CTS-I Examination: Job Task Analysis

Domain A: Conducting Pre-Installation Activities
Task 1: Review Audiovisual Project Documentation

Knowledge of:
- Converting scales
- Local language
- Reading and interpreting drawings
- Interpreting measurements and symbols

Skill in:
- Interpreting measurements
- Interpreting symbols
- Reading blueprints
- Reading written documentation
- Utilizing the Internet
- Basic computer operations
- Basic math
- Listening
- Verbal communication
- Written communication
- Typing
- Writing legibly

Domain A: Conducting Pre-Installation Activities
Task 2: Conduct Technical Site Survey

Knowledge of:
- Arranging site access and access limitations
- Site obstacles (i.e., ceilings, flooring, walls)
- Infrastructure (i.e., conduit, floor boxes, power location, data points, grounding)
- Mounting/rigging points for substructures
- Documenting observations (i.e., photographs, sketches, layouts)
- Special requirements (i.e., local code requirements, regulations, special cable requirements, cable management)
- Scaffolding
- Communicating site observations to project management
- Chain of command procedures
- Conduit capacities
- Electrical components (cable trays, pathways, backboxes, etc.)
- Employer policies
- General construction principles
- Installation options and alternatives
- Installation process
- Local codes
- Calculating throw distances
- Measuring distances
- Products
- System functionality
- Tool limitations and capabilities
- Basic first aid
- Lock out/tag out standards
- Safety standards (OSHA, health and safety, etc,)
- Hazard awareness

Skill in:
- Calculation of conduit capacities
- Calculation of throw distances
- Measuring distances
- Basic computer operations
- Basic math
- Interpersonal communication
- Technical writing
- Climbing ladders
- Taking documentary photographs of site conditions
- Using a manlift

Domain A: Conducting Pre-Installation Activities

Task 3: Prepare for Audiovisual Installation

Knowledge of:

- Audiovisual tools, materials and equipment
- Identifying connectors and cable requirements (quantity and type)
- Specialty tools (lifts, transportation, etc.)
- Network provisioning information
- Cable pull lists and hardware lists
- Special fabrication
- Permitting
- Calculating cable take offs
- Calculating load capacities
- Determining dimensions of custom parts
- Estimating project and task durations
- Reading and Interpreting schedules
- Selecting tools and sizes
- Safety meetings
- Cable specifications/limits/application
- Access limitations
- Basic first aid
- Chain of command procedures
- Conduit capacities
- Electrical components (cable trays, pathways, backboxes, etc.)
- Employer policies
- General construction principles
- Creating schedules
- Installation options and alternatives
- Installation processes
- LAN/WAN topology
- Local codes
- Network terminology
- Permitting requirements
- Products
- Project budgets
- Project timelines
- Proper tool use
- Resource allocation
- RoHS compliance requirements
- Security requirements
- Signal types transmitted by different cables
- Structural components and capacities
- Supply management
- System functionality
- Types of connectors and appropriate cable types
- Tool limitations and capabilities
- Activities performed by other construction trades

Skill in:

- Calculation of cable take offs (estimate cable quantities)
- Calculation of load capacities
- Determining dimensions of custom parts
- Estimating project and task durations
- Following instructions
- Reading and interpreting schedules
- Selecting correct tools and sizes
- Basic computer operations
- Basic math
- Interpersonal communication

Domain A: Conducting Pre-Installation Activities
Task 4: Evaluate Overall Facility Conditions

Knowledge of:
- Site logistics (parking, loading docks, elevators, lifts, etc.)
- Building access obstacles
- Required infrastructures
- Appropriate site conditions (i.e., dust free, HVAC operational, power, lighting)
- Calculating weight capacities
- Measuring distances
- Activities performed by other construction trades
- Building timelines
- General construction principles
- Security requirements
- Visual-spatial relationships
- Construction hazards
- General hazards
- Facility specific hazards

Skill in:
- Calculation of weight capacities
- Measuring distances
- Written communication
- Verbal communication

Domain A: Conducting Pre-Installation Activities
Task 5: Maintain Tools and Equipment

Knowledge of:
- Rechargeable meters
- Drilling and cutting tools (bits, wire strippers, wire cutters, saw blades, etc.)
- Calibrating test equipment
- Labeling kits
- Electrical safety testing
- Tagging of electrical tools and equipment
- First aid kits and fire extinguishers
- Testing and tagging of safety and access equipment
- Equipment testing protocols
- Grounding
- Electrical power and electrical current
- Pre-use equipment checks
- Tagging requirements to verify inspection
- Tool and equipment calibration requirements
- Voltage

