

STATE OF CONNECTICUT DEPARTMENT OF CONSUMER PROTECTION  
OCCUPATIONAL & PROFESSIONAL LICENSING DIVISION  
Telephone (860) 713-6135 Fax (860) 713-7230  
Website: www.ct.gov/dcp

TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN LICENSE

Experience and Pre-licensing Education

All courses taken for credit towards a Connecticut TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN'S License must be **Pre-approved** by the Department of Consumer Protection.

- **Schools** shall not use addresses and telephone numbers of a TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN'S office, or a TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN'S franchise.
- **Approved courses** shall not be held on the premises of a TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN'S EMPLOYER'S office, or TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN'S LABOR SOURCE or franchise.
- The approval of a course is limited to the course as specifically described in your approval letter from us for each course application. No change of course title, content, instructor, location, schedule, certificate, etc., is approved unless updates or modifications are resubmitted to the Department of Consumer Protection prior to use.
- Classroom hours and school name must appear on all certificates.

The certificate of education for TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIANS will be on SCHOOL OFFICIAL LETTERHEAD. Our office requests that approved TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIAN schools send a sample of their letterhead with names and signatures of school representatives and/or the raised seal of the school.

In order to qualify, the candidate must meet the minimum hours specified by the Department of Consumer Protection. A final examination of the related instruction is required and administered by the approved educational providers for certification. Proper completion of the experience and training requirements requires the participation of the candidate and the approved educational provider. The Candidate must demonstrate to the educational provider satisfactory knowledge and/or experience in each of the 28 sections specified by the Department of Consumer Protection.

All required sections must be completed before the candidate will be allowed to take the examination. Falsification of compliance with the experience or training records may result in disqualification of both the candidate and/or the educational provider and loss of license/state approval.

Approved educational providers shall use current up to date rules, regulations, and standards in the approved curriculum.

Applicant(s) shall provide the educational provider verifiable proof of knowledge and experience. The educational provider shall provide satisfactory proof to the Department of Consumer Protection that all modules have been completed and the candidate has taken a final examination. The final examination shall include questions related to all required modules.

All courses shall be based on the most current standards, regulations, and laws applicable to telecommunications design.

In consultation with the Department of Consumer Protection, educational providers may determine preexisting conditions that may be considered in determining an applicant's qualifications.

**School Course Filing Requirements:**

The filing for each course shall include, but not be limited to, the following:

- (1) Detailed Course Outline,
- (2) Instructor's Lecture Guidelines,
- (3) Copy of Text and Related Teaching Materials,
- (4) Copy of Final Examination,
- (5) Copy of any Quizzes,
- (6) Grading System,
- (7) Copy of Affidavits and Certificates to be Issued,
- (8) Copy of All Proposed Advertising and Publicity,
- (9) Seminars and Indoctrination Attended by Instructors,
- (10) Locations of All Classrooms,
- (11) Names and Addresses of All Instructors to be Used

**Affidavit or Certificate Requirements:**

No affidavit or certificate of successful completion of an approved course of study in TELECOMMUNICATIONS INFRASTRUCTURE LAYOUT TECHNICIANS shall be issued to any student unless said student shall have first attended such classroom instruction. Each school shall issue an affidavit to the student in such form as may be adopted by the school attesting to the required minimum attendance, dates of attendance, and final numerical grade if any for the course. Said affidavit is to be signed by an authorized official of the school.

**Course approval by the Department of Consumer Protection:**

Each school conducting an approved course shall, at least 60 days prior to the first scheduled session of each course, submit to the Department of Consumer Protection a schedule of the dates, hours, locations, advertising and instructors for each course to be offered. No course shall commence or be advertised as approved, nor shall an instructor be used in the classroom, without prior written approval of the Department of Consumer Protection. There shall be no change or alteration in any approved course or instructional staff without prior written notice and approval of the Department of Consumer Protection.

**Audit of Records:**

All schools conducting approved courses shall keep and retain complete records of student attendance and grades for a period of at least three years after the completion of each course and such records shall be available for inspection / audit

**Department Audits:**

The Department of Consumer Protection may, without prior notice, visit the school and observe the instruction given to insure proper standards as to method of delivery, instruction, and confirm content of any approved courses.

