum 50% requirement

B. No, the tube must span the full 48-inch duct width per the manufacturer's installation instructions

C. Yes, because the tube only needs to reach the center of the duct where airflow is strongest

D. No, but two 36-inch tubes can be installed side by side to cover the full width

38. A fire alarm technician is installing devices in a building with a metal roof deck and exposed steel bar joists. The technician is mounting a smoke detector base directly to the metal deck using self-drilling screws. What concern exists with this mounting method?

A. Self-drilling screws do not provide adequate pullout strength for detector mounting on metal deck

B. The screw penetration may compromise the roof deck's waterproofing membrane above

C. The metal deck may create a grounding path that interferes with the detector's SLC communication

D. Self-drilling screws generate metal shavings that can contaminate the detector's sensing chamber

39. A fire alarm technician is installing a fire alarm system in a small medical clinic. The clinic has a reception area, examination rooms, a laboratory, and a storage room for medical supplies. The design calls for smoke detectors throughout. In which room would a multi-criteria detector be most beneficial over a standard photoelectric detector?

A. The laboratory because chemical fumes and equipment operation may cause nuisance alarms with standard detectors

B. The reception area because the high foot traffic creates air currents that affect standard detectors

C. The storage room because the medical supplies generate particulate matter when handled

D. The examination rooms because hand sanitizer vapors can trigger standard smoke detectors

40. A fire alarm technician finishes installing a complete fire alarm system. The installation includes 95 addressable smoke detectors, 12 manual pull stations, 6 monitor modules, 4 control modules, 45 horn/strobes, and a DACT communicator. Before the system can be considered complete, what comprehensive test must be performed?

A. A 24-hour continuous monitoring test to verify the system operates without false alarms

B. A manufacturer's factory acceptance test conducted remotely via the panel's network connection

C. A code compliance audit performed by the fire alarm system designer before AHJ notification

D. An acceptance test where every device, function, and interface is individually tested and verified

41. A fire alarm technician is installing addressable devices and encounters a room where the construction drawings show a wall-mounted device at 48 inches above the floor. The device is a carbon monoxide detector that is part of the fire alarm system. What NEC article governs the wiring for this device if it is connected to the fire alarm panel's SLC?

A. NEC Article 725 because carbon monoxide detectors are classified as signaling devices

B. NEC Article 760 because the device is connected to the fire alarm panel's SLC circuit

C. NEC Article 760 governs the SLC wiring regardless of the individual device type connected to it

D. NEC Article 770 because carbon monoxide detection requires fiber optic communication

42. A fire alarm technician is running a conduit from the fire alarm panel in the basement to a remote annunciator on the first floor. The conduit passes through the basement ceiling (first floor assembly). At the first floor, the conduit emerges into a concealed wall cavity and runs horizontally to the annunciator location. Where in this run is firestopping required?

A. Only at the annunciator location where the conduit exits the wall cavity into the occupied space

B. At the point where the conduit penetrates the floor assembly between the basement and first floor

C. At every point where the conduit changes direction between the panel and the annunciator

D. Firestopping is not required because the conduit provides continuous fire protection for the cables

43. A fire alarm technician needs to install 10 smoke detectors in a large open office area that measures 60 feet by 45 feet with a smooth flat ceiling at 9 feet. Using the default 30-foot spacing, the technician lays out detectors in a grid pattern. What is the maximum distance from any point on the ceiling to the nearest detector per NFPA 72?

A. 21 feet which is 0.7 times the 30-foot listed spacing for spot-type smoke detectors

B. 30 feet which is the full listed spacing distance for spot-type smoke detectors

C. 15 feet which is half the listed spacing to account for the large open area configuration

D. 25 feet which is the adjusted spacing for ceilings between 8 and 10 feet in height

44. A fire alarm technician is installing a fire alarm system in a building that has an existing security alarm system. The security system uses its own control panel and dedicated wiring. The building owner asks if the fire alarm cable can share conduit with the security system wiring to reduce installation costs. What determines whether this sharing is permissible?

A. Sharing is always permitted because both systems are low-voltage life safety systems

B. Sharing is never permitted under any circumstance per NEC Article 760

C. Sharing depends on the security system's wire gauge relative to the fire alarm wire gauge

D. Sharing depends on whether the security wiring is classified as power-limited per the NEC

45. A fire alarm technician is installing a fire alarm system in a commercial kitchen. The kitchen has a Type I commercial exhaust hood over the cooking line with an integrated fire suppression system. The fire alarm system must monitor the suppression system. What interface devices are typically needed?

A. Smoke detectors installed inside the exhaust hood to detect cooking fires at the source

B. A monitor module connected to the suppression system's alarm contacts for signal reporting

C. Flame detectors mounted on the hood canopy to detect grease fires on the cooking surfaces

D. Heat detectors wired directly to the hood suppression system to trigger agent release

46. A fire alarm technician has completed a fire alarm installation in a new building. The general contractor asks whether the fire alarm system needs to be tested before the building can receive its certificate of occupancy. What is the correct answer?

A. Testing is optional if the installing contractor certifies in writing that the system was installed per code

B. Only a visual inspection is required for the certificate of occupancy; functional testing can wait

C. Yes, acceptance testing witnessed by the AHJ must be completed before occupancy is granted

D. Testing is required only if the building exceeds three stories or 10,000 square feet in area

DOMAIN 1.2 — MAINTENANCE (Questions 47–82)

47. A fire alarm technician arrives at a building to perform semiannual testing and discovers that the fire alarm panel displays three active trouble signals that have been present for over a month. The building owner says the troubles have been there "for a while" and asks the technician to proceed with the scheduled testing. How should the technician respond?

A. Proceed with testing as scheduled because trouble signals do not affect the testing process

B. Perform testing on the non-affected circuits only and return later to address the troubles

C. Contact the AHJ for guidance before touching the system because active troubles void the inspection

D. Address the existing trouble conditions first because unresolved troubles can affect test validity

48. During functional testing of an addressable fire alarm system, the technician activates a smoke detector at address 022. The panel displays "ALARM — SMOKE DETECTOR — ADDRESS 022 — JANITOR CLOSET." The technician is actually testing a detector in the main lobby, not the janitor closet. What corrective action is needed?

A. The location descriptor for address 022 must be corrected in the panel programming

B. The detector must be removed and reinstalled with a new address assignment

C. The SLC wiring must be traced to verify the conductor routing matches the drawings

D. The panel software must be updated because the device database has become corrupted

49. A fire alarm system in a restaurant generates nuisance alarms from a smoke detector near the kitchen entrance approximately three times per week. All alarms occur during peak cooking hours. The detector is a standard photoelectric type. What is the most appropriate corrective action?

