

Appendix A: CTS-D Exam Content Outline

The CTS-D exam specifications were developed by combining the importance, criticality, and frequency data obtained from the Job Task Analysis study. The resulting data were converted to percentages and the percentages were used to determine the number of questions related to each domain and task that should appear on the multiple-choice CTS-D examination. The test specifications in the table below list how many questions are included in each Domain and Task and the percentage of the test included in each domain. The Job Task Analysis Final Report can be downloaded at www.AVIXA.org/ctsd under “CTS-D Resources.”

CTS-D Exam Content Outline	% of Exam	# of Items
Domain A: Conducting a Needs Assessment	15.2%	19
Task 1: Identify stakeholders/decision-makers	1.6%	2
Task 2: Identify skill level of end users	1.6%	2
Task 3: Educate the AV client	0.8%	1
Task 4: Review client technology master plan	1.6%	2
Task 5: Identify clients' procurement processes	0.8%	1
Task 6: Research clients' business process	0.8%	1
Task 7: Research clients' business environment	0.8%	1
Task 8: Define AV needs (absolutes)	2.4%	3
Task 9: Identify scope of work	2.4%	3
Task 10: Identify regulatory requirements and project certification goals	2.4%	3
Domain B: Collaborating With Other Professionals	25.6%	32
Task 1: Review A/E (architectural and engineering) drawings	4%	5
Task 2: Coordinate architectural/interior design criteria	3.2%	4
Task 3: Coordinate structural/mechanical criteria	3.2%	4
Task 4: Coordinate electrical criteria	3.2%	4
Task 5: Coordinate lighting criteria	3.2%	4
Task 6: Coordinate IT and network security criteria	4%	5
Task 7: Recommend acoustical criteria	2.4%	3
Task 8: Coordinate life safety and security criteria	2.4%	3
Domain C: Developing AV Designs	49.6%	62
Task 1: Create draft AV design	10.4%	13
Task 2: Confirm site conditions	8%	10
Task 3: Produce infrastructure drawings	10.4%	13
Task 4: Produce AV system documents	11.2%	14
Task 5: Produce AV build documentation	9.6%	12
Domain D: Conducting Project Implementation Activities	9.6%	12
Task 1: Participate in project implementation communication	2.4%	3
Task 2: Perform system verifications	4%	5
Task 3: Conduct system close out activities	3.2%	4
Total	100.0%	125

NOTE: Applicants and stakeholders should download the most up-to-date free edition of the CTS-D Candidate Handbook that may include important policy and procedure updates by going to the AVIXA website at www.AVIXA.org.
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CTS-D Examination: Job Task Analysis

A detailed job task analysis is available on the CTS-D Exam Resource page of AVIXA's website. Visit www.AVIXA.org/ctsd

Domain A: Conducting a Needs Assessment

Task 1: Identify stakeholders/decision-makers

Knowledge of:

- Contractual relationships
- How to identify project decision makers

Attributes:

- Ability to work as part of a team or team leader
- Good verbal communication skills
- Good written communication skills
- Attention to detail
- Good interpersonal skills

Domain A: Conducting a Needs Assessment

Task 2: Identify skill level of end users

Knowledge of:

- Video components
- Networking
- AV terminology

Attributes:

- Ability to translate AV speak into IT speak
- Ability to translate AV speak into lay terms
- Good listening skills
- Good verbal communication skills
- Good written communication skills
- Good interpersonal skills

Domain A: Conducting a Needs Assessment

Task 3: Educate the AV client

Knowledge of:

- Basic concepts of auxiliary systems
- Accessibility issues
- AV systems
- Networking
- Local regulatory issues
- AV products

Attributes:

- Basic computer skills
- Ability to communicate ideas clearly
- Public speaking

Domain A: Conducting a Needs Assessment

Task 4: Review client technology master plan

Knowledge of:

- Basic fiscal planning terminology (ROI, etc.)
- Client's structured cabling system
- Equipment life cycles
- RoHS and other green issues

Attributes:

- Good verbal communication skills
- Good written communication skills

Domain A: Conducting a Needs Assessment

Task 5: Identify clients' procurement processes

Knowledge of:

- Purchasing terms and processes

Attributes:

- Good verbal communication skills
- Good written communication skills
- Good interpersonal skills

Domain A: Conducting a Needs Assessment

Task 6: Research clients' business process

Knowledge of:

- Workflows in business environments

Attributes:

- Good verbal communication skills
- Good written communication skills
- Good interpersonal skills

Domain A: Conducting a Needs Assessment

Task 7: Research clients' business environment

Knowledge of:

- Existence of encryption standards
- IT bandwidth
- Network systems & terminology (IP based networks)

Attributes:

- Good verbal communication skills
- Good written communication skills
- Good interpersonal skills

Domain A: Conducting a Needs Assessment

Task 8: Define AV needs (absolutes)

Knowledge of:

- AV systems
- Networking

Attributes:

- Good verbal communication skills
- Good written communication skills

Domain A: Conducting a Needs Assessment

Task 9: Identify scope of work

Knowledge of:

- Basic drafting skills
- General AV products
- AV systems
- markups/profit margins for budgeting
- other technology disciplines (structured cabling, lighting, acoustics, networking etc.)
- Program report checklists

Skill in:

- Basic and Advanced math
- Good verbal communication skills
- Good written communication skills
- Flexibility

Domain A: Conducting a Needs Assessment

Task 10: Identify regulatory requirements and project certification goals

Knowledge of:

- Local regulatory issues

Skill in:

- Utilizing reference materials
- Good verbal communication skills
- Good written communication skills
- Good interpersonal skills

Domain B: Collaborating With Other Professionals

Task 1: Review A/E (architectural and engineering) drawings

Knowledge of:

- Architectural details that impact AV
- Architectural drawing symbols
- AV best practices (stage height, size of screen vs. seating arrangements, viewing angles, viewing distances, height of screen, ceiling soffits, distribution of audio, etc.)
- Drawing conventions

Skill in:

- Ability to calculate room dimensions
- Ability to read construction drawings
- Good math skills
- Understanding of construction specifications
- Understanding of drawing scale
- Attention to detail
- Ability to mentally visualize based on drawings
- Ability to use a scale ruler
- Ability to use a scientific calculator

Domain B: Collaborating With Other Professionals

Task 2: Coordinate architectural/interior design criteria

Knowledge of:

- AV design best practices
- AV equipment capabilities
- Construction materials
- Construction practices
- Current display technologies

Attributes:

- Ability to calculate area
- Ability to identify 3-dimensional interference issues from 2 dimensional plans
- Ability to visualize spatial relationships from plans
- Understanding of AV maintenance requirements
- Understanding of AV systems operational requirements
- Understanding of equipment space and access requirements
- Understanding of ergonomic best practices
- Understanding of Inverse Square Law
- Ability to utilize reference materials

Skill in:

- CAD Software
- Using a calculator
- Using a computer
- Using light meters
- RTA (real time analyzer)
- Using scale rulers and measuring devices
- Using a SPL (sound pressure level) meter

Domain B: Collaborating With Other Professionals**Task 3: Coordinate structural/mechanical criteria****Knowledge of:**

- Mechanical (HVAC) components
- Equipment clearance/safety issues
- equipment mounting technologies
- Mechanical handling and access equipment
- Local codes
- Equipment mounting best practices
- Structural mounts
- Types of mounting hardware

Attributes:

- Ability to calculate BTU loads
- Understanding of proper air flow
- Ability to understand manufacturer specifications

Skill in:

- CAD Software
- Using a calculator
- Using a computer
- Using scale rulers and measuring devices
- Mechanical drawings

Domain B: Collaborating With Other Professionals**Task 4: Coordinate electrical criteria****Knowledge of:**

- AV best practices
- Electrical regulatory requirements
- Appropriate use of 3 phase power
- Grounding
- Ohm's Law

Attributes:

- Ability to calculate conduit size
- Ability to calculate electrical power loads
- Ability to calculate amplifier load requirements
- Understanding of electrical terminology
- Understanding of power management technology

Skill in:

- Using a calculator
- Utilizing reference materials

Domain B: Collaborating With Other Professionals**Task 5: Coordinate lighting criteria****Knowledge of:**

- Attributes of luminaries
- Color Rendering Index (CRI) by application
- Lighting color temperature by application
- Lighting controls protocols (DMX, RS 232, closed contact, DALI, RS 485, RS 422, etc.)
- Lighting fixture types
- Maximum allowable light levels at the screen
- Room lighting levels by application

Attributes:

- Ability to measure lighting levels
- Ability to calculate contrast ratios
- Ability to use a light meter

Skill in:

- CAD Software
- Using a calculator
- Lighting cut sheets
- Lighting design software
- Utilizing reference manuals

Domain B: Collaborating With Other Professionals**Task 6: Coordinate IT and network security criteria****Knowledge of:**

- Existence of encryption standards
- IP protocols and addressing
- Fiber optics
- IT terminology
- Networking terminology
- Structured cabling
- Wireless network systems

Skill in:

- Ability to communicate with IT professionals

Domain B: Collaborating With Other Professionals

Task 7: Recommend Acoustical Criteria

Knowledge of:

- Inverse Square Law
- Ohm's Law
- Speaker placement
- Speech intelligibility metrics
- Acoustic isolation from adjacent spaces

Skill in:

- Basic math and physics of sound (wavelengths, frequency, logarithms, etc.)
- Ability to calculate speaker coverages
- Ability to measure ambient noise

Domain B: Collaborating With Other Professionals

Task 8: Coordinate life safety and security criteria

Knowledge of:

- Electronic security systems
- Fire alarm systems
- Equipment network requirements
- Local codes
- Physical security issues

Skill in:

- Utilizing reference materials

Domain C: Developing AV Designs

Task 1: Create draft AV design

Knowledge of:

- Image aspect ratios
- Audio components
- Audio crossovers
- AV systems
- Cable types
- Control components
- Digital world clock
- Distance limitations
- Equipment manufacturers
- AV market forces/trends
- Networks
- Properties of sound and light
- Signal types
- AV streaming over IP
- Video components
- Video formats (HDTV, SDTV, etc.)
- Video timing (Genlock, video sync)
- Signal limitations
- Content encryption techniques and DRM
- Redundancy

Skill in:

- Math and physics
- Audio design software
- Computers
- Utilizing reference manuals
- Comprehending user manuals and specifications

Attributes:

- Ability to apply Inverse Square Law, logarithmic calculations
- Ability to apply Ohm's Law
- Ability to calculate contrast ratio
- Ability to calculate PAG/NAG
- Ability to calculate required amplifier power
- Ability to calculate screen brightness/contrast ratio
- Ability to calculate speaker coverages
- Ability to calculate video bandwidth
- Ability to calculate audio delay
- Ability to calculate projector throw distances
- Ability to calculate viewing angles
- Ability to determine screen size for application
- Basic computer skills
- Basic drafting skills
- Basic understanding of control system protocols
- Understanding of basic principles of RF propagation
- Understanding of bit rate
- Understanding of decibels
- Understanding of display technologies (plasma, LCD, CRT, DLP, LED, LCoS)
- Understanding of limitations of control systems
- Understanding of microphone and loudspeaker polar patterns
- Understanding of product warranties
- Understanding of quantization
- Understanding of resolution capabilities (pitfalls of mixing resolutions)
- Understanding of relationship between font size and screen size (visual acuity)
- Understanding of sampling rate and Nyquist Frequency
- Understanding of sensory communication (human ear, eyes, etc.)
- Understanding of signal properties (frequency, wavelength, amplitude, phase, bandwidth)

Domain C: Developing AV Designs

Task 2: Confirm site conditions

Attributes:

- Image aspect ratios
- Audio components
- Audio crossovers
- AV systems
- Cable types
- Control components
- Digital world clock
- Distance limitations
- Equipment manufacturers
- AV market forces/trends
- Networks
- Properties of sound and light
- Signal types
- AV streaming over IP
- Video components
- Video formats (HDTV, SDTV, etc.)
- Video timing (Genlock, video sync)
- Signal limitations
- Content encryption techniques and DRM
- Redundancy

Skill in:

- Using ladders safely
- Using a light meter
- PPE
- Using scale rulers and measuring devices
- SPL meters

Domain C: Developing AV Designs

Task 3: Produce infrastructure drawings

Knowledge of:

- Architectural terminology
- Construction abbreviations
- Construction practices
- Architectural/engineering drawing symbols

Skill in:

- CAD software
- Computers
- Drafting supplies
- Using scale rulers and measuring devices

Attributes:

- Ability to convert measurements
- Ability to direct the production of CAD drawings
- Ability to read construction drawings
- Basic drafting skills
- Attention to detail

Domain C: Developing AV Designs

Task 4: Produce AV system documents

Knowledge of:

- Network systems & terminology (IP based networks)
- Architectural terminology
- AV best practices
- Reading equipment setup configurations
- Regulatory requirements

Skill in:

- CAD software
- Computers
- Drafting supplies
- Using a printer/plotter

Attributes:

- Ability to convert measurements
- Ability to create schematic diagrams
- Ability to direct the production of CAD drawings
- Ability to produce custom furniture details
- Basic drafting skills
- Understanding of DSP products

Domain C: Developing AV Designs

Task 5: Finalize project documentation

Knowledge of:

- AV delivery models
- Project documentation

Attributes:

- Understanding of specification and tender documentation
- Ability to specify performance criteria

Domain D: Conducting Project Implementation Activities

Task 1: Participate in project implementation communication

Knowledge of:

- Construction contractual relationships
- Construction roles and responsibilities
- Construction terminology

Attributes:

- Understanding of construction processes
- Good verbal communication skills
- Good written communication skills
- Attention to detail
- Diplomacy
- Flexibility
- Tact
- Understanding of construction documents
- Understanding of construction forms
- Understanding of project documents and specifications

Domain D: Conducting Project Implementation Activities

Task 2: Perform system verifications

Knowledge of:

- Audio and video theory
- Acceptable signal levels
- Test equipment

Skill in:

- Using an audio analyzer
- Using an audio generator
- Using a colorimeter
- Using an impedance meter
- Using a laptop
- Using a level (spirit level)
- Using a light meter
- Using a multimeter
- Using an oscilloscope
- RTA
- Using a SPL meter
- Using a tape measure
- Using a test pattern generator
- Using testing software
- Using UTP cable testers
- Using a wave form monitor

Attributes:

- Ability to identify common audio problems
- Ability to identify common video problems
- Ability to read system schematic diagrams

Domain D: Conducting Project Implementation Activities

Task 3: Conduct system close out activities

Attributes:

- Conflict resolution skills
- Good verbal communication skills
- Good written communication skills
- Attention to detail
- Common sense
- Meticulous