Video Security Systems Technician

Level II Certification

Content Outline

National

Institute for

Certification in

Engineering

Technologies

NICET ®

Introduction

The purpose of this certification program is to recognize the professionalism of qualified technicians and provide a way for others to distinguish those technicians who have demonstrated job knowledge and work experience. NICET will do this by defining and testing relevant knowledge and evaluating experience.

This document presents the content that is covered in the examination and other criteria for certification as a Video Security Systems Technician at Level II. This program is based on an analysis of the tasks that are performed by a competent technician. The content outline is a listing of tasks that should be performed well by a Level II certified Technician. Also included are knowledge and skills needed to succeed at each task. These tasks are the focus of the test questions that make up the Level II exam.

The tasks are grouped into larger areas of responsibilities, or "domains". The domains are:

> Project Planning
>
> System Installation
>
> System Testing and Commissioning
>
> Troubleshooting
>
> Planning and Conducting User Training
>
> Documentation
>
> Project Management   (No tasks at Level II)

A general description or profile of a Level II Technician includes the following characteristics:

Education: Minimum expected for Level I, with coursework or other experiences that develop knowledge of algebra, basic electronic and video concepts, business and technical English, and published technical standards.

Work Experience: A minimum of two years of related work, one year of which must be specifically involved with installation and maintenance of video systems. Up to one year may be involved with related electronic or optical systems, provided that at least six months of this is in installation of low voltage electronic communications systems. (An Electronics Associates Degree from an ABET accredited program may be substituted for 18 months of work experience.)

Responsibility: Work under general supervision, performing installation of type A video systems under routine circumstances without immediate supervision.

Acquired Competencies: In addition to Level I competencies, perform installation and routine testing of standard video apparatus for a type A system. Replace components or perform simple maintenance tasks as directed. Train users in system operation. Document actions and report problems.

<u>Tasks Performed by the Level II Technician</u>

(Installs Type A Systems)

2.1 *"Project Planning" Tasks*

2.1.1 Perform site assessment and determine requirements for installation of type A system.

Knowledge:

System power requirements

NEC cable listings and conduit standards

NEC 300-21

NFPA 101, 6.1-6.3 (1997)

Skills:

Determine requirements for tools and mounting hardware for installing type A systems.

Determine requirements for cable, conduit, and conduit mounting hardware necessary for installing type A systems, including sleeving and firestopping.

Identify structural elements, materials, and spaces to be used for or affected by installation.

Locate, identify, and map potential power sources.

Review the site for real and potential safety hazards.

2.1.2 Verify that work plans, timetables, and equipment lists for the installation of type A systems are complete, accurate, and reasonable.

Knowledge:

Video system symbols according to the legend on architectural drawing

Architectural scales used on drawings and blueprints

Purpose and layout of timetables

Functions of equipment assigned to a Type A system

Skills:

Determine size, area, volume, and distances on the job site from drawings and blueprints.

Verify that the list of required equipment is complete and accurate.

Read and interpret work plans, timetables, and equipment lists to determine whether the time allotted to install and test the assigned equipment is appropriate for the job.

2.2 *"System Installation" Tasks*

2.2.1 Verify the appropriate type and location of camera mounts and select associated mounting hardware.

Knowledge:

Applications appropriate to different types of mounting hardware, considering various combinations of structure, materials, and weight level

Location and mounting requirements of various CCTV applications

Skills:

Read and interpret site plans.

Verify proper installation by subordinates.

Properly communicate with supervisors and subordinates to coordinate installation.

2.2.2 Install and connect camera housings and/or domes.

Knowledge:

Proper application of indoor and outdoor camera and equipment housings

Outdoor enclosure issues involving:

- Temperature
- Fogging
- Drip loops
- Conduit and mount sealing
- Sun Shields
- Dust and moisture seals
- Pressurized enclosure

Skills:

Properly seal all outdoor connections to maintain a water and dust-tight enclosure.

2.2.3 Aim and focus cameras.

Knowledge:

Lens and camera adjustments

How environmental factors might affect camera operation and application

Skills:

Read design specifications to insure proper image range for the application.

Read the manufacturers installation and set up instructions.

2.2.4 Provide adequate grounding and surge/lightning protection for the system.

Knowledge:

Purpose of grounding and what constitutes adequate grounding for a system and its components

Surge and lightning protection requirements

NEC standards for low voltage grounds

Skills:

Determine the manufacturer's grounding and protection requirements.

Apply proper surge/lightning protection capacities for the equipment and the environment.

Use a VOM/DVM to test for electrical ground.

2.2.5 Install, connect, and verify operation of sequential switchers.

Knowledge:

Sequential switcher features and operation

Skills:

Operate sequential switchers.

Calculate time loss factors caused by dwell times.

Read, understand, and apply manufacturer's specification and set-up sheets.