A. Relocate the detector farther from the kitchen entrance to reduce cooking fume exposure

B. Replace the photoelectric detector with a multi-criteria or heat detector appropriate for the location

C. Install a protective cover over the detector to reduce the amount of cooking smoke entering the chamber

D. Increase the detector's alarm threshold in the panel programming to reduce its sensitivity

50. Per NFPA 72, when testing the communication link to a supervising station, the technician must verify that the station receives what specific information with each test signal?

A. The test signal content must include the correct building identification, signal type, and zone information

B. The station must only confirm that a signal was received without verifying the signal content

C. The correct account number and signal type must be verified along with the station's response time

D. Only the transmission time must be verified to ensure it falls within the required maximum

51. A fire alarm technician is performing annual testing on a voice evacuation system. The technician activates the system and listens to the pre-recorded message. The message is clearly audible and intelligible in most areas but cannot be heard at all in one stairwell. What is the most likely cause?

A. The stairwell's acoustic properties are absorbing the sound before it reaches all levels

B. The stairwell speakers are on a separate amplifier circuit that was not activated during testing

C. The stairwell concrete construction reflects the sound making it seem louder than it actually is

D. The speaker circuit serving the stairwell has a fault preventing audio delivery to those speakers

52. A fire alarm system has been in service for 7 years. Smoke detector sensitivity testing was performed at year 1, year 3, and year 5. The next sensitivity test is due at what year?

A. Year 7 following the alternate-year schedule established from the first year test

B. Year 8 because the interval extends after the third test is completed

C. Year 6 because the third test should have been at year 5 triggering annual testing

D. Year 9 because the interval changes to every 4 years after three consecutive tests

53. During annual testing of emergency control functions, the fire alarm technician activates a smoke detector in an elevator lobby. The elevator recall relay activates and the elevators begin traveling to the recall floor. However, one elevator stops between floors and does not complete its travel. What should the technician document?

A. The fire alarm system interface is functioning correctly because the recall signal was sent

B. The elevator that stopped between floors failed to complete recall and must be investigated

C. The stuck elevator is a mechanical issue that does not affect the fire alarm system test

D. The test must be repeated after the stuck elevator is freed to verify proper recall function

54. A fire alarm technician is performing semiannual testing on smoke detectors in an elementary school. To minimize disruption, the principal requests that all testing be done during a single school day. The building has 180 smoke detectors. Is it feasible to test all 180 detectors in a single day while maintaining test quality?

A. Yes, but only if two technicians work simultaneously testing 90 detectors each

B. No, NFPA 72 limits semiannual testing to a maximum of 50 detectors per day

C. Yes, if the technician maintains a systematic approach testing approximately 20 detectors per hour

D. The feasibility depends on the building layout, system type, and the technician's testing efficiency

55. A fire alarm system generates a trouble signal for "GROUND FAULT — NAC 2." The technician uses a megger to test NAC 2 with all devices disconnected. The megger reads 180 MΩ between conductor 1 and ground, and 175 MΩ between conductor 2 and ground. Both readings are above the minimum acceptable threshold. What should the technician do next?

A. Clear the trouble at the panel because the megger readings indicate no ground fault exists

B. Replace the panel's NAC 2 output board because the ground fault detection may be hypersensitive

C. Reconnect the devices one at a time and megger after each to identify which device has the fault

D. Document the readings and return in one week to retest the circuit for intermittent faults

56. During a fire alarm inspection, the technician discovers that several notification appliances have been removed from the walls during a building renovation. The renovation contractor painted the walls and did not reinstall the devices. What must be documented?

A. The missing notification appliances are a critical deficiency that must be reinstalled immediately

B. The renovation contractor is liable for the missing devices and must be contacted directly

C. The painted walls improve aesthetics and the devices can be reinstalled during the next testing visit

D. Only the devices in occupied areas need reinstallation; devices in unoccupied areas can wait

57. A fire alarm technician is testing the panel's response to a ground fault on an IDC. The technician intentionally creates a ground fault on Zone 4 by connecting one conductor to the conduit with a jumper wire. The panel should respond with what indication?

A. An alarm signal for Zone 4 because ground faults on IDCs are treated as alarm conditions

B. A trouble signal for Zone 4 because ground faults are supervisory conditions that impair the circuit

C. A supervisory signal for Zone 4 because ground faults indicate equipment in an off-normal state

D. No response because modern panels cannot detect ground faults on individual zone circuits

58. A fire alarm system in a hotel has 400 smoke detectors. During semiannual testing, the technician discovers that 6 detectors on the 12th floor fail to activate when tested with approved aerosol smoke. All other detectors in the building pass. What is the most likely common cause for these 6 failures?

A. The SLC circuit serving the 12th floor has insufficient voltage to properly power the detectors

B. All 6 detectors were manufactured in the same production batch with a common defect

C. The 12th floor detectors are a different model than the rest of the building's detectors

D. Environmental contamination on the 12th floor has degraded the sensing chambers of these detectors

59. A fire alarm technician discovers during inspection that the fire alarm panel's AC power indicator is off. The panel appears to be running on battery power. The technician checks the dedicated branch circuit breaker at the electrical panel and finds it in the ON position. The technician measures voltage at the breaker and reads 121 VAC. What should the technician investigate next?

A. The battery connections because low battery voltage can cause the AC indicator to malfunction

B. The panel's internal fuse or power supply because AC is present at the breaker but not reaching the panel

C. The wiring between the breaker and the panel for a break or disconnection in the circuit

D. The panel manufacturer's technical support for a remote diagnostic of the power supply circuit

60. Per NFPA 72, the fire alarm system must generate a trouble signal for loss of primary AC power within what maximum time frame?

A. Within 3 hours of primary AC power loss to prevent nuisance trouble signals from brief outages

B. Immediately upon any interruption of primary AC power regardless of duration

C. Within 1 hour of sustained AC power loss as a compromise between prompt and nuisance-free reporting

D. Within 24 hours to match the secondary battery standby duration requirement

61. A fire alarm technician is troubleshooting a conventional fire alarm panel. Zone 8 shows a trouble condition. The technician disconnects the Zone 8 field wiring at the panel terminals. The trouble clears. The technician then reconnects the wiring and the trouble returns. The technician measures the voltage across the Zone 8 terminals with the field wiring connected and reads 0.2 VDC. What type of fault is most likely present?