Skill in:
- Basic math
- Recognizing defective equipment
- Using a voltmeter

Domain A: Conducting Pre-Installation Activities
Task 6: Prepare Site for Installation

Knowledge of:
- Marking installation locations for equipment and services
- Assembling scaffolding
- Identifying hazards and taking safety measures
- Calculating throw distances
- Measuring distances
- Asbestos
- Ceiling systems
- Construction terminology
- General construction principles
- Hazards
- Responsibilities of other trades
- Scaffolding assembly
- System functionality
- Ladder safety
- Fall protection

- Confined spaces
- Customer safety
- Safety zones
- OSHA/HSE

Skill in:
- Interpersonal communication
- Basic math

Domain B: Conducting Site Rough-In/First Fix
Task 1: Deinstallation of Existing Equipment/Cabling

Knowledge of:
- Selecting equipment/cabling that should be removed
- Removing equipment/cabling
- Disposing of removed equipment/cabling
- Storing equipment/cabling per customer instructions or scope of work.
- Preparing equipment for reinstallation (testing, cleaning, labeling, etc.)
- Calculating weights and loads
- Electrical power
- Local disposal regulations
- Manual handling techniques
- System functionality
- OSHA/HSE
- Cadmium hazard
- Asbestos
- CRT

Skill in:
- Interpersonal Communication
- Drilling holes
- Painting
- Cutting drywall/plaster board

Domain B: Conducting Site Rough-In/First Fix
Task 2: Pulling Cable

Knowledge of:
- Identifying cable paths by signal types
- Cable pull lists and drawings
- Cable groupings
- Cable routes/paths for non-conduit cables
- Cutting in mud rings, low voltage rings, electrical boxes (or pattresses), backboxes, etc.
- Installing cable supports/containment
- Preparing cables for pulling
- Marking cables
- Marking spools and drums
- Pulling cable
- Securing cable
- Securing cable ends
- Calculating areas
- Calculating lengths
- Interpreting drawings
- Measuring diameters
- Measuring lengths
- Measuring volumes
- Measuring with an architect's scale
- Cable pulling techniques
- Cable terminology
- Cable types and applications
- Conduit capacities
- Fiber optic cables
- Fiber optic cable handling techniques
- Firestop requirements
- OSHA/HSE/COSHH and related standards
- Project requirements
- Tensile and shear strengths
- Fiber optic disposal
- Asbestos
- Power tool certifications
- Confined spaces
- COSHH - Control of hazardous substances

Skill in:
- Calculating areas
- Calculating lengths
- Interpreting drawings
- Measuring diameters
- Measuring lengths
- Measuring volumes
- Basic math
- Applying firestop materials
- Climbing ladders
- Cutting cable
- Making a snout (wire pull cable harness)
- Pulling cable
- Marking cable

Domain B: Conducting Site Rough-In/First Fix

Task 3: Mount Substructure

Knowledge of:
- Locations for mountings
- Methods/materials for mountings
- Prefabricated structures
- Installing anchors
- Attaching substructures
- Testing mountings of substructures
- Measuring distances
- Calculating weight capacities
- Adequacy of substructures
- Blocking (or noggin)
- Concrete construction methods and materials
- Correct locations for placing fasteners
- Engineering lumber
- Fasteners (capabilities, limitations, options, etc.)
- Glue laminated construction methods
- Pipes
- Powder actuated tools
- Rigging
- Safe working loads (weights and safety margins)
- Seismic restraints
- Slotted channel and accessories (unistruts)
- Steel construction methods and materials
- Tensile and shear strengths
- Threaded rods
- Throw distances
- Wood frame construction methods and materials
- OSHA/HSE
- Powder actuated tool certification
- Safety zones
- General work site conditions

Skill in:
- Measuring distances
- Basic math
- Cutting
- Drilling
- Calculating weight capacities
- Interpersonal communication

Domain C: Installing Audiovisual Systems
Task 1: Conduct Off-Site Fabrication

Knowledge of:
- Creating material lists for off-site fabricated items
- Assembling off-site fabricated items
- AC theory
- Basic electronic components (resistors, diodes, transformers)
- Basic metalworking techniques: types of metal, gage, drilling, tapping, punching, layout, bend radius
- Basic woodworking techniques: types of wood and finishes, drilling, cutting, layout, laminates
- DC theory
- Lead time and schedule restrictions
- Materials
- Outsourcing and fabrication options
- Punch tools
- Tap and die use
- Tool selection
- OSHA and health and safety Requirements

