

DACUM CHART  
JOB AND TASK ANALYSIS

For

INFOCOMM  
INTERNATIONAL  
CERTIFIED TECHNOLOGY  
SPECIALIST - DESIGN  
(CTS-D\*)

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# InfoComm Certified Technology Specialist Designer (CTS-D)

## Job Description:

A Certified Technology Specialist Designer (CTS-D) is an AV systems designer who assesses clients' needs, designs AV systems, and prepares AV design documents, by coordinating and collaborating with other professionals to create AV systems that satisfy clients requirements.

Following is the final proposed examination blueprint resulting from this job analysis.

Content Area	% of Exam	Items on Exam
A. Conducting a Needs Assessment	12%	15
B. Collaborating with Other Professionals	27%	34
C. Developing AV Designs	52%	65
D. Conducting Project Implementation Activities	9%	11
Total	100%	125

Duties/Tasks/Steps		%	# of Items
<b>A</b>	<b>Conducting a Needs Assessment</b>	<b>12%</b>	<b>15</b>
	1 Identify stakeholders/decision-makers	2%	2
	2 Identify skill level of end users	2%	2
	3 Educate the AV client	1%	1
	4 Review client technology master plan	2%	2
	5 Identify clients' purchasing processes	1%	1
	6 Research clients' business environment	1%	1
	7 Define AV needs (absolutes)	2%	3
	8 Identify Scope of Work	2%	3
<b>B</b>	<b>Collaborating With Other Professionals</b>	<b>27%</b>	<b>34</b>
	1 Review A/E (architectural and engineering) drawings	3%	4
	2 Identify architectural/interior design considerations	3%	4
	3 Identify structural/mechanical considerations	3%	4
	4 Identify electrical requirements	3%	4
	5 Identify lighting requirements	3%	4
	6 Identify IT requirements	3%	4
	7 Recommend Acoustical Criteria	2%	3
	8 Identify life safety and security interface issues (BMS - Building Management Systems)	2%	3
	9 Identify regulatory issues	3%	4
<b>C</b>	<b>Developing AV Designs</b>	<b>52%</b>	<b>65</b>
	1 Create draft AV design	11%	14
	2 Confirm site conditions	9%	11
	3 Produce infrastructure drawings	11%	14
	4 Produce AV drawings	11%	14
	5 Produce AV build documentation	10%	12
<b>D</b>	<b>Conducting Project Implementation Activities</b>	<b>9%</b>	<b>11</b>
	1 Participate in project implementation communication	2%	3
	2 Perform system verifications	3%	4
	3 Conduct system close out activities	3%	4
		100%	125

## Specific Knowledge Required of CTS-D

<b>Specific Knowledge Required of CTS-D</b>	
Ability to apply Inverse Square Law, logarithmic calculations	Knowledge of electrical regulatory requirements
Ability to apply Ohm's Law	Knowledge of equipment clearance/safety issues
Ability to calculate amplifier load requirements	Knowledge of equipment life cycles
Ability to calculate area	Knowledge of equipment manufacturers
Ability to calculate audio delay	Knowledge of equipment mounting best practices
Ability to calculate BTU loads	Knowledge of equipment network requirements
Ability to calculate conduit size	Knowledge of fiber optics
Ability to calculate contrast ratio	Knowledge of grounding
Ability to calculate electrical power loads	Knowledge of image aspect ratios
Ability to calculate PAG/NAG	Knowledge of Inverse Square Law
Ability to calculate projector throw distances	Knowledge of IT bandwidth
Ability to calculate room dimensions	Knowledge of IT terminology
Ability to calculate screen brightness/contrast ratio	Knowledge of lighting color temperature by application
Ability to calculate speaker coverages	Knowledge of lighting control protocols (DMX, RS 232, closed contact, DALI, RS 485, RS 422, etc.)
Ability to calculate video bandwidth	Knowledge of lighting fixtures types
Ability to calculate viewing angles	Knowledge of local codes and regulations
Ability to communicate with IT professionals	Knowledge of markups/profit margins for budgeting
Ability to convert measurements	Knowledge of maximum allowable light levels at the screen
Ability to create schematic diagrams	Knowledge of network systems & terminology
Ability to determine screen size for application	Knowledge of network systems (IP based networks)
Ability to diagnose common audio and video problems	Knowledge of Ohm's Law
Ability to direct the production of CAD drawings	Knowledge of other technology disciplines (structured cabling, networking etc.)
Ability to identify 3 dimensional interference issues from 2 dimensional plans	Knowledge of physical security issues
Ability to identify project decision makers	Knowledge of project documentation
Ability to measure ambient noise	Knowledge of properties of sound and light
Ability to measure lighting levels	Knowledge of purchasing terms and processes
Ability to produce custom furniture details	Knowledge of reading equipment setup configurations
Ability to read construction drawings	Knowledge of redundancy
Ability to read system schematic diagrams	Knowledge of regulatory requirements
Ability to specify performance criteria	Knowledge of RoHS and other green issues