A. An open circuit on Zone 8 because the voltage reading should be higher on a supervised circuit

B. A short circuit on Zone 8 because the near-zero voltage indicates the conductors are connected together

C. A ground fault on Zone 8 because the voltage reading is affected by current leaking to ground

D. The panel's Zone 8 input board has failed because it is not outputting supervision voltage

62. During annual testing, the fire alarm technician tests the door holder release function. A smoke detector near a fire-rated door activates and the panel displays the alarm. The magnetic door holder releases and the door begins to close. However, the door stops 6 inches from fully closing because a doorstop has been placed behind the door by building maintenance. What should be documented?

A. The fire alarm interface test passed because the magnetic holder released as programmed

B. The door closer spring tension must be increased to overcome the resistance of the doorstop

C. The doorstop placement is a building maintenance issue that does not affect fire alarm testing

D. The doorstop prevents the fire door from fully closing and must be removed to maintain fire compartmentalization

63. A fire alarm technician is reviewing a panel's event log during an inspection. The log shows 147 "ALARM — WATERFLOW" events over the past 6 months. The building has had no actual fires. No sprinkler heads have been found activated. What is the most probable cause of these frequent waterflow alarms?

A. The waterflow switch has a manufacturing defect in its paddle mechanism

B. The waterflow switch retard setting is too short to filter out pressure-related paddle movements

C. Water pressure surges in the sprinkler system are causing brief paddle movements triggering the switch

D. The fire alarm panel has a software error generating false waterflow events in the log

64. A fire alarm technician measures the voltage at the panel's battery terminals and reads 27.4 VDC with the charger connected and the system in normal standby. The technician's coworker says the charger is overcharging the batteries. Is this assessment correct?

A. No, 27.4 VDC is a normal float charge voltage for a 24 VDC sealed lead-acid battery system

B. Yes, any voltage above 26 VDC indicates the charger is operating above its rated output

C. No, but only because the batteries are new and require a higher initial charging voltage

D. Yes, the maximum safe float voltage for a 24 VDC SLA battery pair is 26.8 VDC

65. During testing, a fire alarm technician activates a pull station and the panel correctly displays the alarm. The horn/strobes activate. The technician calls the supervising station, which reports receiving a "trouble" signal rather than an "alarm" signal. What is the most likely cause?

A. The panel processed the alarm correctly but the communication module transmitted the wrong event code

B. The communication module is transmitting alarm signals from the wrong building account

C. The telephone line has noise that corrupted the alarm signal into a trouble signal during transmission

D. The pull station generated both an alarm and trouble signal simultaneously confusing the communicator

66. Per NFPA 72 Table 14.4.3.2, what is the required testing frequency for emergency control functions such as elevator recall and HVAC shutdown?

A. Semiannually to match the smoke detector testing frequency schedule

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

C. Annually as part of the comprehensive system functional test

D. Only during acceptance testing with verification during each annual visual inspection

67. A fire alarm system in a warehouse generates a trouble signal reading "SLC 1 — DEVICE REMOVED — ADDRESS 078." The technician visits the device location and finds that the smoke detector head is properly seated in its base. What other cause could generate a "device removed" trouble?

A. The detector head's address setting does not match the address the panel expects at that physical location

B. The SLC wiring at this device has an intermittent connection preventing reliable communication

C. The detector model installed at address 078 is not in the panel's supported device database

D. The detector at this address has reached end of life and its internal processor has stopped responding

68. During a fire alarm inspection, the technician notices that the building's fire alarm system testing records show that sensitivity testing has been performed using only the panel's built-in sensitivity reports. Physical sensitivity testing with a calibrated instrument has never been performed. Per NFPA 72, is this approach acceptable for an analog addressable system?

A. Yes, NFPA 72 permits the use of panel sensitivity reports as an acceptable sensitivity testing method

B. No, physical testing with a calibrated instrument is required in addition to panel reports

C. Yes, but only for the first five years after installation, after which physical testing is required

D. No, panel reports are informational only and cannot substitute for physical calibrated testing

69. A fire alarm technician is performing a semiannual battery visual inspection. The technician finds that one battery in a series pair has a slightly swollen case but no visible leakage. The other battery appears normal. The technician performs a load test and both batteries maintain adequate voltage during the test. Should the batteries be replaced?

A. No, since the load test passed, the batteries can remain in service until the next scheduled test

B. Yes, a swollen case indicates internal degradation and both batteries should be replaced as a pair

C. No, only the swollen battery needs replacement while the normal battery can remain in service

D. Yes, but replacement can be deferred for 30 days if the load test results are documented

70. A fire alarm system displays "TROUBLE — COMM FAILURE" indicating loss of communication with the supervising station. The system uses an IP communicator connected to the building's data network. The technician checks the communicator and finds the network cable is disconnected. After reconnecting the cable, the trouble clears within 5 minutes. What should the technician investigate?

A. Whether the panel needs a firmware update to prevent future communication failures

B. Whether the supervising station's receiving equipment needs reconfiguration for the account

C. Why the network cable was disconnected and whether the connection is properly secured

D. Whether the IP communicator should be replaced with a cellular unit for better reliability

71. A fire alarm technician is inspecting a fire alarm system and discovers that the panel's internal clock shows 2:15 PM when the actual time is 3:45 PM — a 90-minute discrepancy. Why is this a concern?

A. Inaccurate timestamps in the event log compromise incident investigation and regulatory documentation

B. The clock discrepancy will cause the panel to activate notification appliances at incorrect times

C. A 90-minute time error indicates the panel's processor is failing and must be replaced

D. The clock discrepancy prevents the panel from communicating correctly with the supervising station

72. During annual testing, the fire alarm technician tests a horn/strobe and observes that the temporal-three pattern sounds correct but the strobe does not flash during alarm. The technician measures voltage at the device terminals and reads 23.8 VDC during alarm. What is the most likely cause?

A. The voltage is too low for the strobe component to operate at its rated candela output

B. The panel programming has disabled the visible output for this specific notification appliance

C. The NAC circuit polarity is reversed which allows the horn to operate but not the strobe

D. The strobe component within the combination device has failed and the device requires replacement

73. A fire alarm technician discovers during inspection that a building has had two renovations in the past three years. Each renovation added devices and modified the fire alarm system. The as-built drawings have not been updated since the original installation. What impact does this have?

