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UNIFIED FACILITIES CRITERIA (UFC)

OPERATIONS AND MAINTENANCE:

INSPECTION, TESTING, AND MAINTENANCE OF FIRE PROTECTION SYSTEMS

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY (Preparing Activity)

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND

UNIFIED FACILITIES CRITERIA (UFC)

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Record of Changes (changes indicated by **1**\ ... /**1**/)
Change No. Date Location

This UFC supersedes AFJMAN 32-1059 (AFM 91-37), TM 5-695, and MO-117, dated 1 September 1989.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD(AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the more stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Support Agency (AFCESA) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request (CCR). The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://dod.wbdg.org/.

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AUTHORIZED BY:

DONALD L. BASHAM, P.E.
Chief, Engineering and Construction
U.S. Army Corps of Engineers

DR. JAMES W WRIGHT, P.E.
Chief Engineer
Naval Facilities Engineering Command

KATHLEEN I. FERGUSON, P.E.
The Deputy Civil Engineer
DCS/Installations & Logistics
Department of the Air Force

Dr. GET W. MOY, P.E.
Director, Installations Requirements and Management
Office of the Deputy Under Secretary of Defense (Installations and Environment)

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CHAPTER 1

INTRODUCTION

1-1 **BACKGROUND.** This Unified Facility Criteria (UFC) has been developed from an evaluation of DoD facilities, from surveys of maintenance methods, and from selection of the best practices of the Department of Defense, other government agencies, and the private sector. It is based on recognized reliability-centered maintenance concepts and reliability-centered risk management. It was prepared using model building maintenance codes, *National Fire Codes*, industrial standards, and other recognized standards to the maximum extent feasible. Personnel safety and continuity of mission were primary considerations.

1-2 **PURPOSE AND SCOPE.** This UFC provides requirements for inspection, test, and maintenance (ITM) of engineered fire protection features in Department of Defense (DoD) facilities. Do not deviate from these criteria without prior approval of the component office of responsibility: U.S. Army, HQ USACE/CEMP-E; U.S. Navy, NAVFACENGCOM HQ - CHENG; U.S. Marine Corps, HQMC Code LFF-1; U.S. Air Force, HQ AFCESA/CES; Defense Logistics Agency, HQ DLA-D through DLSC-BIS; National Imagery and Mapping Agency, NIMA/MSF; and all other DOD components, Office of the Deputy Under Secretary of Defense (Installations) via the DOD Committee on Fire Protection Engineering. Do not use this UFC for acceptance or commissioning of fire protection systems.

1-3 **APPLICABILITY.**

1-3.1 Criteria in this UFC apply to DoD facilities located on or outside of DoD installations, whether acquired by appropriated or non-appropriated funds, or third party financed and constructed. Facilities include all temporary or permanent structures and their contents, including waterfront facilities, outside storage, and shore protection for ships and aircraft, as well as mobile and stationary equipment.

1-3.2 Criteria in this UFC apply to DoD leased facilities outside of DoD installations whether by appropriated or non-appropriated funds, or third party financed and constructed when DoD or a DoD contractor maintains the facility.

1-3.3 DoD leased facilities located outside of DoD installations, whether by appropriated or non-appropriated funds, or third party financed and constructed when the facility is maintained by leaser shall be maintained in accordance with the requirements of the local (off base) authority having jurisdiction or in the absence of such requirements this UFC.

1-4. **AUTHORITY.** This UFC implements the National Technology Transfer and Advancement Act, Public Law 104-113, March 7, 1996, section 12(d)(3).

1-5 **REFERENCES.** See Appendix A.

1-6 **OBJECTIVE.** ITM tasks in this UFC represent the minimum required to achieve a 99 percent overall system reliability in response to an actual fire event.

1-7 **CRITERIA.** Use the task frequencies in this UFC in lieu of frequencies in the *National Fire Codes* except as indicated in paragraph 1-7.1.

1-7.1 **Systems/Applications Not Covered.** When a specific system or application is not addressed by this UFC, follow national building codes, recognized industry standards, and standard engineering practices. In the absence of such technical information, contact the DoD component authority having jurisdiction (AHJ) (paragraph 1-7.4). Fire department operations, staffing, and equipment are not addressed by this UFC.

1-7.2 **Conflicts.** If a conflict exists between this UFC and any other DoD document, referenced code, standard, or publication, this UFC takes precedence. Individual DoD components (reference paragraph 1-7.4) may issue technical guidance, which takes precedence.

1-7.3 **Waivers.** Waivers may be approved by the AHJ where an alternative ITM action providing equivalent fire protection and life safety exists and is also approved. Requests must include justification, hazard analysis, cost comparison, criteria applied, and other pertinent data. Lack of funds or cost savings do not justify a waiver. Waivers may be granted only for specific requests, and will not extend to cases with similar circumstances.

1-7.4 **Authority Having Jurisdiction (AHJ).** For this UFC, the AHJ is the component office of responsibility: Army, HQ USACE/CEMP-E; Navy, NAVFACENGCOM HQ - CHENG; Marine Corps, HQMC Code LFF-1; Air Force, HQ AFCESA/CES; DLA, HQ DLA-D through DLSC-BIS; National Imagery and Mapping Agency, NIMA/MSF; and all other DOD components, Office of the Deputy Under Secretary of Defense (Installations) via the DOD Committee on Fire Protection Engineering.

Note: The DoD Standing Committee on Fire Protection Engineering comprises the AHJ from each service or agency.