2.2.6 Install, connect, and verify operation of quads and video multiplexers.

Knowledge:

Video signal distribution requirements

Quad and video multiplexer application, features and operation

Skills:

Use system layout drawings to determine the signal path and termination points.

Set up quads and multiplexers for proper operation according to manufacturer specification and set up sheets.

2.2.7 Install, connect, and verify operation of analog video recorders.

Knowledge:

Environmental requirements of video recorders

Characteristic differences between VHS, SVHS, and high-density formats

Tape quality and its characteristics

Overall application differences between the various styles of recorders, such as 24-hour, time-lapse, event

Skills:

Properly connect external switcher pulse output for a multiplexer application.

2.2.8 Install, connect, and verify operation of DVRs.

Knowledge:

Environmental requirements of DVRs

Characteristic differences between analog and digital recording formats

Programmable capabilities of DVRs and how they apply to the specific job

Meanings of resolution and digitization and how their interaction can affect playback quality

Skills:

Read and interpret the manufacturer's specification and set up instructions and apply them to the specific job.

Calculate digital storage space required for the application.

2.2.9 Install, terminate, and verify integrity of fiber cables.

Knowledge:

Differences between single and multi-mode fibers

Applications of optical loss budget

Characteristics (bend radius, sizes) and applications of fiber cable

Characteristics of, and differences between, the different types of connectors

Types of splices that apply to single mode and multi-mode fiber in CCTV applications

Skills:

Use correct techniques for fiber optic cable installation and termination.

Operate light source and meter for fiber optic cable testing.

Properly use a fiber optic termination kit.

2.3 *"System Testing and Commissioning" Tasks*

2.3.1 Assemble, balance, and test cameras and lenses for Type A system.

Knowledge:

Tools and processes required for setting the back focus for zoom, fixed focal length, and varifocal lenses

Tools and processes required for balancing the iris for a proper 1 vpp signal output

Camera and lens formats

Differences between video and DC lenses

Differences between C and CS Standards

Types of lens connectors and how to install them on the lens cords when appropriate

Meanings of the following video concepts:

- Field/frames
- Focus and depth of field
- Resolution
- Signal to noise ratio
- NTSC/PAL
- Digital Compression
- Lux, lumens, and footcandles
- Backlight compensation
- Pixel

- Grid Resolution
- Electronic Iris
- Horizontal and Vertical Sync
- Vertical Phase
- Light Sensitivity
- Color burst
- White balance
- f-stop

Skills:

Test camera settings for optimum iris response using an oscilloscope and/or a proper hand-held video meter.

Test camera/lens for proper back-focus response.

Use proper soldering techniques for auto-iris lens connectors.

Use a test pattern for back focusing a camera.

2.3.2 Adjust monitors.

Knowledge:

Basic concepts of monitor function and operation, such as vertical, horizontal, color adjust, etc.

Relationship between monitor adjustments and camera adjustments, application, and environment

Proper video termination

Skills:

Use a color bar generator to adjust the monitor.

2.3.3 Set up Type A recording devices.

Knowledge:

Know the meaning and implications of the following video recording concepts:

- Frames per second (time loss factors)
- Playback resolution versus record resolution
- Field versus frame recording (analog)
- Compression factors and how they apply (digital)

Indicators of proper and improper functioning of analog and digital recording devices

Generic recorder set-up features such as scheduled recording, recording speeds, alarm programming, date/time, and camera switch pulse

Skills:

Operate Type A recording devices.

Test functions of Type A recording devices as appropriate for the application.

Determine the proper procedures for setting up a DVR or VCR.

Determine the appropriate set-up for the particular application.

Set up a procedure for the handling, rotation, and storage of video tapes appropriate to the site and the purposes of the system.

2.3.4 Set up and establish proper alarm or trigger interface with switching system.

Knowledge:

Types or styles of alarm triggers:

- Video motion detection
- Activity detection
- Dry contact

Programmable responses of different switching systems

Skills:

Determine the proper alarm input/output set-up procedures for a sequential switcher, quad splitter, multiplexer.

Determine the proper alarm input and responses for time-lapse, event, 24/72 hour HD, and DVD recorders appropriate to a specific situation.

Set up activity detection for a specific area or range of areas.

Set up a dry contact trigger through door contact, photo beam, PIR, and/or other means for the purpose of triggering event or alarm.

Test multiplexers for optimum record level under alarm condition.

2.3.5   Adjust and verify proper phasing of cameras.

Knowledge:

Effects of alternating current on camera phasing

Synchronization as related to vertical phase adjust with cameras

Effects of camera phasing upon video switching and recording

Skills:

Follow proper procedures for phasing cameras.

Use a monitor, oscilloscope, and/or phase meter to verify and adjust phasing.

Adjust power connections (polarity) as needed.