A. The outdated drawings do not affect system operation since the panel programming is current

B. The drawings must be updated because outdated documentation impairs maintenance and troubleshooting

C. Only the panel programming records need updating since they contain all current device information

D. The drawings can remain as-is because annual testing records document all system changes

74. A fire alarm technician is testing notification appliances during annual testing. In a large conference room, two wall-mounted strobes are installed — one on the east wall and one on the west wall. During the test, both strobes flash but they are clearly out of synchronization. What code requirement does this violate?

A. The flash rate requirement that limits strobes to between 1 and 2 flashes per second

B. The candela output requirement that both strobes must have identical ratings in the same room

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

D. The mounting height requirement that both strobes must be at the same elevation above the floor

75. A fire alarm system in an office building has been in service for 10 years without any major modifications. The building owner asks whether the entire system needs to be replaced due to its age. What guidance does NFPA 72 provide?

A. NFPA 72 requires complete system replacement every 10 years regardless of condition

B. NFPA 72 requires complete system replacement every 15 years for all commercial occupancies

C. NFPA 72 does not mandate system replacement based on age — the system must be properly maintained and tested

D. NFPA 72 requires the panel to be replaced at 10 years but allows detectors to remain indefinitely

76. During a fire alarm inspection, the technician discovers that the building owner has installed a wall-mounted flat-screen monitor directly over the fire alarm control panel. The monitor covers the panel's LCD display and several indicator LEDs. What must be documented?

A. The monitor obstructs access to the panel display and must be relocated for proper panel visibility

B. The monitor can remain if it is on a swing arm that allows it to be moved when panel access is needed

C. The obstruction does not affect system operation because the panel operates automatically

D. Only the LCD display needs to be visible; indicator LEDs are supplementary and may be covered

77. A fire alarm technician is testing a tamper switch on a sprinkler system post indicator valve (PIV). The technician turns the PIV operating nut two full revolutions toward the closed position. The panel does not generate a supervisory signal. What should be documented?

A. The test is acceptable because PIV tamper switches require three full revolutions to activate

B. The tamper switch has failed its functional test and must be adjusted, repaired, or replaced

C. The PIV tamper switch is exempt from the two-revolution requirement and uses a different standard

D. The test must be repeated by fully closing the PIV before determining whether the switch has failed

78. A fire alarm technician is performing the annual battery load test. The manufacturer's test procedure requires applying the full system alarm load to the batteries for a specific duration while monitoring voltage. The batteries start at 26.6 VDC. After the specified duration under load, the batteries read 19.8 VDC. The minimum acceptable end-voltage for this panel is 20.4 VDC. Do the batteries pass?

A. Yes, 19.8 VDC exceeds the minimum 18 VDC threshold for all fire alarm battery systems

B. Yes, the 0.6 VDC difference is within the acceptable measurement tolerance of most meters

C. No, because any voltage drop during a load test greater than 6 volts indicates battery failure

D. No, 19.8 VDC is below the minimum acceptable end-voltage of 20.4 VDC for this panel

79. A fire alarm system generates a trouble signal that reads "SLC 1 — SHORT CIRCUIT." The technician disconnects SLC 1 at the panel and the trouble clears. The technician reconnects the first half of the SLC and the trouble remains clear. The technician adds the second half and the short trouble returns. What is the next troubleshooting step?

A. Divide the second half at its midpoint and test each quarter independently to narrow the fault location

B. Replace all devices on the second half of the SLC because one device has an internal short

C. Megger test the second half conductors with devices connected to identify the shorted section

D. Check the panel's SLC output board because intermittent shorts indicate a panel-level fault

80. During annual testing of a fire alarm system, the technician activates a smoke detector near a fire-rated door with a magnetic holder. The panel displays the alarm, notification appliances activate, and the magnetic holder releases. The door closes completely. The technician resets the system and observes that the magnetic holder re-energizes and holds the door open again. Is this the expected behavior?

A. No, the door must remain closed after a fire alarm until building management manually props it open

B. Yes, but only if the door is equipped with an automatic door closer rated for fire-door applications

C. Yes, the magnetic holder re-energizes when the system resets, which is normal operation

D. No, magnetic holders should remain de-energized until the fire department gives an all-clear signal

81. A fire alarm technician is reviewing the inspection and testing records for a building and notices that the records show "N/A" (not applicable) for several smoke detectors that were not tested during the last semiannual inspection. The reason noted is "detectors inaccessible due to furniture." What must be documented?

A. The inaccessible detectors must be tested and the building owner must provide access at the next opportunity

B. Marking detectors as N/A is acceptable practice when physical access is temporarily restricted

C. The untested detectors are automatically considered as passed if they were tested during the previous cycle

D. The technician should have tested the detectors regardless of furniture placement in the area

82. Per NFPA 72, what document must be updated whenever the fire alarm system undergoes a modification such as adding devices, changing programming, or expanding circuit coverage?

A. Only the panel's internal programming log because it automatically records all changes

B. The as-built drawings and the Record of Completion must both be updated to reflect changes

C. Only the inspection and testing records need updating to show the modification date

D. The system's warranty documentation must be updated with the manufacturer for support

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

83. A fire alarm technician is reviewing a NAC loading calculation on a shop drawing. The calculation shows 12 horn/strobes at 0.295 amps each for a total of 3.54 amps. The NAC output is rated at 3.0 amps. What must the designer do before this circuit can be installed?

A. Redesign the circuit by splitting devices across two NAC outputs or adding a booster power supply

B. Request an increased NAC output rating from the panel manufacturer for this specific installation

C. Proceed with installation because the 20% safety factor in battery calculations compensates

D. Install 12 AWG conductors instead of 14 AWG to increase the circuit's current-carrying capacity

84. A fire alarm floor plan shows a room measuring 40 feet by 30 feet. The drawing shows two wall-mounted strobes — one on the 40-foot wall and one on the 30-foot wall. Per NFPA 72 Table 18.5.5.5.1(a), the technician needs to verify whether the candela ratings shown on the drawing are adequate. What room dimension determines the required candela for each strobe?

A. The distance from each strobe to the center of the room determines the candela requirement

B. The total room perimeter divided by the number of strobes determines the candela requirement

C. The square footage of the room determines a single candela requirement for all strobes

D. Each strobe's coverage area based on the room geometry determines its individual candela requirement

85. A fire alarm riser diagram shows a notation "CLASS A — PATHWAY SURVIVABILITY LEVEL 2" next to the SLC loop serving a high-rise building's voice evacuation system. What does this notation require for the SLC installation?

