

CTS-D Practice Exam



Certified
Technology
Specialist
Design



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Domain A: Conducting a Needs Assessment:

Task 1: Identify stakeholders/decision-makers

1. According to best practice, who is the owner's representative on an AV project?
 - A) Architect of the building project is usually in charge of owner AV
 - B) Electrical consultant almost always represents the client for all AV
 - C) Client will usually pick the AV manager, or committee to organize communication
 - D) Design team and mechanical consultant are usually picked by the client

Task 2: Identify skill level of End users

2. What information do you need to solicit from end users regarding their familiarity and experience using AV equipment?
 - A) Background training and abilities of users
 - B) Attention span and motivation level of the users
 - C) Knowledge of the users reaction to various presentation styles
 - D) Visual acuity and attention level of the trainee audience

Task 3: Educate the AV client

3. During the architectural program phase a ____ is an excellent way to educate the AV customer about practical design issues involved in implementing their requests.
 - A) Needs analysis
 - B) Program report
 - C) Request for change
 - D) Request for qualifications

Task 4: Review client technology master plan

4. How do you determine the client's long term plans and needs in terms of equipment and support maintenance?
 - A) Ask advice from other AV industry experts and vendors
 - B) Contract with a consulting company to determine client needs
 - C) Consult the owner, examine standards and design manuals, and the project report
 - D) Design a generic system which fits any organization of that size

Task 5: Identify clients' purchasing processes

5. In the bid (tender) process how does one determine the client's standard terms and conditions?
 - A) Consult the request for proposal (RFP) and examine the project description
 - B) Examine the statement of AV integrator qualifications
 - C) Use a benchmarking approach with a fellow AV design competitor
 - D) Consult recommendations put together by local government building inspectors

Task 6: Research clients' business environment

6. How does one determine the client's ratio of technology enabled rooms to personnel?
- A) Divide the project budget by the total number of employees
 - B) Consult the project directory and the head AV technician
 - C) Determine the total electrical capacity for the building and use 67% of it
 - D) Consulting the architectural program document, design phase discussions

Task 7: Define AV needs (absolutes)

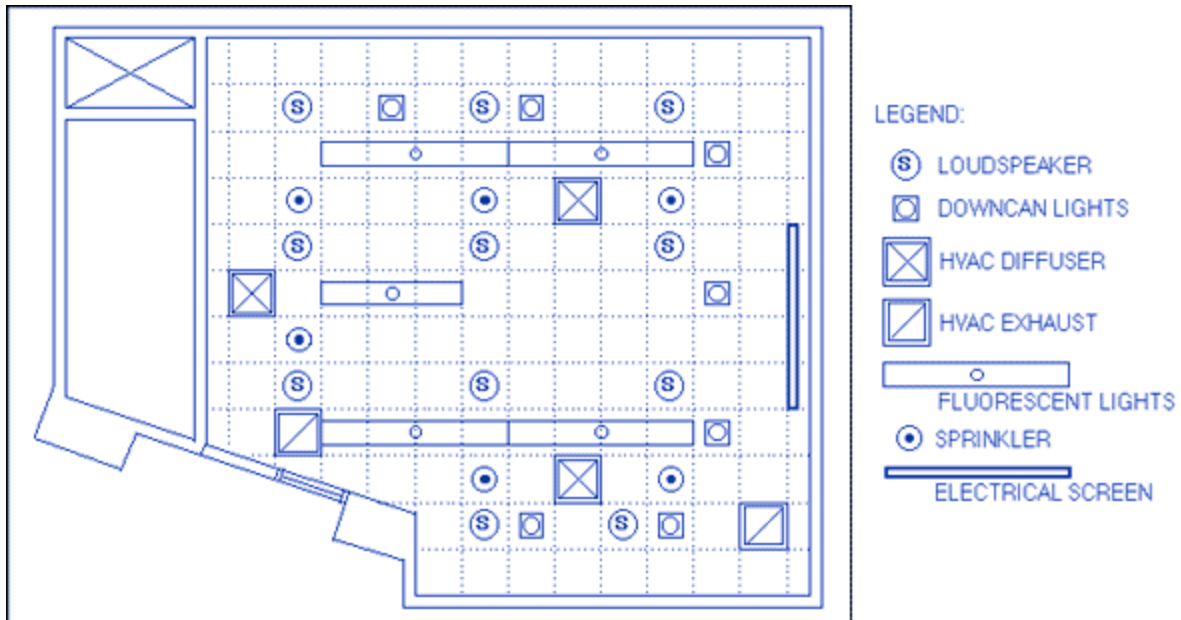
7. How does the AV designer determine if the client has an AV budget sufficient for the AV needs?
- A) Consult with qualified professionals to evaluate AV needs versus funds available
 - B) Call the company's bank to determine their available funds
 - C) Ask the local government assessment office to provide information on finances
 - D) Avoid budget issues as much as possible and focus on design and engineering
8. How does the AV Designer determine project schedules and timelines?
- A) Call the architect and the owner for dates and system information
 - B) Use your own judgment based upon past experience
 - C) Consult the project schedule outlining AV integration in a timeline
 - D) Follow your company schedule provided by your senior project integrator