1-8 **PERSONNEL QUALIFICATIONS**

1-8.1 **ITM Tasks.** ITM tasks should be performed by craftpersons trained/qualified in the maintenance and repair of the subject fire protection system or subsystem. "Trained/qualified" includes personnel completing the DoD Fire Alarm Systems course or DoD Fire Suppression Systems course at the Technical Training Center, Sheppard Air Force Base, Texas. Also, other recognized journeyman/craftsman-level qualifications for fire protection system maintenance and repair may perform ITM tasks for those systems. Technical tasks must be performed according to manufacturer's instructions. Certain jurisdictions may require varying level of continuing education to maintain recognized

journeyman/craftsman-level qualifications. Overseas locations should contact their Command Fire Protection Engineering office for guidance on local qualifications requirements.

1-8.2 **Other Inspections.** This UFC also lists inspection tasks that should be performed during other regularly scheduled facility inspections/evaluations. Fire prevention personnel, safety personnel, maintenance craftspersons, or other individuals could perform these inspection tasks.

1-9 **RECORDS.** Each installation will maintain a permanent record of completed ITM tasks in accordance with each agency's program for reoccurring facility maintenance record keeping. Records may be hard copy or electronic. Where there are no agency-wide programs, records must be developed locally. Records will be maintained for every facility, and include, as a minimum, each ITM task, date scheduled, date completed, and craftsperson completing the task.

CHAPTER 2

FACILITY SYSTEMS

2-1 RELIABILITY CENTERED MAINTENANCE (RCM) METHODOLOGY.

The objective of ITM for fixed fire protection systems is to assure that the systems will function on demand. RCM analysis identifies any defects responsible for system malfunction and how they can be detected and corrected before a fire. A byproduct of RCM analysis is a list of ITM tasks and how often they must be accomplished (frequencies) to achieve a desired reliability (0.99 for this UFC; reference paragraph 1.6). The methodology used to develop the ITM tasks in this UFC is summarized in AFCESA Technical Report, "Risk Based Reliability Centered Maintenance of DoD Fire Protection Systems," January 1999. The model used in the report assumed a system demand of one event in fifty (1/50) years and a task effectiveness (ITM done right) of 99 percent. This RCM analysis emphasized task effectiveness (is it the right thing to do and is it done right?) and timeliness (is it done before a demand?). The resulting list of tasks and frequencies, therefore, considered frequency and probabilities of demands and failures.

2-2 ITM TASK DESCRIPTIONS AND FREQUENCIES

Note: Military Family Housing Systems are addressed in Chapter 3.

2-2.1 **Task Descriptions.** The ITM tasks in Tables 2-1 through 2-19 and 3-1 through 3-2 were selected to assure the fire protection would function upon demand.

2-2.1.1. **Supervised Components.** Supervision of components increases the likelihood that conditions or faults will be detected without an inspection activity. In these cases, the ITM task is to respond to the alarm and to test the supervisor device (e.g., valve tamper switch) periodically. Accordingly, the tables reflect the improved fault or condition detection by specifying less frequent inspections. Different frequencies are recommended for monitored and for unmonitored fire alarm control equipment. A monitored system is a system which transmits trouble alarms to a supervisory station.

2-2.1.2. **Event-Driven Tests.** Some tests should be event-driven. For example, a main drain test is intended to verify the open condition of a control valve to a sprinkler or water spray system, and needs to be done only when the control valve has been operated for maintenance or testing. The frequency indicated in the tables is after valve operation.

2-2.1.3. **Excluded National Fire Code Tasks.** Some of the tasks the *National Fire Codes* recommend are not included in the tables. These are tasks which do not improve the operability of the systems because: (1) the faults they detect are not significant; (2) the faults are detected by other tasks or means; or (3) the faults will be self-evident (fix it when it breaks) and do no significantly impair the system.

2-2.1.4. **Non-ITM Activities.** Inspection activities listed at the end of each ITM table are

not part of the ITM program, but part of building overall inspection, and are listed for information only. They were not included in the model used to develop the 99 percent reliability requirements; however, they should be incorporated into each DoD component activity's fire prevention, safety, facility condition, and related inspection/evaluation program.

2-2.2 **Fire Detection and Alarm Systems.** The type and frequency of ITM tasks for fire detection and alarm systems depend on whether the system is monitored or not. Guidance on the tasks in Table 2-1 is contained in the *Inspection, Testing, and Maintenance* section of National Fire Protection Association Standard 72 (NFPA 72). Residential smoke detectors are addressed in Chapter 3.

Table 2-1. Fire Detection and Alarm System ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Panels and Annunciator Equipment (unmonitored only)	1. Inspect panel condition (connections, fuses, LEDs).
Annual	1. Control Panel and Annunciator Equipment (monitored)	1. Test to verify proper receipt of alarm supervisory and trouble signals (inputs) and operation of notification appliances and auxiliary functions (outputs). 2. Verify all lamps and LEDs are illuminated. 3. Load test backup batteries (when provided).
	2. Initiating Devices: a. Fire Alarm Boxes	1. Verify box is accessible (visual).
	b. Radiant Energy Detectors	1. Test to verify alarm initiation and receipt. 2. Verify no facility change which affects performance.
	c. Gas Detectors	1. Test to verify alarm initiation and receipt. 2. Verify no facility change which affects performance.