A. The SLC must use FPLP cable installed in standard EMT conduit throughout the building

B. The SLC must be protected by 2-hour fire-rated construction or 2-hour rated cable with a loop return path

C. The SLC must use armored cable with a separate ground conductor for each device connection

D. The SLC must be installed in rigid metal conduit with firestop at every floor penetration

LEVEL I — SIMULATION EXAM 8: ANSWER KEY AND EXPLANATIONS

1. A — NFPA 72 Section 10.5 requires that all devices connected to a fire alarm system be listed for use with the specific control panel or listed as compatible. Installing detectors from one manufacturer on a panel from another without verified compatibility can result in communication failures, incorrect readings, and unreliable operation. Always verify listing compatibility before installation.

2. D — When fire alarm cable passes through a hole in a metal stud, the sharp edges of the drilled or punched hole can cut into the cable jacket and conductor insulation. NEC Section 300.4 requires a listed bushing or grommet to protect conductors from the sharp metal edges. This protection prevents insulation damage that could cause ground faults or short circuits over time.

3. D — NFPA 72 Section 10.6.7.2 permits the secondary battery standby duration to be reduced from 24 hours to 4 hours when the primary power supply is backed by a qualifying emergency generator with automatic start, automatic transfer, and adequate fuel capacity. A 72-hour fuel supply exceeds the minimum fuel requirement, qualifying this installation for the reduced battery duration.

4. B — Lock-on devices are required on all fire alarm panel dedicated branch circuit breakers per NEC Article 760, regardless of building type, height, or system size. The lock-on device prevents the breaker from being accidentally turned off, ensuring the fire alarm panel's primary power supply remains continuously energized during normal building operation.

5. A — An isolator module segments the SLC so that a short circuit fault on one section of the loop does not disable communication on the other sections. Without isolators, a single short circuit on the SLC could prevent the panel from communicating with all devices on the entire loop. Isolator modules limit the impact of a fault to the section between two isolators.

6. C — The default listed spacing for spot-type smoke detectors on smooth, flat ceilings is 30 feet per NFPA 72 Chapter 17. This spacing applies to corridor installations the same as any other space with a smooth flat ceiling. NFPA 72 does not impose a reduced spacing requirement specifically for hotel corridors or sleeping occupancy corridors.

7. C — A return air grille creates a strong air current that can pull smoke away from a detector mounted near the opening, preventing smoke from entering the sensing chamber. The detector must be relocated away from the return air grille to a location where smoke can accumulate naturally at the ceiling without interference from the air handling system's return air intake.

8. B — A megger reading of 2.5 MΩ between a conductor and ground is significantly lower than the 200+ MΩ readings on all other circuits, indicating compromised insulation on Zone 3. This low reading reveals a developing ground fault — likely from damaged insulation caused during cable pulling, a staple penetrating the jacket, or moisture contamination. The fault must be located and repaired before the system is energized.

9. D — The number of smoke detectors required depends on the room's specific dimensions and layout — not just the total square footage. A room that is 90 feet long by 50 feet wide requires a different detector grid than a room that is 67 feet by 67 feet, even though both are approximately 4,500 square feet. The technician must lay out detectors on a grid based on the 30-foot spacing applied to the actual room dimensions.

10. A — A voltage reading of 19.2 VDC is above the minimum listed operating voltage of 16 VDC for the notification appliances. The device will operate within its listed parameters at this voltage and produce its rated sound and light output. While the margin is modest, the circuit meets the code requirement as long as the voltage remains above 16 VDC under all operating conditions.

11. B — Cable support intervals depend on the specific cable type being installed and the applicable NEC article governing that cable designation. Different cable types may have different maximum support intervals. The technician should verify the manufacturer's installation instructions and the applicable NEC section for the specific fire alarm cable being used to determine the correct support spacing.

12. A — Fire alarm panels are electrical equipment that must comply with NEC working clearance requirements per Article 110.26. These clearances ensure that technicians have adequate space to safely access the panel for installation, maintenance, troubleshooting, and emergency operations. The panel must not be installed in a location where other equipment blocks the required working space.

13. D — The detector's manufacturer specifies an operating temperature range of 32°F to 120°F. At 35°F, the cold storage facility temperature falls within this listed range. The detector is suitable for this environment based on the manufacturer's published specifications. Operating a detector outside its listed temperature range would be a code violation and could result in unreliable performance.

14. C — While the wire length of 5,800 feet is within the manufacturer's 6,500-foot maximum, the technician should also verify that the total standby and alarm current draw of all 120 devices does not exceed the SLC's rated current capacity. SLC loops have both length and current limitations, and exceeding either can cause communication failures and unreliable device operation.

15. B — Telecommunications equipment rooms contain high-value electronic equipment that is susceptible to fire damage. Smoke detection provides the earliest possible warning, allowing staff to respond before a developing fire causes significant equipment damage. Heat detectors respond

too slowly to protect sensitive electronics, and the environment does not typically generate nuisance conditions for properly placed smoke detectors.

16. A — Each 45-degree bend counts individually toward the 360-degree maximum between pull points. Two 45-degree bends consume 90 degrees total (45 + 45 = 90). All bends — regardless of angle — count toward the cumulative 360-degree maximum. There is no exemption for bends less than 90 degrees.

17. D — The equipment grounding connection provides a low-impedance fault current path from the panel enclosure back to the electrical service entrance. If a fault occurs — such as a hot conductor contacting the metal enclosure — the fault current flows through the grounding conductor and trips the circuit breaker, removing the shock hazard. This is the primary safety purpose of equipment grounding per NEC Article 250.

18. B — NFPA 72 Section 18.5.5.1 requires wall-mounted visible notification appliances to have their entire lens between 80 and 96 inches above the finished floor, or at least 6 inches below the ceiling, whichever is lower. At 92 inches with a 96-inch ceiling, the lens is within the 80-96 inch range and 4 inches from the ceiling. While 6 inches below ceiling is preferred, the mounting meets the primary height range requirement.

19. C — Standby energy is calculated by multiplying the total standby current by the standby duration: 0.62 amps × 24 hours = 14.88 ampere-hours. This represents the energy the batteries must provide during 24 hours of normal non-alarm operation. The alarm energy and 20% safety factor are added to this value in subsequent calculation steps.

20. A — In most conventional fire alarm systems, removing a smoke detector head from its twist-lock base breaks the IDC circuit path at that device location. This creates an open circuit condition that the panel detects as a loss of the EOLR supervision reference. The panel responds by generating a trouble signal for that zone, indicating a circuit integrity problem.

21. C — Fire alarm cable routed in ceiling spaces with sprinkler piping must not obstruct the sprinkler heads' discharge pattern or interfere with the deflector. Cable or conduit positioned too close to a sprinkler head can block the water spray pattern, creating gaps in fire suppression coverage. NFPA 13 and the IBC establish clearance requirements around sprinkler heads that must be respected.

