

PRACTICE EXAM 7: CTS-I

SIMULATION

QUESTIONS 1–125

Domain A — Conducting Pre-Installation Activities

1. A CTS-I installer arrives at a jobsite to perform a pre-installation walkthrough and finds that the architectural drawings show a reflected ceiling plan dated six months earlier, while a separate mechanical drawing dated two weeks earlier shows different diffuser locations. The most appropriate action is:

- A. Document both drawings and request clarification on which represents the current design
- B. Use the older reflected ceiling plan since it was prepared first
- C. Use the newer mechanical drawing since it is more recent
- D. Proceed with installation based on field conditions regardless of drawings

2. A project specification requires all rack equipment to be labeled on the front with a specific label format. The installer's company uses a different standard label format that includes the same information plus additional fields. The most appropriate response is:

- A. Use the company's standard format since it includes all required information
- B. Use the company's format but add a note in the as-built documents
- C. Use the project's specified format as required by contract specifications
- D. Use whichever format the client representative verbally approves on-site

3. An installer reviewing wiring schedules notices that three cables are specified to terminate at the same device port, with different labels but identical destinations. The appropriate response is:

- A. Combine the three cables into a single run to simplify installation
- B. Document the discrepancy and escalate to the design team for clarification
- C. Pull only one of the three cables and abandon the other two specifications
- D. Terminate all three cables at the same port and label them separately

4. A pre-installation walkthrough identifies that the proposed projector location conflicts with an existing fire sprinkler head. The sprinkler head cannot be relocated per fire code. The appropriate response is:

- A. Remove the sprinkler head during AV installation and cap the branch line
- B. Install the projector with reduced clearance and accept the conflict
- C. Install an alternative fire suppression system in the projector zone
- D. Coordinate with the design team to relocate the projector position

5. A 2-inch EMT conduit has an internal cross-sectional area of 3.36 square inches. With 5 cables each having a cross-sectional area of 0.18 square inches and 3 cables each at 0.12 square inches, the total cable area is:

- A. 1.26 square inches
- B. 1.42 square inches
- C. 1.56 square inches
- D. 1.34 square inches

6. Continuing from the previous question, the fill percentage using the 2-inch EMT conduit is:

- A. 31.2%

- B. 37.5%
- C. 42.3%
- D. 45.8%

7. A pre-installation meeting with the client reveals that the project will include the demolition of an existing AV system in the same space. What additional pre-installation consideration does this create?

- A. The existing system must be tested before demolition to document baseline
- B. The existing system equipment must be donated to charity before removal
- C. Assessment of deinstallation scope including abandoned cabling, equipment disposition, and pathway conditions
- D. The demolition work must be coordinated with the original installer only

8. An installer's hardware list calculation includes 400 cable ties, 150 velcro straps, 250 labels, and assorted connectors. The installer's company inventory shows 250 cable ties, 75 velcro straps, and 175 labels. What is the procurement gap for each item?

- A. Cable ties: 150, Velcro: 75, Labels: 75
- B. Cable ties: 200, Velcro: 75, Labels: 50
- C. Cable ties: 100, Velcro: 50, Labels: 100
- D. Cable ties: 150, Velcro: 75, Labels: 75, requiring additional procurement

9. A 1-inch EMT conduit has an internal cross-sectional area of 0.864 square inches. The installer plans to pull 10 cables each having a cross-sectional area of 0.049 square inches. The fill percentage is:

- A. 56.7%
- B. 50.2%
- C. 45.6%
- D. 40.3%

10. From the previous question, this fill percentage:

- A. Meets NEC requirements for three or more cables
- B. Is below the NEC fill limit for two cables
- C. Exceeds the NEC 40% fill limit and requires pathway redesign
- D. Complies with the NEC 53% limit for single cables

11. A pre-installation review identifies that power requirements for the planned equipment exceed the capacity of the dedicated AV circuit installed during electrical rough-in. The most appropriate response is:

- A. Reduce the AV equipment scope to fit within the available circuit
- B. Install a supplemental circuit using available breaker capacity
- C. Connect the excess load to a general-purpose office circuit
- D. Coordinate with the electrical engineer to resolve capacity before AV installation

12. A site survey discovers that the proposed cable pathway passes through a space with exposed asbestos tile ceilings. What requirement does this create?

- A. Use N95 dust masks for normal installation work
- B. Stop work and coordinate with qualified asbestos abatement personnel
- C. Install cable using adhesive hangers to avoid disturbing the tiles
- D. Notify only the project manager and continue with normal precautions

13. A drawing scale of 1" = 40'-0" is most commonly used for:

- A. Overall site plans showing the full building footprint
- B. Detailed mounting hardware drawings
- C. Equipment rack elevations

D. Single-room layouts at higher detail

14. A pre-installation take-off calculation includes cable lengths with service loops at both ends. A run is measured as 42 feet in the physical pathway, with a 4-foot service loop at the rack end and a 5-foot loop at the device end. Adding 15% contingency, the total order length is approximately:

- A. 47 feet
- B. 53 feet
- C. 59 feet
- D. 62 feet

15. A site survey identifies that the AV equipment room HVAC will share conditioned air with an adjacent restroom. The appropriate concern is:

- A. Humidity levels will damage AV equipment
- B. Airflow from the restroom is always lower quality
- C. Restroom odors may contaminate the AV equipment room
- D. Contamination from the restroom may enter the AV equipment room

16. An installer's pre-installation review identifies that the rack elevation drawing shows 38U of equipment in a 42U rack, with 2U of blanking panels and 2U of reserved space. The effective available space for equipment is:

- A. 38 rack units as shown in the drawing
- B. 40 rack units considering blanking panels as optional
- C. 42 rack units at full capacity
- D. 36 rack units after all reserved space

17. A pre-installation meeting reveals that the AV installation will occur after all other construction work is complete. The appropriate concern is:

- A. Finished surfaces must be protected throughout installation
- B. Other trades will not be available for coordination
- C. The completed building will make cable pulls easier to perform
- D. Schedule pressure will increase since AV is the final trade

18. A pre-installation survey documents that the specified equipment rack door is 36 inches wide but the equipment room doorway is 34 inches wide. The appropriate response is:

- A. Install the rack on its side to fit through the doorway
- B. Remove the rack doors for transport and reinstall in the room
- C. Substitute a rack with a narrower door frame
- D. Document the conflict and coordinate resolution with the design team

19. A 1.25-inch EMT conduit has an internal cross-sectional area of approximately 1.496 square inches. The 40% fill limit for three or more cables permits total cable area of:

- A. 0.750 square inches
- B. 0.528 square inches
- C. 0.598 square inches
- D. 0.625 square inches

20. A pre-installation site survey identifies that access to the third-floor installation location requires use of a passenger elevator that cannot accommodate the full-length equipment rack. The appropriate response is:

- A. Coordinate with the general contractor for freight elevator access or staging

- B. Cut the rack in half for transport and reassemble on the floor
- C. Hoist the rack through a window using rigging equipment
- D. Install a smaller rack model that fits in the passenger elevator

21. An installer's pre-installation labor calculation assumes 40 hours of baseline work, plus adjustments for difficult site access (+15%) and trade coordination complexity (+10%). The total estimated hours are:

- A. 55 hours
- B. 50 hours
- C. 47 hours
- D. 60 hours

22. A pre-installation review identifies that project documentation includes equipment models that are not on the manufacturer's current product roadmap. The appropriate response is:

- A. Assume the models are available since they were specified
- B. Contact the manufacturer's sales team to negotiate pricing
- C. Use discontinued models from the installer's existing stock
- D. Verify availability through formal substitution request and procurement lead times

23. A site survey checklist is performed systematically because:

- A. Checklists ensure that no observation category is omitted during the survey
- B. Checklists replace the need for written documentation
- C. Checklists are required for OSHA compliance
- D. Checklists reduce the time needed to perform the survey