Table 2-1. Fire Detection and Alarm System ITM Tasks (Continued)

Frequency	Component	Tasks
Annual (Continued)	3. Notification Appliances and Voice Communication (telephone, speakers, horns, and strobe lights)	1. Test to verify operability.
	4. Digital Alarm Transmitters and Receivers	1. Test to verify operability.
2 Years	1. Initiating Devices: a. Fire Alarm Boxes	1. Operate to verify alarm receipt
	b. Heat Detectors (restorable)(only those required by MIL-HDBK-1008)	1. Test with heat source to verify alarm initiating and receipt. 2. Verify no facility change which affects performance.
	c. Smoke Detectors (only those required by MIL-HDBK-1008)	1. Test with smoke or aerosol to verify smoke entry and alarm initiation and receipt. 2. Verify no facility change which affects performance.
	d. Supervisory Devices (low air, temperature, water level)	1. Test to verify initiation and receipt of supervisory alarm.
5 Years	1. Smoke Detectors (only those required by MIL-HDBK-1008)	1. Test detector sensitivity to ensure the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked).
As Part of Building Inspection	Entire System	1. Visually check: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. 2. Exercise evacuation notification appliances for audibility, clarity, and visibility.

2-2.3 **Wet Pipe Automatic Sprinkler Systems.** Technical guidance on the tasks in Table 2-2 is contained in NFPA 25. Residential sprinklers are addressed in Chapter 3.

Table 2-2. Wet Pipe Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (without lock or supervision)	1. Verify valve position.
Annual	1. Control Valves (locked or supervised)	1. Verify valve position.
	2. Waterflow Alarm Devices	1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if supervised).
	3. Alarm Valve and Trim	1. Visually check exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legibility of hydraulic nameplate.
	4. Main Drain	1. Conduct main drain test to verify supply (valve position)
	5. Fire Department Connection	1. Verify accessibility and condition. 2. If caps removed or missing, check for obstructions.
2 Years	1. Control Valves	1. Operate valve through entire travel to verify function. 2. Lubricate valves and stems to ensure operability.
5 Years	1. Alarm Valve	1. Clean and inspect internally to verify condition.
	2. Anti-freeze Loops	1. Confirm correct solution mixture
10 Years	1. Gauges	1. Recalibrate or replace gauges.
20 Years	1. Fast Response Sprinklers and Extra High Temperature Heads	1. Test sample heads to verify response characteristics.
50 Years	1. Standard Sprinkler Heads	1. Replace or test sample heads to verify response characteristics.
As Part of Building Inspection	Entire System	Visually check: 1. Pipe hangers. 2. Heads for obstruction. 3. Piping for leaks. 4. Riser condition. 5. Sprinkler spares. 6. Area susceptible to freezing.

2-2.4 **Dry Pipe Automatic Sprinkler Systems.** Technical guidance for these tasks is contained in NFPA 25.

Table 2-3. Dry Pipe Automatic Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (without lock or supervision)	1. Verify valve position.
Annual	1. Control Valves (locked or supervised)	1. Verify valve position.
	2. Waterflow Alarm Devices	1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve align-ment and tamper switch (if supervised).
	3. Dry Pipe Alarm Valve and Trim	1. Visually inspect exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legi-bility of hydraulic nameplate.
	4. Main Drain	1. Conduct main drain test to verify supply (valve position).
	5. Fire Department Connection	1. Verify accessibility and condition. 2. If caps removed or missing, check for obstructions.
	6. Dry Pipe Alarm Valve Enclosure Heating	1. Verify operability at beginning of heating season (for constant cold areas annually).
	7. Low Temperature Alarm	1. Verify initiation and receipt of alarm at beginning of heating season.
	8. Low Point Drains	1. Drain all low points to remove condensation prior to cold season.
2 Years	1. Control Valves	1. Operate valve through entire travel to verify function. 2. Lubricate valve stem.
	2. Dry Pipe Alarm Valves	1. Trip valve to verify operability. 2. Inspect internal condition before resetting and clean valve seat. 3. Check priming water level (before and after trip test).

Table 2-3. Dry Pipe Automatic Sprinkler Systems ITM Tasks (Continued)

Frequency	Component	Tasks
2 Years (Continued)	3. Quick Opening Devices	1. Test to verify operability.
	4. Low Air Pressure Alarm	1. Test to verify initiation and receipt of supervisory alarm.
	5. Automatic Air Pressure Maintenance Devices	1. Inspect to verify proper operation.
5 Years	1. Strainers	1. Internal inspection and cleaning to verify condition.
10 Years	1. Gauges	1. Recalibrate or replace gauges.
20 Years	1. Fast Response Sprinklers and Extra High Temperature Heads	1. Test sample heads to verify response characteristics.
50 Years	1. Standard Sprinkler Heads	1. Replace or test sample heads to verify response characteristics.
As Part of Building Inspection	Entire System	Visually check: 1. Pipe hangers. 2. Heads for obstruction. 3. Piping for leaks. 4. Riser condition. 5. Sprinkler spares.

2-2.5 **Deluge Sprinkler Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 25.

Table 2-4. Deluge Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (without lock or supervision)	1. Verify valve position.
Annual	1. Control Valves (locked or supervised)	1. Verify valve position.
	2. Waterflow Alarm Devices	1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if supervised).

Table 2-4. Deluge Sprinkler Systems ITM Tasks (Continued)

Frequency	Component	Tasks
Annual (Continued)	3. Deluge Alarm Valve and Trim	1. Inspect exterior of valves, gauges, trim alignment. 2. Verify pressure and legibility of hydraulic nameplate.
	4. Main Drain	1. Conduct main drain test to verify supply (valve position).
	5. Fire Department Connection	1. Verify accessibility and condition. 2. If caps removed or missing, check for obstructions.
	6. Valve and Riser Heated Enclosure (if provided)	1. Verify operability at beginning of heating season.
	7. Low Temperature Alarm	1. Verify initiation and receipt of alarm at beginning of heating season.
2 Years	1. Control Valves	1. Operate valve to verify operability. 2. Lubricate valve stem.
	2. Deluge Valve	1. Trip to verify operability. 2. Verify manual actuators are operable. 3. Inspect internal condition and clean valve seat before resetting.
	3. Low Point Drains	1. Drain all low points after deluge valve test and before cold weather.
5 Years	1. Strainers	1. Inspect internally and clean to verify condition.
10 Years	1. Gauges	1. Recalibrate or replace.
	2. Deluge Valve	1. Conduct full flow test.
As Part of Building Inspection	Entire System	1. Visually check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. e. Sprinkler spares. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed.