22. B — NEC Section 760.136 permits power-limited fire alarm cables to share cable trays with other power-limited cables. Both FPLP fire alarm cable and power-limited security cables can coexist in the same cable tray because they are both classified as power-limited circuits. The separation requirements in Article 760 apply to separating fire alarm circuits from power and Class 1 circuits — not from other power-limited systems.

23. D — Both the smoke detector at address 045 and the waterflow switch monitor module at address 046 should be programmed as alarm points. Smoke detectors generate alarm signals for fire conditions, and waterflow switches generate alarm signals indicating sprinkler head activation.

Tamper switches are the devices that generate supervisory signals — waterflow switches are alarm devices.

24. A — PVC Schedule 40 conduit is the standard choice for underground installations beneath concrete slabs. PVC is moisture-resistant, corrosion-resistant, and designed for direct burial and under-slab applications. EMT is not suitable for underground use because it corrodes, and flexible metal conduit lacks the structural rigidity needed for concrete encasement.

25. A — Smoke detectors can be mounted directly on concrete ceilings using appropriate anchors such as tapcon screws or concrete expansion anchors. An unfinished basement with an exposed concrete ceiling does not require a finished surface for detector mounting. The detectors must be installed per NFPA 72 spacing and placement rules regardless of whether the ceiling is finished or exposed.

26. D — Having both smoke and heat detection in the same room provides complementary coverage. The smoke detector provides early warning for smoldering fires that produce significant smoke before flames develop. The heat detector responds to fires that develop rapidly with intense heat but minimal initial smoke — such as a flammable liquid fire or an electrical arc fire. Together, they cover a broader range of fire scenarios.

27. C — The measured voltage of 108 VAC falls below the panel manufacturer's minimum specified input range of 110 VAC. Operating the panel below its rated input voltage can cause power supply instability, charging circuit malfunction, and unreliable system operation. The cause of the low voltage must be investigated — possible causes include an undersized branch circuit, excessive voltage drop in the supply wiring, or a utility voltage problem.

28. B — A Class B NAC circuit can be wired in any linear topology as long as it originates at the panel's NAC output and terminates with the EOLR at the last device. The circuit can serve devices in multiple corridors, rooms, or areas in any sequence. The key requirement is that the circuit has a single path from the panel to the EOLR with all devices connected along that path.

29. D — Remote annunciator mounting height is typically determined by the AHJ's requirements and practical considerations — the annunciator must be at a height where arriving firefighters can read the display and operate any controls without obstruction. There is no single NFPA 72 requirement specifying the exact mounting height for annunciators. The AHJ's requirements and accessibility for emergency responders drive the installation height.

30. C — Wire resistance = 800 feet × (1.98 / 1000) = 1.584 ohms. V_drop = 1.8 amps × 1.584 ohms = 2.85 volts. Voltage at farthest device = 24 − 2.85 = 21.15 VDC. This voltage is above the typical 16 VDC minimum listed operating voltage with a comfortable 5.15-volt margin, confirming the 12 AWG conductors are adequate for this circuit length and current.

31. A — The 75 dB at the pillow sleeping area requirement per NFPA 72 Section 18.4.5.1 applies to any room where people sleep — including daycare nap rooms where children sleep during the day. The code makes no distinction between nighttime sleeping rooms and daytime nap rooms. The

notification system must produce 75 dB at the pillow location to ensure sleeping occupants are awakened.

32. B — Tamper switches generate supervisory signals — not alarm signals — when a sprinkler control valve is moved from its normal position. The monitor module must be programmed as a supervisory input in the panel so that a valve position change produces the correct signal type. Programming it as an alarm input would cause unnecessary building alarm activation and fire department dispatch for a valve position change.

33. D — Old plaster walls and ceilings without suspended ceilings or accessible ceiling spaces make concealed wiring installation extremely difficult. Fishing wires through plaster walls is unreliable and risks damaging the plaster. Surface-mounted conduit and device boxes are typically the most practical installation method in these buildings, providing visible but protected wiring pathways.

34. C — In conventional fire alarm systems, each smoke detector adds a small amount of internal resistance to the IDC when it is connected. As more devices are wired onto the circuit, the cumulative resistance of the conductors and device internal components increases slightly, changing the total resistance the panel sees at its terminals. This is normal behavior and the panel is designed to accommodate it within its supervision range.

35. A — OSHA 29 CFR 1926.405 requires ground-fault circuit interrupter (GFCI) protection on all 125-volt, single-phase, 15- and 20-ampere temporary power receptacles and extension cords used on construction sites. This requirement applies to all power tools and extension cords regardless of their length or the type of work being performed.

36. D — At 65 feet, smoke rising from a fire at the ground level may cool and decelerate before reaching the ceiling, potentially stratifying at a height well below the skylight. Spot-type smoke detectors mounted at the 65-foot ceiling may never receive smoke from a fire below due to this stratification effect. Alternative detection methods — such as beam detectors at multiple elevations or aspirating systems — should be considered.

37. B — The duct detector manufacturer's installation instructions specify that the sampling tube must span the full width of the duct to ensure air is sampled across the entire cross-section. A 36-inch tube in a 48-inch duct leaves 12 inches of the duct unsurveyed, creating a gap where smoke could pass undetected. The correct tube length — or a tube configuration specified for the 48-inch duct width — must be used.

38. C — Mounting a detector directly to a metal deck using self-drilling screws can create an unintended grounding path between the detector base and the building's structural steel. This grounding connection can interfere with the SLC communication by creating ground loops or parasitic current paths that affect the panel's ability to communicate reliably with the detector. An insulating mounting plate or listed mounting method should be used.

39. A — The laboratory is the most likely location for nuisance alarms from a standard photoelectric detector due to chemical fumes, reagent vapors, and equipment exhaust that can enter the sensing chamber. A multi-criteria detector analyzing smoke, heat, and CO inputs simultaneously can distinguish these environmental conditions from real fire signatures, significantly reducing false alarms while maintaining detection reliability.

40. D — NFPA 72 Section 14.4.1 requires that acceptance testing verify every device, every function, and every interface in the fire alarm system. This means every smoke detector, every pull station, every horn/strobe, every control module output, every emergency control function, and every communication link must be individually tested and verified before the system is accepted.

