



Special Hazards Systems

Level II Certification Content Outline

Standard Model Program with Computer-Based Testing

The candidate for NICET certification as a Level II Special Hazards Systems technician should have the knowledge and experience to:

Under limited supervision, inspect, maintain, repair, install, perform functional tests on, commission, and apply basic specs and standards to the placement and configuration of components in gaseous, dry, and wet agent systems.

Note: For each exam, the skills and knowledge listed under each task are suggestive of those involved in that task, but are not intended to constitute an exhaustive listing.

2.1 Inspection, Testing, and Maintenance Tasks

(Approximately 22-28% of the exam)

2.1.1 Verify integrity of detection and control system circuits.

Knowledge:

Control panel functions
Basic electronics
Meanings of, and test procedures for, short circuits, open circuits, and ground faults

Skills:

Use a multimeter to test for short circuits, open circuits, and ground faults.
Verify integrity of circuits in compliance with NFPA 70 Article 760 and NFPA 72 Chapter 12.
Document results.

2.1.2 Conduct a smoke detector sensitivity test.

Knowledge:

Types of smoke detectors and their functions

Skills:

Follow manufacturer procedures for using smoke sensitivity tools.
Determine acceptable sensitivity limits from smoke detector manufacturer
Clean smoke detectors.
Comply with NFPA 72: 14.4.4.3.4.
Document results.

2.1.3 Test notification devices for audibility.

Knowledge:

Types of notification devices that require audibility testing
Sound-producing equipment that may impact notification device coverage
Types of conditions that might interfere with notification device audibility

Skills:

Operate a calibrated decibel meter.
Take audibility readings in accordance with NFPA 72: Annex D.
Determine whether audibility levels comply with NFPA 72: Annex D.
Document results.

2.1.4 Install firmware upgrades on system devices.

Knowledge:

Control panel functions
Firmware-to-control panel interfaces
Control panel programming

Skills:

Use manufacturer software to upgrade device firmware.
Document firmware updates.
Test system to ensure proper operation after firmware update.

2.1.5 Arm and disarm systems.

Knowledge:

Actuator types and their functions
Emergency control functions and interfaces
Manual system components (and their mechanical functions)
Electrical wiring types and their voltages
Procedures for disarming and arming releasing mechanisms

Skills:

Follow manufacturer guidelines for arming and disarming system.
Use manufacturer-recommended tools for resetting system.
Follow static energy safety requirements.
Remove actuator.
Reinstall actuator.
Disconnect pneumatic and cable devices.
Disconnect releasing/actuating devices.
Reconnect system devices.
Ensure clean and tight connections.
Record actions.

2.1.6 Visually inspect foam systems for damage or conditions that could limit proper functioning.

Knowledge:

Foam system types, their visual characteristics, and their functions
Product tank types and their visual characteristics

Skills:

Ensure proper valve alignment.

(Task 2.1.6 continued on next page)



(Task 2.1.6 Skills continued)

Inspect discharge devices for physical damage, obstructions, and corrosion.
Inspect supports for damage and metal-to-metal, connection-point corrosion.
Inspect foam chamber to ensure that vapor seals are intact on cone-roof tanks.
Ensure that air aspirators are free of obstructions.
Ensure that high-back pressure foam makers are free of product.
Perform inspection in accordance with NFPA 25 Chapter 11, NFPA 11 Chapter 11, and NFPA 16 Chapter 9.

2.1.7 Check storage tank liquid level and collect foam concentrate sample for lab analysis.

Knowledge:

Foam tank types and their physical characteristics
Foam types Potential sources of pollution in concentrate
Frequencies for testing in NFPA 25

Skills:

Follow manufacturer instructions for collecting and preparing samples.
Drain pressure from bladder tank prior to collecting sample.
Collect a foam sample according to testing laboratory's preference.
Perform inspection in accordance with NFPA 25 Chapter 11.
Submit documentation with sample to lab.

