



Inspection and Testing of Water-Based Systems

Standard Model/Computer-Based Testing

Level II Content Outline

The candidate for NICET certification at Level II in the Inspection and Testing of Water-Based Systems should have the knowledge and experience to:

Under limited supervision, inspect and test wet pipe and dry pipe sprinkler systems; inspect standpipe systems, fire pumps, tanks, and fire mains for evidence of damage, deficiency, or impairment; and complete standard reports.

There are three exams listed at Level II; all three plus the two listed at Level I are required for certification at Level II.

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.

Test # 10019: Level II Inspection

2.1 Inspection

(Questions related to these tasks makeup 100% of the exam)

2.1.1 Perform visual inspection of installed sprinklers for damage and visually apparent operational deficiencies or impairments, and verify presence of an adequate supply of spare sprinklers.

Knowledge:

NFPA 25: 5.2.1, 5.2.1.3, 5.4.1.4, 5.4.1.5
Function and appearance of the parts of a sprinkler
Minimum clearance rules for sprinklers

Skills:

Differentiate between markings/paint applied at the factory and those applied after installation.
Recognize damage and other conditions that affect the operation of a sprinkler.
Recognize violations of sprinkler clearance rules.
Determine whether an adequate supply of spare sprinklers has been provided.

2.1.2 Inspect fire pumps and fire pump system components for damage and visually apparent operational deficiencies or impairments.

Knowledge:

NFPA 25: 8.2 and Table A.8.2.2
Function and appearance of the major parts of each type of fire pump system

Skills:

Determine inspection frequencies by referring to NFPA 25: Table 8.1.
Verify that the scope of an inspection can be fulfilled in conformance with NFPA 25: 8.2.
Inspect pump houses for conditions that could affect proper operation of the enclosed fire pump.
Inspect a pump system for indications of conditions that could affect its proper functioning.
Inspect a fire pump electrical system for indications of conditions that could affect the pump's proper functioning.
Inspect a fire pump diesel system for indications of conditions that could affect the pump's proper functioning.

2.1.3 Inspect tanks for water levels, air pressures, or temperatures that are outside of expected ranges.

Knowledge:

Units of measure for temperature
NFPA 25: 9.2.4.1

Skills:

Use NFPA 25: 9.2.1, 9.2.2, 9.2.4, and Table 9.1 to determine inspection frequencies.
Recognize indicators of the correct fill level and/or desired air pressure for a tank.
Read thermometers and water level and air pressure gauges.



Identify visible damage to a thermometer or gauge, or readings that are outside of the expected range.

2.1.4 Visually inspect standpipe and hose systems for damage and visually apparent operational deficiencies or impairments.

Knowledge:

Function and appearance of major components of standpipe systems

NFPA 25: Table 6.1/"Inspection"

Scope of NFPA 1962

Skills:

Use NFPA 25: Table 6.1 to determine inspection frequencies.

Verify that the scope of an inspection can be fulfilled in conformance with NFPA 25: Table 6.2.2, first column (except "Hose").

Determine whether hose is present and properly stored.

Identify external deficiencies that limit or threaten the functionality of a standpipe system, except for hoses.

Use NFPA 25: Table 13.1 to determine inspection frequencies for standpipe valves.

2.1.5 Inspect fire mains, including hydrants, post indicator valves (PIVs), exterior hose houses, monitor nozzles, and mainline strainers for damage and apparent operating condition.

Knowledge:

NFPA-25: Chapter 7.2, and 13.3.2

Skills:

Determine inspection frequencies from NFPA 25: Table 7.1.

Identify hydrant outlets.

Identify externally visible deficiencies that could limit or threaten the functionality of fire mains.

Identify externally visible deficiencies that could limit or threaten the functionality of wet barrel or dry barrel hydrants.

Identify externally visible deficiencies that could limit or threaten the functionality of post indicator valves.

Identify externally visible deficiencies that could limit or threaten the functionality of hose houses.

Identify externally visible deficiencies that could limit or threaten the functionality of monitor nozzles.

2.1.6 Visually inspect the interior of drained and opened pipes for evidence of foreign material.

Knowledge:

NFPA 25: 14.2.1

Methods for inspecting pipe interiors

Indicators of the presence of foreign material

Skills:

Use NFPA 25: 14.2 to determine inspection frequencies.

Identify obstructions such as sludge, rocks, coupons, slime, MIC, rust, scale, corrosion, trash, zebra mussels, sediment, etc.

Visually inspect pipe interiors.