Task 8: Identify scope of work

9. How does one define project responsibilities and identify AV technology requirements?
- A) The project architect and business manager will outline the responsibilities in the RFP
 - B) Follow the project directory & program report
 - C) Ask the owner what he wants along the way as project progresses
 - D) Follow guidelines determined by state and local building inspectors
10. What information is needed to create a conceptual design including budget estimates?
- A) The equipment list meets these criteria and will disclose all costs
 - B) A cost analysis study will quickly reveal what is needed in the AV system
 - C) Program report that addresses costs of needed systems, purchase and installation
 - D) The commissioning report will reveal all details concerning equipment cost analysis

Domain B: Collaborating With Other Professionals

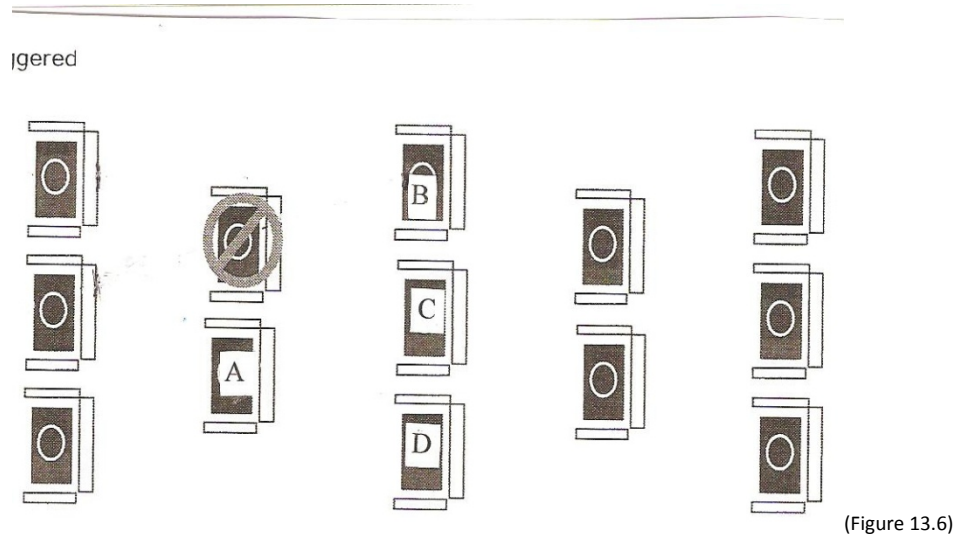
Task 1: Review Architectural and Engineering drawings



11. Given the drawing above, what deficiencies might have affected this AV drawing?

- A) Lighting, duct work, and sprinkler plumbing had to be considered
- B) Fluorescent lights and electrical screen were an issue
- C) Noisy ductwork may have influenced sprinkler design
- D) Loudspeakers near sprinklers may lead to electrical short circuits

Task 2: Identify architectural/interior design considerations



12. How can this sightline issue (figure 13.6 above) be **efficiently** corrected in the design phase?

- A) Use a staggered seat arrangement without tiered seating
- B) Use a tiered seating arrangement with seats aligned
- C) Eliminate any seats which block the view
- D) Raise the room ceiling and place viewing screen higher on wall

13. How do we determine the farthest distance a viewer should be placed from a screen for detailed viewing in a venue?

- A) Divide the length of the room by six
- B) Multiply the screen height by six
- C) Multiply the width of the viewing area by one
- D) Divide the width of the room by six

Task 3: Identify structural/mechanical considerations

14. If the efficiency rating of an amplifier is 65% and the amplifier draws 7 amperes (A) at 120 V of alternating current (VAC) what is the heat load it generates?

- A) 2850 Btu/hr
- B) 1200 Btu/hr
- C) 840 Btu/hr
- D) 1500 Btu/hr

15. According to best practices what is the safe working load (SWL) requirement for overhead mounting of a 75 pound (33.75 kg) projector?