2.1.8 Conduct a room integrity test.

Knowledge:

Below-Ceiling-Leakage Area (BCLA)
Highest-protected height requirements
Geometry (room area and volume)

Skills:

Interpret as-built drawings.
Properly use an infiltrometer and position it in the correct position within opening.
Calibrate infiltrometer's vacuum gauges and pressure gauges.
Follow the testing procedures incorporated in the infiltrometer manufacturer's software package.
Identify sources of leakage, and recommend solutions to responsible party.
Apply the requirements of NFPA 2001: 7.7.2.3 and Annex C.
Conduct a smoke pencil test in accordance with NFPA 2001: Annex C to identify areas of leakage.
Ensure that the room complies with NFPA 75 requirements.
Perform integrity test to determine whether an enclosure's venting complies with design specifications and NFPA 2001.
Determine whether the room will hold the designed extinguishing concentration of the agent.
Verify that the room is as depicted in the record drawings.
Compare test results with previous test result data.
Document test results.

2.1.9 Perform a sequence-of-operations test.

Knowledge:

Control panel programming
System controls' arming and disarming procedures
Detection schemes (single-detector, cross-zone, counting, etc.)
Emergency control functions (elevator recall, damper operation, air handler shutdown, automatic door closure, building fire alarm activation, emergency power-off, emergency shutdown, automatic gate openers, remote monitoring, smoke purge, etc) and their interfaces
Releasing functions (sprinkler system activation, simulated agent activation, maintenance bypass switch, manual actuators, abort operation, low pressure switches)

Skills:

Interpret as-built drawings.
Interpret sequence-of-operations matrices.
Verify first alarm; check for time delays.
Check for proper detection functions.
Test fire alarm functions in accordance with NFPA 72, including Chapter 21.
Check for proper emergency control functions and interfaces.
Check for proper releasing functions.
Operate selector valves and lockout valves according to procedures in appropriate NFPA standard.
Document results.

2.1.10 Verify whether container's agent quantity and/or pressure is within the allowable range.

Knowledge:

Basic math
Ambient conditions (temperature, altitude, barometric pressure) that permit variances in quantity and/or pressure

Skills:

Use NFPA 11, 12, 12A, 13, 17, 69, 72, 90A, 101, 170, 750, 2001, 2010 to determine whether agent quantity is within an allowable range.
Compare current agent quantity with the documented quantity.
Compare current agent pressure with the documented pressure.

2.1.11 Test a system's emergency standby battery power supply.

Knowledge:

Battery appearance and physical characteristics
Symptoms of battery defects
NFPA requirements for battery replacement frequency

Skills:

Visually determine battery condition.
Check amount of time since battery replacement.
Identify battery type.
Operate a load test meter.
Operate a multimeter.
Document results.



2.2 Repair and Recharge Tasks

(Approximately 10-16% of the exam)

2.2.1 Troubleshoot electrical circuitry.

Knowledge:

Wiring classes and styles

Wire types, construction/layers, and the functions of each layer

Circuit functions of switches, relays and transformers

Functions of suppression system components and the role of each in the proper operation of a system

Typical auxiliary functions that may be interfaced to the circuit

Emergency control functions and interfaces

Single-detector, crosszone and counting zone detection schemes

Detection circuit types (conventional, addressable, analog, digital, multiplex) and their construction

Visual appearance of fiber-optic lines

RS232, RS485 data circuit components and connectors

Factors that determine the capacity of notification / sound circuits, and elements of supervision, sync / non-sync, coded signal, wattage per speaker, voltage levels, current-limited/non-current limited

Power supply and limitations

Standard troubleshooting techniques

Skills:

Use NFPA 170 to interpret drawings.

Use manufacturer's literature to determine and follow system controls in arming and disarming procedures.

Perform ohms law calculations for DC circuits.

Identify switches, relays, and transformers, and their impact on the circuit.

Interpret manufacturer's recommendations and guidelines for circuit components, test equipment, and test procedures.

Trace circuits.

Recognize series and parallel circuits, and connect test equipment to measure voltage, current, and resistance.

Use multimeters, tone generators, linemen butt sets, insulation testers, lamps, dynamic battery testers, and blasting galvanometers to test circuits and measure electrical parameters.

Verify that wiring complies with NFPA 70: Article 760.

Test fire alarm circuits, following the guidelines in NFPA 72 Table 14.4.3.2.