2.1.7 Visually inspect the interior of opened and drained alarm, dry pipe, deluge, and swing check valves, and strainers for any conditions that might limit proper functioning, and to clean strainers.

Knowledge:

NFPA 25: 13.4.1.2, 13.4.2.1, 13.4.3.1.7, 13.4.4.1.5, and 13.4.4.1.6

Which preaction, deluge and dry pipe valves need to be opened to be reset

Internal components of alarm, dry pipe, deluge, and swing check valves and their functioning

Skills:

Use NFPA 25: Table 13.1 to determine inspection frequencies.

Reset alarm valves, dry pipe valves, and check valves.

Locate, remove, clean, and replace strainers.

Recognize damage to components or other indicators of limited functionality

Identify visible damage or deficiencies that could limit or threaten the functionality of the valve or strainer.

2.1.8 Verify the presence of correct system signage.

Knowledge:

NFPA 25: 4.1.8, 5.2.7, 13.3.1, and 13.4.4.1.3

Skills:

Verify that correct signage is in place and provides needed information.

Report signage deficiencies.

**Test # 10020: Level II Testing****2.2 Testing**

(Questions related to these tasks makeup 100% of the exam)

2.2.1 Determine whether sprinklers and gauges are due for testing or replacement.**Knowledge:**

NFPA 25: 5.3.1 testing and replacement requirements for sprinklers

NFPA 25: 5.3.2 testing and replacement requirements for gauges

Appearances of the types of sprinklers for which NFPA 25: 5.3.1 lists specific testing or replacement requirements

Types of markings that are found on sprinklers indicating type and age

Skills:

Use NFPA 25: Table 5.1 to determine testing frequencies.

Use markings and physical characteristics to determine sprinkler types.

Use markings on sprinklers to determine their ages.

Use information on gauges to determine their ages.

Review available testing records.

Recommend testing or replacement of sprinklers and gauges.

2.2.2 Perform a main drain test.**Knowledge:**

Purpose of main drain test

Problems that can arise during, or as a result of, the test procedure

Skills:

Use NFPA 25: 13.2.5, 13.3.3.4, and Table 13.1 to determine testing frequencies.

Obtain records of the acceptance main drain test and any subsequent main drain tests.

Locate points in system at which testing procedures will be conducted.

Survey the surrounding area for potential discharge damage issues prior to testing.

Conduct a main drain test.

Evaluate the test results.

Record the test results and any conditions that suggest further investigation.

2.2.3 Test control valves for proper function.**Knowledge:**

NFPA 25: 13.3.3

Appearances and functions of various types of control valves, including butterfly, indicating, non-rising stem gate, and OS & Y valves

Appearances and purposes of spanner wrenches and roadway box keys

Skills:

Use NFPA 25: Table 13.1 to determine testing frequencies.

Locate control valves.

Conduct valve tests, including torsion tests and range of motion tests.

Evaluate functioning per NFPA 25: 13.3.3.1 and 13.3.3.2.

Record and report test results.

2.2.4 Perform priming water, low air pressure, and quick-opening device tests on dry pipe systems.**Knowledge:**

NFPA 25: 13.4.4.2.1, 13.4.4.2.4, and 13.4.4.2.6

Various trim arrangements used for dry-pipe valves
Quick-opening device (QOD) operation

Skills:

Determine testing frequencies.

Locate, read, and interpret manufacturers' instructions.

Conduct a priming water test and evaluate results.

Conduct a low air pressure test and evaluate results.

Conduct a QOD trip test and evaluate results.

Identify damage to components.

Record and report test results and any observed component damage.

**2.2.5 Perform a partial flow trip test on a dry pipe system.****Knowledge:**

Testing frequencies listed in NFPA 25: 13.4.4.2.2.3
Procedures required to return a system to service
Tools required for procedure

Skills:

Use tools required for testing.
Determine when a partial flow trip test is mandated or allowed.
Locate the points at which test procedures are to be conducted.
Perform a dry pipe system partial flow trip test per NFPA 25: A.13.4.4.2.2.3.
Identify problems that can arise during or as a result of the testing procedures, and take steps to prevent or resolve them.
Return system to service.
Record and report test results.

