

## ELECTRONIC SYSTEMS CERTIFIED DESIGNER (ESC-D) International (English)

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Recommended for industry professionals with at least 5 years of experience who are focused on system design and project completion.

This document outlines the body of knowledge on which the certification exam is built. CEDIA resources such as classes, books, and online training are designed to support this body of knowledge. Please refer to the **ESC-D Exam Prep Resources** document to find which resources support each area of study.



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DESIGNER

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### Domain Needs Assessment (10%)

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Task 1: Initiate and investigate the scope of a project using a structured information gathering methodology to obtain customer information. (4%)

#### KNOWLEDGE OF:

1. System and subsystem requirements that need to be gathered during the project scoping phase
2. Experience requirements (e.g., expectations for reliability and usability, lifestyle and day-to-day use) that need to be gathered in client interview process

#### SKILL IN:

1. Organizing and developing the content necessary to create a formal client survey procedure
2. Identifying missing information pertinent to the design objectives
3. Understanding client expectations

Task 2: Assess the site conditions by reviewing architectural plans and/or visiting the site in order to pre-empt architectural and structural complications. (4%)

#### KNOWLEDGE OF:

1. General construction methods and structural issues
2. Industry installation methods (e.g., cable types, termination, and routing; device mounting)
3. Standards and best practices

#### SKILL IN:

1. Working with architectural and engineering drawings
2. Determining spatial relationships
3. Sketching room/existing conditions
4. Assessing site conditions (e.g., site map, existing and new construction, house layout, equipment location, unusual situations, etc.)

Task 3: Provide solutions for value engineering. (2%)

**KNOWLEDGE OF:**

1. Cost analysis
2. Value engineering concepts
3. Installation complexities and design options
4. Life cycle costs

**SKILL IN:**

1. Estimating and analyzing costs to ensure the design meets budget constraints
2. Analyzing differences where solution options affect the design
3. Designing a work package that meets budget constraints (complete package of equipment, materials, and labor for each deliverable in the system)

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Domain  Project Design (50%)

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Task 1: Create functional specifications by translating the results of the needs assessment. (12%)

**KNOWLEDGE OF:**

1. Equipment functionality and technicalities
2. Cognitive principles and ergonomics

**SKILL IN:**

1. Describing the sequence of system touch points (i.e., all user interactions with system)
2. Creating documents that illustrate sequential behaviors and interdependences (e.g., flowcharts, block diagrams)
3. Specifying expected system performance levels
4. Designing a system that meets or exceeds client expectations

# CEDIA JOB TASK ANALYSIS (EXAM BLUEPRINT)

Task 2: Create physical specifications by translating the results of the functional specifications into system requirements. (25%)

