

7.3 Hose Test.

7.3.1 General. All system hose shall be examined annually for damage. If visual examination shows any deficiency, the hose shall be immediately replaced or tested as specified in 7.3.2.

7.3.2 Testing.

7.3.2.1 All hose shall be tested every 5 years.

7.3.2.2 All hose shall be tested at 1½ times the maximum container pressure at 130°F (54.4°C). The testing procedure shall be as follows:

- (1) The hose is removed from any attachment.
- (2) The hose assembly is then placed in a protective enclosure designed to permit visual observation of the test.
- (3) The hose must be completely filled with water before testing.
- (4) Pressure then is applied at a rate-of-pressure rise to reach the test pressure within 1 minute. The test pressure is then maintained for 1 full minute. Observations are then made to note any distortion or leakage.
- (5) If the test pressure has not dropped or if the couplings have not moved, the pressure is released. The hose assembly is considered to have passed the hydrostatic test if no permanent distortion has taken place.
- (6) Hose assembly passing the test must be completely dried internally. If heat is used for drying, the temperature must not exceed the manufacturer's specifications.
- (7) Hose assemblies failing a hydrostatic test must be marked and destroyed and be replaced with new assemblies.
- (8) Each hose assembly passing the hydrostatic test is marked to show the date of test.

7.4 Enclosure Inspection. Other than as identified in 7.4.1, the enclosure protected by the clean agent shall be thoroughly inspected at least every 12 months to determine if penetrations have occurred that could lead to agent leakage, if other changes have occurred that could change volume of hazard, or both. Where the inspection indicates conditions that could result in the inability of the enclosure to maintain the clean agent concentration, the conditions shall be corrected. If uncertainty still exists, the enclosure shall be retested for integrity in accordance with 7.7.2.3.

7.4.1 An enclosure inspection shall not be required every 12 months if a documented administrative control program exists that addresses barrier integrity.

7.5* Maintenance.

7.5.1 These systems shall be maintained in full operating condition at all times. Actuation, impairment, and restoration of this protection shall be reported promptly to the authority having jurisdiction.

7.5.2 Any troubles or impairments shall be corrected in a timely manner consistent with the hazard protected.

7.5.3* Any penetrations made through the enclosure protected by the clean agent shall be sealed immediately. The method of sealing shall restore the original fire resistance rating of the enclosure.

7.6 Training.

7.6.1 All persons who could be expected to inspect, test, maintain, or operate fire extinguishing systems shall be thoroughly trained and kept thoroughly trained in the functions they are expected to perform.

7.6.2* Personnel working in an enclosure protected by a clean agent shall receive training regarding agent safety issues.

7.7 Approval of Installations.

7.7.1 General. The completed system shall be reviewed and tested by qualified personnel to meet the approval of the authority having jurisdiction. Only listed equipment and devices shall be used in the systems. To determine that the system has been properly installed and will function as specified, the following tests shall be performed.

7.7.2 Installation Acceptance.

7.7.2.1 General. It shall be determined that the protected enclosure is in general conformance with the construction documents.

7.7.2.2 Review Mechanical Components.

7.7.2.2.1 The piping distribution system shall be inspected to determine that it is in compliance with the design and installation documents.

7.7.2.2.2 Nozzles and pipe size shall be in accordance with system drawings. Means of pipe size reduction and attitudes of tees shall be checked for conformance to the design.

7.7.2.2.3 Piping joints, discharge nozzles, and piping supports shall be securely fastened to prevent unacceptable vertical or lateral movement during discharge. Discharge nozzles shall be installed in such a manner that piping cannot become detached during discharge.

7.7.2.2.4 During assembly, the piping distribution system shall be inspected internally to detect the possibility of any oil or particulate matter soiling the hazard area or affecting the agent distribution due to a reduction in the effective nozzle orifice area.

7.7.2.2.5 The discharge nozzle shall be oriented in such a manner that optimum agent dispersal can be effected.

7.7.2.2.6 If nozzle deflectors are installed, they shall be positioned to obtain maximum benefit.

7.7.2.2.7 The discharge nozzles, piping, and mounting brackets shall be installed in such a manner that they will not potentially cause injury to personnel. Agent shall not directly impinge on areas where personnel could be found in the normal work area. Agent shall not directly impinge on any loose objects or shelves, cabinet tops, or similar surfaces where loose objects could be present and become missiles.

7.7.2.2.8 All agent storage containers shall be properly located in accordance with an approved set of system drawings.

7.7.2.2.9 All containers and mounting brackets shall be fastened securely in accordance with the manufacturer's requirements.

7.7.2.2.10* If a discharge test is to be conducted, containers for the agent to be used shall be weighed before and after discharge. Fill weight of containers shall be verified by weighing or other approved methods. For inert gas clean agents, container pressure shall be recorded before and after discharge.

7.7.2.2.11 Adequate quantity of agent to produce the desired specified concentration shall be provided. The actual room volumes shall be checked against those indicated on the system drawings to ensure the proper quantity of agent. Fan coastdown and damper closure time shall be taken into consideration.

7.7.2.2.12 The piping shall be pneumatically tested in a closed circuit for a period of 10 minutes at 40 psi (276 kPa). At the end of 10 minutes, the pressure drop shall not exceed 20 percent of the test pressure.