Specific Knowledge Required of CTS-D

<b>Specific Knowledge Required of CTS-D</b>	
Ability to use a tape measure or other measuring device	Knowledge of room lighting levels by application
Ability to use SPL and light meters	Knowledge of signal limitations
Ability to visualize spatial relationships from plans	Knowledge of signal types
Ability to work as part of a team or team leader	Knowledge of speaker placement
Basic computer skills	Knowledge of speech intelligibility metrics
Basic drafting skills	Knowledge of structured cabling
Basic understanding of control system protocols	Knowledge of test equipment
General knowledge of electronic security systems	Knowledge of types of mounting hardware
General knowledge of fire alarm systems	Knowledge of video components
General knowledge of mechanical (HVAC) components	Knowledge of video components
General product knowledge	Knowledge of video formats (HDTV, SDTV, etc.)
In-depth knowledge of audio and video theory	Knowledge of video timing (Genlock, video sync)
Knowledge of existence of encryption standards	Knowledge of wireless network systems
Knowledge of acceptable signal levels	Math skills
Knowledge of accessibility issues	Product knowledge
Knowledge of architectural details that impact AV	Public speaking ability
Knowledge of architectural drawing symbols	Understanding of AV maintenance requirements
Knowledge of architectural terminology	Understanding of AV systems operational requirements
Knowledge of architectural/engineering drawing symbols	Understanding of basic principles of RF propagation
Knowledge of attributes of luminaries	Understanding of bit rate
Knowledge of audio components	Understanding of construction processes
Knowledge of audio crossovers	Understanding of construction specifications
Knowledge of AV best practices (size of screen vs. seating arrangements, viewing angles, viewing distances, height of screen, ceiling soffits, distribution of audio, etc.)	Understanding of decibels (all derivatives)
Knowledge of AV delivery models (design-build vs. design-bid-build)	Understanding of display technologies (plasma, LCD, CRT, DLP, LED, LCoS, D-ILA)
Knowledge of AV equipment capabilities	Understanding of drawing scale
Knowledge of AV market forces/trends	Understanding of DSP products
Knowledge of AV streaming over IP	Understanding of electrical terminology

## Specific Knowledge Required of CTS-D

<b>Specific Knowledge Required of CTS-D</b>	
Knowledge of AV terminology	Understanding of equipment space and access requirements
Knowledge of basic fiscal planning terminology (ROI, etc.)	Understanding of ergonomic best practices
Knowledge of cable types	Understanding of Inverse Square Law
Knowledge of client's structured cabling system	Understanding of limitations of control systems
Knowledge of Color Rendering Index (CRI) by application	Understanding of microphone and loudspeaker polar patterns
Knowledge of construction abbreviations	Understanding of Nyquist criterion & quantization rate
Knowledge of construction materials	Understanding of power management technology
Knowledge of construction practices	Understanding of product warranties
Knowledge of construction roles and responsibilities	Understanding of proper air flow
Knowledge of construction terminology	Understanding of relationship between font size and screen size (visual acuity)
Knowledge of contractual relationships	Understanding of resolution capabilities (pitfalls of mixing resolutions)
Knowledge of control components	Understanding of sampling rate
Knowledge of current display technologies	Understanding of sensory communication (human ear, eyes, etc.)
Knowledge of DHCP vs. static IP addressing	Understanding of signal properties (frequency, wavelength, amplitude, phase, bandwidth)
Knowledge of digital word clock	Verbal communication skills
Knowledge of distance limitations	Written communication skills
Knowledge of drawing conventions	