41. C — NEC Article 760 governs the wiring of fire alarm systems, including all circuits connected to the fire alarm control panel's SLC. When a carbon monoxide detector is connected to the fire alarm panel's SLC, the SLC wiring is classified as a fire alarm circuit under Article 760 regardless of the individual device type. The article governs the circuit, not the individual device.

42. B — Firestopping is required at the point where the conduit penetrates the floor assembly between the basement and the first floor. This penetration passes through a fire-rated floor assembly, and the opening around the conduit must be sealed with an approved firestop to prevent fire and smoke from traveling between floors. Horizontal runs within concealed wall cavities on the same floor do not typically require firestopping.

43. A — NFPA 72 requires that no point on the ceiling be more than 0.7 times the listed spacing from the nearest detector. For a 30-foot listed spacing: $0.7 \times 30 = 21$ feet maximum from any ceiling point to the nearest detector. This ensures that smoke traveling along the ceiling can reach a detector within the response time window needed for effective early warning.

44. D — Whether fire alarm cable can share conduit with security system cable depends on the electrical classification of the security wiring per the NEC. If the security system wiring is classified as power-limited (under NEC Article 725), sharing may be permitted under specific conditions in NEC Section 760.136. If the security wiring is classified as power or Class 1, sharing is prohibited.

45. B — The fire alarm system monitors the commercial kitchen hood suppression system through a monitor module connected to the suppression system's alarm contacts. When the suppression system activates — releasing agent onto the cooking line — the alarm contacts close and the monitor module reports the activation to the fire alarm panel. The fire alarm system monitors the suppression system; it does not control or trigger its release.

46. C — Acceptance testing witnessed by the AHJ or the AHJ's designated representative must be completed before the building can receive its certificate of occupancy. NFPA 72 Section 14.4.1 requires acceptance testing to verify that every component and function of the fire alarm system operates correctly. The building cannot be legally occupied until the fire alarm system is tested and approved.

47. D — Active trouble signals indicate existing system faults that could affect the validity of testing results. A ground fault, an open circuit, or a communication failure on one circuit may impact the behavior of other circuits during testing. Addressing the existing troubles first ensures the system is in a known baseline condition before testing begins, producing reliable and meaningful test results.

48. A — The functional test verified every element of the complete signal chain: the smoke detector activated, the panel correctly identified the device by address and location, the notification appliances activated on the correct floors per the sequence of operations, and the supervising station received and confirmed the alarm signal. All required components of a complete functional test have been verified.

49. D — The ground fault cleared with SLC 2 fully disconnected. It remained clear with only the first half connected. It returned when the second half was added. This conclusively proves the fault is located on the second half of SLC 2. The technician should now divide the second half to further isolate the specific section containing the ground fault.

50. C — When testing the communication link, the technician must verify that the supervising station receives the correct account number (identifying the building), the correct signal type (alarm, supervisory, or trouble), and must confirm the station's response time falls within acceptable parameters. Simply confirming signal receipt without verifying content does not constitute a complete communication test.

51. D — If the pre-recorded message is audible and intelligible on all other floors but completely absent in one stairwell, the most likely cause is a fault on the speaker circuit serving that stairwell. The speakers may have an open circuit in the wiring, a disconnected amplifier connection, or a blown amplifier output channel. The specific circuit must be traced and the fault identified and repaired.

52. A — NFPA 72 Table 14.4.3.2 requires sensitivity testing within one year of installation and every alternate year thereafter. Following the schedule from the initial test: year 1, year 3, year 5, year 7, year 9, and so on. The next test after year 5 is due at year 7, continuing the consistent alternate-year cycle.

53. B — The fire alarm system correctly sent the recall signal and the elevators began responding. An elevator that stops between floors during recall has failed to complete the recall function. This is a deficiency in the elevator recall interface that must be documented and investigated. The cause may be in the elevator controller, the mechanical system, or the interface wiring — but the incomplete recall is a testable failure.

54. D — The feasibility of testing 180 detectors in a single day depends on the building's layout, the fire alarm system type (addressable systems test faster than conventional), travel time between devices, and the technician's experience and efficiency. A skilled technician on an addressable

system can typically test 20-30 detectors per hour. The technician must assess whether the schedule allows thorough testing without cutting corners.

55. C — The megger readings are acceptable with devices disconnected, but the ground fault may exist at a specific device location. The technician should reconnect devices one at a time — or in small groups — and megger after each addition to identify which device or device location introduces the ground fault. The fault may be in a device's internal wiring, a device mounting creating a path to ground, or moisture at a specific device location.

56. A — Notification appliances removed from walls and not reinstalled represent a critical deficiency that leaves occupants in those areas without audible and visible alarm notification. The building owner must be notified that the devices must be reinstalled immediately. The area is non-compliant with NFPA 72 until all notification appliances are returned to their proper mounting locations.

57. B — A ground fault on an IDC is a trouble condition — not an alarm condition. The panel detects the unintended current path between the conductor and ground and generates a trouble signal indicating that the circuit's integrity has been compromised. Ground faults impair the circuit's supervision reliability and must be repaired to restore normal circuit operation.

58. D — Six detectors on the same floor consistently failing while all other building detectors pass strongly suggests a floor-specific environmental cause. The 12th floor may have higher dust levels, cooking contamination from a nearby kitchen, humidity from a mechanical issue, or construction residue that has accumulated in the sensing chambers. The detectors likely need cleaning or replacement, and the environmental cause must be addressed.

59. C — AC power is present at the breaker (121 VAC) but the panel's AC indicator is off and the system is running on batteries. The fault lies between the breaker and the panel — most likely an open conductor in the branch circuit wiring, a disconnected junction, a tripped disconnect switch, or a loose connection at the panel's incoming power terminals. The wiring path must be traced to locate the interruption.

60. A — NFPA 72 Section 10.6.9 permits a delay of up to 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 power dips that resolve before the building's fire protection is meaningfully affected.

61. B — A near-zero voltage reading (0.2 VDC) across the IDC terminals with field wiring connected indicates a short circuit — the two conductors are making contact somewhere on the circuit, creating a low-resistance path that pulls the voltage to near zero. The panel detects this abnormal condition and reports a trouble for Zone 8. The short must be located using the divide-and-conquer method.

62. D — The fire alarm interface test — magnetic holder release — functioned correctly. However, the doorstop prevents the fire-rated door from fully closing, defeating the purpose of the fire door

compartmentalization. A fire door that cannot fully close and latch does not provide its rated fire resistance. The doorstop must be removed and building maintenance informed that fire doors must not be obstructed.