2-2.6. **Pre-Action Automatic Sprinkler Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 25.

Table 2-5. Pre-Action Automatic Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (without lock or supervision)	1. Verify valve position.
Annual	1. Control Valves (locked or supervised)	1. Verify valve position.
	2. Waterflow Alarm Devices	1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if supervised).
	3. Pre-Action Valve and Trim	1. Inspect exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legibility of hydraulic nameplate.
	4. Main Drain	1. Conduct main drain test to verify supply (valve position).
	5. Fire Department Connection	1. Verify accessibility and condition. 2. If caps removed or missing, check for obstructions.
	6. Valve and Riser Heated Enclosure (if provided)	1. Verify operability at beginning of heating season.
	7. Low Temperature Alarm	1. Verify initiation and receipt of alarm at beginning of heating season.
2 Years	1. Control Valves	1. Operate valve through entire travel to verify function. 2. Lubricate valve stem.
	2. Pre-Action Valve	1. Trip to verify proper operation. 2. Verify manual actuators (if provided). 3. Inspect internal condition and clean valve seat before resetting.

Table 2-5. Pre-Action Automatic Sprinkler Systems ITM Tasks (Continued)

Frequency	Component	Tasks
2 Years (Continued)	3. Low Point Drains	1. Drain all low points after pre-action valve trip test and before cold weather (if unheated area).
	4. Air supply (if present)	1. Test automatic air pressure maintenance device. 2. Test low air supply alarm.
5 Years	1. Strainers	1. Clean and inspect interior to verify condition.
10 Years	1. Gauges	1. Recalibrate or replace gauges.
20 Years	1. Fast Response Sprinklers and Extra High Temperature Heads	1. Test sample heads to verify response characteristics.
50 Years	1. Closed Head Nozzles	1. Replace or test sample closed head nozzles to verify response characteristics.
As Part of Building Inspection	Entire System	1. Visually Inspect System: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. 2. Ensure: a. Manual stations in-place and unobstructed. b. Check sprinkler spares. c. Detectors unblocked/uncovered. d. Panels secured and indicator lamps functional. e. Notification appliances in place. f. Manual stations in place and unobstructed.

2-2.7 **Water Spray Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on these tasks is contained in NFPA 25.

Table 2-6. Water Spray Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (without lock or supervision)	1. Verify valve position.
Annual	1. Control Valves (locked or supervised)	1. Verify valve position.
	2. Waterflow Alarm Devices	1. Operate to verify initiation and receipt of alarm. 2. Verify alarm test valve alignment and tamper switch (if supervised).
	3. Pre-Action Valve and Trim	1. Inspect exterior of valves, gauges, trim alignment. 2. Verify valve pressure and legibility of hydraulic nameplate.
	4. Main Drain	1. Conduct main drain test to verify supply (valve position).
	5. Fire Department Connection	1. Verify accessibility and condition. 2. If caps removed or missing, check for obstructions.
	6. Valve and Riser Enclosure Heater	1. Verify operability at beginning of heating season.
	7. Low Temperature Alarm	1. Verify initiation and receipt of alarm at beginning of heating season.
2 Years	1. Control Valves	1. Operate valve to verify operability. 2. Lubricate valve stem.
	2. Water Spray Valve	1. Trip to verify operability. 2. Verify manual actuators (if provided). 3. Verify spray pattern (if experience shows nozzles are not moved, this can be extended to 10 years or after modifications). 4. Inspect interior of valve and clean valve seat before resetting.

Table 2-6. Water Spray Systems ITM Tasks (Continued)

Frequency	Component	Tasks
2 Years (Continued)	3. Low Point Drains	1. Drain all low points after pre-action valve trip test and before cold weather.
5 Years	1. Strainers	1. Clean and inspect interior to verify condition.
10 Years	1. Gauges	1. Recalibrate or replace.
20 Years	1. Fast Response Sprinklers and Extra High Temperature Heads	1. Test sample heads to verify response characteristics.
50 Years	1. Standard Sprinkler Heads	1. Replace or test sample heads to verify response characteristics.
As Part of Building Inspection	Entire System	1. Visually check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. e. Sprinkler spares 2. Ensure: a Manual stations in-place and unobstructed. b. Detectors unblocked/uncovered. c. Panels secured and indicator lamps functional. d. Notification appliances in place. e. Manual stations in place and unobstructed.

2-2.8 **Water Mist Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 750.