**Each school desirous of offering approved courses shall submit a formal filing for each course module with the Department of Consumer Protection.**

These shall include, but not be limited to, the following modules:

**Introduction: Total Hours: 4000**

This Checklist has been prepared by the State of Connecticut, Department of Consumer Affairs, to verify the knowledge and experience of a candidate for the Telecommunication Infrastructure Layout Technician license. In order to qualify, the candidate must meet the minimum hours specified in each Section of the Checklist.

Proper completion of this Checklist requires the participation of the candidate and a responsible Supervisor. The Candidate must demonstrate to the supervisor satisfactory knowledge and/or experience in each category. All sections of the Checklist must be completed. An approved educational provider may substitute equivalent on the job experience for the recommended number of hours in each module.

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16. Grounding, Bonding, and Electrical Protection
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19. Local Area Networks and Internetworking
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26. Design, Construction and Project Management
27. Power Distribution
28. CAD Experience

## 1. Codes, Standards and Regulations: Hours: 150

This section affirms the Interns familiarity with the myriad of codes, standards and regulations that govern the telecommunications industry. This area includes:

### a. Regulations Affecting Telecommunications

- i. Federal
- ii. State
- iii. Local
- iv. Americans with Disabilities Act (ADA)

### b. FCC Rules and Regulations

- i. Part 68
- ii. Part 15
- iii. OSHA Rules and Regulations

### c. Important Codes and Standards

- i. ANSI/TIA/EIA Premises Cabling Standards
- ii. National Electrical Code
- iii. National Electrical Safety Code
- iv. National Fire Protection Association Codes
- v. National and local Building Codes

## 2. Definitions, Abbreviations, Acronyms, and Symbols: Hours: 50

This section confirms the Interns familiarity and experience with the terminology used in telecommunications. This area includes:

- a. Definitions
- b. Abbreviations, Acronyms, and Units of Measure
- c. Symbols

### 3. Horizontal Pathway Systems: Hours: 225

This section confirms the Interns familiarity and experience with the design of the horizontal pathways systems for telecommunications.

This area includes:

#### a. General

- i. Design Considerations
- ii. Electromagnetic Interference (EMI)
- iii. Grounding and Bonding
- iv. Administration
- v. Firestopping
- vi. Wet Locations
- vii. Hazardous Locations

#### b. Sizing Considerations

- i. Usable floor space
- ii. Occupant Density
- iii. Cable Density
- iv. Cable Diameter (Determining Pathway Size)

#### c. Types of Horizontal Pathways

- i. Underfloor Duct Systems
- ii. Cellular Floor Systems
- iii. Access Floors
- iv. Ceiling Distribution Systems
- v. Cable Tray
- vi. Conduit and Raceway Systems
- vii. Other
  - 1. Catenary Support
  - 2. Perimeter Raceway Systems
  - 3. Overfloor Ducts
  - 4. Molding Raceways
  - 5. Poke Thru

#### 4. Horizontal Cabling Systems: Hours: 225

This section verifies the Interns familiarity and experience with the design of the Horizontal cabling distribution systems. This area includes:

##### a. General

- i. Design considerations
- ii. Electromagnetic Interference (EMI)
- iii. Grounding and Bonding
- iv. Administration
- v. Topology
- vi. Centralized Cabling
- vii. Consolidation and Transition points

##### b. Horizontal Cable

- i. Cable Lengths
- ii. Cable Types
- iii. Cable Selection
- iv. 100 ohm Twisted-Pair Categories
- v. Category Selection
- vi. Optical Fiber Cable Performance
- vii. Hybrid Cables
- viii. Composite Cables
- ix. Bundled Cables
- x. Cable Slack
- xi. Crossovers/Polarity

##### c. Horizontal Cable Hardware

- i. Equipment Connections
- ii. Telecommunications Outlets
- iii. Cabling Adapters
- iv. 100 ohm Twisted-Pair Cable Outlets
- v. Multimode Optical Fiber Outlets
- vi. Small Form Factor Connectors