<b>Calculations</b>
Perform simple math operations of addition
Perform simple math operations of subtraction
Perform simple math operations of multiplication
Perform simple math operations of division
Use a calculator
Compare numbers
Perform mathematical operations with fractions
Perform mathematical operations with decimals
Perform math operations using single and multiple digit numbers
Change numbers from fractions to decimals and back
Make rough estimates
Collect information to solve a problem
Transfer number sequences from a source to a column
Solve percent problems
Multiply and factor algebraic expressions
Solve formula calculations with one unknown
Solve problems with graphs
Measure angles
Change numbers from percents to decimals and back
Solve ratio problems
Perform math operations using exponential numbers
Perform angular calculations
Figure averages
Perform math operations using signed (positive and negative) numbers
Solve right triangle problems using Pythagorean theorem
Solve oblique triangle problems
Solve right triangle trigonometry problems
Solve angle-circle problems
Solve triangle-circle problems
Solve oblique triangle trigonometry problems
Solve formula calculations with more than one unknown
solve compound angle problems

<b>Basic Measurement</b>
Read, interpret, and use size-scale relationships
Record measurements, using appropriate unit notations (feet, yards, etc.)
Measure linear distances (length, width, etc.)
Read and use the scale of a drawing
Find the dimensions of an object from a scale drawing
Make simple scale drawings
Read measurements taken with common measuring tools
Use tools to measure quantities and solve problems involving measurements
Estimate and approximate measurements
Convert measurements from one unit to another (English to Metric, etc.)
Measure area (square inches, square centimeters, etc.)
Calculate the perimeter and areas of common figures
Read and apply coefficient measurements indicated in a table or chart
Measure length to 1/4 of an inch
Measure length to 1/8 of an inch
Measure volume (cubic inches, liters, etc.)
Measure length to 1/6 of an inch
Measure length to 1/32 of an inch
Find distances and directions on land maps
Measure temperature to within 1 degree F/C

<b>Communications</b>
Ask questions
Evaluate options/alternatives
Listen
Communicate using the vocabulary/terminology of a related trade
Evaluate solutions
Participate in brainstorming
Read and follow a map, chart, plan, etc.
Read and follow directions found in equipment manuals and code books
Read drawings and specifications sheets
Read flowcharts
Communicate with co-workers and/or business people in writing (letters, memos)
Find information in catalogs
Read and interpret directions found on labels, packages, or instruction sheets
Communicate with co-workers and/or business people verbally (face-to-face)
Communicate with co-workers and/or business people verbally (telephone, radio)
Explain procedures
Find information in references (Machinery handbook, tap/drill charts, etc.)
Read codes (building codes, electrical codes, standards, etc.)
Read information from tables and graphs (bar, circle, etc.)
Research information
Follow oral job instructions
Summarize information
Write reports
Present to others
Apply assertiveness
Write words and numbers legibly
Compare names
Read statistical data

<b>General Attitudes Required of CTS-D Rank Ordered by Importance</b>	
Accurate/Precise	Leader
Analytic	Tolerant
Common sense	Confident
Good listener	Courteous
Adaptable/Flexible	Integrity
Respectful	Responsible/accountable
Safety conscious	Team player
Self-control	Work efficiently (time)
Conscientious	Free of substance abuse
Creative	Goal-oriented
Organized	Quality focused
Patience	Self-discipline
Cooperative	Personal hygiene
Customer-Oriented	Self-esteem
Dependable	Trustworthy
Ethical	Work efficiently (resources)
Focused	Work in teams
Industrious	Non-aggressive
Neat	Persistent
Punctual	Sense of humor
Eager to learn new things	Tactful
Lack of prejudice (bias)	Honest
	Professional

<b>Specific Attributed/Attitudes Required of CTS-D</b>	
Assertiveness	Integrity
Attention to detail	Interpersonal skills
Common sense	Mental visualization ability
Diplomacy	Meticulous
Flexibility	Tact

<b>Senses Required of CTS-D</b>
Hear
Talk
Detect abnormal noises
See clearly at 20 inches or less (with/without optical assistance)
See clearly at 20 feet or more (with/without optical assistance)
Judge depth (the position and distance of objects) with the eyes
See and discriminate colors

<b>Tools/Equipment</b>
Audio analyzer
Audio design software
Audio generator
CAD Software
Calculator
Colorimeter
Computer
Construction documents
Construction forms
Drafting supplies
Impedance meter
Ladders
Laptop
Level (spirit level)
Light meters
Lighting cut sheets
Lighting design software
Manufacturer specifications
Mechanical drawings
Multimeter
National CAD Standard (reference book)
Oscilloscope
PPE (personal protection equipment)
Printer/Plotter
Program report checklist
Project documents and specifications
Recording device (camera, camcorder, etc.)
Reference materials
RTA (real time analyzer)
Scale ruler or other measuring device
Scientific Calculator
SPL (sound pressure level) meter
Tape measure or other measuring device
Test pattern generator
Testing software
Torchlight/flashlight
User manuals and specifications
UTP cable testers
Waveform monitor