Read and interpret system wiring diagrams.

Review and/or modify system programming.

Read and interpret sequence of operation matrices.

2.2.2 Conduct testing of cylinders and hoses.

Knowledge:

Potential hazards associated with pressurized containers
Units of pressure

Skills:

Follow the testing requirements and frequencies given in NFPA 12, 12A, 17, 17A, 69, 750, 2001, 2010.

Obtain, read, and interpret hydrostatic test procedures and information from the hydro-test test equipment manufacturer's specifications.

Obtain, read, and interpret cylinder data from the cylinder manufacturer's literature.

Determine the maximum operating pressure for the cylinder.

Visually inspect the cylinder.

Safely operate portable and shop hydrostatic testing equipment according to 29 CFR Part 1910: 132-138.

Perform a hydrostatic test on a cylinder according to Compressed Gas Association (CGA) pamphlet(s) C-6 and C-1, and DOT 49 CFR.

Dry the cylinder with a heater.

Record and report test procedures and results.

2.2.3 Recharge clean agent cylinders.

Knowledge:

Units of pressure

Units of weight

Agencies that regulate recharge and pressurized cylinder transportation

Skills:

Interpret agent's MSDS to determine its hazards.

Use hand and power tools to disconnect and remove cylinders and tanks.

Determine whether cylinders are eligible for recharging according to NFPA 12, 12A, 17, 17A, 750 and 2001, and DOT 49 CFR prior to recharge.

Obtain and follow the agent manufacturer's requirements and procedure for recharging cylinders.

Select and use cylinder inspection equipment in accordance with Compressed Gas Association (CGA) pamphlet C-6.

Conduct external and internal inspections of cylinders in accordance with Compressed Gas Association (CGA) pamphlet C-6.

Verify calibration of the filling and testing equipment prior to use.

Follow proper connection and filling procedures per manufacturer's instructions.

Properly use and install safety shipping devices for cylinders.

Recondition a cylinder valve according to the manufacturer's instructions.

Use pressure gauges, thermometers, and weigh scales to monitor the cylinder filling process, and properly fill cylinder to the desired agent level according the system design specifications.

Use agent leak standard device to verify whether recharged cylinder's leak rate is within acceptable range in manufacturer listing.

Use a leak detector to check for potential cylinder leaks.

Properly record and report filling functions and anomalies.

Document pre-recharge inspection/requalification results according to Department of Transportation requirements prior to shipment.

Handle and test cylinders in accordance with 49 CFR parts 171-179.

Properly secure clean agent cylinders.

Test the system releasing circuit with the clean agent cylinder disconnected.

Reconnect suppression cylinders to the discharge piping and return system to normal operation.

Stamp re-qualified cylinders in accordance with Compressed Gas Association (CGA) pamphlet C-6.

**2.2.4 Recharge foam system tanks.****Knowledge:**

Proper valve positions for various system configurations
Methods for measuring a tank's content/liquid level
Units of pressure

Skills:

Properly measure a tank's content/liquid level.
Identify a tank's existing content/foam concentrate type.
Interpret and follow the tank manufacturers' filling procedures.
Operate vacuum pumps and hoses.
Operate foam concentrate pumps and hoses.
Operate the pressure regulator for a compressed nitrogen or compressed air cylinder.
Operate and read a pressure gauge.

2.2.5 Conduct foam bladder integrity tests.**Knowledge:**

Components of a foam bladder tank and their functions

Procedures for foam bladder integrity test
Concentrate pumping/transfer techniques
Units of pressure

Skills:

Operate vacuum pumps.
Operate foam concentrate pumps.
Operate and read a pressure gauge.
Recognize various types of foam bladder types
Follow the bladder tank manufacturer's procedures for conducting foam bladder integrity tests.
Record and report test procedures and results.

2.2.6 Replace damaged electrical system components.**Knowledge:**

Names, functions, and visual appearances of electrical components
Procedures for connecting electrical components

Skills:

Identify damage to electrical components, including physical, water, and over-current damage.
Obtain compatibility information from manufacturers' component compatibility lists.
Operate diagnostic tools such as multimeters, battery load testers/meters, and flame detector test lamps to determine component functionality, detector sensitivity meter.
Use hand tools such as screwdrivers and wire strippers to remove, insert and connect components.
Use static control devices to prevent damage to components.
Configure address for replaced devices.