##### d. Cross Connect Jumpers and Patch Cords

- i. Length Requirements
- ii. Hybrid Patch Cords
- iii. Connection Schemes
- iv. Verification Testing

e. Cabling Practices

- i. Cable Management Practices
- ii. Connector Termination Practices
- iii. Zone Distribution

5. Backbone Pathway Systems: Hours: 225

This section verifies the Interns familiarity and experience with the design of Intra-building Backbone Pathway Systems. This area includes:

a. General

- i. Vertical Alignment
- ii. Sleeves and Slots
- iii. Open Shafts
- iv. Metallic Raceways or Conduits
- v. Conduit Fill
- vi. Sizing Pull Boxes

b. Heavy Cable Installation

- i. Installation Guidelines
- ii. Knots
- iii. Mounting Cable Reels
- iv. Lowering Cables
- v. Raising Cables
- vi. Core Hitches
- i. Methods of Supporting Vertical Backbone Cables

c. Support Facilities

d. Grounding and Bonding

6. Backbone Building Cabling Hours: 225

This section verifies the Interns familiarity and experience with the design of Inter-building Backbone Cabling systems. The areas include:

a. General

- i. NEC Requirements
- ii. Cable Markings
- iii. Substitutions
- iv. Fiber Cable Types

b. Backbone Cable Planning

- i. Copper Design
- ii. Fiber Counts

c. Indoor Hardware

- i. Mounting Options
- ii. Splicing Hardware
- iii. Termination Hardware
- iv. Patch Panels

7. Campus Pathways: Hours: 50

This section verifies the Interns familiarity and experience with the design of Inter-building Campus backbone Pathways. This area includes:

a. General

- i. Entrance Cable
- ii. Safety Procedures
- iii. Underground Pathways
- iv. Buried Cable
- v. Aerial Pathways
- i. Trench
  - ii. Locating Buried Cables
  - iii. Shoring Requirements
  - iv. Joint Trench Requirements
  - v. Warning Tape
  - vi. Trenching Methods
    - 1. Backhoe
    - 2. Compact Trencher
    - 3. Vibratory Plow
    - 4. Directional Boring
- i. Bends
- ii. Minimum Depth
- iii. Encasements
- iv. Service Station Requirements
- v. Maintenance Holes

b. Direct-Buried and Underground Pathways

c. Conduit

- 1. Placement
    - 2. Conduit Entry
    - 3. Interior Hardware
    - 4. Covers
    - 5. Concrete Strength
  - 1. Poles
    - 2. Cables
    - 3. Grounding and Insulating
  - vi. Corrosion-Resistant Conduit
  - vii. Conduit on Poles
  - viii. Pull Cords
  - ix. Media Separation
  - x. Innerduct
  - xi. Underground Considerations
    - i. Ribbed Conduit
    - ii. Maintenance Hole (MH)
    - iii. Maintenance Hole Hardware
    - iv. Sulfate Reducing Hardware
  - i. Poles
    - ii. Pole Loading
    - iii. Pole Depths
    - iv. Slack Span
    - v. Guying
    - vi. Suspension Strand
    - vii. Optical Fiber
    - viii. Aerial Duct
    - ix. Separations and Clearances
- d. Cable Placement
- e. Aerial Plant

## 8. Campus Cabling: Hours: 50

This section verifies the Interns knowledge and experience with Campus Backbone Cabling Systems. This area includes:

- a. Campus Backbone Cabling Design
  - i. Definitions
  - ii. Requirements
  - iii. Facility Requirements
  - iv. Collages and Universities
  - v. Shared Tenant Service

b. System Design

- i. A Backup Communications
- ii. Location Criteria
- iii. Media Separation
- iv. Cost versus Service Analysis
- v. Subdividing
- vi. Easements

c. Right of Way and Encroachment Permits

- i. Types of Right of Ways
  - 1. Public
  - 2. Private
  - 3. Railroad
- i. Types of Cables
- ii. Metallic Cables
- iii. Optical Fiber Cable
- iv. Installation considerations
- v. Cable Protection during installations
- vi. Splicing Methods
- vii. Cable termination
- viii. Cable Closures
- ix. Pressurization

d. Cable and Wire

9. Work Areas: Hours: 100

This section verifies the Interns familiarity and experience with the design of Work Areas. This area includes:

- a. Outlet Locations
- b. Cord
- c. Open Office Systems
  - i. Furniture Systems
  - ii. Multi-User Telecommunications Outlet Assembly (MUTOA)
  - iii. Consolidation Point (CP)
  - iv. Undercarpet Systems

## 10. Telecommunications Rooms: Hours: 300

This section verifies the Interns familiarity and experience with the design of Telecommunications Rooms. This area includes:

### a. Applications

- i. Horizontal Cross-Connects
- ii. Backbone Cross-Connects
- iii. Fiber Facilities
- iv. Entrance Facilities

### b. General Requirements

- i. Ceiling Height
- ii. Cross-Connect Field
- iii. Conduits, Trays, Slots, Sleeves, and Ducts
- iv. Doors
- v. Dust and Static Electricity
- vi. Environmental Control
- vii. Fire and Flood Protection
- viii. Floor Loading
- ix. Grounding and Bonding
- x. Lighting
- xi. Location
- xii. Other Uses
- xiii. Power
- xiv. Security
- xv. Size
- xvi. Wall Linings
- xvii. Wall and Rack Terminations
- i. Administration
- ii. Conduits, Trays, Slots, Sleeves, and Ducts
- iii. Bonding and Grounding
- iv. Size
- v. Smaller Buildings
- vi. Layout
- vii. Clearances
- viii. Special Size Requirements
- ix. Terminations Space Allocation

### c. Design

## 11. Equipment Rooms: Hours: 200

This section verifies the Interns knowledge and experience with the design of telecommunications equipment rooms. This area includes:

- a. General
  - i. Definition
  - ii. Multiple Functions
  - iii. Customer Investment
  - i. Active Equipment
  - ii. Cross Connect Facilities
  - iii. Building Facilities
  - iv. Assessment
  - i. Major Factors
  - ii. Access to Cable Pathways
  - iii. Delivery Access
  - iv. Entrance Facility Requirements
  - v. Telecommunications Systems
  - vi. Existing Systems
  - vii. Electric and EMI Sources
  - viii. Multi-tenant Buildings
  - ix. Unacceptable Locations
  - i. Adequate Equipment Space
  - ii. Sizing
  - iii. Equipment Arrangement
  - iv. Working Clearances
  - v. Access Provider Space
  - vi. Work Area Space
  - vii. Equipment Installation Methods
    - i. Pathways within Equipment Room
    - ii. Pathways entering Equipment Room
- b. Design
- c. Location
- d. Space Allocation and Layout
- e. Cable Installation and Pathways

- i. Power Requirements
- ii. National Electrical Code
- iii. Maintaining Power Quality
- iv. Branch Circuits
- v. Dedicated Power Feeders
- vi. Power Coordination
- vii. Backup Power
- i. HVAC Operation
- ii. Environmental Control Requirements
- i. Wall Requirements
- ii. Floor Requirements
- iii. Ceiling Requirements
- iv. Entrances
- v. Security
- i. Lighting
- ii. Fire Protection
- iii. Firestopping
- iv. Maintaining Warranties
- v. Noise Levels
- vi. Sensitive Equipment and Electromagnetic Interference
- vii. Earthquake, Disaster and Vibration Requirements
- i. Reviewing Design with Customer
- ii. Planning Installation
- iii. Installation Access
- iv. Installation of Equipment
- v. Inspection of the Equipment Room
- f. Electrical Power
- g. Environmental Control
- h. Structural Requirements
- i. Miscellaneous Considerations
- j. Design, Approval, Installation and Final Inspection

## 12. Telecommunication Entrance Facilities and Termination: Hours: 100

This section verifies the Interns familiarity and experience with the design of Entrance Facilities. This area includes:

### a. General

#### i. Required Services Entrances

### b. Service Entrance Considerations

#### i. Multi-Building Developments

#### ii. Campus Arrangements

#### iii. One-tenant Campus

#### iv. Right of Way

#### v. Locating other Utilities

#### vi. Loop Diversity

#### vii. Dual Entrances

#### i. Underground Entrances

##### 1. Sizing Entrance Conduits

##### 2. Innerduct

##### 3. Adding Conduits

##### 4. Sharing Conduits

##### 5. Choosing Pull Points

##### 6. Cover Depth

##### 7. Tie-in Connections

##### 8. Termination Points

##### 9. Fastening Entrance Conduits

##### 10. Sealing Conduits

##### 11. Bonding and Grounding

##### 1. Trench depth

##### 2. Avoiding Sunken trench

##### 3. Identifying Subsurface Facilities

##### 4. Clearing Foundation Landscaping

##### 5. Direct Buried Methods

##### 6. Shoring Requirements

#### ii. Buried Entrances

## c. Types of Entrances

### iii. Aerial Entrances

1. Limitations
2. Potential Problems
3. Maximum Span
4. Separations and Clearances
5. Types of Exterior Walls
6. Vertical Wall Attachments
7. Small Cable Drops
8. Vertical Conduit Masts
9. Entrance Through Walls

### iv. Termination Space

1. Inside Termination Space Requirements
2. Outside Building Terminals (Pedestals and Cabinets)

### v. Network Interfaces and Demarcation Points

1. Definition
2. Classifications
3. Groups
4. Types
  - a. Voice
  - b. Data
  - c. Network Channel Equipment Jacks
5. Locations
6. Centralization versus Distribution
7. Hardware

13. Special Design Considerations: Hours: 200

This section verifies the Interns familiarity and experience with the Special Design Considerations This area includes

- a. Public Telephones
  - i. Types
  - ii. Enclosures
  - iii. Directories
  - iv. Clearances
  - v. Safety Considerations
  - vi. Foundations
  - vii. Environmental Protection
  - viii. Overhead Entrance Wire
  - ix. Americans With Disabilities Act
- b. Automatic Teller Machines
- c. Facsimile Machines
- d. Poolside Telephone Service
- e. Attendant and Reception Areas
- f. Power Stations
- g. Tunnels
- h. Marinas

14. Telecommunications Administration: Hours: 150

This section verifies the Interns familiarity and experience with the implementation of a Telecommunications Administration System. This area includes:

- a. General
  - i. Benefits
  - ii. Numbering Schemes
  - iii. Elements
    - i. Spaces
    - ii. Pathways
    - iii. Cables
    - iv. Connecting Hardware
    - v. Grounding System
    - vi. Equipment
  - i. Paper Records
  - ii. Record System Components
  - iii. User Records
  - iv. Circuit Records
  - v. Equipment Records
  - vi. Building Records
    - i. Space Identification
    - ii. Pathway Identification
    - iii. Cable Identification
    - iv. Hardware Identification
    - v. Grounding System Identification
    - vi. Equipment Identification

- 14.
  - b. Labeling
  - c. Record Keeping System
  - d. Alphanumeric Schemes

15. Firestopping: Hours: 100

This section verifies the Interns familiarity and experience with the design of Firestopping Systems. This area includes

- a. General
    - i. Purpose
    - ii. Terms
    - iii. Role of Firestopping
    - iv. Secondary Functions
    - v. Firestopping and Disaster Avoidance
  - i. Appropriate Systems
  - ii. Selecting Materials/Systems
  - iii. Component Preparation
  - iv. Qualified Electrical Apparatus
  - i. Fire Zones
  - ii. Barriers Design
  - i. Resistivity of Through-Penetration Firestops
  - ii. Fire Rating Classifications
  - iii. Systems and Tests
  - iv. Time Temperature Curves
  - v. Membrane Penetration Firestops
  - i. Testing Criteria
  - ii. Qualifications for Field Testing
  - iii. Qualifications for Testing Openings
  - iv. Miscellaneous Information
  - i. Mechanical Systems
  - ii. Non-Mechanical Systems
- b. Firestopping Systems
  - c. Fire Rated Barriers
  - d. Testing and Guidelines for Fire Stops
  - e. Evaluation of Firestop Systems