Acronyms and Types of Cables Used by a CTS-D Professional

<b>Acronyms</b>
API - Application Programming Interface
BTU - British Thermal Units
CDM - Construction Design Management
CFM - Cubic Feet per Minute
DALI - Digital Addressable Lighting Interface
DDA - Disability Discrimination Act
DHCP - Dynamic Host configuration Protocol
DMX - Digital Multiplexing
DSP - Digital Signal Processor
LEED -Leadership in Environmental Energy Design (?)
LS0H - Low Smoke Zero Halogen
NAG - Needed Audio Gain
OTDR Optical Time Domain Reflectometer
PAG -Potential Audio Gain
PPE - Personal protection equipment
RCP - Reflected Ceiling Plan
RFI - Request for Interpretation / Information
RoHS-Restriction of the Use of Certain Hazardous Substances
SPL - Sound Pressure Level
STP - Shielded Twisted Pair
TDR - Time Domain Reflectometer
UPS - Un-interrupted Power Supply
UTP - Unshielded Twisted Pair

<b>Cable Types</b>
Coaxial (50 and 75 ohm)
Fiber Optic (Single mode, Multimode)
Multi-COAX (Bundled) RGBHV, component, S-video, Composite video signals
Multi-Conductor (Structured Cable) CAT3/5/6/7, COAX, up combined in single jacket
Non-plenum
Plenum/LS0H
STP (Shielded Twisted Pair) Audio, Control, Etc.
TRIAx
UTP (Unshielded Twisted Pair) CAT3/5/6/7

Audio, Video and Mechanical Components

Audio Components
A/D + D/A converters
Amplifiers (Impedence-based vs constant voltage)
Assisted Listening Systems
Audio Codec
Audio DSP
Balancing interfaces
CD players, hard disk, cassette
Crossovers
Delay
Delegate conferencing
Distribution Amps
Equalizers (graphic, parametric, filters )
Loudspeakers (Surface-mount, line array, ceiling, self powered)
Volume controls
Limiters, expanders, compressors, gates
Microphones (condensor, dynamic, wireless, wired)
Mixers (Analog, Digital, Auto)
Pre-amps/line driver
Switchers/Matrix Routers

Video Components
A/D and D/A converters
Cameras
Digital Video Recorder/Players
Display Devices
Document Cameras
DVD
DVD/VCR
Non Linear Video Systems
Scalers
Scan Converters
Switchers/Matrix Routers
Tuners
Video Cassette Player/Recorders
Video Distribution Amps & Line Drivers
Video Mixers
Video Processors
Video Streaming Codecs
Video Conference Unit

<b>Mechanical HVAC Components</b>
Air Diffuser
Air Handling Unit
Air Inlet
Air Outlet
Building Automation System [EMS, BMS ]
Celing Plenum
Constant Air Volume System (Conventional System) (own line)
Conventional system
Duct
Own line
Passive Diffuser
Perimeter Zone
Sound Attenuator
Task/Ambient conditioning (TAC/Auxiliary Systems)
Variable Air volume System (Damper) (own line)

## Signal Types

<b>Signal Types</b>	
AES-EBU	MIDI
Analog ramping	Other proprietary formats
Audio	Other proprietary formats
Balanced audio	PCM (pulse code modulation)
Cobranet	RF
Component video (3,4,5 wire)	RGBHV
Composite video	RGBS
Constant voltage (25,70,100 volt)	RGsB
Contact closure	RS232
Control signals	RS422
Direct coupled (2,4,8,16 ohm)	RS485
Dolby Digital	S video
DTS	SDI
DVI-A	SPDIF
DVI-D	Speaker level
DVI-I	TCP/IP
Ethersound	TCPIP
Firewire (IEEE 1394)	Toslink(optical)
HDMI	Unbalanced audio
HD-SDI	USB
Infrared	voltage control
Line level (professional or consumer)	
Mic level	

<b>Audio Systems</b>
Assistive listening systems
Intercom systems
Delegate systems
Noise/sound masking systems
Public address systems
Simultaneous interpretation systems
Program audio systems
Mix-minus systems
Speech reinforcement systems
Surround sound systems
Recording systems
Live sound systems
Audioconferencing systems