24. A pre-installation survey reveals that the proposed equipment room temperature is maintained at 82°F during building operating hours. This temperature:

- A. Is within professional equipment operating range
- B. Should be verified during all climate conditions
- C. Exceeds professional equipment room target of 68-75°F and requires HVAC adjustment
- D. Is acceptable since most equipment tolerates higher temperatures

25. A wiring schedule specifies Cat6A cable for video-over-IP applications. The installer's inventory includes both Cat6 and Cat6A cable. The appropriate response is:

- A. Use Cat6 cable to reduce project costs
- B. Use the specified Cat6A cable as required for performance
- C. Mix Cat6 and Cat6A based on specific run requirements
- D. Consult the client on preferred cable type before purchase

26. A pre-installation walkthrough discovers that the specified wall-mounted display location aligns with a vertical expansion joint in the wall structure. The appropriate response is:

- A. Ignore the expansion joint since it will not affect mounting
- B. Add structural reinforcement across the joint for mounting
- C. Mount the display directly to the drywall with extra anchors
- D. Document the finding and coordinate with the structural engineer for appropriate mounting approach

27. A pre-installation review of project documentation uses which drawings to verify mounting dimensions?

- A. Architectural elevations and detail drawings showing mounting positions and dimensions

- B. Plumbing drawings showing water line locations
- C. Electrical panel schedules
- D. Site plans showing overall building layout

28. The AVIXA CTS-I certification requires adherence to which ethical standard?

- A. ASHRAE Code of Professional Conduct
- B. NEC Section 110.16 for electrical work
- C. The AVIXA Code of Ethics and Conduct
- D. OSHA 1926 Subpart M safety code

Domain B — Conducting Site Rough-In/First-Fix

29. An installer working on a scaffold 18 feet above ground level must comply with which OSHA fall protection requirement?

- A. Fall protection with guardrails on all open sides or personal fall arrest
- B. Fall protection is not required below 20 feet on scaffolds
- C. Fall protection through a spotter monitoring the worker only
- D. Fall protection through safety nets below the scaffold

30. A cable pull through a 60-foot conduit run with 3 bends totaling 180 degrees experiences pulling tension approaching the cable's maximum. The appropriate response is:

- A. Continue pulling at reduced speed to complete the run
- B. Apply additional lubricant at the entry point and continue
- C. Switch to mechanical pulling assistance for constant tension
- D. Stop the pull and investigate the cause before proceeding

31. An installer preparing to cut concrete for a floor-mounted outlet box must implement which OSHA-required controls?

- A. Carbide-tipped blade replacement every 50 cuts
- B. Water suppression, local exhaust ventilation, or respiratory protection per the silica standard
- C. Standard N95 dust masks accepting normal dust generation
- D. Work scheduled only during evening hours when the building is empty

32. The structural blocking required to support a 150-pound display mounted on a stud wall must:

- A. Span multiple studs and be installed by the framing contractor before drywall
- B. Be installed by the AV installer using adhesive and drywall screws
- C. Replace the existing drywall with plywood after AV installation
- D. Use metal plates secured with screws in the drywall surface

33. An installer mounting equipment to a concrete ceiling must use which fastener type?

- A. Wood screws threaded into the concrete
- B. Plastic expansion anchors with appropriate torque
- C. Concrete-rated wedge anchors or sleeve anchors
- D. Sheet metal screws with rubber grommets

34. A 3/8-inch threaded rod in A307 steel has a tensile failure capacity of approximately 5,700 pounds. With a 5:1 overhead safety factor, the working load is approximately:

- A. 1,425 pounds
- B. 2,850 pounds
- C. 2,000 pounds

D. 1,140 pounds

35. An installer working 25 feet above the floor on a boom lift platform must wear:

A. A personal fall arrest system attached to a designated anchor on the platform

B. A safety harness without a lanyard for mobility

C. No fall protection beyond the platform guardrails

D. Fall arrest attached to the ground-based anchor system

36. A cable pulled through conduit is supported in the ceiling plenum space using J-hooks. The required spacing for typical Cat6A cable is:

A. 2 to 3 feet between J-hooks

B. 4 to 5 feet between J-hooks

C. 8 to 10 feet between J-hooks

D. 12 to 15 feet between J-hooks

37. A scissor lift operator must verify which conditions before elevating the platform with a 200-pound operator and 50 pounds of tools?

A. Only the ground firmness under each wheel

B. Only the operator's weight is within capacity

C. Only the lift's battery charge level

D. Firm, level ground and combined weight within rated capacity

38. The minimum bend radius during cable installation per typical manufacturer specifications is:

A. 2 times the cable diameter

- B. 8 times the cable diameter
- C. 4 times the cable diameter
- D. 6 times the cable diameter

39. An installer discovers asbestos-containing material while removing legacy cabling. The appropriate response is:

- A. Stop work and contact qualified asbestos abatement personnel
- B. Use standard respiratory protection and continue removal
- C. Cap the ends of affected material and continue with normal work
- D. Notify the client informally without stopping the work

40. The 4-to-1 rule for extension ladder positioning means that for every:

- A. 1 foot of working height, the base extends 4 feet from the structure
- B. 4 feet of working height, the base extends 1 foot from the structure
- C. 4 degrees of angle, the ladder extends 1 foot from the structure
- D. 4 inches of ladder width, the ladder accommodates 1 worker

41. A cable pulled through conduit must be supported by J-hooks, cable trays, or similar supports attached to:

- A. Adjacent HVAC ductwork for mounting convenience
- B. Ceiling grid system components for accessibility
- C. Existing electrical conduit runs
- D. Structural members of the building

42. OSHA requires fall arrest anchor points to have a minimum rated capacity of:

- A. 5,000 pounds per worker attached
- B. 3,500 pounds per worker attached
- C. 2,500 pounds per worker attached
- D. 1,000 pounds per worker attached

Domain C — Installing Audiovisual Systems

43. A 30U rack frame provides how many inches of vertical mounting height?

- A. 50.0 inches
- B. 52.5 inches
- C. 48.0 inches
- D. 45.0 inches

44. A rack power distribution unit rated at 15 amperes at 120 volts provides how much continuous load capacity under the 80% rule?

- A. 15 amperes continuously
- B. 13 amperes continuously
- C. 10 amperes continuously
- D. 12 amperes continuously

45. The standard rack mounting width measured between front mounting flanges is:

- A. 19 inches

- B. 17 inches
- C. 18 inches
- D. 21 inches

46. A 2U rack-mount device occupies how many inches of vertical mounting height?

- A. 3.0 inches
- B. 4.0 inches
- C. 3.5 inches
- D. 2.5 inches

47. Blanking panels installed in unused rack units primarily serve which purpose?

- A. Providing additional cable management surfaces
- B. Preserving airflow paths and preventing hot exhaust recirculation
- C. Improving the rack's structural rigidity under load
- D. Increasing the rack's grounding effectiveness

48. A 20-ampere circuit's continuous load limit under the 80% rule is:

- A. 20 amperes
- B. 18 amperes
- C. 22 amperes
- D. 16 amperes

49. An XLR connector cable carries a balanced audio signal. The standard pin assignments per the AES convention are:

- A. Pin 1 ground, Pin 2 hot, Pin 3 cold
- B. Pin 1 hot, Pin 2 ground, Pin 3 cold
- C. Pin 1 cold, Pin 2 ground, Pin 3 hot
- D. Pin 1 hot, Pin 2 cold, Pin 3 ground

50. Phantom power for condenser microphones is standardized at:

- A. 24 volts DC
- B. 12 volts DC
- C. 48 volts DC
- D. 9 volts DC

51. A balanced audio cable carrying signal rejects common-mode interference through which mechanism?

- A. Frequency-dependent filtering of high-frequency interference
- B. Magnetic shielding from a ferrite core
- C. Voltage differences between two signal conductors that cancel identical noise
- D. Optical isolation between source and destination