7.7.2.2.12.1 The pressure test shall be permitted to be omitted if the total piping contains no more than one change in direction fitting between the storage container and the discharge nozzle and if all piping has been physically checked for tightness.

7.7.2.2.13* A flow test using nitrogen or an inert gas shall be performed on the piping network to verify that flow is continuous and that the piping and nozzles are unobstructed.

7.7.2.3* Review of Enclosure Integrity. All total flooding systems shall have the enclosure examined and tested to locate and then effectively seal any significant air leaks that could result in a failure of the enclosure to hold the specified agent concentration level for the specified holding period. Quantitative results shall be obtained and recorded to indicate that the specified agent concentration for the specified duration of protection is in compliance with Section 5.6, using an approved blower fan unit or other means as approved by the authority having jurisdiction. *(For guidance, see Annex C.)*

7.7.2.4 Review of Electrical Components.

7.7.2.4.1 All wiring systems shall be properly installed in compliance with local codes and the system drawings. Alternating current (ac) and direct current (dc) wiring shall not be combined in a common conduit or raceway unless properly shielded and grounded.

7.7.2.4.2 All field circuits shall be free of ground faults and short circuits. Where field circuitry is being measured, all electronic components, such as smoke and flame detectors or special electronic equipment for other detectors or their mounting bases, shall be removed and jumpers shall be properly installed to prevent the possibility of damage within these devices. Components shall be replaced after measuring.

7.7.2.4.3 Power shall be supplied to the control unit from a separate dedicated source that will not be shut down upon system operation.

7.7.2.4.4 Adequate and reliable primary and 24 hour minimum standby sources of energy shall be used to provide for operation of the detection, signaling, control, and actuation requirements of the system.

7.7.2.4.5 All auxiliary functions such as alarm-sounding or displaying devices, remote annunciators, air-handling shutdown, and power shutdown shall be checked for proper operation in accordance with system requirements and design specifications. If possible, all air-handling and power-cutoff controls shall be of the type that, once interrupted, require manual restart to restore power.

7.7.2.4.6 Silencing of alarms, if desirable, shall not affect other auxiliary functions such as air handling or power cutoff if required in the design specification.

7.7.2.4.7 The detection devices shall be checked for proper type and location as specified on the system drawings.

7.7.2.4.8 Detectors shall not be located near obstructions or air ventilation and cooling equipment that would appreciably affect their response characteristics. Where applicable, air changes for the protected area shall be taken into consideration. *(Refer to NFPA 72 and the manufacturer's recommended guidelines.)*

7.7.2.4.9 The detectors shall be installed in a professional manner and in accordance with technical data regarding their installation.

7.7.2.4.10 Manual pull stations shall be properly installed, readily accessible, accurately identified, and properly protected to prevent damage.

7.7.2.4.11 All manual stations used to release agents shall require two separate and distinct actions for operation. They shall be properly identified. Particular care shall be taken where manual release devices for more than one system are in close proximity and could be confused or the wrong system actuated. Manual stations in this instance shall be clearly identified as to which zone or suppression area they affect.

7.7.2.4.12 For systems with a main/reserve capability, the main/reserve switch shall be properly installed, readily accessible, and clearly identified.

7.7.2.4.13 For systems using abort switches, the switches shall be of the deadman type requiring constant manual pressure, properly installed, readily accessible within the hazard area, and clearly identified. Switches that remain in the abort position when released shall not be used for this purpose. Manual pull stations shall always override abort switches.

7.7.2.4.14 The control unit shall be properly installed and readily accessible.

7.7.2.5 Functional Testing.

7.7.2.5.1 Preliminary Functional Tests. The following preliminary functional tests shall be performed:

- (1) If the system is connected to an alarm receiving office, notify the alarm receiving office that the fire system test is to be conducted and that an emergency response by the fire department or alarm station personnel is not desired. Notify all concerned personnel at the end user's facility that a test is to be conducted and instruct personnel as to the sequence of operation.
- (2)*Disable each agent storage container release mechanism so that activation of the release circuit will not release agent. Reconnect the release circuit with a functional device in lieu of each agent storage container release mechanism.
- (3) Check each detector for proper response.
- (4) Check that polarity has been observed on all polarized alarm devices and auxiliary relays.
- (5) Check that all end-of-line resistors have been installed across the detection and alarm bell circuits, where required.
- (6) Check all supervised circuits for proper trouble response.

7.7.2.5.2 System Functional Operational Test. The following system functional operational tests shall be performed:

- (1) Operate detection initiating circuit(s). Verify that all alarm functions occur according to design specifications.
- (2) Operate the necessary circuit to initiate a second alarm circuit, if present. Verify that all second alarm functions occur according to design specifications.
- (3) Operate manual release. Verify that manual release functions occur according to design specifications.
- (4) Operate abort switch circuit, if supplied. Verify that abort functions occur according to design specifications. Confirm that visual and audible supervisory signals are received at the control panel.
- (5) Test all automatic valves, unless testing the valve will release agent or damage the valve (destructive testing).
- (6) Check pneumatic equipment, where required, for integrity to ensure proper operation.