<b>Video Systems</b>
CCTV systems
CATV, SATV, MATV systems
IPTV systems
Multi-image display systems
Videoconferencing systems
Presentation systems
Video archival systems
High definition systems
Rear projection systems

<b>Interactive Systems</b>
Audience response systems
Kiosk systems
3D immersive systems
Virtual presence systems

<b>Broadcast Systems</b>
Digital signage systems
Media retrieval and storage systems
Post production systems (recording/editing)
Audio production/recording
Live audio/video production

<b>Control Systems</b>
Room scheduling systems
Asset management systems
Integrated control systems
Access control systems

<b>Transmission Technologies</b>
Fiber optics
Satellite systems
Video streaming systems
Copper (UTP, STP, Coax, and Triax)
RF
IR
IP distribution

<b>Venues</b>
Command and control systems
Court systems
Education (K-12) systems
Distance education systems
Entertainment systems
Transportation systems
Interactive simulators
Exhibit systems
Hospitality systems
Medical systems
Retail systems
Corporate auditorium systems
Convention centers
Board rooms
Sloped floor meeting rooms
Training rooms
Video-teleconferencing rooms
Worship systems
Law Enforcement systems

<b>Related Systems/Technology</b>
Furniture design & installation
Lighting & shade systems
IP Network systems
Power management systems
Non-AV RF systems (DAS, Wi-Fi, etc.)
Security systems/alarm systems/access control systems
Structure and Rigging systems
Telephone/Voice systems
Sustainable/Green Design (LEED, WEE, RoHS)

Duties/Tasks/Steps		
<b>A</b>		<b>Conducting a Needs Assessment</b>
	<b>1</b>	<b>Identify stakeholders/decision-makers</b>
	a	Communicate with client
	b	Create meeting notes (documentation regarding stakeholders)
	c	Identify facility manager, IT representative, client's agent, security representatives, building manager
	<b>2</b>	<b>Identify skill level of end users</b>
	a	Assess end user's familiarity with AV systems terminology
	b	Question end users regarding AV systems experience and familiarity
	c	Solicit information regarding complexity of existing systems
	d	Ask end users about availability of AV support staff (technical support)
	<b>3</b>	<b>Educate the AV client</b>
	a	Discuss relevant technologies with client
	b	Present AV information
	c	Demonstrate AV technologies
	d	Prepare presentation materials
	<b>4</b>	<b>Review client technology master plan</b>
	a	Ask client for internal standards for AV spaces
	b	Research client's existing systems
	c	Determine client's long term technology plans
	d	Determine client's amortization plans
	e	Determine client's equipment support maintenance plans
	<b>5</b>	<b>Identify clients' purchasing processes</b>
	a	Determine if project is going to bid
	b	Determine client's standard terms and conditions
	c	Determine purchase order lead times
	d	Identify key purchasing individuals (who to invoice, etc.)
	e	Identify if there are preferred vendors

Knowledge/Attributes	Attributes	Tools/Equipment
Knowledge of contractual relationships	Attention to detail	
Ability to identify project decision makers	Interpersonal skills	
Ability to work as part of a team or team leader		
Verbal communication skills		
Written communication skills		
Ability to translate AV speak into IT speak	Interpersonal skills	
Ability to translate AV speak into lay terms		
Knowledge of video components		
Knowledge of AV terminology		
Listening skills		
Verbal communication skills		
Written communication skills		
Ability to communicate ideas		Computers
Basic computer skills		
Familiarity of basic concepts of auxiliary systems		
Knowledge of accessibility issues		
Knowledge of AV systems		
Knowledge of local regulatory issues		
Product knowledge		
Public speaking ability		
Knowledge of basic fiscal planning terminology (ROI, etc.)		
Knowledge of client's structured cabling system		
Knowledge of equipment life cycles		
Knowledge of RoHS and other green issues		
Verbal communication skills		
Written communication skills		
Knowledge of purchasing terms and processes	Interpersonal skills	
Verbal communication skills		
Written communication skills		