52. A 10 dB increase in audio signal power represents:

- A. A doubling of power
- B. A tenfold increase in power
- C. A halving of power

D. A fivefold increase in power

53. The decibel formula for power ratios uses the multiplier:

A. 20

B. 15

C. 5

D. 10

54. A 70-volt distributed audio amplifier rated at 300 watts should drive total tap loads of approximately:

A. 240 watts

B. 300 watts

C. 200 watts

D. 360 watts

55. The transformer at each loudspeaker on a 70-volt distributed audio system primarily serves to:

A. Boost the signal level for long cable runs

B. Convert AC voltage to DC for solid-state drivers

C. Step down the high-voltage line to the loudspeaker's required voltage

D. Provide phantom power to the loudspeakers

56. Cat5e network cable supports a maximum frequency of:

A. 250 MHz

B. 350 MHz

- C. 500 MHz
- D. 100 MHz

57. The maximum permissible untwist length at the termination of Cat6A cable is:

- A. 0.25 inches
- B. 0.5 inches
- C. 0.75 inches
- D. 1.0 inches

58. Modern coaxial connector installation for video applications uses which termination technique?

- A. Compression termination using a cable-specific tool
- B. Insulation displacement contact
- C. Soldered termination of the center conductor
- D. Threaded mechanical termination

59. The maximum recommended copper cable distance for HDBaseT transmission of 4K video at 60 Hz is approximately:

- A. 50 meters (164 feet)
- B. 75 meters (246 feet)
- C. 100 meters (328 feet)
- D. 200 meters (656 feet)

60. EDID information is exchanged between the source and display through:

- A. A separate management network connection
- B. Manual configuration entered at both ends
- C. RS-232 serial connection between source and display
- D. The DDC channel embedded within the HDMI or DisplayPort cable

61. HDCP 2.2 encryption is required for protected transmission of:

- A. Audio content over Dante networks
- B. 4K UHD content from compatible sources
- C. 1080p content from any source
- D. Standard-definition video over coaxial cable

62. Multi-mode fiber OM3 supports 10 Gbps Ethernet transmission to approximately:

- A. 300 meters
- B. 400 meters
- C. 200 meters
- D. 100 meters

63. APC fiber connectors are color-coded as:

- A. Blue
- B. Yellow
- C. Beige
- D. Green

64. The Dante audio networking protocol typically operates with latency of:

- A. 50 to 100 milliseconds
- B. 0.25 to 1 millisecond
- C. 5 to 10 milliseconds
- D. 10 to 20 milliseconds

65. SDVoE distributes uncompressed 4K60 video over which minimum network infrastructure?

- A. 10 Gbps Ethernet
- B. 1 Gbps Ethernet
- C. 100 Mbps Ethernet
- D. Wireless 802.11ac

66. The IEEE 802.3at standard for Power over Ethernet provides what power at the powered device?

- A. 12.95 watts
- B. 51 watts
- C. 25.5 watts
- D. 71 watts

67. An IPv4 address with a /24 subnet mask provides how many usable host addresses?

- A. 256 hosts
- B. 252 hosts
- C. 126 hosts
- D. 254 hosts

68. The private IPv4 address ranges defined under RFC 1918 include:

- A. 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16
- B. Only 10.0.0.0/8
- C. Only 192.168.0.0/16
- D. Only 172.16.0.0/12

69. A control system using RS-232 serial communication operates at typical baud rates between:

- A. 1200 and 4800 bps
- B. 4800 and 9600 bps
- C. 9600 and 115200 bps
- D. 250000 and 500000 bps

70. RS-232 communication between controller and device requires matching configuration of:

- A. IP address, subnet mask, and gateway
- B. Baud rate, data bits, parity, and stop bits
- C. MAC address and VLAN configuration
- D. Frequency, modulation, and encryption

71. IR control of AV equipment is generally:

- A. Unidirectional with no status feedback from the controlled device
- B. Bidirectional with status feedback from the controlled device
- C. Effective at distances up to 500 feet from the controller
- D. Compatible with all consumer and professional equipment

72. A control processor sending IP commands receives no response from a controlled device. The most appropriate first diagnostic step is:

- A. Reboot the control processor to clear cached information
- B. Replace the network cable connecting the device
- C. Update firmware on the controlled device
- D. Verify network connectivity to the device using ping

73. A loudspeaker rated at 4 ohms impedance is connected to an amplifier. Maximum total cable resistance at 5% of loudspeaker impedance is:

- A. 0.40 ohms
- B. 0.10 ohms
- C. 0.20 ohms
- D. 0.50 ohms

74. Three loudspeakers each rated at 8 ohms connected in parallel present what combined impedance to the amplifier?

- A. 24 ohms
- B. 2.67 ohms
- C. 4 ohms
- D. 8 ohms

75. A digital signal degrading over distance through a transmission medium typically exhibits:

- A. Gradual quality degradation similar to analog signals
- B. Increasing color saturation as distance increases

- C. Audible noise that grows progressively louder
- D. Full quality maintained until catastrophic failure at the digital cliff

76. A waveform monitor displays which video signal characteristic?

- A. Video signal amplitude over time
- B. Video chrominance on a polar plot
- C. Audio levels accompanying the video
- D. Network bandwidth utilization

77. A vectorscope displays which video signal characteristic?

- A. Video signal amplitude over time
- B. Audio frequency response across the spectrum
- C. Network packet loss patterns
- D. Video chrominance on a polar plot

78. A projector with a throw ratio of 1.5:1 positioned 21 feet from the screen produces what image width?

- A. 31.5 feet
- B. 14 feet
- C. 10.5 feet
- D. 7 feet

79. The recommended target white point for video calibration is:

- A. 5500K (D55)

- B. 7500K (D75)
- C. 6500K (D65)
- D. 9300K (D93)

80. The recommended target gamma for standard video content is approximately:

- A. 2.2
- B. 1.8
- C. 2.4
- D. 2.0

81. The AVIXA DISCAS standard recommends that for basic decision-making content, the farthest viewer should be no more than:

- A. 4 times the image height
- B. 6 times the image height
- C. 12 times the image height
- D. 8 times the image height

82. A measurement microphone used for room equalization should have:

- A. Cardioid polar pattern with extended low-frequency response
- B. Flat, documented frequency response with omnidirectional polar pattern
- C. Hypercardioid pattern with maximum off-axis rejection
- D. Ribbon transducer with vintage warm sound character

83. The AES67 standard primarily provides:

- A. Encryption of audio streams for security purposes
- B. Power delivery to networked audio devices
- C. Open interoperability between different manufacturers' systems
- D. Frequency-domain analysis of audio signals

84. A polarity tester in audio system verification confirms:

- A. All loudspeakers in a system move in the same direction on the same signal
- B. The amplifier output voltage is within manufacturer specifications
- C. The audio signal level is appropriate for the connected loudspeaker
- D. The audio cable shielding is properly bonded to ground

85. Cable certification for installed Cat6A cabling tests which characteristics?

- A. Length and continuity only
- B. Voltage drop and current capacity only
- C. Visual inspection of cable jacket only
- D. Insertion loss, return loss, NEXT, ANEXT, propagation delay, and other parametric measurements

86. A 1080p video signal at 60 Hz with 8-bit color requires approximately what bandwidth?

- A. 3.0 Gbps
- B. 4.5 Gbps
- C. 6.0 Gbps
- D. 9.0 Gbps

87. A 4K video signal at 60 Hz with 10-bit color and HDR requires approximately what bandwidth?

- A. 12 Gbps
- B. 18 Gbps
- C. 24 Gbps
- D. 36 Gbps

88. A 70-volt distributed audio system has 10 loudspeakers at 20-watt taps and 5 loudspeakers at 10-watt taps. Total tap load is:

- A. 250 watts
- B. 300 watts
- C. 200 watts
- D. 275 watts

Domain D — Perform Systems Close-Out

89. The ANSI/AVIXA 10:2013 standard establishes which framework for verification items?

- A. Categories Critical, Important, and Optional
- B. Stages Initial, Intermediate, and Final
- C. Levels A, B, and C representing essential, specialized, and unique items
- D. Groups Functional, Aesthetic, and Documentary

90. A punch list classifies a non-functional audio channel at a specific input as:

- A. A cosmetic deficiency affecting appearance only

- B. A substantive deficiency affecting system function
- C. A pre-existing condition outside the installation scope
- D. A user training issue requiring documentation

91. Substantial completion is the formal milestone at which:

- A. The installer's contract begins with work to be performed after
- B. All punch list items have been completed and verified
- C. Final retention is fully released to the installer
- D. The system is ready for its intended use and warranty period typically begins

92. A 12-month warranty effective date is tied to:

- A. Substantial completion when the client takes beneficial use
- B. The original contract signing date
- C. The date equipment was delivered to the warehouse
- D. The first day of installation work

93. As-built documentation records:

- A. The original design intent for the installation team
- B. Contract scope between parties
- C. The installed system's actual configuration for future reference
- D. Change orders processed during construction

94. A typical client end-user training session is best characterized by:

- A. Extended technical sessions covering all system capabilities
- B. Brief focused sessions on essential operations with hands-on practice
- C. Lecture-style presentation without hands-on participation
- D. Self-paced video training without instructor presence

95. A quick reference guide should include:

- A. Detailed technical specifications for each equipment piece
- B. Complete signal flow diagrams for the system
- C. Manufacturer service contact information
- D. Essential functions with screenshots and simple instructions

96. A service agreement typically provides:

- A. Defined response times, scheduled preventive maintenance, and priority service
- B. Free equipment replacement throughout the agreement
- C. Complete installation upgrades at no additional cost
- D. Manufacturer warranty extension for installed equipment

97. A typical preventive maintenance schedule for a commercial AV installation recommends:

- A. Monthly visits for all installations regardless of usage
- B. Quarterly visits as the universal standard
- C. Annual visits with more frequent visits for high-use environments
- D. Visits only when system problems occur

98. The signed sign-off documentation at project completion creates:

- A. Authorization for manufacturer warranty registration
- B. A formal written record of client acceptance
- C. Documentation for tax depreciation purposes
- D. A trigger for the next construction phase

99. A walk-through during the substantial completion process involves:

- A. The installer, client representative, and sometimes the general contractor
- B. Only the lead installer reviewing their work
- C. Only the design engineer and manufacturer
- D. The client's accounting staff reviewing costs

100. A certificate of substantial completion documents:

- A. The original cost of installed equipment
- B. Serial numbers of all installed equipment
- C. Expected service life of components
- D. That the system is ready for use even though minor work may remain

101. A client representative who signs project completion documents typically holds:

- A. Limited authority for informal acknowledgment only
- B. Formal signing authority for the client organization
- C. Authority to verify the installation date only
- D. Authority to modify original contract terms

102. Project closeout deliverables on larger AV installations typically include:

- A. Only equipment manuals
- B. Only warranty cards
- C. Only as-built drawings
- D. As-built drawings, equipment manuals, warranty documentation, and verification reports

Domain E — Conducting Ongoing Project Responsibilities

103. The primary purpose of daily progress reports is to:

- A. Document activities, labor, materials, and issues for the project record
- B. Calculate weekly invoice amounts
- C. Document equipment serial numbers
- D. Track individual installer productivity for reviews

104. A request for information (RFI) is most appropriately used to:

- A. Document materials consumed during work
- B. Request additional labor resources
- C. Obtain clarification from the design team on field-discovered issues
- D. Submit invoices to client accounting

105. A field engineering decision involving substituting equivalent accessories is typically:

- A. A major adaptation requiring formal change order
- B. A minor adaptation within installer authority but requiring documentation

- C. A code violation requiring inspector notification
- D. A breach of contract requiring work stoppage

106. Trade coordination on a construction project is primarily managed through:

- A. The client's facilities director who coordinates all trades
- B. Direct communication between trades without supervisor involvement
- C. The architect providing daily schedule updates
- D. The general contractor's superintendent and structured coordination meetings

107. A change order is required when:

- A. Work scope expands beyond original contract specifications
- B. Materials are consumed faster than estimated
- C. The installer must perform work during evening hours
- D. Equipment fails during installation and requires replacement

108. The "clean as you go" practice in AV installation means:

- A. The crew cleans the jobsite at the end of each work week
- B. Specialized cleaning contractors handle cleanup
- C. Cable scraps, packaging, and debris are managed continuously
- D. Cleanup is deferred until the project's close-out phase

109. Construction debris from AV installation is typically disposed of through:

- A. The AV firm's own dedicated dumpster

- B. The general contractor's construction waste management system
- C. The client's regular building trash service
- D. Personal disposal by individual installers

110. A delay caused by another trade's incomplete work should be reported by the AV installer through:

- A. Direct confrontation with the other trade's foreman
- B. Posting on the project's social media or messaging platforms
- C. Filing a formal grievance with the building owner
- D. The project manager who can coordinate appropriate response

111. OSHA's silica standard requires which controls during concrete cutting?

- A. Water suppression, local exhaust ventilation, or respiratory protection
- B. Standard N95 dust masks regardless of exposure
- C. Work scheduled during favorable weather only
- D. Carbide-tipped blade replacement every 100 cuts

112. A coordination drawing developed through Building Information Modeling (BIM) primarily supports:

- A. Marketing presentations to potential clients
- B. Building permit applications submitted to local authorities
- C. Conflict identification and resolution between MEP, fire protection, and technology systems
- D. Insurance documentation for the construction project

113. An AV installer who discovers an unexpected condition that affects the original design has the responsibility to:

- A. Modify the installation without notifying others
- B. Report the condition through appropriate channels for engineering review
- C. Wait for the design team to discover the condition
- D. Document the condition for as-built drawings only

114. Reporting a delay to the project manager should occur:

- A. Only after the delay causes a missed schedule milestone
- B. During the next scheduled coordination meeting
- C. Only when the cause of the delay is definitively documented
- D. As soon as the potential delay is identified, even if impact is uncertain

115. A scope change identified during installation should:

- A. Be routed through the project manager for change order processing
- B. Be implemented immediately to maintain project schedule
- C. Be ignored if representing a small amount of additional work
- D. Be assigned to the next available installer without documentation

116. Work performed on AV equipment beyond the original contract scope without formal change order approval typically results in:

- A. Reimbursement at premium emergency rates
- B. Automatic addition to the next monthly invoice
- C. Labor and materials consumed without compensation to the installer

D. Default acceptance by the client at the original contract rate

117. The professional documentation captured during field engineering decisions supports:

- A. Direct communication between the installer and equipment manufacturers
- B. Both as-built records and traceability of decisions under installer authority
- C. Sales discussions with future potential clients
- D. Performance reviews of individual installation crew members

118. The installer's responsibility regarding firestopping at fire-rated wall penetrations is to:

- A. Defer all firestopping to the general contractor without coordination
- B. Apply silicone caulk as a temporary measure
- C. Use the same firestop material regardless of the wall's fire rating
- D. Either perform firestopping correctly or coordinate with the firestop contractor

119. An installer who discovers asbestos-containing material during cable removal should:

- A. Stop work immediately and contact qualified asbestos abatement personnel
- B. Continue work using respiratory protection
- C. Cap both ends of the affected cable and continue work
- D. Notify only the client without involving regulatory authorities