## KNOWLEDGE OF:

1. Home Theater (including surround formats, screens, masking, seating, recommended practices, performance goals)
2. Acoustics, sound isolation, and acoustical treatment options
3. Audio (e.g., cables, components, loudspeakers, speaker sensitivity, distributed audio coverage, outdoor speakers, source options, immersive audio, streaming audio formats, SPL, amplifier power)
4. Video (e.g., cables, formats, resolution, copyright protection, storage, streaming, digital imaging, broadcast formats, IPTV, display technologies, Blu-ray, 4K, HDR, color gamut, image brightness, viewing distance, viewing angle, anamorphic systems)
5. Cabling standards (e.g., CEA 2030, TIA 570-C, NEC, backbone, HDMI, HDBaseT, fiber optics)
6. Cable containment (e.g., conduit, raceways, cable trays, armored cables, ducts)
7. Communications (e.g., telecom, VoIP, cellular, PBX/PABX, internet options, video conferencing)
8. Communication topologies (e.g., Star, Mesh, Bus, Ring)
9. Networking (specifying hardware and infrastructure, defining specifications related to QoS, segmentation, bandwidth requirements, network data security, wireless network design, alternate carriers such as Powerline and MoCa)
10. Wireless networking protocols (e.g., WiFi, Z-wave, Zigbee, Bluetooth, DECT, cellular)
11. Interactive media spaces (e.g., gaming, performance such as karaoke or golf simulators)
12. Device automation (e.g., gates, gas/electric fires, spa and pool control, irrigation, smart appliances, etc.)
13. Media servers (e.g., DVR, content management, A/V Codecs, mobile devices as sources)
14. Motorization
15. Equipment mounting (wall/ceiling mounts, racks)
16. Power management (e.g., power conditioning, grounding, bonding, renewable technology, energy management, DC storage and distribution, UPS)
17. Where to locate prevailing safety regulations
18. Control systems, including control topologies and components, user interface design, mobile devices, and communications standards (e.g., RS232, RS422, RS485, DALI, IP, etc.)
19. Other user interfaces (e.g., ambient devices, biometrics, voice)
20. Integration of security and fire alarm systems (e.g., access control, presence awareness, NVRs, CCTV)
21. Lighting and shade system design and control
22. HVAC system integration
23. Architecture and general construction methods (e.g., load-bearing vs non load-bearing walls, engineered beams)
24. Considerations related to multiple dwelling units and housing of multiple occupancies (e.g., vertical and horizontal wiring infrastructures)
25. Interior finishes (e.g., millwork, finish work, drywall)
26. RF/CATV/DSS distribution systems and HD/digital signal distribution (e.g., analog, digital, camera specs and optics, HDMI compatibility)
27. Basic electrical theory (e.g., Ohm's law, etc.)
28. Product specification variants (e.g., manufacturer measurement techniques)
29. Equipment space and load bearing requirements
30. Equipment power, ventilation, and control requirements
31. Cabling installation in challenging or difficult environments (e.g., EMI, RFI)

# CEDIA JOB TASK ANALYSIS (EXAM BLUEPRINT)

## SKILL IN:

1. Considering future design expansions
2. Reading and interpreting product specifications, choosing products
3. Documenting system specifications
4. Identifying applicable technologies
5. Performing system related calculations (e.g., heat, electrical, AV, structural loads)
6. Determining ventilation requirements (e.g., CFM, pathways, penetrations, etc.)
7. Designing audio/video distribution systems
8. Specifying, calculating, and analyzing acoustic design
9. Specifying spatial/mechanical/mounting/installation methods
10. Specifying and predicting performance levels
11. Determining functionality and programming requirements
12. Designing for serviceability, usability, and reliability

Task 3: Define the programming specification from the functional specification in order to determine what is to be controlled, the method and complexity of control, and the operational parameters including scripts, zone maps, and input/output relationships for the fully operational system. (8%)

## KNOWLEDGE OF:

1. Product functionality and configuration variables
2. Operational requirements, method and complexity of control
3. Flowcharts, state diagrams, and macros
4. Interface standards and protocols (e.g., RS232, RS485, TCP/IP, IR, digital I/O, contact closure, KNX, DALI)

## SKILL IN:

1. Describing sequential events
2. Specifying I/O relationships between events and actions
3. Determining fault scenarios, backup, and error recovery

Task 4: Create the user interface specification by proposing physical control arrangements in order to provide control consistent with client needs and desires. (5%)

## KNOWLEDGE OF:

1. Ergonomics, aesthetics, and human factors
2. User interface options and applications, including mobile apps
3. Hierarchical methods of control
4. Limitations of user interfaces
5. Product defaults

## SKILL IN:

1. Choosing the appropriate control device
2. Evaluating user interface designs

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## Domain **3** Design Documentation (30%)

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Task 1: Create pre-sale documentation (e.g., bill of material, resource list, and labor products) based on a cost estimate in order to communicate the requirements of the project to other stakeholders. (5%)

### KNOWLEDGE OF:

1. Roles and responsibilities of all trades, sub-contractors, and other design professionals associated with the project
2. Subsystem knowledge, including interconnection and interaction

### SKILL IN:

1. Generating details related to equipment, parts, and materials within the project budget and scope
2. Describing assemblies and sub-assemblies

Task 2: Generate electronic system plans for distribution to relevant parties post sale by preparing or modifying architectural plans in order to determine the location of devices and wire routes, including installation and construction notes. (6%)

### KNOWLEDGE OF:

1. Drawing legends, icon definition, and usage (ANSI-J-STD-710)
2. Product placement criteria
3. Serviceability and usability
4. Drawing layers
5. Installation guidelines and criteria
6. Document revision control and security
7. Interior design (aesthetic considerations, furniture layout)
8. Site considerations and human and animal traffic patterns

### SKILL IN:

1. Reading and annotating drawings
2. Interpreting installation guidelines and criteria
3. Creating drawings (e.g., plans, elevations, RCPs, details)
4. Specifying product placement (i.e., user interfaces, components, equipment mounting, speaker layout, etc.)