Duties/Tasks/Steps		
6	Research clients' business environment	
	a	Determine what the client's business is
	b	Determine ratio of technology enabled rooms to personnel
	c	Determine if AV is necessity or luxury
	d	Evaluate current use of collaborative technologies
	e	Determine encryption requirements for client's business communications
	f	Determine if there are preferred equipment vendors
	g	Determine if client is local firm or international firm
7	Define AV needs (absolutes)	
	a	Determine if client already has an AV budget
	b	Determine client's expectations and wishes
	c	Evaluate client's programs that AV needs to support
	d	Determine project schedules and timelines
	e	Develop the AV program (number of VC rooms, number of presentation rooms, etc.)
8	Identify Scope of Work	
	a	Define project responsibilities
	b	Identify AV technology requirements
	c	Analyze needs assessment data
	d	Create conceptual design
	e	Define maintenance requirements
	f	Create budget estimates
	g	Provide client with system options
	h	Prepare proposal/program report (summarize findings)
<b>B</b>	<b>Collaborating With Other Professionals</b>	
1	Review A/E (architectural and engineering) drawings	
	a	Confirm room dimensions
	b	Identify room obstructions
	c	Review room adjacencies
	d	Review reflected ceiling plans
	e	Review furniture layouts
	f	Review furniture layout dimensions
	g	Identify potential equipment locations
	h	Review elevation plans
	i	Review section plans
	j	Review specifications
	k	Evaluate room deficiencies
	l	Identify architectural details that may impact AV

Knowledge/Attributes	Attributes	Tools/Equipment
Knowledge of existence of encryption standards	Interpersonal skills	
Knowledge of IT bandwidth		
Knowledge of network systems & terminology (IP based networks)		
Verbal communication skills		
Written communication skills		
Knowledge of AV systems		
Verbal communication skills		
Written communication skills		
Basic drafting skills	Flexibility	Program report checklist
General product knowledge		
Knowledge of AV systems		
Knowledge of markups/profit margins for budgeting		
Knowledge of other technology disciplines (structured cabling, networking etc.)		
Verbal communication skills		
Written communication skills		
Ability to calculate room dimensions	Attention to detail	National CADD Standard (reference book)
Ability to read construction drawings	Mental visualization	Scale ruler
Knowledge of architectural details that impact AV		Scientific Calculator
Knowledge of architectural drawing symbols		
Knowledge of AV best practices (size of screen vs. seating arrangements, viewing angles, viewing distances, height of screen, ceiling soffits, distribution of audio, etc.)		
Knowledge of drawing conventions		
Math skills		
Understanding of construction specifications		
Understanding of drawing scale		

Duties/Tasks/Steps		
	<b>2</b>	<b>Identify architectural/interior design considerations</b>
	a	Propose AV equipment locations
	b	Identify signage requirements
	c	Coordinate custom millwork/woodwork/furniture/casework requirements
	d	Coordinate colors and finishes
	e	Identify sightline issues (viewing angles, viewing distances, obstructions, camera angles, etc.)
	f	Identify display size requirements
	g	Recommend room sizes
	h	Recommend ceiling heights
	i	Identify room adjacency issues
	j	Identify room environments control devices (shades, blinds, motorized doors, electronic windows, room partitions, etc.)
	k	Address ergonomic issues (maximum reach, visual angles, task lighting, visual acuity, etc.)
	l	Review seating layouts (staggered, tiered, fixed, attached, egress, etc.)
	m	Identify display options (rear, front, plasma, LCD, multiple, etc.)
	n	Identify loudspeaker options
	o	Recommend ceiling access panels
	p	Assess control room location and suitability
	q	Assess thermal management issues
	<b>3</b>	<b>Identify structural/mechanical considerations</b>
	a	Identify equipment mounting requirements
	b	Identify demarcation points of liability
	c	Identify HVAC issues (vibration, noise, heat, location, CFM, etc.)
	d	Calculate AV heat loads (BTU calculations, watts, etc.)
	e	Recommend equipment cooling requirements (air flow)
	f	Identify plumbing issues that impact AV systems
	g	Identify fire safety issues that impact AV systems

Knowledge/Attributes	Attributes	Tools/Equipment
Ability to calculate area		CAD Software
Ability to identify 3 dimensional interference issues from 2 dimensional plans		Calculator
Ability to visualize spatial relationships from plans		Computer
Knowledge of AV design best practices		Light meters
Knowledge of AV equipment capabilities		Reference materials
Knowledge of construction materials		RTA (real time analyzer)
Knowledge of construction practices		Scale rulers and measuring devices
Knowledge of current display technologies		SPL (sound pressure level) meter
Math skills		
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 calculate BTU loads		CAD software
Ability to calculate electrical power loads		Calculator
General knowledge of mechanical (HVAC) components		Computers
Knowledge of equipment clearance/safety issues		Manufacturer specifications
Knowledge of equipment mounting technologies		Mechanical drawings
Knowledge of local codes		Scale rulers and measuring devices
Knowledge of equipment mounting best practices		
Knowledge of Ohm's Law		
Knowledge of structural mounts		
Knowledge of types of mounting hardware		
Understanding of proper air flow		