Skill in:
- Cutting
- Drilling
- Marking out items

Domain C: Installing Audiovisual Systems
Task 2: Prepare Audiovisual Rack

Knowledge of:
- Drawings and project documentation
- Assembling audiovisual equipment racks from kits
- Populating audiovisual equipment racks
- Installing rack infrastructures (lacing, power, fans, peripherals, etc.)
- Documenting serial numbers of equipment
- Interpreting rack elevations
- Measuring rack units
- ADA requirements
- Electrical power and grounding
- Rack accessories and components
- Rack elevation design
- Screw gun settings, torque settings
- Standard rack unit and width
- System functionality and components
- Ventilation requirements
- Weight distribution

Skill in:
- Reading comprehension
- Assembling a rack

Domain C: Installing Audiovisual Systems

Task 3: Wire the Audiovisual Equipment Rack

Knowledge of:

- Setting up workstations (terminating supplies, heat shrink guns, etc.)
- Selecting cables for applications
- Determining cable dressing strategies
- Measuring cable lengths
- Terminating cables (audiovisual, network, power, etc.)
- Installing cables and cable management techniques
- Cable labeling
- Testing cable
- Testing rack loaded components
- Documenting changes (mark ups)
- Selecting die sets
- Measuring cable lengths
- Crimping techniques (BNC, spade lugs, bell caps, ferrules)
- Adjusting torque on screw gun
- Balanced and unbalanced audio
- Cable types
- Client requirements (e.g., military, government)
- Compression connections
- Compression techniques
- Connector types
- Cable preparation for connector types
- Crimp connections
- Dressing techniques for racks
- Fiber optic terminations
- Insulation displacement
- Labeling systems
- Lacing components
- Linear compression techniques
- Plenum rated tie wraps
- Tie wrap applications and selection
- Service loops
- Signal separation
- Signal types
- System functionality
- The project specifications
- OSHA/HSE
- Spacing of components for access to connections

Skill in:

- Applying heat shrink
- Basic computers
- Creating service loops
- Dressing wire
- Soldering
- Cutting wire
- Applying barrier strips

Domain C: Installing Audiovisual Systems

Task 4: Distribute Audiovisual

Knowledge of:

- Equipment manifests and delivery schedules
- What to do in the event of equipment damage
- Obtaining delivery confirmations
- Documenting serial numbers of equipment
- Client and company policies and procedures
- Reading and using floor plans
- Hazards
- Projects
- Proper loading techniques to avoid equipment damage
- Site restrictions
- Timelines
- Wrapping, banding, palleting equipment
- Safe bending and lifting techniques
- OSHA/HSE
- Loading techniques

Skill in:

- Basic math
- Interpersonal communication

- Reading and writing
- Written communication

Domain C: Installing Audiovisual Systems
Task 5: Mount Audiovisual Equipment

Knowledge of:
- Acceptable substructures for specific purposes
- Installing mounting brackets and mounting hardware
- Customized millwork/joinery for audiovisual installations
- Installing equipment
- Preparing cables for termination
- Terminating cables
- Connecting power to equipment
- Dressing cables
- Measuring distances
- Calculating weight capacities
- Blocking (or noggin)
- Cleaning supplies and techniques
- Concrete construction methods and materials
- Correct locations for placing fasteners
- Correct mountings for components
- Engineered lumber
- Fasteners (capabilities, limitations, options, etc.)
- Glue laminated construction methods
- Metal frame construction methods and materials
- Pipes
- Powder actuated tools
- Rigging
- Safe working loads (weights) and safety margins
- Seismic restraints
- Slotted channel and accessories (unistrut)
- Steel construction methods and materials
- Tensile and shear strengths
- Threaded rods
- Throw distances
- Wood frame construction methods and materials
- OSHA/HSE
- Safety zones
- Work site safety

Skill in:
- Measuring distances
- Basic math
- Calculating weights
- Interpersonal communication
- Cutting
- Drilling

Domain C: Installing Audiovisual Systems
Task 6: Terminate Cables

Knowledge of:
- Preparing cable ends
- Connectors
- Applying insulation (heat shrink, sleeving, etc.)
- Attaching connectors
- Labeling cables
- Identifying fiber optic terminations (sc/st/fc/mt-rj)
- Crimping techniques (BNC, spade lugs, bell caps, ferrules)
- Compression techniques
- Fiber optic cable types (single mode, multi-mode) and sizes
- Fiber optic technology (transceivers)
- Fiber optic terminology
- Handling techniques for fiber optic cable
- Insulation displacement
- Interduct (conduit type for fiber optic)
- Cable types
- Limitations of fiber optic cables and connectors