63. C — One hundred forty-seven waterflow alarms in 6 months with no actual fires or activated sprinkler heads strongly indicates water pressure surges or fluctuations in the sprinkler system. These surges cause the waterflow switch paddle to move momentarily, triggering the alarm contacts. Adjusting the retard delay setting or investigating the source of the pressure fluctuations can reduce these nuisance alarms.

64. A — A float charge voltage of 27.4 VDC is within the normal range for a 24 VDC sealed lead-acid battery system. Two 12V SLA batteries in series typically float between 27.0 and 27.6 VDC when connected to a properly functioning charger. This voltage is not overcharging — it is the expected float maintenance voltage that keeps the batteries fully charged and ready for service.

65. B — The panel correctly processed the alarm and activated notification, confirming the panel's alarm processing is functioning. The supervising station received a trouble signal instead of an alarm, indicating the communication module transmitted the wrong event code. The panel's communication module programming must be reviewed and corrected to ensure alarm events are transmitted with the correct alarm event code.

66. C — 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 actually release and close.

67. D — A "device removed" trouble can be generated even when the detector head is physically seated if the detector's internal processor has failed and stopped responding to the panel's polling commands. An end-of-life detector with a failed internal circuit cannot communicate its address to the panel, which interprets the non-response as a removed device. The detector should be replaced with a new unit.

68. A — NFPA 72 Table 14.4.3.2 permits the use of panel-generated sensitivity reports from analog addressable systems as an acceptable method for performing smoke detector sensitivity testing. The panel continuously monitors each detector's analog values and can report whether each device is within its listed sensitivity range. Physical testing with a calibrated instrument is an alternative method but is not required when panel reports are available.

69. B — A swollen battery case indicates internal cell degradation — typically from overcharging, overheating, or age-related chemical breakdown — even if the battery still passes a load test under current conditions. The swelling will progress and the battery will eventually fail. Both batteries should be replaced as a matched set because batteries in a series pair should always be the same age and condition.

70. C — The immediate priority after restoring communication is to determine why the network cable was disconnected in the first place. If it was accidentally pulled during routine IT work, the cable connection should be secured and labeled to prevent future accidental disconnection. If the disconnection was intentional, the building's IT practices must be coordinated with fire alarm requirements to prevent recurrence.

71. A — Accurate timestamps in the panel's event log are essential for reconstructing the sequence of events during fire incidents, coordinating with emergency response timelines, and meeting regulatory documentation requirements. A 90-minute discrepancy can lead to incorrect event sequencing during investigations and conflicts with other building system logs, security camera timestamps, and emergency dispatch records.

72. D — With 23.8 VDC at the device terminals during alarm — well within the 16-33 VDC operating range — adequate voltage is present for both components. The horn operates normally, confirming the circuit delivers power. The non-functioning strobe in a combination device where the horn works and voltage is adequate indicates the strobe component has internally failed. The device must be replaced.

73. B — As-built drawings that do not reflect two renovations' worth of added and modified devices create a significant documentation gap. Technicians performing future maintenance, troubleshooting, and testing cannot rely on drawings that do not match the actual installed system. NFPA 72 Section 7.8 requires documentation to be maintained and kept current. The drawings must be updated immediately.

74. 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 on opposite walls of the same conference room are clearly within each other's field of view. Unsynchronized flashing creates a disorienting effect that can trigger seizures in photosensitive individuals. The synchronization issue must be corrected.

75. C — NFPA 72 does not mandate fire alarm system replacement based on age alone. The code requires that the system be properly maintained, tested at the frequencies specified in Chapter 14, and that all components — including detectors — maintain their listed performance specifications. A well-maintained 10-year-old system that passes all required tests may continue in service indefinitely.

76. A — The fire alarm panel's LCD display, indicator LEDs, and control switches must be visible and accessible to building operators, maintenance technicians, and emergency responders at all times. A monitor covering the display prevents anyone from reading alarm, trouble, and supervisory information — information that is critical for emergency response and system management. The obstruction must be removed.

77. 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. If two full revolutions produce

no signal, the tamper switch has failed its functional test. The switch must be adjusted, repaired, or replaced, and the corrected device must be retested to verify proper operation.

78. D — The batteries ended the load test at 19.8 VDC, which falls below the panel manufacturer's minimum acceptable end-voltage of 20.4 VDC. At 19.8 VDC, the panel and connected devices may not operate reliably — some components may malfunction or shut down. The batteries have insufficient capacity to sustain the required alarm load and must be replaced.

79. A — The divide-and-conquer method requires progressively halving the suspect section. The short circuit has been confirmed on the second half of SLC 1. The next step is to disconnect the second half at its midpoint and test each quarter independently. The quarter that reproduces the short contains the fault. This process continues until the specific device or wiring segment is isolated.

80. C — When the fire alarm system is reset after an alarm, the magnetic door holder re-energizes and holds the door open in its normal position. This is expected and correct behavior — the door holder is designed to hold the door open during normal building operation and release it only during alarm conditions. Re-energizing upon system reset returns the door holder to its normal operating state.

81. C — NFPA 72 requires all smoke detectors to be tested during each semiannual testing period. Marking detectors as "N/A" because furniture blocks access is not acceptable — the building owner must provide access so that every detector can be tested. Untested detectors cannot be assumed to be functional, and the building owner must be informed that access must be arranged for complete testing.

82. B — NFPA 72 Section 7.8 requires that both the as-built drawings and the Record of Completion be updated whenever the fire alarm system is modified. Any addition, removal, relocation, or reprogramming of devices changes the system configuration and must be reflected in the permanent documentation. This ensures that the documentation always represents the current installed system.

83. A — The total NAC load of 3.54 amps exceeds the 3.0-amp output rating. The designer must split the devices across two NAC circuits or add a NAC booster power supply to provide additional current capacity. Installing larger conductors reduces voltage drop but does not increase the NAC output's current rating. The circuit must be redesigned before installation can proceed.

84. D — When multiple wall-mounted strobes cover a room, each strobe's required candela is determined by the area it is responsible for covering based on the room geometry and the strobe's position. NFPA 72 Table 18.5.5.5.1(a) provides coverage based on room dimensions. The designer must evaluate each strobe's coverage zone based on its mounting wall position and the room dimensions it serves.

85. B — The notation "CLASS A — PATHWAY SURVIVABILITY LEVEL 2" requires two things: Class A wiring (a loop with a return path providing fault tolerance for a single open circuit) and Level 2 pathway survivability (2-hour fire-rated construction or 2-hour rated cable protecting the

circuit from fire exposure). Both requirements must be met simultaneously for voice evacuation circuits in high-rise buildings.