- A) 500 pounds (225 kg)
- B) 375 pounds (168.75 kg)
- C) 300 pounds (180 kg)
- D) 275 pounds (123.75 kg)

Task 4: Identify electrical requirements

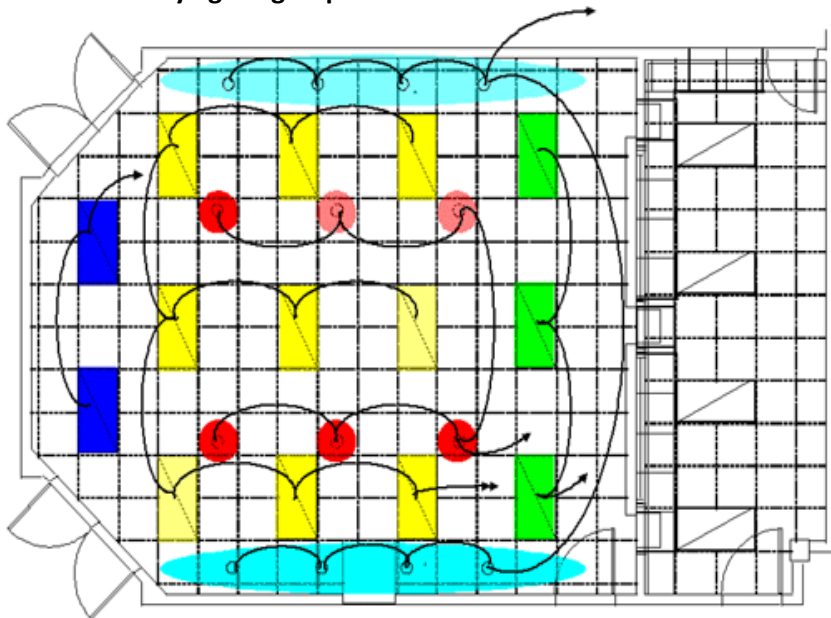
16. When running conduit it is important to remember that the conduit will require:

- A) Room to expand 45% due to latent heating
- B) Internal insulation, usually an injected polyurethane jell
- C) Adequate mounting support to withstand cable pulling
- D) A slip sleeve to insure adequate air space for cable

17. The first step when determining conduit capacity for cable should be to determine the:

- A) Cable resistance and multiply by a factor of 5
- B) Allowable fill percentage based upon local codes and regulations.
- C) Wire dimensions exclusive of insulation multiplied by 3.1459
- D) Bend radius for all cables utilized in the installation

Task 5: Identify lighting requirements



18. In the lighting diagram above depicting zone lighting, which lighting zone is depicted by the red lights in the diagram?

- A) Seating area fluorescent lights
- B) Seating area down lights
- C) Sidewall wash lights
- D) Front and rear lights

19. When utilizing fluorescent light in a commercial application it has a significant advantage over other lighting in that:

- A) No color shift is produced by dimming the lamp
- B) Black and white illumination is superior to other lighting
- C) It does not emit EMI therefore no shielding is needed
- D) Wireless power connections are an option

Task 6: Identify IT requirements

20. Why might you recommend to an AV client to set up a dynamic host configuration protocol (DHCP) server system?

- A) More secure server set up
- B) It is a static address system
- C) Reduced possibility of address duplication
- D) No acknowledgement of delivery increases speed

21. Why should the AV designer be knowledgeable about a client's existing WLAN?

- A) Load access compatibility could be an issue
- B) May need to integrate POE equipment into the system
- C) There could be signal interference issues
- D) There could be signal incongruence issues

Task 7: Recommend Acoustical Criteria

22. How can the AV designer address ambient noise issues caused by HVAC equipment and ductwork vibration?

- A) Silencers, baffles, and insulation panels
- B) Place dampers near diffusers and grilles
- C) Using larger ducts and high speed fans where practical
- D) Use sensible heat rather than latent heat

23. Reflected sound could be:

- A) A problem if the reflective material is directly behind the presenter
- B) An asset if arriving within 50 ms after the direct sound
- C) Scattering the sound throughout the venue
- D) A factor when using fabric wrapped fiberglass panels

Task 8: Identify life safety and security interface issues

24. If your venue is located in an earthquake prone region what mounting precautions need to be taken to ensure the safety and security of persons and property?