2.2.6 Perform a full flow trip test on a dry pipe system to determine whether a change in the water delivery time has occurred, and a dry pipe system air leakage test.**Knowledge:**

NFPA 25: 13.4.4.2.2.2 – 13.4.4.2.2.3 for testing frequencies and scheduling considerations
Tools and equipment needed for the testing procedures

Skills:

Locate points in the system that will be used in the test procedures.
Identify problems that can arise during or as a result of the testing procedures, and take steps to prevent or resolve them.
Use the tools and equipment required for the testing procedures.
Conduct a full flow trip test of a dry pipe system consistent with NFPA 25: 13.4.4.2.2.2, 13.4.4.2.3 – 13.4.4.2.5.2, and A.13.4.4.2.2.2.
Conduct a dry pipe system air leakage test consistent with NFPA 25: 13.4.4.2.9.
Note any damage to parts of the system, or any conditions that could limit its functionality.
Return system to service.
Determine the water delivery time and compare with records from past tests.
Record and report test results and any deficiencies.

2.2.7 Perform a waterflow alarm test on a sprinkler system.**Knowledge:**

NFPA 25: 5.3.3, including pass/fail criteria
Alarm connections of various systems
Appearances and functions of the major components of fixed wet pipe or dry pipe sprinkler systems
Problems that can arise during, or as a result of, the test procedure

Skills:

Use NFPA 25: 5.3.3 to determine testing frequencies.
Identify the alarm company and AHJ for notification.
Survey surrounding area for potential discharge damage issues prior to testing.
Identify any undesired consequences that could result from an alarm signal.
Conduct a waterflow alarm test to verify water flow and alarm activation.
Document and report test results and any deficiencies identified.

2.2.8 Test supervisory signaling devices such as valve tamper switches, low air pressure, and low temperature to verify proper signal transmission and reception.**Knowledge:**

Tools required for tests
Appearances and functions of the major parts of various supervisory signaling devices
Environmental, system, or other conditions required for a successful test

Skills:

Use NFPA 25: Table 5.1 to determine testing frequencies.
Identify alarm and AHJ contacts for notification of test-related signals.
Identify the various supervisory signaling devices requiring testing.
Procure and use the tools needed for testing.
Test devices in accordance with manufacturer instructions to verify proper signal transmission and reception.
Locate, read, and interpret manufacturers' instructions.

**2.2.9 Perform no-flow (churn) and weekly tests on a fire pump.****Knowledge:**

NFPA 25: 8.3.1, 8.3.2, and 8.3.3.2(1)

Testing frequency in NFPA 25: Table 8.1

Functions and appearances of the parts of each type of fire pump

Controller isolation switch safety precautions

Skills:

Identify alarm and AHJ contacts for notification of test-related signals.

Locate and identify fire pumps and controllers.

Conduct a churn test of an electric fire pump.

Conduct a churn test of a diesel fire pump.

Determine rated churn pressure.

Identify unique pump characteristics (e.g. reduced-voltage / soft-start, variable speed, etc.) and modify test procedures/criteria accordingly.

Recognize and resolve any problems that arise while the fire pump is operating in the no flow condition.

Use test outcomes and observations to determine the operational readiness of the fire pump.

Identify any damage to the pump system equipment, and any conditions or problems encountered during testing that could limit or threaten the pump system's functionality.

Record and report test results.

2.2.10 Test antifreeze solutions to determine their freezing points.**Knowledge:**

NFPA-25: Section 5.3.4 and Table 5.3.4.1 (a) and (b)

Purpose, parts, and operation of a handheld refractometer

Purpose, parts, and operation of a hydrometer

Skills:

Identify the system's capacity.

Determine the number of test samples required.

Identify the target freezing point for the antifreeze solution.

Locate the points for the test procedure.

Obtain a sample of the antifreeze solution.

Measure the specific gravity of the antifreeze solution using a hydrometer.

Measure the specific gravity of the antifreeze solution using a refractometer.

Identify the solution and its freezing point.

Record and report test results.

2.2.11 Identify system conditions discovered during inspection and/or testing that would prompt an obstruction investigation.**Knowledge:**

NFPA 25: 14.2.2

Skills:

Identify the conditions that indicate that an obstruction investigation should be recommended.

Identify the nature and possible sources of obstructing material.

Record and report observations and recommendations.



Test # 10021: Level II Work Practices

2.3 Documentation

(Questions related to these tasks makeup 12-16% of the exam)

2.3.1 Prepare formal reports for work under the scope of Level II.

Knowledge:

NFPA 25: 4.4

Role of the inspector/tester in determining the status of a water-based fire protection system

Retention requirements as listed in NFPA 25: 4.4

Skills:

Determine which information must be included in reports.

Identify which party or parties should receive the final report.