2.3 Installation Tasks

(Approximately 32-38% of the exam)

2.3.1 Terminate wiring at panels and devices.**Knowledge:**

Types of connectors and their applications
Terminal strip and connection limitations
High and low voltage cable separation requirements in the same enclosure

Skills:

Interpret system drawings, specifications, and sequence-of-operations matrices.
Interpret control panel and device manufacturers' instructions.
Use a multimeter or volt-ohmmeter to confirm continuity.
Bundle and route internal panel wiring to meet codes and standards.
Assure that wire termination conforms to NFPA 70 and 72.

2.3.2 Test the integrity of installed wire for ground faults and for adequate insulation.**Knowledge:**

NFPA 72: Table 14.4.3.2
Testing tools and their functions
Hazards associated with insulation testing

Skills:

Locate and identify the two ends of an installed wire.
Test wiring in accordance with NFPA 70 and 72: Table 14.4.3.2.
Test circuits for ground faults using a multimeter.
Use an insulation tester to test wire integrity.
Document results.

2.3.3 Perform initial system programming to implement a sequence-of-operations**Knowledge:**

Suppression system devices and their functions
Basic programming concepts
BCD (binary-coded decimal)
Computer/device connections, interfaces, and I/O port assignments

Skills:

Interpret system drawings, specifications, and sequence-of-operations matrices.
Determine the capacity and limitations of the panel, and the types of suppression system devices to be monitored or controlled.
Define input and output devices.
Obtain programming procedures from the manufacturer's literature.
Program a sequence-of-operations.
Test monitored or controlled devices to verify that the program functions in accordance with the sequence-of-operations and NFPA 72.

2.3.4 Address field devices.**Knowledge:**

Field device physical characteristics and functions
BCD (binary-coded decimal)

Skills:

Verify that devices supplied are correct.
Operate barcode readers, dip switches, rotary switches, and configuration IR tools.
Use various manufacturer-specified addressing schemes to enter device locations into the control panel software.
Record device addresses on the as-built drawings.
Obtain and interpret manufacturers' documentation for field devices.

**2.3.5 Program detection devices for sensitivity.****Knowledge:**

Detection device types and their functions
Programming methods used for setting detector sensitivity

Skills:

Interpret plans and specifications to determine required sensitivity settings.
Interpret and follow manufacturer specifications for setting detector sensitivity.

2.3.6 Set flame detector viewing angles according to the system plans and site conditions.**Knowledge:**

Geometry
Flame detector types and operation

Skills:

Use angle finders and/or laser pointers to establish the cone of vision.
Use ruled scales.
Interpret design drawings.
Interpret and follow manufacturer specifications.

2.3.7 Actuate and verify operation of electrical detection and control devices during pretesting and commissioning.**Knowledge:**

Control panel/device functions
Signaling devices and their functions

Skills:

Test devices in accordance with NFPA 72 Table 14.4.3.2.
Verify that low voltage wiring complies with NFPA 70: Article 760.
Use tools to test devices and reset actuators.
Interpret system drawings to locate devices to be tested.
Interpret system sequence-of-operations matrix.
Interpret and follow manufacturer testing requirements.

2.3.8 Actuate and verify operation of mechanical devices during pretesting and commissioning.**Knowledge:**

Means of actuation of mechanical devices, including valves, manifolds, etc.
Mechanical device characteristics and their operation
Direction of flow requirements

Skills:

Test mechanical devices in compliance with NFPA 11, 12, 12A, 17, 17A, 750, 2001, and 2010.
Disable and enable releasing mechanisms of special hazards system for testing purposes.
Interpret and follow manufacturer testing requirements.
Verify proper placement and orientation of components in accordance with manufacturer specifications.

2.3.9 Install foam system control valves and proportioning equipment.**Knowledge:**

Types of piping and their applications
Direction of flow indicators
Types of foam systems, proportioning equipment, and control valves

Skills:

Use equipment to handle and lift materials.
Use hand tools.
Use power tools and pipe threading machine.
Interpret device location diagrams in NFPA 11 and 16.
Properly orient and place devices.
Interpret manufacturer recommendations.