120. The professional purpose of root-cause analysis after a service incident is to:

- A. Determine which crew member is responsible for the failure
- B. Document the failure for future legal proceedings

- C. Understand why the failure occurred so the same failure does not recur
- D. Calculate warranty coverage applicable to the failure

121. A typical AV installation's expected service life before major refresh is approximately:

- A. 2 to 3 years
- B. 7 to 10 years
- C. 15 to 20 years
- D. 25 to 30 years

122. End-of-life indicators for an AV installation typically include:

- A. Increasing service frequency, declining reliability, and parts unavailability
- B. Increased user satisfaction with system performance
- C. Decreased frequency of preventive maintenance visits
- D. Reduced electricity consumption by aging equipment

123. Decommissioned AV equipment containing configuration data should be:

- A. Returned to the manufacturer in original packaging for credit
- B. Donated to charitable organizations without modification
- C. Stored in the client's facility for potential future use
- D. Factory-reset or data-wiped before leaving the client's site

124. The Restriction of Hazardous Substances (RoHS) directive primarily addresses:

- A. Workplace safety requirements for AV installation work
- B. Building code requirements for AV equipment installation
- C. Restricted materials in electronic equipment requiring responsible handling
- D. Manufacturer warranty terms for installed AV equipment

125. The relationship between an installer and an installation typically extends:

- A. Only through the initial installation phase to client handover
- B. Through the entire service life of the system via maintenance and service activities
- C. Through manufacturer warranty period only
- D. Until the next election of building management

PRACTICE EXAM 7: ANSWER KEY

WITH FULL ANSWER EXPLANATIONS

Questions 1–125

Domain A — Conducting Pre-Installation Activities

1. A — Document both drawings and request clarification on which represents the current design. Drawings from different trades with different dates indicate potential coordination issues that require resolution by the design team. Unilateral selection of one drawing over another bypasses the design accountability and may install to an obsolete specification.
2. C — Use the project's specified format as required by contract specifications. Project specifications are contract requirements that the installer must follow regardless of the installer's preferred practices. Deviating from specified requirements without formal substitution approval creates contract noncompliance even when the installer's alternative is technically adequate.
3. B — Document the discrepancy and escalate to the design team for clarification. Multiple cables specified to terminate at the same port suggests either an error in the documentation or a specific design intent not apparent to the installer. Professional practice resolves such ambiguities through the design team rather than making assumptions that may not match design intent.
4. D — Coordinate with the design team to relocate the projector position. Life-safety infrastructure like fire sprinklers has priority over AV equipment placement, and conflicts require design resolution. Removing or modifying fire protection components is not within the AV installer's authority and creates code violations.
5. A — 1.26 square inches. Total cable area equals $(5 \times 0.18) + (3 \times 0.12) = 0.90 + 0.36 = 1.26$ square inches. This calculation is essential for verifying that the proposed cable count fits within NEC fill requirements.
6. B — 37.5%. Dividing 1.26 square inches by 3.36 square inches equals 0.375, or 37.5%. This falls below the 40% NEC fill limit for three or more cables, confirming the cable count is code-compliant in this conduit.
7. C — Assessment of deinstallation scope including abandoned cabling, equipment disposition, and pathway conditions. Demolition of existing systems adds scope beyond standard new installation,

requiring assessment of what must be removed, how it will be disposed of, and what condition the existing pathways are in. This assessment supports proper project scoping and scheduling.

8. D — Cable ties: 150, Velcro: 75, Labels: 75, requiring additional procurement. Cable ties: 400 required – 250 available = 150 gap. Velcro: 150 – 75 = 75 gap. Labels: 250 – 175 = 75 gap. Calculating procurement gaps accurately prevents shortages during installation.
9. A — 56.7%. Total cable area is $10 \times 0.049 = 0.49$ square inches; dividing by 0.864 square inches equals approximately 56.7%. This calculation provides the basis for evaluating NEC compliance.
10. C — Exceeds the NEC 40% fill limit and requires pathway redesign. The 56.7% fill percentage exceeds the 40% NEC limit for three or more cables, creating a code violation. Professional response is to coordinate with engineering to add conduit capacity rather than pulling cables that violate fill limits.
11. D — Coordinate with the electrical engineer to resolve capacity before AV installation. Electrical capacity deficiency is an engineering issue requiring engineering resolution before AV work proceeds. Reducing scope, using other circuits, or supplemental installations compromise the design and may create additional issues.
12. B — Stop work and coordinate with qualified asbestos abatement personnel. Asbestos-containing materials require specialized handling by qualified abatement contractors because disturbance releases fibers that cause diseases emerging decades later. Informal handling creates serious long-term health hazards.
13. A — Overall site plans showing the full building footprint. Large scales like 1" = 40'-0" are used for overall site plans and building layouts where a large area must fit on the drawing. Detailed drawings showing mounting hardware, rack elevations, and similar details use much smaller scales.
14. C — 59 feet. Base length equals $42 + 4 + 5 = 51$ feet, plus 15% contingency (approximately 8 feet) equals 59 feet. Take-off calculations include service loops and contingency to ensure adequate cable without excessive waste.
15. D — Contamination from the restroom may enter the AV equipment room. Shared HVAC between an AV equipment room and a restroom creates potential for humidity, odor, and contamination migration that affects AV equipment. Documentation and coordination with mechanical engineering addresses this issue before installation.
16. A — 38 rack units as shown in the drawing. The rack elevation already accounts for blanking panels and reserved space, so the 38 rack units represents the actual equipment mounting. The 2U of blanking panels and 2U of reserved space are intentional design elements, not deductions from the 38U equipment space.

17. B — Finished surfaces must be protected throughout installation. AV installation after all other construction means that finished surfaces (paint, flooring, wall finishes, millwork) are already in place and must be protected from damage during AV work. Professional installation includes surface protection that prevents marring, scratching, and contamination.
18. D — Document the conflict and coordinate resolution with the design team. Dimensional conflicts between equipment and building access require coordinated resolution rather than improvisation. Design team coordination may produce a smaller equipment model, modified door frame, or phased disassembly that maintains installation quality.
19. C — 0.598 square inches. The 40% fill limit multiplied by 1.496 square inches equals approximately 0.598 square inches. This calculation determines the maximum cable area that can be pulled through the conduit under NEC rules for three or more cables.
20. A — Coordinate with the general contractor for freight elevator access or staging. Freight elevator access is the standard solution for transporting large equipment to upper floors, with coordination through the general contractor who controls building access during construction. Cutting equipment, window hoisting, or substitution create installation problems and compromises.
21. B — 50 hours. Base 40 hours \times 1.15 (difficult access) equals 46 hours, then \times 1.10 (trade coordination) equals approximately 51 hours, which rounds to approximately 50 hours. Productivity factors are typically applied multiplicatively to the base estimate.
22. D — Verify availability through formal substitution request and procurement lead times. Discontinued products require verified substitutions coordinated through formal change processes with adequate procurement lead time. Assuming availability, informal negotiations, or using obsolete stock creates procurement failures at critical points.
23. A — Checklists ensure that no observation category is omitted during the survey. Site survey checklists prompt surveyors through each observation category systematically, preventing the common failure mode of focusing on certain areas while missing others. Checklist-driven surveys are substantially more complete than unstructured walkthroughs.
24. C — Exceeds professional equipment room target of 68-75°F and requires HVAC adjustment. Professional AV equipment operates most reliably in 68-75°F, and 82°F exceeds this range substantially. Documentation and coordination with HVAC engineering addresses the temperature through system adjustment before equipment installation.
25. B — Use the specified Cat6A cable as required for performance. Video-over-IP applications require Cat6A for their high bandwidth characteristics; Cat6 is inadequate for these applications. Substituting lower-category cable compromises system performance even though both cable types carry the same Ethernet protocol.
26. D — Document the finding and coordinate with the structural engineer for appropriate mounting approach. Expansion joints accommodate differential movement between building sections, and

mounting across them requires engineered solutions. Ignoring the joint or adding reinforcement without engineering input creates mounting failures and potential structural issues.