- A) Fluorescent light mounts should be avoided due to glass dangers
- B) There should be a warning horn connected to a seismic sensor
- C) Lightweight construction panels and AV materials should be used
- D) Stabilizer arms, sway bars, and safety cables should be utilized

Task 9: Identify regulatory issues

25. The AV designer needs to remember that construction codes and regulations are:

- A) Usually set by national standards committees
- B) Determined by local jurisdictions, or by the authority having jurisdiction
- C) Set by the NEC and FCC
- D) Subject to negotiation with contractors

Domain C: Developing AV Designs

Task 1: Create Draft AV Design

26. What is the typical input size for a matrix switcher application?
- A) Most signal switchers use the 128 bit encrypted
 - B) Inputs of 8, 16, 32, 64, or 128 are not uncommon
 - C) RGBHV signals can only use a 64 input switcher
 - D) Signal inputs are all treated the same in most switchers
27. Stereo loudspeaker systems typically use what type of signal?
- A) Analog
 - B) RGBH
 - C) high gain
 - D) low gain
28. The two basic AV signal types are:
- A) Dynamic and Static
 - B) Bit and Megabyte
 - C) Sine and Cosine
 - D) Digital and Analog
29. What is the advantage of converting an analog signal to digital?
- A) More signal headroom
 - B) Easier to address signal degradation, storage, and recording issues
 - C) Digital signals carry audio and video feeds that analog will not
 - D) Digital signals are more energy efficient to broadcast
30. One way to plan for future AV expansion in the system is to:
- A) Run extra lighting to unused rooms for future use
 - B) Set up initial signal paths and switchers with extra inputs
 - C) Purchase generators for extra electrical capacity for future use
 - D) Install extra speakers even though they are not yet needed
31. In the interest of value engineering what are possible means the AV designer might use to reduce costs?
- A) Use alternate approaches, substitutions, reduce or delete subsystem components
 - B) Suggest to the client that the project goals and objectives be expanded
 - C) Ask the architect to utilize cheaper construction material in the initial construction
 - D) Suggest structural changes in the AV power grid to save on electrical
32. Under what circumstances might you advise a client to implement a multi-point video conferencing control unit?
- A) For distance learning to several classrooms
 - B) When two end-points need to communicate
 - C) For international video conferencing
 - D) For use in dial up and connect conferencing

Task 2: Confirm Site Conditions

33. During the ___ phase of design the AV designer needs to help the architect address such issues as mechanical and electrical room placements, as well as sightline issues affecting ceiling heights.

- A) Program
- B) Design development
- C) Conceptual design
- D) Diagnostic

34. What factors besides the inverse square law of sound must be considered when measuring sound levels at the venue and filing reports?

- A) Absorption, diffusion, reverberation (RT 60), background noise (NC, RC)
- B) Attenuation(NC), destabilization, cross creep, resistance (Ohm)
- C) Distance (SP), refraction (RQ), sound translation (STL)
- D) Diminution, destabilization, interference, shifting