- Linear compression techniques
- Stripping techniques
- RoHS compliance requirements
- Signal types
- Testing fiber optic cable for signal continuity and attenuation
- OSHA/ESE
- Eye protection
- Fiber optic technology safety protocols
- RoHS

Skill in:
- Applying heat shrink
- Soldering
- Cutting wire

Domain C: Installing Audiovisual Systems
Task 7: Configure Network Attached Components (ISDN, IP, POTS, etc.)

Knowledge of:
- Network topologies
- Loading network configurations into equipment
- Preparing AV Internet protocol tables
- Broadband service (cable, satellite, etc.) and service protocols
- Network connectivity
- Basic router configuration (e.g., Linksys WRT54G)
- Cable types/specifications
- Classifications of IP addresses (routable, unroutable)
- Testing network connectivity (ping)
- Testing terminations
- Network equipment
- Network systems
- Network terminology
- Projects
- Wireless connectivity (wifi, RF, IR)

Skill in:
- Communicating with subcontractors
- Basic computers
- Interpersonal communication

Domain C: Installing Audiovisual Systems
Task 8: Load Control Programs

Knowledge of:
- Establishing communications with devices
- Obtaining correct versions of uploadables
- Loading audiovisual programming
- Verifying codes are loaded and saved
- Testing communications to ancillary devices
- Selecting cables
- Downloading firmware updates
- Audiovisual equipment configurations
- Baud rates
- Company policies and procedures for archiving and saving code
- DSP programs
- Firmware (verification, updates, compatibility)
- Obtaining manufacturer updates
- Signal types

Skill in:
- Basic computers

Domain C: Installing Audiovisual Systems

Task 9: Test the Audiovisual Equipment

Knowledge of:

- Operational procedures for audiovisual equipment
- Correct cable connectivity
- Selecting appropriate test equipment and supplies
- Proper test methods and requirements
- Performing audiovisual tests
- Comparing tests results with specifications
- Troubleshooting AV equipment
- Performing corrective actions to systems
- Calculating anticipated impedance
- Calculating Ohm's Law
- Measuring impedance
- Testing audio DSP
- Testing audio signal paths
- Testing device communications
- Testing limits
- Testing RF signal paths
- Testing speakers
- Testing video signal paths
- Adjusting audio gain
- Anti-static techniques
- Audio gain structures
- Signal processing components (EQ, limiter)
- System functionality
- Vendor policies, phone numbers
- Video system timing
- Wave form monitors and vectorscopes
- Electrical safety

Skill in:

- Basic computers
- Adjusting basic colour balance display

Domain C: Installing Audiovisual Systems

Task 10: Calibrate Audiovisual Equipment

Knowledge of:

- Calibration standards
- Component adjustments
- Aligning display equipment to system configurations for optimal performance
- Adjusting gain structure for audio
- Adjusting gain structure for video
- Setting user preferences for equipment (power management, signal type, etc.)
- Aiming loud speakers
- Adjusting camera configurations
- Setting limits for equipment (cameras, screens, etc.)
- Setting up lighting (presets, fixture positions, zoning, etc.)
- Setting up assisted listening devices
- Adjusting gain and channel on RF frequencies
- Adjusting microphones for optimal performance
- Timing video and audio systems
- Adjusting equalization of rooms (sound systems, etc.)
- Setting data baud rates
- Calculating anticipated impedance
- Calculating Ohm's Law
- Determining speaker taps
- Measuring impedance
- Measuring signal levels
- Reading schematics
- Anti-static techniques
- Audio gain structure
- Distributed audio systems
- Equalization of a room
- Project requirements and specifications
- Signal processing components (EQ, limiter)
- Signal to noise ratio
- System functionality
- Video system timing
- Wave form monitor and vectorscope
- Electrical safety
- Reading and setup of EDID

- HDCP

Skill in:
- Basic computers
- Interpersonal communication
- Reading and writing
- Adjusting audio DSP
- Adjusting audio gain
- Adjusting basic color balance displays
- Adjusting video system timing
- Setting speaker taps
- Setting and locking limits
- Setting RF Channels
- Aiming and positioning microphones

Domain D: Perform Systems Close Out
Task 1: Demonstrate to Client or Client's Representative that System Performs to Specifications

Knowledge of:
- Generating punch lists/deficiency lists
- Resolving punch lists and deficiency lists
- Substantial completion sign-offs
- Project timelines
- System functionality
- Troubleshooting techniques
- Test equipment

Skill in:
- Basic computers
- Interpersonal communication
- Reading and writing

Domain D: Perform Systems Close Out
Task 2: Obtain Project Completion Sign Off from Client or Client's Representative

Knowledge of:
- Deliverables (inventory lists/assets register, manuals, remotes, as-builts, etc.)
- Warranty coverages
- Maintenance schedules
- Project timelines
- System functionality

Skill in:
- Basic computers
- Interpersonal communication
- Reading and writing

Domain D: Perform Systems Close Out
Task 3: Provide Training on Equipment Operation

Knowledge of:
- Training techniques
- Training attendance logs
- Company policies and procedures
- Customer expectations
- System functionality

Skill in:
- Basic computers
- Verbal Communication

Domain E: Conducting Ongoing Project Responsibilities
Task 1: Perform Site Clean-up

Knowledge of:
- Debris removal
- Cleaning protocols and methods
- Appropriate cleaning products for equipment
- Site protocols (dumpsters, rules, etc.)

Domain E: Conducting Ongoing Project Responsibilities
Task 2: Complete Daily Progress Reports

Knowledge of:
- Reporting procedures for damaged, defective or missing equipment
- Reporting procedures for man-hours
- Reporting procedures for additional expenses
- Estimating time to project completion
- Reporting procedures for project delays, design deficiencies, changes in scope of work and requests for additional resources
- Company policies and procedures
- Project tasks
- Vendor policies and phone numbers

Skill in:
- Basic computers
- Interpersonal communication
- Planning
- Observation
- Reading and writing

Domain E: Conducting Ongoing Project Responsibilities
Task 3: Coordinate with Other Contractors

Knowledge of:
- Construction progress meetings
- Reporting procedures for discrepancies and coordination issues
- Responsibilities of various contractors
- Scheduling practices

Skill in:
- Communicating with other contractors
- Interpersonal communication

Domain E: Conducting Ongoing Project Responsibilities
Task 4: Conduct Field Engineering

Knowledge of:
- Creating field mark-ups (design changes, site conditions, etc.)
- Making design modifications to accommodate site issues
- Making installation decisions in response to assessments of sites
- Communicate changes to engineering, project managers and others
- Adequacy of substructures
- Blocking (or noggin)
- Cleaning supplies and techniques
- Company policy and procedures
- Concrete construction methods and materials
- Correct locations for placing fasteners
- Correct mountings for components
- Engineered lumber
- Equipment capabilities
- Fasteners (capabilities, limitations, options)
- Glue laminated construction methods
- Completing markups
- Metal frame construction methods and materials
- Pipes

- Powder actuated tools
- Rigging
- Safe working loads (weights) and safety margins
- Seismic restraints
- Slotted channel and accessories (unistrut)
- Steel construction methods and materials
- Tensile and shear strengths
- Threaded rods
- Wood frame construction methods and materials

Skill in:
- Communicating with other contractors
- Interpersonal communication
- Basic math

Domain E: Conducting Ongoing Project Responsibilities
Task 5: Repair Audiovisual Systems

Knowledge of:
- Troubleshooting system problems
- Making recommendations for problem resolution
- Implementing problem resolutions
- Calculating signal levels
- Measuring impedance
- Testing audio DSP
- Testing audio signal paths
- Testing device communications
- Testing limits
- Testing RF signal paths
- Test speakers
- Testing video signal paths
- Company policy and procedures
- Conferencing products
- Control systems
- Customer expectations
- DSP
- Individual system component capabilities
- Service agreements and warranties
- Signal to noise ratios
- System functionality
- Troubleshooting techniques
- Vendor policies

Skill in:
- Interpersonal communication
- Adjusting audio gain
- Adjusting basic color balance displays

Domain E: Conducting Ongoing Project Responsibilities
Task 6: Maintain AV Systems

Knowledge of:
- Maintenance requirements for systems
- Maintenance schedules
- Obtaining parts and supplies for maintenance
- Performing maintenance activities
- Performing system/component functionality tests
- Submitting maintenance documentation
- Cleaning procedures and products
- Manufacturer's recommended maintenance schedules
- Service agreements and warranties
- Testing practices

Skill in:
- Interpersonal communication