- f. Categories of Firestop Systems
  - i. Types of Putty
  - ii. Types of Caulk
  - iii. Cementitious Materials
  - iv. Intumescent Sheets
  - v. Intumescent Wraps
  - vi. Silicone Foam
  - vii. Pre-Manufactured Pillows
  - viii. Pre-Fabricated Intumescent Collars
  - ix. Plenum Sheet Blanket
  - x. Intumescent Blocks
    - i. Brick, Concrete Block and Concrete Walls
    - ii. Gypsum Wall Board
    - iii. Lath and Plaster Walls
    - iv. Combination Walls
    - v. Floor Assemblies
    - vi. Floor/Ceiling Assemblies
    - vii. Structural Steel
    - viii. Roof/Ceiling Assemblies
    - ix. Vertical Shafts
    - x. Curtain Wall Floor/Ceiling Seals
    - xi. General
    - xii. Disaster Avoidance
    - xiii. Egress Program
- g. Non-Mechanical Firestop Systems
- h. Firestop Applications

16. Grounding, Bonding, and Electrical Protection: Hours: 250

This section verifies the Interns familiarity and experience with the design of Grounding, Bonding and Electrical Protection. This area includes:

- a. General
  - i. Safety
  - ii. Planning
  - iii. Responsibilities
  - i. Electrical Exposure
  - ii. Approvals
  - iii. Code
  - iv. Bonding
- b. Definitions
  - i. Avoidance of Electrical shock
  - ii. Electrical Shock Levels
  - iii. Prevention
  - i. Lightning Protection System
  - ii. Electrical Power Systems
  - iii. Telecommunications Bonding and Grounding
    - 1. Bonding Practices
    - 2. Grounding Practices
    - 3. System Practices
    - 4. ANSI/TIA/EIA-607
      - 1. Primary Protectors
      - 2. Fuses and Fuse Links
      - 3. Secondary Protectors
      - 4. Enhanced Protection
    - 1. General
    - 2. Basis
    - 3. Isolation
    - 4. Codes
    - 5. Isolated Ground
    - 6. Exposed Cable Sheath Terminations
    - 7. Data Center Grids
    - 8. Enhanced Grounding Electrode System
    - 9. Antenna Towers
    - 10. Telecommunications Switching Centers
    - 11. Zoned Protection
  - iv. Backbone Cable Protection
  - v. Equipment Grounding
  - vi. Telecommunications Circuit Protectors
  - vii. Protector Technology
  - viii. Primary Protector Installation Practices
  - ix. Specific Protection Methods
- c. Personnel Protection
- d. Basic Protection Systems

## 17. Electromagnetic Compatibility: Hours: 100

This section verifies the Interns knowledge and experience with electromagnetic compatibility in telecommunications. This Area includes:

- a. General
  - i. Electromagnetic Radiation
  - ii. Need for Compatibility
  - iii. Responsibility
  - iv. Terms and Definitions
  - i. Electromagnetic Fields
    - ii. Desirable and Undesirable Electromagnetic Fields
    - iii. External and Internal EMI
    - iv. Evidence of EMI
  - i. Electromagnetic Compatibility
    - ii. Measuring EMC
    - iii. Terminology
  - i. Problem Identification
    - 1. Conditions of unwanted EMI
    - 2. Factors Affecting EMI
      - 1. Basis EMC Philosophy
      - 2. Product Immunity
      - 3. EMI Mechanisms
      - 4. Sources of EMI
      - 5. Cabling
        - 1. Emissions
        - 2. Immunity
        - 3. Noise
        - 4. Grounding
  - ii. Solution
  - iii. Regulations and Standards

- b. Electromagnetics
- c. Electromagnetic Compatibility
- d. Electromagnetic Interference
  - 1. Joint use with Tunnel
  - 2. Equipment Rooms
  - 3. Horizontal cabling
  - 4. EMI Avoidance
  - 5. Electrical Power Wiring
- 1. Filtering
- 2. Shielded Rooms
- 3. Bandwidth of Twisted –pair Cabling
- iv. Telecommunications EMC Guidelines
- v. EMC in Cabling Systems