Table 2-7. Water Mist Systems ITM Tasks

Frequency	Component	Task
Weekly	1. Water Tanks (unsupervised, unmonitored)	1. Check water level.
	2. Air Compressor/ Receiver/Cylinders (unsupervised, unmonitored)	1. Check air pressure.
Semi-Annual	1. Pumps	1. Churn test to ensure operability.
	2. Air Compressors	1. Start to ensure operability.
	3. System Operating Components	1. Inspect to verify valve alignment and valve is free of damage.
Annual	1. Water Tanks (supervised and monitored)	1. Check water level and supervisory switch.
	2. Air Compressors/ Receivers/Cylinders (supervised and monitored)	1. Check air pressure and supervisory pressure switch.
	3. Water Flow Alarm	1. Operate to verify initiation and receipt of alarm.
	4. Pumps	1. Conduct full flow functional test.
	5. Pressure Relief Devices	1. Manually operate to ensure operability.
	6. Manual Actuators	1. Verify operability.
	7. Control Valve (sectional water supply valve)	1. Verify operability and position.
5 Years	1. Pressure cylinders (normally at atmos-pheric pressure)	1. Pressurize to verify operability.
	2. System	1. Conduct flow test.
	3. Water	1. Verify water quality when refilling.
	4. Water Tanks	1. Inspect tanks for structural integrity prior to refilling.
	5. Nozzle Sampling	1. Test sample heads to verify response characteristics.

Table 2-7. Water Mist Systems ITM Tasks (Continued)

Frequency	Component	Task
5-12 Years	1. Storage Vessels	1. Conduct hydrostatic test for pressure cylinders in accordance with US Occupational Safety and Health Administration (OSHA) and US Department of Transportations (DOT) standards.
As Part of Building Inspection	Entire System	1. Visually check: a. Check pipe hangers. b. Check heads for obstruction. c. Check piping for leaks. d. Check riser condition. e. Check nozzle spares. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed.

2-2.9 **Foam and Foam-Water Systems.** Table 2-8 addresses low expansion foam systems for flammable liquid tanks as covered in NFPA 11. Table 2-9 addresses low expansion foam spray and sprinkler systems including aqueous film forming foam (AFFF), as covered in NFPA 16, 16A, and 25. Table 2-10 addresses high expansion foams as covered in NFPA 11A.

Table 2-8. Low Expansion Foam Systems for Flammable Liquid Tanks ITM Tasks

Frequency	Component	Tasks
Annual	1. Foam Concentrate	1. Inspect for quality and evidence of sludge or deterioration.
	2. Foam Pumps/Proportioners	1. Test to verify operability and proper proportioning. 2. Flush pumps after operation.
	3. System Actuators	1. Verify all manual and automatic actuation functions.
	4. Foam Concentrate Strainers	1. Inspect and clean if necessary.
	5. Distribution/Discharge	1. Ensure discharge devices are free of damage. 2. Inspect pipe and hanger to verify support and pitch.

Table 2-8. Low Expansion Foam Systems for Flammable Liquid Tanks ITM

Tasks (Continued)

Frequency	Component	Tasks
5 Years	1. Distribution Piping (including underground)	1. Spot-check piping interior for evidence of deterioration.
	2. Strainers (water supply)	1. Inspect and clean if necessary.

Table 2-9. Foam Spray and Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Monthly	1. Control Valves (unsupervised and unmonitored)	1. Verify valve in open (proper) position.
Semi-Annual	1. Foam Concentrate	1. Verify adequate supply and foam quality.
	2. Foam Proportioning System	1. Test pump to ensure operability. 2. Inspect proportioning system for proper valve alignment and system condition.
Annual	1. Control Valves (supervised and monitored)	1. Verify valve in proper position.
	2. Foam Concentrate Strainers	1. Inspect exterior to ensure blow down valve is closed.
2 Years	1. Control Valve	1. Operate valve through entire travel to verify function. 2. Lubricate stem.
	2. Foam Proportioning System	1. Conduct full flow test to ensure proper system function. 2. Verify proper concentration.
	3. Actuators	1. Verify operability of manual and automatic actuators.
	4. Distribution System	1. Verify nozzle (head) coverage during flow test. 2. Inspect piping hangers, heads, and nozzles for condition and location.
	5. Foam Concentrate Strainers	1. Inspect and clean after flow test.

Table 2-9. Foam Spray and Sprinkler Systems ITM Tasks (Continued)

Frequency	Component	Tasks
5 Years	1. Balancing Valve	1. Flush to prevent concentrate build-up on diaphragm.
	2. Strainers (water supply)	1. Inspect and clean if necessary.
10 Years	1. Foam Concentrate Tank	1. Drain, flush and perform internal inspection for corrosion. If pressure vessel, perform hydrostatic test.
As Part of Building Inspection	Entire System	1. Visually check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. 3. Check sprinkler spares.

Table 2-10. High Expansion Foam Systems ITM Tasks

Frequency	Component	Tasks
Annual	1. Foam Concentrate	1. Inspect to verify adequate supply.
	2. Foam Generator	1. Inspect to verify condition and proper valve alignment.
2 Years	1. Foam Generator	1. Conduct discharge test to verify operability.
	2. Actuators	1. Verify all manual and automatic actuators function.
After Activation	1. Strainers	1. Inspect and clean after system actuation.

Table 2-10. High Expansion Foam Systems ITM Tasks (Continued)

Frequency	Component	Tasks
As Part of Building Inspection	Entire System	1. Visually Check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed.

2-2.10 **Standpipe Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 14 and 25.

Table 2-11. Standpipe Systems ITM Tasks

Frequency	Component	Tasks
Semi-Annual	1. Hose Connection and Pressure Reducing Valves	1. Inspect for damage, leaking, missing caps, and obstruction.
2 Years	1. Piping	1. Inspect for damage and pipe supports.
5 Years	1. Standpipe	1. Conduct flow test to verify flow capacity. 2. Hydrostatic test to ensure integrity.
As Part of Building Inspection	Entire System	1. Visually check: a. Pipe hangers. b. Connections for obstruction. c. Piping for leaks. d. Riser condition.

2-2.11 **Hydrants and Monitors.** Technical guidance on the tasks in Table 2-12 is contained in NFPA 25.