Complete reports on Level II inspection and testing activities, results, and observations.

2.4 Safety

(Questions related to these tasks makeup 14-18% of the exam)

2.4.1 Follow safe practices for Level II inspections and tests.

Knowledge:

NFPA 25: 4.8 and 4.9

OSHA 29 CFR 1926.32 (f)

Lock out/Tag Out procedures (OSHA 29 CFR, 1910.147 (a)(1)(i))

Confined space entry precautions (OSHA 29 CFR, 1910.146)

Fall protection requirements (OSHA 29 CFR, 1926.104)

Skills:

Locate, read, and interpret the manufacturers' recommendations for proper use of testing equipment.

Recognize other potentially unsafe conditions at a worksite and obtain a determination and a resolution on how to proceed.

Determine whether contained liquids or gases are under pressure.

Determine whether electrical circuits are energized.

Identify potentially hazardous equipment deficiencies.

Identify situations that require lock-out/tag-out.

Ensure that correct procedures are followed during entry into confined spaces.

2.5 Work Management

(Questions related to these tasks makeup 68-72% of the exam)

2.5.1 Plan a sequence of inspection and testing tasks.

Knowledge:

Information, documents, and tools required for each task
Sequence of testing that makes sense and maximizes efficiency

Steps involved in each task

Frequencies/scheduling of inspection tasks

Support required from fitters, alarm technicians, or other qualified personnel

Equipment requirements for various procedures

Skills:

Coordinate impairments and/or work area disruptions.

Determine support required from fitters, alarm technicians, or other qualified personnel.

Determine priorities among various considerations.

Plan placement and/or movement of equipment.

Develop the sequence.

2.5.2 Identify the tools and equipment required for Level II inspection or testing of water-based fire protection systems.

Knowledge:

NFPA 25

NFPA 291

Names and appearances of tools required for performance of standard inspection and testing procedures

Skills:

Identify the tools required for specific inspection and testing procedures.

Recognize when test equipment needs recalibration or equipment.

2.5.3 Identify records from the contractor's and the owner's files related to the system to be inspected.

Knowledge:

NFPA 25: 4.4

Fire protection system terminology

Representation of building elements and system components in fire protection system plans

Purposes/scope of various types of plans and reports

Types of documents/information required

Possible alternate sources of required information

Skills:



Read and interpret fire protection system plans, acceptance test reports, and inspection and testing reports.

2.5.4 Conduct a pre-inspection conference with the owner.

Knowledge:

Inspection and testing procedures and frequencies for various systems and components
Time required for performance of various inspection and testing procedures
Scheduling considerations for various inspection and testing procedures

Skills:

Identify the alarm monitoring company and AHJ.
Coordinate access to the facility and/or system components.
Coordinate disruptive aspects of inspection and testing procedures with the facility's work processes.
Coordinate any support needed for property damage avoidance.
Read the scope of the contract.
Communicate clearly and professionally.

2.5.5 Notify applicable parties about test-related fire alarm and supervisory signals.

Knowledge:

Role of system monitoring service
NFPA 72: 3.3.67.7.1-5
Types of monitoring services (protected premises, central station, proprietary, remote, and fire command)

Skills:

Follow-up after testing to confirm receipt of signals.
Notify the monitoring service that testing has been completed.

2.5.6 Work with the owner to plan and implement an impairment procedure.

Knowledge:

NFPA 25: 15.3, 15.5 – 15.7
Planned and Emergency Impairments types
Potential consequences to system operation while impaired
Tagging procedures

Skills:

Identify the alarm monitoring company and AHJ contacts for notification.
Plan for the beginning and end of the impairment.
Plan for potential fire hazards that could arise during the impairment.
Establish notification procedures before and after the impairment.
Estimate the time required for the pre-planned impairment.
Utilize valve shut-off/impairment tags.
Encourage the owner to limit operations during impairment.
Develop a plan so that systems can be returned to service immediately if a problem arises.
Manage work processes during the impairment to minimize its duration.
Respond to an emergency impairment.

2.5.7 Conduct a post-inspection conference with the owner.

Knowledge:

NFPA 25: 4.1.4, 15.6, 15.7, A.4.1.4
Conditions that constitute an emergency impairment
Deficiencies that affect the functionality of the system

Skills:

Explain inspection and test results to the owner.
Provide notifications in response to an impairment and/or system deficiency.
Recommend corrective actions.
Advise the owner that the system has been restored.
Communicate clearly and professionally.