Duties/Tasks/Steps	
<b>4</b>	<b>Identify electrical requirements</b>
	a Identify cable pathways (size, quantity, destination, signal separation, etc.)
	b Identify electrical load requirements
	c Identify bonding and grounding issues
	d Identify service issues (interference, phasing, use of raw power, etc.)
	e Identify technical power requirements
	f Recommend electrical boxes (back box, floor box, J-box, etc.)
	g Identify location of electrical outlets for AV
	h Identify emergency power (UPS, generator, etc.) considerations and requirements
<b>5</b>	<b>Identify lighting requirements</b>
	a Recommend light levels
	b Review lighting conditions
	c Coordinate with lighting consultant or electrical contractor
	d Recommend lighting zones/circuits
	e Recommend lighting angles
	f Recommend dimming requirements
	g Measure room lighting
	h Recommend lighting color temperature
	i Recommend color rendition index (CRI)
	j Recommend lighting controls
<b>6</b>	<b>Identify IT requirements</b>
	a Recommend location and number of data/voice drops for AV
	b Recommend VPN
	c Recommend circuiting types (ISDN, IP, Analog, POTS/DID, etc.)
	d Identify network requirements (bandwidth, protocols, etc.)
	e Provide schedule of AV network appliances
	f Identify WIFI channels/zoning
	g Coordinate wireless frequencies with existing systems
	h Provide a schedule of wireless AV devices
<b>7</b>	<b>Recommend Acoustical Criteria</b>
	a Recommend noise criterion
	b Recommend RT 60 levels (reverberation time)
	c Recommend sound transmission class
	d Identify AV equipment noise
	e Measure ambient room noise
	f Recommend noise masking systems
	g Identify potential reflection problems
	h Recommend speech transmission index

Knowledge/Attributes	Attributes	Tools/Equipment
Ability to calculate conduit size		Calculator
Ability to calculate amplifier load requirements		Reference materials
Knowledge of AV best practices		
Knowledge of electrical regulatory requirements		
Knowledge of grounding		
Knowledge of Ohms Law		
Understanding of electrical terminology		
Understanding of power management technology		
Ability to measure lighting levels		CAD Software
Knowledge of attributes of luminaries		Calculator
Knowledge of Color Rendering Index (CRI) by application		Light meter
Knowledge of DMX		Lighting cut sheets
Knowledge of lighting color temperature by application		Lighting design software
Knowledge of lighting control protocols (DMX, RS 232, closed contact, DALI, RS 485, RS 422, etc.)		Reference materials
Knowledge of lighting fixtures types		
Knowledge of maximum allowable light levels at the screen		
Knowledge of room lighting levels by application		
Ability to communicate with IT professionals		
Knowledge of DHCP vs. static IP addressing		
Knowledge of existence of encryption standards		
Knowledge of fiber optics		
Knowledge of IT terminology		
Knowledge of networking terminology		
Knowledge of structured cabling		
Knowledge of wireless network systems		
Ability to calculate speaker coverages		
Ability to measure ambient noise		
Knowledge of Inverse Square Law		
Knowledge of Ohms Law		
Knowledge of speaker placement		
Knowledge of speech intelligibility metrics		



Knowledge/Attributes	Attributes	Tools/Equipment
General knowledge of electronic security systems		Reference materials
General knowledge of fire alarm systems		
Knowledge of equipment network requirements		
Knowledge of local codes		
Knowledge of physical security issues		
Knowledge of local codes and regulations		Reference materials
Ability to apply Inverse Square Law, logarithmic calculations		Audio design software
Ability to apply Ohm's Law		Computers
Ability to calculate contrast ratio		Reference materials
Ability to calculate PAG/NAG		User manuals and specifications
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		
Knowledge of image aspect ratios		
Knowledge of audio components		
Knowledge of audio crossovers		
Knowledge of AV systems		
Knowledge of cable types		
Knowledge of control components		
Knowledge of digital word clock		
Knowledge of distance limitations		
Knowledge of equipment manufacturers		
Knowledge of AV market forces/trends		
Knowledge of networks		
Knowledge of properties of sound and light		
Knowledge of signal types		
Knowledge of AV streaming over IP		
Knowledge of video components		
Knowledge of video formats (HDTV, SDTV, etc.)		