35. What other type of light, besides light coming directly from a source, must be measured?

- A) Refracted
- B) Distorted
- C) Fluorescent
- D) Ambient

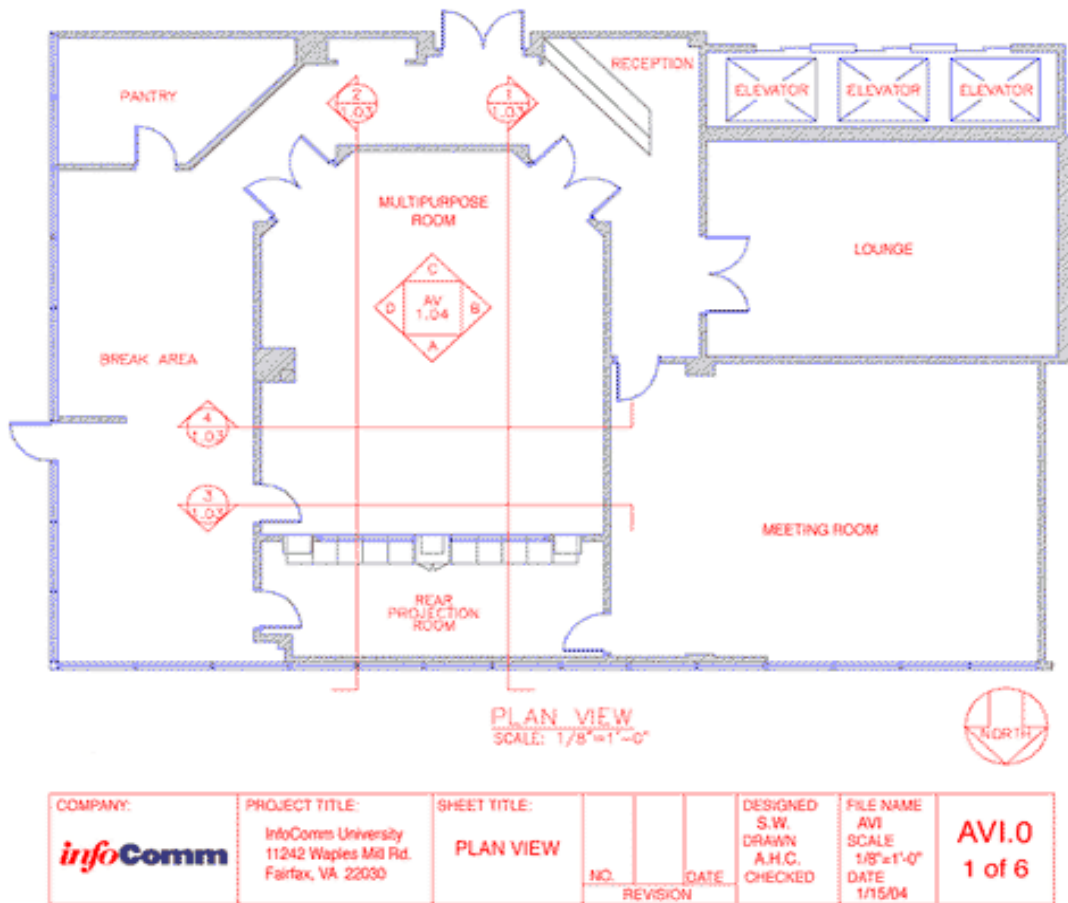
36. For light coming directly from a source such as a light bulb, what measure and instrument should be used?

- A) Foot lamberts with an STL
- B) Candelas with an incident meter
- C) Lux with an incident meter
- D) Footcandles with a light impedance meter

37. How is reflected light calculated?

- A) Multiplying the illuminance onto a surface by the reflectance of the surface
- B) Calculate the ratio of the lightest area to the darkest
- C) Subtract 6 footcandles (fc) for every doubling of the distance from the source
- D) Take twice the distance from the light source and multiply it by .33

Task 3: Produce Infrastructure drawings

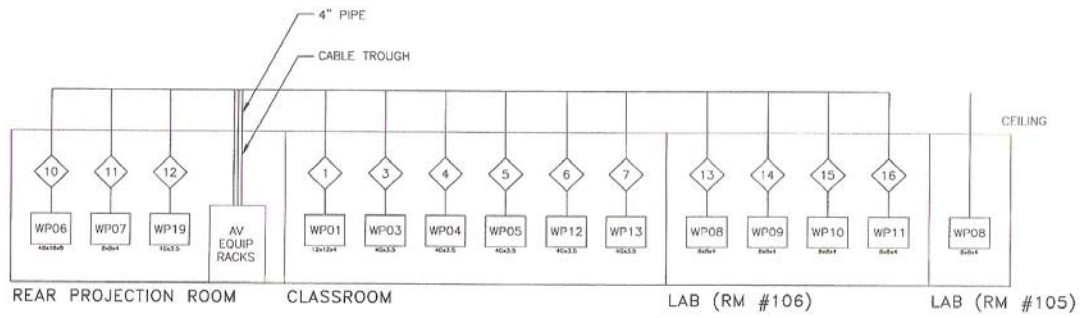


38. Using the diagram above, how would the AV designer confirm room dimensions?

- A) Measure from the 16" studs located in the wall blue print
- B) Calculate from the four corners
- C) Use the scale to measure and convert to feet and meters
- D) Look at lighting fixtures and calculate by surface area

39. An AV conduit riser diagram will show information such as:

- A) Electrical light wiring
- B) Electrical breaker boxes
- C) Junction and pull boxes
- D) Plumbing routes