27. A — Architectural elevations and detail drawings showing mounting positions and dimensions. Architectural elevations provide vertical mounting information, and detail drawings show specific mounting positions with dimensions. These drawings are the primary reference for verifying mounting positions during installation.
28. C — The AVIXA Code of Ethics and Conduct. The AVIXA Code of Ethics establishes the professional obligations for CTS-I credential holders including honesty, confidentiality, competence, and respect for intellectual property. This code defines the professional standards that credential holders agree to uphold.

Domain B — Conducting Site Rough-In/First-Fix

29. A — Fall protection with guardrails on all open sides or personal fall arrest. OSHA construction fall protection standards (29 CFR 1926 Subpart M) require fall protection at 6 feet or greater, typically achieved through guardrails on open sides or personal fall arrest. At 18 feet, fall protection is required without question.
30. D — Stop the pull and investigate the cause before proceeding. Tension approaching manufacturer maximum indicates that the cable is near its damage threshold. Continuing the pull risks invisible internal damage that degrades cable performance permanently; professional practice stops to identify and address the cause.
31. B — Water suppression, local exhaust ventilation, or respiratory protection per the silica standard. OSHA's silica standard (29 CFR 1926.1153) requires specific controls matched to the silica-generating activity and exposure level. Standard N95 masks are insufficient for silica exposure, and water suppression or respirator selection must match the exposure assessment.
32. A — Span multiple studs and be installed by the framing contractor before drywall. Structural blocking for substantial loads requires installation during framing, before walls are closed. The blocking must span multiple studs to distribute load effectively. AV installer mounting to drywall without proper blocking is inadequate for 150-pound loads.
33. C — Concrete-rated wedge anchors or sleeve anchors. Concrete ceilings require anchors specifically designed for concrete materials with installation per anchor specifications. Wood screws, plastic expansion anchors, and sheet metal fasteners cannot effectively engage concrete for AV mounting loads.
34. D — 1,140 pounds. A 5,700-pound failure capacity divided by a 5:1 safety factor equals 1,140 pounds working load. Overhead loads require higher safety factors than non-overhead loads because of the greater consequences of failure into occupied spaces below.

35. A — A personal fall arrest system attached to a designated anchor on the platform. Boom lifts can experience whipping motion that ejects workers over platform guardrails, and OSHA requires personal fall arrest attached to designated anchor points on the platform. Anchoring to ground systems is not permitted.
36. B — 4 to 5 feet between J-hooks. Professional practice spaces J-hooks at 4-to-5-foot intervals for typical Category-rated cabling, providing adequate support to prevent sag and protect cable from abrasion. Closer spacing is appropriate for heavier cable bundles.
37. D — Firm, level ground and combined weight within rated capacity. Scissor lift stability depends on firm, level supporting ground within manufacturer capacity. The combined weight of operators, tools, and materials must not exceed the rated capacity, and both the ground and the load must be verified before elevating.
38. C — 4 times the cable diameter. Manufacturer specifications typically require minimum $4\times$ cable diameter bend radius during installation and $8\times$ diameter in the final installed position. Respecting bend radius prevents internal geometry deformation that degrades high-frequency performance.
39. A — Stop work and contact qualified asbestos abatement personnel. Asbestos must be handled only by qualified abatement personnel because exposure causes diseases emerging decades after exposure. Standard PPE and informal handling create long-term health hazards that are not apparent at the time of work.
40. B — 4 feet of working height, the base extends 1 foot from the structure. The 4-to-1 rule sets the ladder angle so that it is stable and safe to climb without being too vertical or too shallow. A 16-foot working height requires the ladder base 4 feet from the supporting surface.
41. D — Structural members of the building. NEC and professional practice require cable supports to attach to structural members of the building, not to ceiling grid, ductwork, plumbing, or other non-structural elements. This requirement ensures support systems are stable and compliant with applicable codes.
42. A — 5,000 pounds per worker attached. OSHA 29 CFR 1926.502 requires fall arrest anchor points to have minimum rated capacity of 5,000 pounds per worker, providing the safety margin needed to arrest a falling worker. Engineered systems with documented lower capacity may be used but must be specifically designed.

Domain C — Installing Audiovisual Systems

43. B — 52.5 inches. A 30U rack frame provides 30×1.75 inches of vertical mounting height, which equals 52.5 inches. The rack unit measure is calculated by multiplying RU count by 1.75.
44. D — 12 amperes continuously. The 80% rule limits continuous loads to 80% of rating, so $15 \times 0.80 = 12$ amperes. This rule prevents breaker tripping and equipment damage from sustained near-rated current draw.

45. A — 19 inches. The 19-inch width measured between front mounting flanges is the global standard for professional AV, broadcast, data, and telecommunications equipment racks. This standardization allows compatible equipment from any manufacturer to mount into any compatible rack.
46. C — 3.5 inches. A 2U device occupies 2×1.75 inches, which equals 3.5 inches of vertical mounting height. Multiplying RU count by 1.75 gives the precise vertical space requirement for any equipment.
47. B — Preserving airflow paths and preventing hot exhaust recirculation. Blanking panels close unused rack units and maintain the rack's pressurized front-to-back airflow path. Without them, hot exhaust can recirculate back through gaps to be re-ingested by equipment intakes, causing thermal degradation.
48. D — 16 amperes. The 80% rule applied to 20 amperes equals $20 \times 0.80 = 16$ amperes of continuous load. This rule provides headroom against breaker tripping and equipment damage.
49. A — Pin 1 ground, Pin 2 hot, Pin 3 cold. The AES convention for XLR pin assignments is universally adopted in professional audio: Pin 1 carries the shield/ground, Pin 2 carries the hot/positive signal, Pin 3 carries the cold/negative signal. This standardization ensures XLR cables function consistently.
50. C — 48 volts DC. Phantom power for condenser microphones is standardized at 48 volts DC, delivered through balanced audio cables in a configuration that does not affect the audio signal. Lower voltages exist for specific microphones, but 48V is the dominant standard.
51. C — Voltage differences between two signal conductors that cancel identical noise. Balanced audio carries the signal as the voltage difference between two conductors, with interference coupling identically onto both. At the receiver, the difference operation cancels the common-mode noise while preserving the signal.
52. B — A tenfold increase in power. A 10 dB increase represents a power ratio of 10:1, meaning the power has increased tenfold. This reference value is one of the three key decibel facts to memorize, along with 3 dB doubling power and 6 dB doubling voltage.
53. D — 10. The decibel formula for power ratios uses the multiplier 10 ($10 \times \log(P1/P2)$), while the formula for voltage ratios uses 20 (because power scales with voltage squared). Understanding which formula applies prevents calculation errors.
54. A — 240 watts. Professional practice sizes amplifiers at approximately 125% of total tap load, meaning a 300-watt amplifier should drive no more than approximately 240 watts of total tap load ($300 \div 1.25 = 240$). This headroom ensures reliable operation.
55. C — Step down the high-voltage line to the loudspeaker's required voltage. The transformer at each loudspeaker on a 70V distributed audio system steps down the 70-volt line to the lower

voltage that the loudspeaker driver requires, with a tap selector determining the power the loudspeaker draws.

56. D — 100 MHz. Cat5e cable supports a maximum frequency of 100 MHz, considerably less than the 250 MHz of Cat6 and 500 MHz of Cat6A. Each category's bandwidth determines the data rates and applications it can support.
57. B — 0.5 inches. Cat6A cable specifications permit only half an inch of untwist at termination because excess untwist degrades high-frequency performance and crosstalk rejection. Maintaining this minimum is essential for certified performance.
58. A — Compression termination using a cable-specific tool. Modern coaxial connector installation for video applications standardly uses compression termination, in which a metal collar is pushed forward over the connector body to compress it onto the cable. Compression provides superior weatherproofing and mechanical retention compared to older crimp-style connectors.
59. C — 100 meters (328 feet). The HDBaseT specification supports 4K60 video transmission over Cat6A cable up to 100 meters (328 feet), the maximum standard length matching general Ethernet limits. This long-distance capability is one of HDBaseT's key advantages.
60. D — The DDC channel embedded within the HDMI or DisplayPort cable. EDID information is exchanged via the Display Data Channel (DDC), which runs within the HDMI or DisplayPort cable on dedicated pins. This embedded channel allows automatic EDID exchange without separate connections.
61. B — 4K UHD content from compatible sources. HDCP 2.2 (and later versions) is required for 4K content because the original HDCP 1.x standard was not designed for 4K bandwidth. Every device in the signal path must support the required HDCP version, or protected content will not display.
62. A — 300 meters. OM3 multimode fiber specifications support 10 Gbps Ethernet transmission to 300 meters, substantially exceeding the 100-meter limit for copper. OM4 extends this to 400 meters, and OM5 to even greater distances.
63. D — Green. APC (Angled Physical Contact) fiber connectors are color-coded green to distinguish them from PC and UPC connectors which are blue or beige. This distinct color coding prevents accidental mating of incompatible connector types.
64. B — 0.25 to 1 millisecond. Dante audio networking operates with extremely low latency at standard settings, typically 0.25 to 1 millisecond depending on the specific configuration. This low latency is essential for professional audio applications where noticeable delay would degrade user experience.
65. A — 10 Gbps Ethernet. SDVoE distributes uncompressed 4K60 video over 10 Gbps Ethernet, which provides the bandwidth required for the uncompressed stream plus headroom for protocol overhead. This requirement is substantially greater than the 1 Gbps of typical office networks.

66. C — 25.5 watts. The IEEE 802.3at standard (PoE+) provides 25.5 watts at the powered device, with 30 watts at the power source equipment. The difference between source output and PD input accounts for cable losses during transmission.
67. D — 254 hosts. A /24 subnet provides 256 total addresses, minus 2 reserved for network and broadcast, leaving 254 usable host addresses. This is the standard subnet size for many local network deployments.
68. A — 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16. RFC 1918 defines three private IPv4 address ranges reserved for internal networks and not routable on the public internet. All three ranges are used in commercial AV installations depending on the client's network architecture.
69. C — 9600 and 115200 bps. RS-232 serial communication operates at typical baud rates between 9600 and 115200 bits per second, with 9600 being the most common default. Higher rates support greater throughput but require shorter cable lengths.
70. B — Baud rate, data bits, parity, and stop bits. RS-232 communication requires matching configuration of these four serial parameters between the controller and the controlled device. Mismatched configurations prevent communication between the devices.
71. A — Unidirectional with no status feedback from the controlled device. IR control transmits commands from controller to device but receives no feedback, making it limited compared to bidirectional protocols. IR also requires line of sight, further limiting its application.
72. D — Verify network connectivity to the device using ping. Ping testing is the most efficient first diagnostic step because it quickly identifies whether the device is reachable on the network. This eliminates the most common cause of communication failures before pursuing more complex diagnostics.
73. C — 0.20 ohms. The 5% of 4 ohms equals 0.20 ohms maximum cable resistance. Maintaining this limit preserves power transfer efficiency and prevents the amplifier from seeing reduced effective impedance that could trigger protection circuits.
74. B — 2.67 ohms. Three 8-ohm loudspeakers in parallel combine as $8 \div 3$, which equals approximately 2.67 ohms. Parallel impedance is always lower than any individual element, and dropping below amplifier minimum specification can cause damage.
75. D — Full quality maintained until catastrophic failure at the digital cliff. Digital signals tolerate degradation without quality loss up to the point where binary ones and zeros become indistinguishable, then fail completely. This binary success/failure characteristic distinguishes digital from analog signal behavior.
76. A — Video signal amplitude over time. A waveform monitor displays video signal voltage as a waveform on a time-axis display, useful for verifying signal levels, sync timing, and amplitude-

based characteristics. Modern software waveform monitors integrate with capture hardware in many verification workflows.

77. D — Video chrominance on a polar plot. A vectorscope displays video chrominance (color information) as a polar plot showing color hue (angle) and saturation (radius from center). This display format is essential for color verification across multiple video sources.
78. B — 14 feet. The throw ratio formula is image distance divided by image width, so image width = $21 \div 1.5 = 14$ feet. Throw ratio calculations determine projector positioning to achieve specific image sizes.
79. C — 6500K (D65). The D65 white point references 6500 Kelvin and is the standard white point for video content calibration. Calibrating to D65 ensures white content appears correctly without warm or cool tints.
80. A — 2.2. Standard video content is encoded for gamma 2.2, establishing the nonlinear relationship between input signal and displayed brightness that matches human visual perception. Display calibration adjusts gamma to match this standard so midtones appear correctly bright.
81. D — 8 times the image height. The AVIXA DISCAS standard recommends maximum viewing distance of 8 times image height for basic decision-making content (where text must be readable from the back of the room). Analytical decision-making content requires shorter distances of 4 times image height.
82. B — Flat, documented frequency response with omnidirectional polar pattern. Measurement microphones are designed for analytical accuracy rather than performance coloration, with flat frequency response and omnidirectional sensitivity producing measurements that reflect the room's actual sound.
83. C — Open interoperability between different manufacturers' systems. AES67 is an open standard from the Audio Engineering Society that enables networked audio systems from different manufacturers to exchange audio. Modern Dante implementations include AES67 compatibility as the common interoperability layer.
84. A — All loudspeakers in a system move in the same direction on the same signal. A polarity tester verifies that every loudspeaker responds with correct polarity to a reference signal. Polarity errors cause destructive interference and substantial loss of low-frequency output that the test identifies.
85. D — Insertion loss, return loss, NEXT, ANEXT, propagation delay, and other parametric measurements. Category-rated cable certification tests multiple parameters that together demonstrate the cable's high-frequency performance meets the specified category. Simple continuity tests are insufficient for verified performance.

86. B — 4.5 Gbps. 1080p60 at 8-bit color depth requires approximately 4.5 Gbps of bandwidth. Cable infrastructure must support this bandwidth because inadequate cable produces signal failure rather than gradual degradation.
87. C — 24 Gbps. 4K60 with 10-bit color and HDR requires approximately 24 Gbps of bandwidth, exceeding the 18 Gbps capacity of Premium High Speed HDMI. Ultra High Speed HDMI or equivalent infrastructure is required for this signal specification.
88. A — 250 watts. $10 \text{ loudspeakers} \times 20 \text{ W} = 200 \text{ W}$, plus $5 \text{ loudspeakers} \times 10 \text{ W} = 50 \text{ W}$, totaling 250 watts. Tap load calculations determine the total power demand on the amplifier.

Domain D — Perform Systems Close-Out

89. C — Levels A, B, and C representing essential, specialized, and unique items. ANSI/AVIXA 10:2013 categorizes verification items into A-Level (essential functions), B-Level (specialized functions present on many installations), and C-Level (unique requirements specific to particular installations). This categorization structures the verification process appropriately.
90. B — A substantive deficiency affecting system function. A non-functional audio channel prevents the system from performing its intended function, making it substantive rather than cosmetic. Substantive deficiencies typically receive higher priority than items affecting only appearance.
91. D — The system is ready for its intended use and warranty period typically begins. Substantial completion is the milestone where the installation is usable for its intended purpose, even though minor work may remain. This triggers warranty effective dates, beneficial use, and final payment becoming due.
92. A — Substantial completion when the client takes beneficial use. Warranty periods typically begin at substantial completion because that is when the system is placed in service and wear begins to accumulate. Tying warranties to original installation dates would unfairly disadvantage clients.
93. C — The installed system's actual configuration for future reference. As-built documentation captures the system as it actually exists, supporting future service work, modifications, and expansions throughout the installation's service life. The documentation is the authoritative reference for what is installed.
94. B — Brief focused sessions on essential operations with hands-on practice. End-user training is most effective when concise, focused on essential operational tasks rather than detailed technical knowledge, and includes hands-on practice. Users who actually operate the system during training retain knowledge better than passive observers.
95. D — Essential functions with screenshots and simple instructions. Quick reference guides are typically one or two pages providing brief, accessible instruction on essential functions with screenshots and simple language. They serve as the most-used training material long after training sessions conclude.

96. A — Defined response times, scheduled preventive maintenance, and priority service. Service agreements typically combine response time commitments, preventive maintenance visits at scheduled intervals, remote support, priority over ad-hoc service requests, and discounted rates for work outside the agreement scope.
97. C — Annual visits with more frequent visits for high-use environments. Professional preventive maintenance schedules typically recommend annual visits for most installations, with more frequent visits for high-use, demanding, or mission-critical environments. The annual baseline captures most preventive needs cost-effectively.
98. B — A formal written record of client acceptance. Signed sign-off documents create the contractual record that the client has inspected, observed, received training on, and accepted the installation as meeting requirements. This record protects both parties from later disputes.
99. A — The installer, client representative, and sometimes the general contractor. The substantial completion walk-through is a formal event where the installer, client representative, and on larger projects the general contractor or commissioning authority walk through together to verify the installation and document any remaining items.
100. D — That the system is ready for use even though minor work may remain. The certificate of substantial completion formally documents that the installation has reached the milestone where the client takes beneficial use, with any remaining punch list items scheduled for resolution before final completion.
101. B — Formal signing authority for the client organization. Project completion documents must be signed by an authorized client representative who has signing authority for the organization (typically a facilities director, project owner, or equivalent role). This formal authority makes the signed acknowledgment binding.
102. D — As-built drawings, equipment manuals, warranty documentation, and verification reports. Comprehensive project closeout includes documentation of the actual installed configuration, equipment operational and service information, warranty terms, and verification results. Each component supports the installation throughout its service life.

Domain E — Conducting Ongoing Project Responsibilities

103. A — Document activities, labor, materials, and issues for the project record. Daily progress reports create the ongoing record of installation work that supports schedule tracking, change management, billing, and historical reference. The reports become particularly valuable when disputes arise about what was accomplished when.
104. C — Obtain clarification from the design team on field-discovered issues. RFIs are formal questions submitted to the design team requesting clarification or direction on issues encountered during installation. The RFI documents both the question and the response, becoming part of the project record.

105. B — A minor adaptation within installer authority but requiring documentation. Substituting equivalent accessories is typically a minor adaptation within installer authority that does not require formal change orders. However, even minor changes should be documented in daily reports and as-built drawings to maintain accurate project records.
106. D — The general contractor's superintendent and structured coordination meetings. The general contractor's superintendent coordinates across all trades on construction projects and is the primary point of contact for schedule coordination, site access, and conflict resolution. Coordination meetings provide the structured forum for trade interactions.
107. A — Work scope expands beyond original contract specifications. Change orders are required when work scope expands beyond the original contract, whether through client requests, field discoveries, design modifications, or coordination requirements. The change order documents the addition, impact, and obtains client approval.
108. C — Cable scraps, packaging, and debris are managed continuously. Clean-as-you-go integrates debris management into installation work, placing cable scraps and packaging into appropriate containers as they are produced. This continuous practice prevents the accumulation that requires time-consuming end-of-day cleanup.
109. B — The general contractor's construction waste management system. Construction debris from AV installation is typically disposed of through the general contractor's waste management infrastructure, which provides general construction waste containers, recyclable material containers, and appropriate disposal routes.
110. D — The project manager who can coordinate appropriate response. Issues with other trades should be routed through the project manager who has the authority and relationship with the general contractor to coordinate resolution. Direct conflict between trades typically damages working relationships and rarely produces effective solutions.
111. A — Water suppression, local exhaust ventilation, or respiratory protection. OSHA's silica standard (29 CFR 1926.1153) requires specific dust controls during silica-generating activities including water suppression at the point of cutting, local exhaust ventilation with HEPA filtration, or respiratory protection appropriate for the exposure level.
112. C — Conflict identification and resolution between MEP, fire protection, and technology systems. BIM coordination drawings show how all building systems fit into ceiling and wall spaces without conflicts. Coordination drawings are developed collaboratively during design, but coordination issues continue to emerge in the field and require real-time resolution.
113. B — Report the condition through appropriate channels for engineering review. Field-discovered conditions affecting design must be reported for engineering review rather than being silently absorbed into the installation. Professional escalation enables design modifications to be properly authorized rather than becoming undocumented improvisations.

114. D — As soon as the potential delay is identified, even if impact is uncertain. Delays reported early permit the project manager to develop mitigation strategies and communicate with the client before commitments are missed. Late reporting deprives the project manager of options and produces surprise schedule slips.
115. A — Be routed through the project manager for change order processing. Scope changes must flow through formal change order processes with project manager coordination, cost and schedule impact assessment, and client approval. Performing scope-change work without authorization consumes labor and materials that may not be recovered through payment.
116. C — Labor and materials consumed without compensation to the installer. Unauthorized scope expansion typically results in labor and materials consumed without recovery, because the work was not part of the original contract and was not authorized through change order. Professional installation firms refuse to perform unauthorized scope expansion.
117. B — Both as-built records and traceability of decisions under installer authority. Field engineering documentation supports both the as-built record of what was actually installed and the professional record of decisions made during installation. This dual function makes documentation valuable for service support and demonstrating professional judgment.
118. D — Either perform firestopping correctly or coordinate with the firestop contractor. Firestopping is life-safety work requiring proper materials and installation methods matched to the specific wall assembly rating. The installer must either perform the work correctly with appropriate training and materials or coordinate with qualified firestop contractors.
119. A — Stop work immediately and contact qualified asbestos abatement personnel. Asbestos exposure causes diseases that may emerge decades after exposure, and only qualified asbestos abatement contractors should disturb suspect materials. Continuing work informally creates exposure with consequences that may not be apparent for years.
120. C — Understand why the failure occurred so the same failure does not recur. Root-cause analysis seeks the fundamental cause of failures so that addressing the cause prevents recurrence rather than just restoring function. Repairs that address symptoms without root causes typically produce repeat failures that consume support resources over time.
121. B — 7 to 10 years. Professional AV installations typically have a service life of 7 to 10 years before substantial refresh is required, with individual components having varying lives within that range. Planning for refresh helps clients budget for system updates and installation firms plan service capacity.
122. A — Increasing service frequency, declining reliability, and parts unavailability. End-of-life indicators include increasing service calls, failures occurring during use rather than being caught by preventive maintenance, inability to support current needs, and unavailability of replacement parts.

123. D — Factory-reset or data-wiped before leaving the client's site. Decommissioned equipment containing configuration data, credentials, network information, or proprietary client information must be reset before disposal to protect that information from exposure. Professional decommissioning includes data removal as a standard step.
124. C — Restricted materials in electronic equipment requiring responsible handling. RoHS (Restriction of Hazardous Substances) restricts the use of certain hazardous materials in electronic equipment and requires responsible handling at end of life. Combined with WEEE directives, RoHS shapes how decommissioned AV equipment must be processed.
125. B — Through the entire service life of the system via maintenance and service activities. The professional installer's relationship with an installation extends through maintenance, service, upgrades, and eventually decommissioning across the system's full service life. This long-term relationship is the foundation of recurring revenue and client loyalty.