2.3.10 Conduct pipe-puff and pressure tests.**Knowledge:**

Pipe thread sealant application methods
Sources of leakage that typically impact testing

Skills:

Conduct tests in accordance with NFPA 11, 12, 12A, 16, 17, 750, 2001, and 2010.
Operate a source of pressurized air or nitrogen.
Attach and read pressure gauges.
Apply the specified test pressures and pneumatically test to determine the integrity of the piping.
Take readings in the correct time periods required as per code and AHJ requirements.
Identify leakage sources or other conditions that may influence the test results.

2.3.11 Verify air transport times and suction pressures of an air-aspirating high-sensitivity smoke detection system.**Knowledge:**

Components of an air-aspirating high-sensitivity smoke detection system and their functions
Methods for performing smoke testing for air sampling detectors
Smoke transport-time testing procedures
Manometer functions and operation

Skills:

Visually inspect piping system for signs of damage or configuration changes.
Verify testing requirements with local AHJ.
Interpret plans and specifications to determine smoke transport times.
Use manometer to verify sample hole suction pressure.
Record transport times and suction pressures on test report.
Read and interpret air-sampling pipe network calculations.
Determine whether transport time is in compliance with NFPA 72 and AHJ requirements.

**2.3.12 Perform a sequence-of-operations test at commissioning.****Knowledge:**

NFPA 170

Detector types and functions

System functions and interfaces and their relationships

Control panel programming procedures

System controls arming and disarming procedures

Single-detector, crosszone, verified, and counting zone detection schemes

Typical auxiliary functions

Emergency control functions and interfaces

Differences between single device testing and end-to-end testing

Skills:

Interpret plans, specifications, as-built drawings, and sequence-of-operations matrices.

Organize testing procedures.

Safely activate detectors in their installed environment.

Interpret manufacturer recommendations and guidelines.

Verify first alarm and check for time delays.

Check for proper emergency control functions and interfaces.

Check for proper releasing functions.

Operate selector valves and lock-out valves according to procedures in appropriate NFPA standard.

Test system functions and interpret results in accordance with NFPA 11, 12, 12A, 16, 17, 17A, 72, 90A, 750, 2001, and 2010.

Interpret test results and recommend corrective actions.

Download a control panel history.

Complete an NFPA Record of Completion.

2.3.13 Perform a final acceptance test (other than concentration) for an AHJ.**Knowledge:**

System device types and system operation

Enclosure integrity test procedures

Pipe integrity test procedures

System operation

Source of flow testing and testing requirements

Skills:

Follow system acceptance procedures according to NFPA 11, 12, 12A, 13, 16, 17, 69, 72, 90A, 101, 170, 750, 2001, 2010.

Interpret system plans, specifications, and as-built drawings.

Interpret specifications and standards to identify the system's objectives

Interpret a sequence-of-operations matrix.

Coordinate with other trades on site.

Communicate with AHJs, project engineers, the owner, and insurance personnel on-site.

Conduct a room integrity test.

Notify occupants, monitoring company, and emergency responders prior to testing.

Determine the existence of interfaces with other interlocked systems.

Operate system devices and interfaced functions.

Document results, including record-of-completion forms and redline and/or as-built drawings.

2.3.14 Install wiring for a special hazards system.**Knowledge:**

Wire types and their physical characteristics

Types of connections/terminations, and their limitations

Skills:

Use NFPA 70 Chapter 9, Table 2 to determine the acceptable bend radius for conduit and tubing.

Determine installation requirements for clean agent system wiring per NFPA 2001: 4.3.1.3

Determine installation requirements for special hazards system wiring per NFPA 72.

Determine insulation compatibility requirements for raceways and junction and termination boxes per NFPA 70: Article 760.

Use power tools, saws, and pulling machine to cut and pull wire.

Use wire pulling devices.

2.3.15 Confirm installation of products to maintain room integrity.**Knowledge:**

Products that maintain room integrity, their purpose, functions, and physical characteristics

Skills:

Follow the manufacturer's instructions for installing products that maintain room integrity.