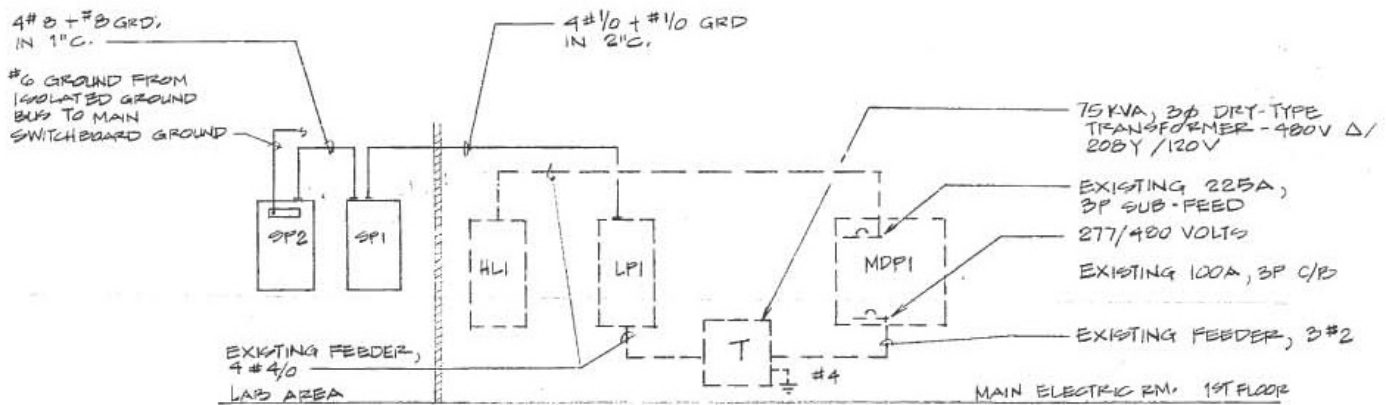
RUN #	PLATE	WIRE BY SVC CONTRACTOR		E.M.C. CONDUIT
		QTY.	TYPE	
1	WP01			(1) 3/4" (2) 1" (1) 1 1/4"
3	WP03			(3) 3/4"
4	WP04			(3) 3/4"
5	WP05			(3) 3/4"
6	WP12			(1) 3/4"
7	WP13			(1) 3/4"
10	WP06			
11	WP07			(1) 2"
12	WP19			(1) 3/4"
15	WP08			(1) 3/4" (1) 1"

NOTES:

All gangable electrical boxes to be 3 1/2" deep.

All gangable electrical boxes to be equipped with 3/4" knockouts.

40. What type of drawing is pictured above?
- A) Electrical coordination riser
 - B) TELCO/DATA coordination diagram
 - C) Conduit Riser diagram
 - D) AV device location drawings



41. What type of architectural drawing is pictured above?
 - A) Power Riser diagram
 - B) TELCO/DATA coordination drawings
 - C) Conduit Riser diagrams
 - D) AV device location drawings

42. What type of design information is found on TELCO/DATA coordination drawings?
 - A) Locations of server, phone and Ethernet lines, WIFI modem
 - B) Drains, water lines, intake valves, security system
 - C) Breaker boxes, lighting, RGBH signal runs
 - D) Locations of conduit runs, mixers, signal compressors

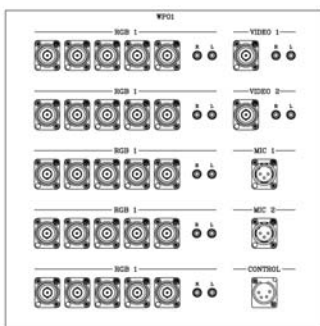
43. When producing shop drawings such as AV signal flow diagrams, what should be included?
 - A) Descriptions of the video feed settings and relays
 - B) Details of equipment configuration and interconnections
 - C) Details about the building infrastructure and sprinkler system
 - D) Vendor details and specifications

44. Where will the equipment dimensional information for a design application be found?
 - A) Electrical coordination drawings
 - B) TELCO/DATA coordination drawings
 - C) Conduit Riser diagrams
 - D) Architectural Specifications

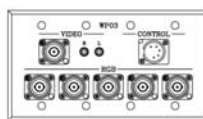
45. What architectural document shows details about equipment mounting?
 - A) Electrical coordination drawings
 - B) Architectural schedules and notes
 - C) Conduit Riser diagrams
 - D) Sectional Block drawings

Task 4: Produce AV Drawings

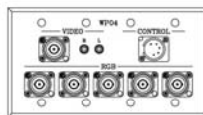
46. When creating a schematic diagram of audio flow for a project what must be included in the diagram?
- Microphones, mixers, switchers, routers, and processors
 - Inputs, outputs, equipment rack locations, ceiling venting
 - Conduit runs, pull boxes, bends
 - Construction materials, wall panels, acoustic tiles
47. What factors need to be considered when designing and drawing rack elevation diagrams?
- User mobility, competence of the technician, quality of the rack material
 - Equipment manufacturer, model year of equipment, number of USB ports
 - Ergonomics, weight distribution, RF and IR reception, heat loads, signal separation
 - Amount of RJ-45 connectors used, amount of conduit used



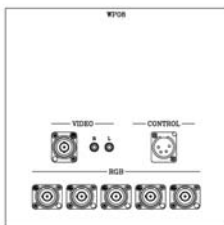
1 WP01
1.2m



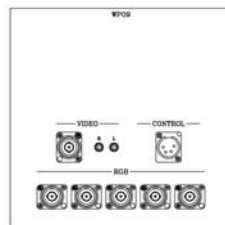
2 WP03
1.2m



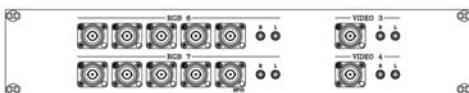
3 WP04
1.2m



6 WP08
1.2m



7 WP09
1.2m



10 RP01
1.2m

48. What type of drawing is shown above?
- Equipment racks and wall plates
 - Video system record drawings
 - Conduit Riser diagram
 - Sectional Block drawing

INPUTS	NAME	NAME								VTC CODEC	ATC HYBRID	PROGRAM MATRIX MIXER IN 1 (LS03)	PROGRAM MATRIX MIXER IN 2 (LS03)
		1	2	3	4	5	6	7	8	A	B	C	D
1	MIC 1 (WALL PLATE)									2	1		
2	MIC 2 (WALL PLATE)									2	1		
3	MIC 3 (RACK PLATE)									2	1		
4	MIC 4 (RACK PLATE)									2	1		
5	MIC 5 (RACK PLATE)									2	1		
6	MIC 6 (RACK PLATE)									2	1		
7	WIRELESS MIC									2	1	1, 2	1, 2
8	CEILING MIC									2	1		
A	VTC CODEC (TA01)											2	2
B	ATC HYBRID (AS02)											1	1
C	PROGRAM AUDIO (MM8)									2	1		
D													

DEVICE: CONFERENCE MIXER (AS01)
MODE: 1-AUDIO CONFERENCE
2-VIDEO CONFERENCE

49. What type of drawing is displayed above?

- A) Equipment racks and wall plates
- B) RGBHV system table
- C) Conduit Riser table
- D) DSP routing table

50. What systems should be included when drawing AV network diagrams?

- A) The connected devices, cabling system, wireless links
- B) Sprinkler system, ceiling plan, touch panel, plumbing runs
- C) Signal control, audio auditing, laser conduit
- D) Lighting and projection, noise synching, ambient noise reduction

54. The final AV drawing package should contain detail drawings and diagrams of:
- A) Manufacturer specifications, ceiling and infrastructure, concrete footer
 - B) Connections, plate & panels, patch panels and control panels, equipment
 - C) Ceiling tile format and composition, ceiling suspension layout
 - D) CPU circuit layouts by individual machine, Rj-45 connections
55. What should be included in the AV specifications, or “project manual” to further describe the system components?
- A) Codes, references, shop drawings, commissioning & testing requirements
 - B) Equipment manufacturer, model year of equipment, number of USB ports
 - C) Ergonomics, weight distribution, RF and IR reception, heat loads, signal separation
 - D) Amount of RJ-45 connectors used, amount of conduit used

Domain D: Conducting Project Implementation Activities

Task 1: Participate in project implementation communication

56. Under what circumstance would a designer need to generate a Request for Information (RFI) form on a project?
- A) There is a mis-match between a diagram and a description on the project
 - B) The owner has a change in the project or requests a change
 - C) There is a site issue having to do with the concrete footers
 - D) The owner finds a major problem in the drain tile surrounding the construction site

Task 2: Perform System Verification

57. When testing the audio system to ensure that the system is equalized you will need an SPL meter, a signal generator and____.
- A) An oscilloscope
 - B) A real time analyzer
 - C) A test pattern generator
 - D) A pink noise generator
58. What are the main systems which need to be tested in the final commissioning verification stage of a project?
- A) Programming and accounting, sending & receiving, command & control
 - B) Random access & digital ranging, VHS components
 - C) Audio, video, network & TELCO, electrical, RF transmission
 - D) Digitalization & decoding, random detection & accessing, intercoms

Task 3: Conduct System Close Out Activities

59. To assure optimum opportunity for end user training on the systems and equipment training group size should be no larger than:

- A) 25 people
- B) 20 people
- C) 10 people
- D) 6 people

60. Comprehensive training of end users and support staff is essential to customer satisfaction and also:

- A) Is not expensive or time consuming because the manufacturer pays for it
- B) Reduces service calls as well as improper use and equipment damage
- C) Reduces AV contractor costs because it is a tax deductible expense
- D) Enables the AV contractor to continue to keep paid personnel at the site

Answer Key & References:

1. (C) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.26-27)
2. (A) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.164-166)
3. (A) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp.20-21)
4. (C) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp. 84-85)
5. (A) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp. 63-66)
6. (D) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.21, 84-85)
7. (A) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.42)
8. (C) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.42)
9. (B) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp.24-25, 64, 80-81)
10. (C) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp.80-81)
11. (A) (Source: InfoComm Academy: *Design Online*)
12. (B) (Source: *AV Design Reference Manual*, 2006, pp. 13-10 to 13-11)
13. (B) (Source: *AV Design Reference Manual*, 2006, pp. 13-4 & 13-5)
14. (A) (Source: *AV Design Reference Manual*, 2006, p.9-8)
15. (B) (Source: *AV Design Reference Manual*, 2006, p.10-2)
16. (C) (Source: *AV Design Reference Manual*, 2006, p.5-14)
17. (B) (Source: *AV Design Reference Manual*, 2006, p.5-22)
18. (B) (Source: *AV Design Reference Manual*, 2006, p.12-26)
19. (A) (Source: *AV Design Reference Manual*, 2006, p.12-27)
20. (C) (Source: *AV Design Reference Manual*, 2006, p.6-20)
21. (C) (Source: *AV Design Reference Manual*, 2006, p.6-30 & 6-31)
22. (A) (Source: *AV Design Reference Manual*, 2006, pp.9-4)
23. (B) (Source: *AV Design Reference Manual*, 2006, pp. 11-14&11-15)
24. (D) (Source: *AV Design Reference Manual*, 2006, pp.10-9)
25. (B) (Source: *CTS Exam Guide*, by Sven Laurik, 2011, p.26)
26. (B) (Source: *AV Design Reference Manual*, 2006, p.17-28)
27. (A) (Source: *AV Design Reference Manual*, 2006, p.17-29, 11-1)
28. (D) (Source: *AV Design Reference Manual*, 2006, p.3-1 to 3.2)
29. (B) (Source: *AV Design Reference Manual*, 2006, pp.3-4 to 3-5)
30. (B) (Source: *AV Design Reference Manual*, 2006, p.17-28)
31. (A) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, pp.108-109)
32. (A) (Source: *AV Design Reference Manual*, 2006, p.15-5)
33. (C) (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.107)
34. (A) (Source: InfoComm Academy: *Design Online*)
35. (D) (Source: *AV Design Reference Manual*, 2006, p. 12-19)
36. (B) (Source: *CTS Exam Guide*, by Sven Laurik, 2011, p.385)
37. (A) (Source: *AV Design Reference Manual*, 2006, p.12-21)
38. (C) (Source: InfoComm Academy: *Design Online*)
39. (C) (Source: *CTS Exam Guide*, by Sven Laurik, 2011, p.221)
40. (C) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" 2009, document AV 304)
41. (A) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" 2009, document #TE1-2)
42. (A) (Source: InfoComm Academy: *Design Online*)
43. (B) (Source: InfoComm Academy: *Design Online*)
44. (D) (Source: InfoComm Academy: *Design Online*)
45. (B) (Source: InfoComm Academy: *Design Online*)
46. (A) (Source: *AV Design Reference Manual*, 2006, pp.14-8 to 14-17)
47. (C) (Source: *InfoComm AV Installation Handbook, The Best Practice for Quality Audio Visual Systems*, 2009, Second Edition, p. 2.2)
48. (A) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" document #AV504)
49. (D) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" document #AV406)
50. (A) (Source: *AV Design Reference Manual*, 2006, p.6.1)
51. (B) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" document #401)
52. (C) (Source: *CTS Exam Guide*, by Sven Laurik, 2011, p.318)
53. (D) (Source: InfoComm "Audiovisual Systems Project Documentation Sample" 2009, document "AV/IT Device Inventory")
54. (B) (Source: *AV Design Reference Manual*, 2006, p.19-14)

55. **(A)** (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.115)
56. **(A)** (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.134-135)
57. **(B)** (Source: *InfoComm AV Installation Handbook, The Best Practices for Quality Audio Visual Systems*, 2009, Second Edition, p. 5.35)
58. **(C)** (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.161-62)
59. **(D)** (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.165)
60. **(B)** (Source: *Audiovisual Best Practices, the Design and Integration Process for the AV and Construction Industries*; InfoComm, 2005, p.164)