18. Principles of Transmission Hours: 450

This section verifies the Interns familiarity and experience with the Principles of Transmission. This area includes:

- a. Metallic Media
  - i. Electrical Conductors
  - ii. American Wire Gauge
  - iii. Insulation
  - iv. Twisted-Pair Cables
  - v. Environmental Considerations
  - vi. Cable Shielding
  - vii. Drain Wires
  - viii. Analog Signals
  - ix. Digital Signals
  - x. Digital Transmission Speeds
  - xi. Transmission Lines
    - 1. Types
    - 2. Asynchronous and Synchronous
    - 3. Digital Hierarchy
    - 4. Video

- xii. Twisted-Pair Standards
- xiii. Twisted-Pair Link Performance
- xiv. Twisted-Pair Channel Performance
- xv. Twisted-Pair Applications
  - 1. Receivers
  - 2. Fiber Medium
- i. Selection
- ii. Fundamental System
- iii. Applications
- iv. Performance Verification
- v. Electronics Compatibility
- vi. Bandwidth
- b. Optical Fiber

19. Local Area Networks and Internetworking: Hours: 300

This section verifies the Interns familiarity and experience with the design of LAN and Internetworking Systems. This area includes:

- a. General
  - i. LAN Basics
  - ii. LAN Architecture
  - iii. Internetworking Basics
  - iv. Links Basics
- i. LAN Components
- ii. Internetworking Components
- i. Basics
- ii. LAN Communications
- iii. Internetworking Communications
- i. Ethernet
- ii. Token Ring
- iii. FDDI
- iv. ATM
- v. Wireless
- b. LAN and Internetworking Components
- c. LAN and Internetworking Communications
- d. Networking Technologies

20. Building Automation Systems: Hours: 50

This section verifies the Interns familiarity and experience with Building Automation Systems. This area includes:

- a. General
  - i. Building Automation Systems
  - ii. BAS Communications Networks
  - iii. Integrating BAS and Telecommunications Systems

21. Private CATV Distribution Systems: Hours: 50

This section verifies the Interns familiarity and experience with Private CATV Distribution Systems. This area includes:

- a. General
  - i. Components
  - ii. Electrical Properties of Coaxial Cable
  - iii. Program Material Sources
  - iv. System Topologies
  - v. Signal Loss
  - vi. Network Design

22. Overhead Paging Systems : Hours: 50

This section verifies the Interns familiarity and experience with Overhead Paging Systems. This area includes:

- a. General
  - i. Types
  - ii. Speaker Selection
  - iii. Circuit Types
  - iv. Amplifiers
  - v. Acceptance Testing

23. Wireless and Microwave Systems : Hours: 50

This section verifies the Interns familiarity and experience with Wireless and Microwave Systems. This area includes:

- a. General
  - i. Radio Fundamentals
  - ii. Equipment
  - iii. Antenna Systems
  - iv. Waveguide and Transmission Lines
  - v. Wave Line Entrance Links

- i. General
- ii. Route Selection
- iii. Site Selection
- iv. Towers
- v. Path Data
- vi. Sites
- vii. Propagation
- viii. Path Profiles
- ix. Interference Avoidance
- x. Clearance
- xi. Diversity
- xii. Fading
- xiii. Distortion Delay
- xiv. Noise Performance
- i. General
- ii. Wireless LAN Communications
- iii. Topology
- iv. Communications Assistance for Law Enforcement Act
- b. .Microwave Systems
- c. Wireless Systems

#### 24. Field Testing: Hours: 150

This section verifies the Interns familiarity and experience with field testing procedures for fiber and copper cables. This area includes:

- a. Copper Cable
  - i. Copper Cabling Tests
  - ii. Copper Cabling Cable Acceptance Tests
  - iii. Copper Cabling Field Testing
  - iv. Maintenance and Troubleshooting
- i. Fiber Cabling Tests
- ii. Fiber Cabling Acceptance Tests
- iii. Fiber Cabling Field Testing
- iv. Maintenance and Troubleshooting
- b. Optical Fiber