2.3.6   Set up the programmable functions of type A systems.

Knowledge:

Programmable functions of a Type A system and its components and how to determine the operating requirements for each

How to recognize and set proper video terminations

Skills:

Perform setup to achieve desired system operation according to system plans.

2.3.7   Review system operation with the customer and obtain acceptance.

Knowledge:

Which documents contain scope of work and customer standards

How to effectively demonstrate system performance

Skills:

Read and interpret the appropriate documents to determine scope of work and customer standards.

Communicate clearly, accurately, and effectively with clients.

Operate completed Type A system with proficiency.

2.4 *"Troubleshooting" Tasks*

2.4.1   Test and check for ground faults and loops.

Knowledge:

Causes of ground faults

Symptoms of ground loops

Basic troubleshooting procedures and processes for ground loops

Correction procedures and processes for ground faults and loops

Types and styles of Ground Loop Correction (GLC) units and where they fit into the Type A system

Skills:

Use an oscilloscope to sweep the video signal for ground loops.

Install the proper GLC unit for the Type A system.

2.4.2   Determine and follow the best sequence of tasks to identify the cause of a given problem.

Knowledge:

Purposes of various tests that might be applied to a type A system

Skills:

Read shop plans, architectural drawings, and blueprints to locate and identify system components and their interconnections.

Determine how interconnected components may be tested independently.

For a given problem, determine the components that might be involved.

Identify the possible sources of a given problem.

Identify which causes are more likely than others and what factors might change the ranking.

2.4.3 Troubleshoot power supply problems including primary/secondary (transformer coils/taps, fuses/breakers, loads/drops, tap settings).

Knowledge:

Structures, functions, and operations of power supplies, fuses, and breakers

Effects of improper tap settings upon connected components and system functions

Skills:

Calculate potential, current, and resistance using Ohm's Laws.

Use DOM/DVM as test equipment to determine loads and drops, test fuse/breaker function, and to test for proper power supply output.

Identify the likely cause or causes of power supply problems.

2.4.4   Troubleshoot housings.

Knowledge:

Structure and functions of housings

How cables enter the housing and their purpose within the housing

Skills:

Properly and safely use lifts, ladders, and scaffolding.

Use VOM/DVM to measure inputs to the housing, heaters, blowers and windshield wipers.

Test the housing's seals.

2.4.5 Troubleshoot problems with camera/lens operations, including manual or automatic irises, DC/video drive lenses, camera shutter speeds, and electronic irises.

Knowledge:

Effects upon a camera's operation of each adjustment or setting on the camera, and each item connected to the camera

Skills:

Use a portable monitor, VOM/DVM, hand-held video meter, and/or oscilloscope to adjust the camera and lens.

2.4.6 Troubleshoot type A head-end component hardware, set-up, and interconnections to locate the source of a problem.

Knowledge:

How each type of component functions and how each can impact system performance

Programmable functions of components

Skills:

Perform Type A system set-up.

Isolate hardware components from cabling.

2.4.7 Troubleshoot monitor external adjustments, including terminations.

Knowledge:

Effects upon the picture of each available adjustment

Skills:

Determine cable paths and monitor interconnections.

Balance picture using a color bar generator and available adjustments.

2.4.8 Verify a fiber optic light path and troubleshoot basic fiber faults.

Knowledge:

Basic fiber optic concepts and principles such as bend radius, connection point quality, cable type, etc.

Factors that can affect fiber optic cable and what can interfere with the light path

Skills:

Use an OTDR, power meter, laser fault checker, and a visible light source to test for optical fiber cable faults.

2.5 *"Planning and Conducting User Training" Tasks*

2.5.1 Determine training needs of end-user personnel.

Knowledge:

ASTD "Teach SMEs to Design Training"

Roles of operators (people who use the system), administrators (who set up or program the system), and maintainers (who perform prescribed periodic maintenance functions) of CCTV systems

Skills:

Determine existing skills and limitations, including technical knowledge, communication ability, and experience, of site personnel.

Determine who will be trained in system set-up and operating functions to ensure that the system can be operated to meet its objectives and to minimize the need for future support.

Determine what end-user maintenance functions are required/recommended for the system.

2.5.2 Plan training session and prepare outline and materials.

Knowledge:

ASTD "Teach SMEs to Design Training"

Operational functions of CCTV systems

Skills:

Determine the system's capabilities relevant to the customer's needs.

Determine the contents of manufacturers' manuals.

Collect manufacturers' instruction manuals and other reference resources and highlight or tab key elements.

Prepare an outline of the steps involved in each operation.

Adapt training plans to available facility.

Arrange for personnel and facility availability and access to equipment.

Minimize potential distractions.

2.5.3 Conduct training session.

Knowledge:

ASTD "Teach SMEs to Design Training"

Common mistakes made when using CCTV systems

Reference sources including what information is available from system documentation, online help, and telephone support, and how to access each

Skills:

Explain the meaning of terminology to be used.

Clearly describe the equipment and functions to be learned.

Deliver lecture, demonstration, discussion, On-the-Job Training, web-based, hands-on, programmed/sequential, simulation, games, group, role-playing, case study, and exercises/tests as appropriate

Demonstrate the functions on the equipment utilizing the training outline.

Coach the student while he/she performs the task.

Coach the student in recovering from mistakes.

Clearly describe the indicators of unacceptable performance of the system and the appropriate response.

Review with the student the various references that are available to answer future questions such as manufacturer's instructions manuals, tech support numbers, web sites, etc.

Respond appropriately and accurately to the student's expressed concerns and questions.

Provide positive reinforcement and motivational incentives.

2.5.4   Evaluate effectiveness of training.

Knowledge:

ASTD "Teach SMEs to Design Training"

Types and level of knowledge required for proper system operation, administration, and end-user maintenance

Skills:

Recognize and correct errors.

Observe and evaluate student performance to determine what portions of the training should be repeated, restated, or reinforced.

Recognize sufficient mastery of skills as well as the need for additional training.

Report results to appropriate party as needed.

Evaluate the effectiveness of training methods and presentation by noting feedback from students, student performance, and follow-up.

2.6 *"Documentation" Tasks*

Note: The letters following some tasks indicate for whom the documentation is required:

S = Shop, C = Customer, G = Government

2.6.1   Mark drawings for locations and types of cameras, lenses, mounts, power sources, circuit breakers, and cable runs. (SC)

Knowledge:

Architectural and video system symbols

Views used on construction plans and the methods for representing juxtaposed objects

Skills:

Use scales, pencils, and straightedges to draw and label video system components and dimensions.

2.6.2   Record set-up information for Type A head-end equipment in manuals. (SC)

Knowledge:

Set-up command terminology

Skills:

Accurately document all set-up procedures in the manuals.

2.6.3   Identify and permanently label cables. (SC)

Knowledge:

Wiring legends and other cable layout plans

Skills:

Use wiring legends and other sources to identify the proper final label caption.

Permanently apply the appropriate labels to cables, using numeric or alphabetic wrap-around labels, or attachable "open comment" tags.

2.7 *"Project Management" Tasks*

No tasks at this Level.

Appendix A
NICET Video Security Systems Classification

The following are some of the types of equipment and system characteristics that delineate "Type A," "Type B," and "Type C" systems, as they are used in the practice analyses for the NICET Video Security Systems certification programs.

Type A Systems

These are basic systems with standard components, low bandwidth transmission, and menu-driven set-up, such as:

Multiplexer/VCR

Quad/VCR

Digital video recorders with time/date, play/record, and anti-tamper functions

Sequential switch

Single keyboard

Indoor/outdoor

Standard cable runs not requiring repeaters or amplifiers (less than 750 ft. for coaxial; less than 1500 ft. for twisted pair)

Type B Systems

These systems can include specialized components, programmable controls, and high-bandwidth transmission, such as:

PTZ

Multiple keyboards

Matrix interfaced with alarms, A/C, or intercom (GPI or dry contact)

Digital video recorders with programmable, alarm-based resolution and frame rate

Fiber transmission systems

Low light

Long cable runs

Covert or portable systems

RF modulators

Type C Systems

These systems can include PCs, serial communication, and wireless transmission, such as:

Integrated systems/serial communications/GUIs

LANs/WANs

Remote systems

Microwave and IR transmission

Digital video recorders with remote interface

Appendix B: Acronyms and Abbreviations

Codes and Standards

ASTD   American Society for Training and Development
BICSI   Building Industry Consulting Service International
CSI   Construction Specification Institute
FCC   Federal Communications Commission
IEEE   Institute of Electrical and Electronics Engineers
NEC   National Electrical Code
NEMA   National Electrical Manufacturers Association
NFPA   National Fire Protection Association
SIA   Security Industry Association
UL   Underwriters Laboratories

General

AGC   Automatic Gain Control
dB   deciBel
DSS   Digital Slow Shutter
DVD   Digital Video Disk
DVM   Digital Volt Meter
DVR   Digital Video Recorder
GLC   Ground Loop Correction
HD   High Density
HVAC   Heating, Ventilating, and Air Conditioning
I/O   Input/Output
IR   InfraRed
IRE   Institute of Radio Engineers (unit of measure)
IT   Information Technology
LAN   Local Area Network
MATV   Master Antenna TeleVision
OTDR   Optical Transducer Directional Reflectometer
PIR   Pulsed InfraRed
RF   Radio Frequency
SVHS   Super Video Home System
UHF   Ultra High Frequency
VCR   Video Cassette Recorder
VHF   Very High Frequency
VHS   Video Home System
VOM   Volt-Ohm Meter
WAN   Wide Area Network