# CEDIA JOB TASK ANALYSIS (EXAM BLUEPRINT)

Task 3: Generate block diagrams (single-line drawing) to show basic system level interconnection between components and sub-systems. (4%)

## KNOWLEDGE OF:

1. Concepts of signal flow and control nomenclature
2. Block diagrams and/or flow charts
3. Components used in systems

## SKILL IN:

1. Generating block diagrams and/or flow charts
2. Organizing layout and annotating for clarity of presentation

Task 4: Create cable documentation (i.e., cabling plan and schedule) by describing the origin, destination, length, and type of each cable along with associated devices for distribution to associated trades. (4%)

## KNOWLEDGE OF:

1. Cable types, outlets/inlets, connectors, back boxes
2. Connection of all sub-systems
3. Signal types
4. Cable characteristics
5. Trades involved
6. Standards (e.g., TIA570-C) and best practices (e.g., CEDIA Recommended Wiring Guidelines) related to cables
7. Cable management practices

## SKILL IN:

1. Using electrical formulas to calculate cable specifications
2. Specifying appropriate cable types (i.e., fire ratings, class, shielding, etc.)
3. Specifying connectors and connectorization

Task 5: Generate schematic drawings by describing the specific input-output, wire and connector types, and method of interconnection in order to document how the components will be connected. (5%)

## KNOWLEDGE OF:

1. Concepts of signal flow and control nomenclature
2. Components used in systems
3. Cables, connectors, pinouts, terminations, and color codes
4. Back-panel layout of all devices in the system
5. Basic point-to-point information including symbols, grounding, voltage requirements, and other safety related information

## SKILL IN:

1. Generating point-to-point drawings
2. Referencing point-to-point to cable schedule
3. Applying electrical and safety requirements
4. Organizing layout and annotating for clarity of presentation
5. Detailing cable connector, pinouts, terminations, and color code requirements
6. Defining drawing layers (e.g., audio, video, control, RF, power)

# CEDIA JOB TASK ANALYSIS (EXAM BLUEPRINT)

Task 6: Compile and re-generate as-built drawings based on post-installation construction documents. (3%)

## KNOWLEDGE OF:

1. Red-lining techniques
2. Change orders
3. Project history

## SKILL IN:

1. Creating, distributing, and managing archive files
2. Reading construction documents
3. Maintaining version control

Task 7: Prepare test specifications to verify system performance and functionality. (3%)

## KNOWLEDGE OF:

1. Functions of test equipment
2. Process for testing entire system
3. Performance goals of the finished systems
4. Setup parameters and performance specifications

## SKILL IN:

1. Creating a quality control and assurance checklist
2. Preparing test reports
3. Interpreting the results of the tests

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## Domain Design Management (10%)

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Task 1: Assess the impact of change orders on the overall design. (6%)

## KNOWLEDGE OF:

1. Technical limitations of system components
2. Original design intent
3. Impact of industry factors (e.g., new technologies, back orders, codes and standards, etc.)
4. Impact of customer factors (e.g., color preference, budget)

## SKILL IN:

1. Recalculating budget costs
2. Analyzing how different solution options affect the design
3. Consulting with clients, installers, and other design professionals

Task 2: Monitor progress of the project to ensure design compliance. (4%)

**KNOWLEDGE OF:**

1. Assigned responsibilities of the contractors and sub-contractors
2. Communication plan
3. Original design intentions

**SKILL IN:**

1. Documenting progress
2. Reviewing periodic status reports produced by the project manager
3. Maintaining communication logs
4. Generating, reviewing, and approving submittals
5. Working with programmers
6. Working within a design team