Table 2-12. Hydrants and Monitors ITM Tasks

Frequency	Component	Task
2 Years	1. Hydrants	1. Inspect for accessibility, leaks, and worn threads. 2. Operate to ensure proper functioning. 3. Verify drainage of barrel (after all operations and before cold weather). 4. Lubricate hydrant to ensure ease of operation.
	2. Yard Monitor Nozzles	1. Inspect for condition. 2. Conduct flow test to verify proper function and range of motion. 3. Lubricate to ensure proper operating conditions.
	3. Hose Houses	1. Inspect for accessibility and physical condition. 2. Verify inventory and its condition.
5 Years	1. Underground and Exposed Piping.	1. Conduct flow tests.
After Flow	1. Strainers	1. Inspect and clean after each flow.

2-2.12 **Fire Pumps.** Technical guidance on these tasks is contained in NFPA 20 and NFPA 25.

Table 2-13. Fire Pumps ITM Tasks

Frequency	Component	Tasks
Monthly	1. Pump House	1. Inspect for proper condition, ventilation and heating.
	2. Control Valve and Isolation Valve	1. Verify proper valve position.
	3. Pressure Gauges	1. Check reading and verify gauge operability.

Table 2-13. Fire Pumps ITM Tasks (Continued)

Frequency	Component	Tasks
Monthly (Continued)	4. Controllers	1. Inspect electric connections. 2. Operate manual and automatic stations.
	5. Batteries	1. Verify proper charge.
	6. Pumps	1. Start and churn to verify operability. (Where equipment permits, allow water to flow back to the source.) 2. Verify operation of relief valves. 3. Verify full level (for engine-driven pumps). 4. Inspect exhaust system for leaks (for engine-driven pumps). 5. For engine driven pumps, start again using second battery set and churn to verify operability. (Where equipment permits, allow water to flow back to the source.)
2 Years	1. Control Valve	1. Operate and lubricate valves to ensure operability.
	2. Controllers	1. Calibrate pressure switches. 2. Exercise circuit breakers and switches to verify operability. 3. Inspect fuses.
	3. Pumps	1. Check coupling alignment to ensure shaft aligned. 2. Check pump shaft end play. 3. Lubricate bearings. 4. Lubricate couplings. 5. Lubricate right-angle drives.
	4. Fuel (Engine-Driven Pumps)	1. Sample fuel to verify quality.
	5. Relief Valves	1. Calibrate valves.
	6. Emergency Power Supply	1. Test to verify availability and capacity for pump motor.
5 Years	1. Pump	1. Conduct flow test to verify pump output.

2-2.13 **Water Supply Tanks.** Technical guidance on these tasks is contained in NFPA 25.

Table 2-14. Water Supply Tanks ITM Tasks

Frequency	Component	Tasks
Weekly (during freezing weather)	1. Tank Heating System (unsupervised and unmonitored)	1. Verify water temperature. 2. Verify operability of tank heaters.
Monthly	1. Control Valves (unsupervised and unmonitored)	1. Verify proper valve position.
Quarterly	1. Water Level (unsupervised and unmonitored)	1. Verify proper water level in tank.
Annual	1. Control Valves	1. Verify proper valve position.
	2. Water Level	1. Verify proper water level in tank.
	3. Tank Heating System	1. Verify operability of tank heater (prior to cold weather). 2. Test temperature alarms to verify proper operation (maintain thermometer in accordance with manufacturer's recommendations).
	4. Tank	1. Inspect exterior for condition, damage, corrosion, and accessibility. 2. Verify air pressure (for pressure tanks).
	5. Cathodic Protection	1. Inspect to ensure proper operation.
2 Years	1. Control Valves (including drain valves)	1. Operate valve through entire travel to verify function. 2. Lubricate valves to ensure operability.
	2. Water Level Alarms and Level Indicators	1. Test water level alarms to verify operability and set points.
	3. Tank Vent	1. Inspect and clean tank vents.
3 Years	1. Tank (without cathodic protection)	1. Conduct internal tank inspection to determine condition and amount of corrosion.

Table 2-14. Water Supply Tanks ITM Tasks (Continued)

Frequency	Component	Tasks
5 Years	1. Tanks (with cathodic protection)	1. Conduct internal tank inspection to determine condition and amount of corrosion.
	2. Pressure Gauges	1. Calibrate gauges.
	3. Check Valves	1. Inspect interior of valves.
	4. Level Indicator Test	1. Calibrate level indicator.

2-2.14 **Dry Chemical Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on these tasks is contained in NFPA 17.

Table 2-15. Dry Chemical Systems ITM Tasks

Frequency	Component	Tasks
Semi-Annual	1. Piping	1. Inspect piping for obstructions and proper support.
	2. Storage Vessels	1. Inspect agent container for condition. 2. Verify storage pressure of propellant.
	3. Agent	1. Verify quantity and quality of agent.
	4. Actuators	1. Inspect manual actuators for accessibility. 2. Inspect detection devices (fusible links or heat detectors) for contamination, and clean. 3. Test actuation system without agent release. 4. Verify interfaces (gas shutoff, power shutoff) operate properly.
Annual	1. Actuators	1. Replace detection devices (fusible links or heat detectors)
5-12 Years	1. Storage Vessels	1. Conduct hydrostatic test for pressure cylinders in accordance with OSHA and DOT standards.

Table 2-15. Dry Chemical Systems ITM Tasks (Continued)

Frequency	Component	Tasks
As Part of Building Inspection	Entire System	1. Visually check: a. Pipe hangers. b. Heads for obstruction. c. Riser condition. 2. Ensure: a. Detectors unblocked/ uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. e. Nozzle covers in place.