Communicate with other trades to ensure that room integrity is maintained.

Conform to UL listings and NFPA 75, 101, and 2001: Appendix C to maintain fire ratings when installing products that maintain room integrity.

2.4 System Design and Configuration Tasks*(Approximately 11-17% of the exam)***2.4.1 Determine wiring and protection requirements for fire protection circuits.****Knowledge:**

NFPA 2001: Section 4.3

Wiring connection requirements for basic electronic components in NFPA 70

Circuit functions of switches, relays, and transformers

Detection circuit types

Notification/sound circuit types

Skills:

Use NFPA 70: Article 760 to determine wire types and their ratings and construction.

Perform ohms law calculations for DC circuits.

Identify potential sources of noise/interference and mitigate their effects on specific cable types.

Provide for grounding and transient protection for fire protection circuits as referenced in NFPA 70: Article 760 and NFPA 72: Chapter 12.

Interpret manufacture specifications to identify RS232 and RS485 data circuit limitations.

Interpret manufacturer specifications to identify optical fiber limitations.

Interpret manufacturer specifications to identify notification/sound circuit type limitations.

Determine the wiring and protection requirements for installation of automatic special hazards systems.

**2.4.2 Conduct a site survey.****Knowledge:**

Basic geometry
Basic building features, structural elements, and materials
Construction types and features and their impact on system layout
Basic fire protection device placement, support, and connection requirements
Electrical clearance requirements for electrical panel and other components per NFPA 70

Skills:

Interpret plans/symbols.
Measure dimensions.
Determine which dimensions are required for a protected area and system type per NFPA 11, 12, 12A, 13, 16, 17, 68, 69, 72, 75, 76, 90A, 101, 170, 750, 2001, 2010.
Document enclosure measurements and the areas and elevations of openings.
Record closure mechanisms and process/enclosure construction.
Identify and record air flow pathways and exchange rates.
Record structural and infrastructural features that could be useful to, or obstruct fire protection system layout.
Record any existing process interlocks and their manufacturer.
Record equipment interface locations.
Investigate and record information related to worksite access for project personnel and equipment.
Record observations and measurements in writing and in field sketches.
Obtain site information from the facility owner and/or occupants.
Obtain MSDS sheets for any chemicals that will be protected by the system.
Identify construction features that are suitable for seismic bracing.
Record number of rings on storage tanks per NFPA 11.
Obtain samples for combustibility testing per NFPA 68 and 69.
Recognize asbestos.
Document locations of existing equipment in other building systems.
Document structural components' construction and fire ratings.

2.4.3 Determine spacing and placement requirements for a site's fire protection system components.**Knowledge:**

NFPA standards that apply to specific hazard systems and their devices
Basic building features
Site characteristics and conditions that require increased or decreased spacing of devices
American Disabilities Act (ADA) requirements for equivalent facilitation, equipment access, and system initiation and notification
Audibility and intelligibility requirements per NFPA 72: Annex D
Requirements for emergency notification systems

Skills:

Use a site survey report and NFPA 11, 12, 12A, 16, 17, 17A, 72, 750, 2001, and 2010 to determine device spacing requirements, including all necessary adjustments for ambient conditions.
Interpret manufacturer specifications for discharge devices. Interpret manufacturer specifications for detection devices.
Comply with AHJ requirements that exceed the minimum requirements of the standards.

2.4.4 Select and lay out piping and restraints.**Knowledge:**

Pipe specifications, their composition, and their applications
Fitting types and their ratings
Pipe bracing systems and their applications
Types and significance of static loads placed on pipes, and dynamic loads on piping systems during discharge

Skills:

Select acceptable type of pipe to meet system needs.
Identify static and dynamic forces likely to be present during the life of the system or during a discharge of the system.
Use NFPA 11, 12, 12A, 16, 17, 17A, 750, 2001, and 2010 to select, size, and lay out pipe based on flow calculations prepared for the project; select mechanical fasteners, hangers, and braces; determine requirements for hanging and bracing pipe; and determine mounting and supporting pipe components:

2.5 Work Management Tasks

(Approximately 2-8% of the exam)

2.5.1 Prepare Requests For Information.**Knowledge:**

Principles of standard business communication
Purpose of formal RFIs
Proper RFI distribution

Skills:

Recognize conditions that warrant the preparation and distribution of an RFI.
Propose a resolution to the situation or problem addressed by the RFI; forward the RFI to the project manager for review and submittal.
Communicate in writing with accuracy and correct grammar.

2.5.2 Compile submittal documents.**Knowledge:**

Documents required for a project submittal and purpose of each
Submittal document reviewers and their roles in the approval process

Skills:

Obtain and organize submittal documentation.

2.5.3 Obtain permits.**Knowledge:**

The role of local building or fire codes in construction
Information typically required for permit applications

Skills:

Identify municipal or state administrative codes that pertain to construction permits.

(Task 2.5.3 continued on next page)



(Task 2.5.3 Skills continued)

Determine which permits and licenses are required for a project in the site's jurisdiction.

Identify occupancy groups, building types and use groups according to IBC and IFC.

2.5.4 Coordinate system installation work with other trades on-site.

Knowledge:

Types of building systems installed by other trades, and their interactions or potential conflicts with fire suppression systems

Skills:

Apply NFPA 72: Chapter 21 to fire protection installation work.

Identify other contractors' field changes that can impact the suppression system work.

Communicate with job site contractors.

2.5.5 Prepare for work tasks

Knowledge:

Suppression system tasks that require owner/occupant/AHJ notification according to NFPA standards

Skills:

Notify owners/occupants, monitoring company, AHJs when necessary.

Evaluate a task's goals and needs; select the proper tools and components for the task.

2.5.6 Prepare project close-out documentation.

Knowledge:

Closeout documentation materials and their purpose

Skills:

Prepare O&M manuals

Prepare as-built drawings

Compile and organize closeout documentation materials.

2.6 Safety Tasks

(Approximately 5-11% of the exam)

2.6.1 Recognize dangers associated with specific special hazard suppression system types.

Knowledge:

Electrical safety in accordance with NFPA 70E

Injuries related to pressurized cylinder/gas handling, chemical reactions/interactions, agent exposure (breathing and/or ingesting), arc flash, and explosive actuator charges

Agent discharge velocities and proximities to non-secured objects

Need for cylinder and piping restraint

Sources of information about the special hazard suppression system.

Potential for reduced visibility during discharge.

Potential for agent migration to areas that are occupied/occupiable

Potential for agent discharge high-decibel sound and frequency

OSHA requirements (per 1910.95 Table G.16) for hearing protection at various decibel levels

Potential for frostbite burns to the skin due to direct exposure to agent discharge in the vicinity of the discharge point.

Skills:

Determine whether agent discharge nozzle is positioned in accordance with NFPA standards and manufacturer requirements.

Determine whether pressure venting is provided.

Select and use appropriate personal protective equipment (PPE) for testing and recharge tasks.

Verify that enclosure volume and agent concentration conforms to system design documents.

Interpret the agent manufacturer's specifications and cautions.

Identify and resolve potential hazards prior to conducting agent flow or discharge acceptance testing.

2.6.2 Practice special safety precautions for CO₂ discharge testing and inert agent discharge testing.

Knowledge:

CO₂-related hazards to personnel in NFPA 12

Injuries related to pressurized cylinder/gas handling, chemical reactions / interactions, agent exposure (breathing and/or ingesting), arc flash, and explosive actuator charges

Potential for agent migration to areas that are occupied/occupiable.

Skills:

Provide supplementary signage per NFPA 12 to warn about the potential of injury and fatality during and shortly after performance of discharge test.

Perform post-agent-discharge removal or exhaust in accordance with OSHA, EPA, state and local requirements.

Follow safety precautions for a CO₂ discharge.

Evacuate test area; control area access and post trained personnel at each access point and migration location to assure that no one enters the test location during testing; keep the area clear until the tested space is verified safe to re-enter.

Control access to the area through which the agent will be evacuated after the test.

Control access to the area through which the agent will be evacuated after the test.

Recognize potential for CO₂ exposure to cause injury or death according to NFPA 12.