25. Residential Cabling: Hours: 50

This section verifies the Interns familiarity and experience with residential cabling designs. This area includes:

- a. General
  - i. Background
  - ii. Components
  - iii. Planning
  - iv. Rough-in Cabling
  - v. Finish Cabling

26. Design, Construction, and Project Management: Hours: 50

This section verifies the Interns familiarity and experience with the Design, Construction, and Project Management. This area includes

- a. General
  - i. Design Team
  - ii. Construction Team
  - iii. Design Phase
  - iv. Construction Phase
  - i. Roles of Team Members
  - ii. Elements
  - i. Role of Team Members
  - ii. Bid vs. RFP
  - iii. Low Bid vs negotiated Bid
  - iv. Bid Documents
  - i. Roles of Team Members
  - ii. General Contractor vs Construction Manager
  - iii. Types of Contracts
  - iv. Forms
  - v. Submittals
  - vi. Meetings
- b. Design
- c. Bidding
- d. Construction

- i. Roles of Team Members
- ii. Computer-Aided facility Management
- iii. Additional Resources
- iv. Codes and Standards
- e. Post Construction

27. Power Distribution: Hours: 50

This section verifies the Interns familiarity and experience with the design of AC and DC power distribution. This area includes

- a. AC Power
  - i. General
  - ii. Power Problems
  - iii. Power Conditioning/Power Protection
- i. General
- ii. DC System Installation
- iii. Batteries
- b. DC Power
- c. ISDN Power Distribution over Copper Pairs
- d. Power System Alarms
- e. Power System Monitoring and Control

28. CAD Experience: Hours: 50

**Other Related Experience/Training:**

Please list any additional training and/or experience in related areas. Any completed training modules shall include a copy of the Certificate issued by the approved provider or a statement from the approved education provider of modules substituted.

**SEAL AS REQUIRED TO BE HELD BY LICENSEE:**

**Connecticut General Statutes:**

The Commissioner of Consumer Protection, within the advice and assistance of the Board, shall have the authority to make regulations pertaining to the design and use of the seals by licensees under Public Act No. 01-164. CPR-80d NEW 8/02 30

### **License Seals and Stamps**

- (a) Each licensee, upon notification of licensure, will be authorized to obtain an official seal of a size and design prescribed by the Department of Consumer Protection. The seal shall be applied to all plans, maps, surveys, sketches, drawings, specifications and documents pertaining to any project submitted by the licensee to his or her client. Where documents are bound together, the application of the seal on one sheet or page shall be considered sufficient, except in filing plans for building permits and appurtenant structures where each sheet shall be sealed.
- (b) A rubber stamp of identical size and design to the specified seal shall suffice. seals are necessary. The licensee shall not affix his or her seal to any plan, map, survey, sketch, drawing, specification or other document not prepared personally or under his or her supervisory control. A licensee may seal, or sign and seal, documents not prepared by the licensee or by an employee under the licensee's supervisory control, provided the licensee shall prepare, and retain for a period of not less than six years, a thorough written evaluation of the professional services represented by the documents, including but not limited to, drawings, specifications, reports, design, calculations and references to applicable codes and standards. Such written evaluation shall clearly identify the project and the documents to which it relates, the sources of the documents and the name of the person or organization for which the written evaluation was conducted and the date of the evaluation: and the seal and signature of the licensee shall also be affixed thereto.
- (c) Holders of official seals and/or stamps are responsible for their use in sealing and/or stamping of engineering and land surveying documents. Loss of seals and/or stamps shall be reported to the Department of Consumer Protection immediately but not later than (15) fifteen days after discovery. Failure to report such a loss may subject the holder to disciplinary action by the Department. A petition for the issuance of a new license may be submitted concurrently with the report of the loss. Misuse of the lost seal and/or stamp by others shall remain the responsibility of the licensee until such loss is reported.

**Seals are to be 1½ inches in diameter and as per design shown hereon and may be obtained from the list of suggested dealers.**

Should you desire additional information or have any questions, please do not hesitate to write or call Richard M. Hurlburt, Director of Occupational and Professional Licensing

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Occupational & Professional Licensing  
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