2-2.15 **Wet Chemical Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 17A.

Table 2-16. Wet Chemical Systems ITM Tasks

Frequency	Component	Tasks
Semi-Annual	1. Piping	1. Inspect piping for obstructions and proper support.
	2. Storage Vessels	1. Inspect agent container for condition. 2. Verify storage pressure of propellant.
	3. Agent	1. Verify quantity and quality of agent.
	4. Actuators	1. Inspect manual actuators for accessibility. 2. Inspect detection devices (fusible links or heat detectors) for contamination, and clean or replace as necessary. 3. Test actuation system without agent release. 4. Verify interfaces (gas shutoff, power shutoff) operate properly.

Table 2-16. Wet Chemical Systems ITM Tasks (Continued)

Frequency	Component	Tasks
Annual	1. Actuators	1. Replace detection devices (fusible links or heat detectors)
5-12 Years	1. Storage Vessels	1. Conduct hydrostatic test for pressure cylinders in accordance with OSHA and DOT standards.
As Part of Building Inspection	Entire System	1. Visually Check: a. Pipe hangers. b. Heads for obstruction. c. Riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. e. Nozzles' covers in place.

2-2.16 **Halon Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 12A.

Table 2-17. Halon Systems ITM Tasks

Frequency	Component	Tasks
Annual	1. Piping	1. Inspect piping and nozzles for condition and orientation.
	2. Flexible Hoses	1. Inspect for damage.
	3. Storage Vessels	1. Inspect storage containers' exterior (tanks, spheres, cylinders).
	4. Agent and Propellant	1. Verify quantity of agent is sufficient. 2. Verify pressure of agent/ propellant is sufficient.
	5. Actuators	1. Inspect manual actuators for accessibility. 2. Test actuation without agent release.

Table 2-17. Halon Systems ITM Tasks (Continued)

Frequency	Component	Tasks
Annual (Continued)	6. Auxiliary Equipment	1. Test to verify interfaces (equipment shutdown, dampers, door closures) operate properly and are activated by the system actuation.
	7. Valves	1. Verify valves in proper alignment.
5 Years	1. Cylinders	1. Complete external inspection of non-discharged cylinders to ensure suitability for use.
	2. Flexible Hoses	1. Pressure test hoses to ensure suitability for use.
2 Years (and after modifications to compartment)	1. Protected Enclosure (Room)	1. Inspect the enclosure to verify integrity and ability to maintain agent concentration.
As Part of Building Inspection	Entire System	1. Visually Check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. e. Nozzles' covers in place.

2-2.17 **Clean Agent Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 2001.

Table 2-18. Clean Agent Systems ITM Tasks

Frequency	Component	Tasks
Annual	1. Piping	1. Inspect piping and nozzles for condition and orientation.
	2. Flexible Hoses	1. Inspect for damage.
	3. Storage Vessels	1. Inspect storage containers' exterior (tanks, spheres, cylinders).
	4. Agent and Propellant	1. Verify adequate quantity of agent. 2. Verify adequate pressure of agent/propellant.
	5. Actuators	1. Inspect manual actuators for accessibility. 2. Test actuation without agent release.
	6. Auxiliary Equipment	1. Test to verify interfaces (equipment shutdown, dampers, door closures) operate properly and are activated by the system actuation.
	7. Valves	1. Verify valves in proper alignment.
2 Years (and after modifications to compartment)	1. Protected Enclosure (Room)	1. Inspect the enclosure to verify integrity and ability to maintain agent concentration.
5 Years	1. Cylinders	1. Perform complete external inspection of non-discharged cylinders to ensure suitability for use.
	2. Flexible Hoses	1. Pressure-test hoses to ensure suitability for use.

Table 2-18. Clean Agent Systems ITM Tasks (Continued)

Frequency	Component	Tasks
As Part of Building Inspection	Entire System	1. Visually Check: a. Pipe hangers. b. Heads for obstruction. c. Piping for leaks. d. Riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. C. Notification appliances in place. d. Manual stations in place and unobstructed. e. Nozzles' covers in place.

2-2.18 **Carbon Dioxide Systems.** Detection devices for actuation are addressed in paragraph 2-2.2. Technical guidance on the tasks is contained in NFPA 12.

Table 2-19. Carbon Dioxide Systems ITM Tasks

Frequency	Component	Tasks
Semi-Annual	1. Liquid Level (low pressure CO_2)	1. Verify adequate liquid level with tank level gauge.
Annual	1. Piping and Nozzles	1. Inspect piping for condition and proper support. 2. Check nozzles for obstruction and alignment.
	2. Flexible Hoses	1. Inspect for damage.
	3. Low Pressure Tanks	1. Check level and pressure gauges. 2. Verify valve alignment.
	4. High Pressure Cylinders	1. Inspect for condition and securing.
	5. Actuation System	1. Exercise control panel function including zone valve operation. 2. Inspect manual actuators for accessibility. 3. Check times and time delay (pre-discharge).

Table 2-19. Carbon Dioxide Systems ITM Tasks (Continued)

Frequency	Component	Tasks
Annual (Continued)	6. Auxiliary Equipment	1. Test to verify interfaces (shutdown, door closers, dampers) operate properly and are activated by the control panel.
2 Years	1. High Pressure Cylinders	1. Verify CO_2 quantity by weighing cylinders.
As Part of Building Inspection	Entire System	1. Visually Check: a. Check pipe hangers. b. Check heads for obstruction. c. Check piping for leaks. d. Check riser condition. 2. Ensure: a. Detectors unblocked/uncovered. b. Panels secured and indicator lamps functional. c. Notification appliances in place. d. Manual stations in place and unobstructed. e. Nozzles' covers in place.