Knowledge/Attributes	Attributes	Tools/Equipment
Knowledge of video timing (Genlock, video sync)		
Knowledge of signal limitations		
Understanding of basic principles of RF propagation		
Understanding of bit rate		
Understanding of decibels (all derivatives)		
Understanding of display technologies (plasma, LCD, CRT, DLP, LED, LCoS, D-ILA)		
Understanding of limitations of control systems		
Understanding of microphone and loudspeaker polar patterns		
Understanding of Nyquist criterion & quantization rate		
Understanding of product warranties		
Understanding of quantization		
Knowledge of redundancy		
Understanding of relationship between font size and screen size (visual acuity)		
Understanding of resolution capabilities (pitfalls of mixing resolutions)		
Understanding of sampling rate		
Understanding of sensory communication (human ear, eyes, etc.)		
Understanding of signal properties (frequency, wavelength, amplitude, phase, bandwidth)		
Ability to mark site		Ladders
Ability to use SPL and light meters		Light meter
Ability to use a tape measure or other measuring device		PPE
Understanding of construction blueprints		Recording device (camera, camcorder, etc.)
Understanding of construction processes		Scale ruler or other measuring device
		SPL meter
		Tape measure or other measuring device
		Torchlight/flashlight
Ability to convert measurements	Attention to detail	CAD Software
Ability to direct the production of CAD drawings		Computer
Ability to read construction drawings		Drafting supplies
Basic drafting skills		Scale ruler
Knowledge of architectural terminology		
Knowledge of construction abbreviations		
Knowledge of construction practices		
Knowledge of architectural/engineering drawing symbols		



Knowledge/Attributes	Attributes	Tools/Equipment
Ability to convert measurements	Attention to detail	CAD Software
Ability to create schematic diagrams		Computer
Ability to direct the production of CAD drawings		Drafting supplies
Ability to produce custom furniture details		Printer/Plotter
Basic drafting skills		
Knowledge of network systems & terminology (IP based networks)		
Knowledge of architectural terminology		
Knowledge of AV best practices		
Knowledge of reading equipment setup configurations		
Knowledge of regulatory requirements		
Understanding of DSP products		
Knowledge of AV delivery models (design-build vs. design-bid-build)		
Knowledge of project documentation		
Ability to specify performance criteria		
Knowledge of construction contractual relationships	Attention to detail	Construction documents
Knowledge of construction roles and responsibilities	Diplomacy	Construction forms
Knowledge of construction terminology	Flexibility	Project documents and specifications
Understanding of construction processes	Tact	
Verbal communication skills		
Written communication skills		

Duties/Tasks/Steps		
2	Perform system verification	
	a	Verify audio, RF and video gain structures
	b	Perform cable continuity tests
	c	Perform audio signal to noise ratio tests
	d	Perform audio THD plus noise tests
	e	Perform impedance tests
	f	Confirm NC and RT-60 levels
	g	Perform pair length distance tests
	h	Adjust contrast brightness
	i	Adjust color
	j	Perform polarity tests
	k	Perform sound pressure level (SPL) tests
	l	Measure and adjust system frequency response
	m	Verify system is free from spurious noises
	n	Verify video interface settings
	o	Verify AV network device settings (i.e., verifying static/DHCP IP exists for device)
	p	Verify video system timing (sync and phase)
	q	Verify that mounted equipment is level and plumb
	r	Verify audio coverage pattern
	s	Confirm wireless coverage
3	Conduct System Close Out Activities	
	a	Review system deliverables (as built/record documents) as per contract
	b	Demonstrate system functionality with client
	c	Review training program
	d	Assure client satisfaction
	e	Initiate ongoing maintenance plan

Knowledge/Attributes	Attributes	Tools/Equipment
Ability to diagnose common audio and video problems	Assertiveness	Audio analyzer
Ability to identify common audio problems	Integrity	Audio generator
Ability to identify common video problems		Colorimeter
Ability to read system schematic diagrams		Impedance meter
In-depth knowledge of audio and video theory		Laptop
Knowledge of acceptable signal levels		Level (spirit level)
Knowledge of test equipment		Light meter
		Multimeter
		Oscilloscope
		RTA
		SPL meter
		Tape measure
		Test pattern generator
		Testing software
		UTP cable testers
		Wave form monitor
Conflict resolution skills	Attention to detail	
Verbal communication skills	Common sense	
Written communication skills	Meticulous	