CHAPTER 3

MILITARY FAMILY HOUSING SYSTEMS

3-1 **SCOPE.** The maintenance concepts for military family housing (MFH) fire protection systems are based on the management and controls unique to the MFH program. In the civilian sector, an owner/tenant makes a personal choice to occupy a dwelling unit and is responsible for their maintenance/repair and any associated fire protection devices. In MFH, occupants are assigned housing units and the housing management activity is responsible for the maintenance/repair of units and associated fire protection devices. Each MFH occupant is required to attend a briefing on their responsibilities as a MFH occupant prior to occupying a new MFH dwelling. These briefings include the occupant's responsibilities for conducting tests and cleaning installed fire protection features. On average, MFH maintenance teams conduct "change of occupancy" maintenance every one to two years; therefore, scheduled maintenance performed by the housing management activity is centered on this change of occupancy.

3-1.1 **Residential Smoke Detectors.** MFH units are required to have hard-wired smoke detectors. Each installation develops programs to train occupants in the testing and maintenance actions for the smoke detector installed. Actions required as part of change of occupant maintenance by the housing management activity are listed in Table 3-1.

3-1.2 **Residential Sprinkler Systems.** Some MFH units are also provided sprinkler systems.

3-1.2.1 Residential sprinkler systems in multi-family buildings up to 4 stories are normally constructed in accordance with NFPA 13R, *Sprinkler Systems, Residential Occupancies Up To and Including 4 Stories*. These systems are maintained in accordance with the tables in Chapter 2 of this UFC. Building occupants are not expected to conduct system tests or maintenance actions.

3-1.2.2 Residential sprinkler systems in multi-family buildings over 4 stories are normally constructed in accordance with NFPA 13, *Sprinkler Systems*. These systems are maintained in accordance with the tables in Chapter 2 of this UFC. Building occupants are not expected to conduct system tests or maintenance actions.

3-1.2.3 Residential sprinkler systems in one- and two-family dwellings and townhouse-style units are normally constructed in accordance with NFPA 13D, *Sprinkler Systems, Dwellings*. Installations develop their own programs to train occupants in the testing and maintenance actions required. Actions required as part of change of occupant maintenance by the housing management activity are listed in Table 3-2.

3-2 **ITM TASK DESCRIPTIONS.** The ITM tasks in Tables 3-1 and 3-2 should be part of the housing maintenance conducted between occupancies.

Table 3-1. MFH Residential Smoke Detectors ITM Tasks

Frequency	Component	Tasks
Change of Occupancy	1. Smoke Detector	1. Activate each detector with an approved smoke simulant. 2. Remove cover and inspect for grease build-up; replace and rebcate detector with evidence of grease build-up in the detector. 3. Vacuum the detector and replace the cover. 4. Activate each detector with the installed test button. 5. Replace any detector failing to activate on either the smoke simulant or the test button.
	2. Backup Battery (if present)	1. Replace battery (if present).
10 Years	1. Smoke Detectors	1. Replace detectors with supplemental/backup batteries or test detector sensitivity to ensure the detector has remained within its listed and marked sensitivity range (or 4 percent obscuration light gray smoke, if not marked).
25 Years	1. Smoke Detectors (hard-wired without battery backup)	1. Replace detectors.

Table 3-2. MFH Residential Sprinkler Systems ITM Tasks

Frequency	Component	Tasks
Change of Occupancy	1. Sprinkler Heads	1. Inspect all heads. 2. Clean or replace heads (as necessary). 3. Inspect ceilings/wall at head for signs of leakage or water stains.
	2. Valves	1. Inspect all valves to ensure they are open and sealed.
	3. Waterflow and Alarm Devices	1. Test to verify operability.
20 Years	1. Fast Response Sprinkler Heads	1. Test a sample of heads or replace.

APPENDIX A

REFERENCES

Government Publications

Department of Defense	Military Handbook 1008 Fire Protection Engineering for Facilities, Engineering, Design, and Construction
HQ AFCESA Technical Report (available at http://www.afcesa.af.mil)	Risk Based Reliability Centered Maintenance of DoD Fire Protection Systems, January 1999

Non-Government Publications

National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101

1. NFPA 11	Standard for Low-Expansion Foam, 1998 Edition
2. NFPA 11A	Standard for Medium- and High-Expansion Foam Systems
3. NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
4. NFPA 12A	Standard on Halon 1301 Fire Extinguishing Systems
5. NFPA 13	Standard for the Installation of Sprinkler Systems
6. NFPA 13 D	Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings
7. NFPA 13 R	Standard for the Installation of Sprinkler Systems in Residential Occupancies up to 4 Stories
8. NFPA 14	Standard for the Installation of Standpipe and Hose Systems
9. NFPA 15	Standard for Water Spray Fixed Systems for Fire Protection
10. NFPA 16	Standard for the Installation of Deluge Foam-Water Sprinkler And Foam-Water Spray Systems
11. NFPA 16A	Standard for the Installation of Closed-Head Foam-Water Sprinkler Systems
12. NFPA 17	Standard for Dry Chemical Extinguishing Systems
13. NFPA 17A	Standard for Wet Chemical Extinguishing Systems
14. NFPA 20	Standard for the Installation of Centrifugal Fire Pumps
15. NFPA 22	Standard for Water Tanks for Private Fire Protection

16. NFPA 25	Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems
17. NFPA 72	National Fire Alarm Code
18. NFPA 750	Standard on Water Mist Fire Protection Systems
19. NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems