Department of Defense

REPORT TO CONGRESS

STUDY ON FIRE EXTINGUISHERS

Office of the Under Secretary of Defense
(Acquisition and Sustainment)

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REPORT TO CONGRESS
STUDY ON FIRE EXTINGUISHERS

Senate Report 116-48, page 148, accompanying S. 1790, the National Defense Authorization Act for Fiscal Year 2020, requests the Secretary of Defense provide a report to the congressional defense committees on current fire suppression mechanisms, with emphasis on the need for portable fire extinguishers, employed by the Department:

> **Study on fire extinguishers**
>
> The committee is aware that portable fire extinguishers are essential to the safety of members of the Armed Forces and their families. The committee notes that protection of service members and their families is imperative to the readiness of the force. Every Department of Defense building should apply building and fire codes that are in line with national model codes and State building and fire codes. The committee notes that national model codes promulgated by the National Fire Protection Association (NFPA) and the International Code Council (ICC) have been adopted by almost every State in the Nation. The committee is concerned that the removal of these devices and subsequent adherence to the change in Unified Facilities Criteria (UFC) has the potential to harm force readiness and protection across the Services. Accordingly, the committee directs the Secretary of Defense to deliver a report to the congressional defense committees, no later than March 1, 2020, on the current fire suppression mechanisms, with emphasis on the need for portable fire extinguishers, employed by the Department. The study should include but not be limited to: (1) A breakdown of all fire codes that the Department follows in accordance with requirements set forth by the national model fire codes developed by the NFPA and the ICC; (2) Any fire codes the Department does not follow with justification for why it is waived; (3) The types of buildings that currently employ both sprinklers and extinguishers; (4) A list of high-risk types of buildings that would benefit from redundant fire suppression that include risks to personnel or egress concerns; (5) Specific to on-base housing, what, if any, fire extinguishers are supplied for cooking areas by either the Department or private contractors; (6) Recommendations, including a timeline, on how to implement redundant fire suppression mechanisms and what changes to the UFC would be required.

Overview

The Department of Defense (DoD) fire protection criteria are contained in Unified Facilities Criteria (UFC) 3-600-01, *Fire Protection Engineering for Facilities*, which cites specific National Fire Protection Association (NFPA) and International Code Council (ICC) code provisions either in part or in entirety. DoD develops fire protection criteria based on these commercial consensus codes and standards in addition to requirements set forth by national insurance underwriters that typically exceed minimum national code requirements. The criteria reflect the need for protecting life, property (building and contents), and mission continuity; risks associated with their loss; and the life-cycle costs associated with providing this protection.

The DoD criteria and consensus building codes require both automatic and passive built-in features for the safety of building occupants and protection of property. The life safety requirements are based upon the principle that occupants will evacuate the facility as soon as they are notified of a fire, rather than remain to attempt to fight a fire. Built-in automatic fire detection, fire control, and fire suppression technology have improved over the years to detect a fire sooner and to control and extinguish the fire faster, which reduces damage and extends egress time for occupants to evacuate. DoD recognizes the advances in these built-in features and leverages this technology to provide improved life safety features and fire protection for DoD personnel, assets, and mission readiness.

DoD fire protection criteria require portable fire extinguishers (PFE) in particular situations, but, consistent with the national model codes and standards, do not consider PFE as life-saving devices or redundant protection to built-in systems. DoD requirements for PFE have generally paralleled the model codes and standards with some exceptions where DoD has not required PFE. In February 2020, DoD amended UFC 3-600-01 in response to section 2861 of the National Defense Authorization Act for Fiscal Year 2020 (Public Law 116-92) to fully conform with PFE requirements in the model codes.

DoD's preference for limiting PFE requirements to specific high-risk situations, rather than employ them broadly in general purpose applications, is based upon cost-effective risk management, consistent with applicable Federal law in the Code of Federal Regulations (CFR). 29 CFR 1910.157 allows agencies to except the use of PFE in facilities where the fire safety policy requires immediate and total evacuation of occupants, and there are emergency action and fire prevention plans meeting the 29 CFR standard. DoD employs a policy of immediate evacuation and widespread installation of built-in suppression systems which afford protection for evacuation of occupants over an extended period of time. The addition of PFE to this scenario provides negligible improvements to life safety while imposing additional life-cycle costs including initial purchase, periodic maintenance, and—not least of all—required training. Recognizing that the presence of PFE in a facility creates an expectation of its use to extinguish a fire, 29 CFR 1910.157(g) requires occupants in facilities outfitted with PFE to receive initial and annual training "to familiarize employees with the general principles of fire extinguisher use and the hazards involved in the incipient state fire fighting." Failure to do so, as is often the case with underfunded budgets, entails the risk of exposing untrained personnel to a dangerous situation. DoD seeks to avoid this risk.

The Department's responses to the request for specific information follow.

(1) A breakdown of all fire codes that the Department follows in accordance with requirements set forth by the national model fire codes developed by the NFPA and the ICC.

DoD fire protection criteria largely incorporate the codes and standards of NFPA and ICC verbatim, as well as those of other related standards organizations. Table 1 lists the provisions which DoD uses without modification.

Table 1: Fire Protection codes and standards adopted without modification by DoD

AMERICAN CORRECTIONAL ASSOCIATION (ACA)
http://www.aca.org/
Planning and Design Guide for Secure Adult and Juvenile Facilities

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
http://www.ansi.org
ANSI B1.20.1, Pipe Thread
ANSI/IEEE 979, Guide for Substation Fire Protection

AMERICAN WATER WORKS ASSOCIATION (AWWA)
http://www.awwa.org
AWWA Manual M 14, Recommended Practice for Backflow Prevention and Cross Connection Control
AWWA Manual M 17, Installation, Field Testing and Maintenance of Fire Hydrants
AWWA Manual M 31, Distribution System Requirements for Fire Protection

ASME INTERNATIONAL
http://www.asme.org/
ASME A17.1, Safety Code for Elevators and Escalators

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
http://www.astm.org
ASTM A351, Standard Specification for Casting, Austenitic for Pressure-Containing Parts
ASTM E84, Standard Method of Test of Surface Burning Characteristics of Building Materials
ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
www.nfpa.org
NFPA 10, Standard for Portable Fire Extinguishers
NFPA 13R, Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies
NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection
NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
NFPA 17, Standard for Dry Chemical Extinguishing Systems
NFPA 17A, Standard for Wet Chemical Extinguishing Systems
NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals
NFPA 51, Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes
NFPA 52, Vehicular Gaseous Fuel Systems Code

Table 1: Fire Protection codes and standards adopted without modification by DoD

NFPA 75, Standard for the Fire Protection of Information Technology Equipment
NFPA 76, Standard for the Fire Protection of Telecommunications Facilities
NFPA 99B, Standard for Hypobaric Facilities
NFPA 102, Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures
NFPA 170, Standard for Fire Safety and Emergency Symbols
NFPA 204, Standard for Smoke and Heat Venting
NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
NFPA 291, Recommended Practice for *Fire Flow* Testing and Marking of Hydrants
NFPA 750, Standard on Water Mist Fire Protection Systems
NFPA 1963, Standard for Fire Hose Connections

SOCIETY OF AUTOMOTIVE ENGINEERS
https://www.sae.org/
SAE 1010, Steel Properties

UNDERWRITERS LABORATORY (UL)
http://www.ul.com/
UL 864, Standard for Control Units and Accessories for Fire Alarm Systems
UL 1283, Electromagnetic Interference Filters
UL 1449, Surge Protective Devices
UL 1479, Fire Tests of Through-Penetration Firestops

(2) Any fire codes the Department does not follow with justification for why it is waived

The Department's fire protection criteria do not allow for any provisions of national model codes or standards to be ignored. However, some DoD criteria represent modifications of national code provisions. Nearly all DoD modifications are equivalent to or surpass the minimum standard required by NFPA or ICC. Because DoD as a Federal agency does not carry private insurance, the criteria incorporate some underwriter's requirements that exceed minimum codes and standards to reduce risk and minimize potential loss. Other modifications are to reduce the sustainment cost of fire protection equipment and systems without compromising their reliability.

DoD's rationale for not employing general purpose PFE as extensively as defined by the national model codes is provided in the introductory overview section. In general, the Department considers the provision of general purpose PFE to represent an unnecessary expense that provides only negligible improvement to life safety and property protection in the vast majority of situations where automatic fire suppression systems are installed and occupants are expected to evacuate. While not fully consistent with national codes, this approach is nonetheless fully consistent with applicable Federal regulation.

Table 2 lists the provisions of codes and standards which DoD modifies.

Table 2: Fire Protection codes and standards adopted with modification by DoD

FACTORY MUTUAL GLOBAL (FM)
http://www.fmglobal.com/
FM Global Data Sheet 1-20, Protection Against Exterior Fire Exposure
FM Global Data Sheet 1-53, Anechoic Chambers
FM Global Data Sheet 5-4, Transformers
FM Global Data Sheet 7-91, Hydrogen
FM Global Data Sheet 8-33, Carousel Storage and Retrieval Systems
FM Global Data Sheet 8-34, Automatic Storage and Retrieval Systems

INTERNATIONAL CODE COUNCIL (ICC)
http://www.iccsafe.org
IBC, International Building Code
IRC, International Residential Code
IWUIC, International Wildland-Urban Interface Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
www.nfpa.org
NFPA 1, Fire Code
NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam
NFPA 12, Standard on Carbon Dioxide Extinguishing Systems
NFPA 13, Standard for the Installation of Sprinkler Systems
NFPA 14, Standard for the Installation of Standpipe and Hose Systems
NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 22, Standard for Water Tanks for Private Fire Protection
NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 30, Flammable and Combustible Liquids Code
NFPA 54, National Fuel Gas Code
NFPA 55, Compressed Gases and Cryogenic Fluids Code
NFPA 58, Liquefied Petroleum Gas Code
NFPA 70, National Electrical Code®
NFPA 72, National Fire Alarm and Signaling Code®
NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures
NFPA 88A, Standard for Parking Structures
NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems
NFPA 92, Standard for Smoke Control Systems
NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 99, Health Care Facilities Code
NFPA 101, Life Safety Code
NFPA 220, Standard on Types of Building Construction
NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 303, Fire Protection Standard for Marinas and Boatyards
NFPA 307, Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves
NFPA 312, Standard for Fire Protection of Vessels During Construction, Conversion, Repair, and Lay-Up
NFPA 400, Hazardous Materials Code
NFPA 409, Standard on Aircraft Hangars
NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response
NFPA 850, Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations
NFPA 909, Protection of Cultural Resource Properties - Museums, Libraries, and Places of Worship
NFPA 1141, Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas
NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting
NFPA 1144, Standard for Reducing Structural Ignition Hazards from Wildland Fire

Table 2: Fire Protection codes and standards adopted with modification by DoD
NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems

(3) The types of buildings that currently employ both sprinklers and extinguishers

DoD currently employs general-purpose PFE in addition to automatic sprinkler systems in only two general types of facilities: medical facilities and detention facilities. This is due to the limited mobility of the occupants that precludes their general evacuation. In these facilities, PFE is considered supplemental (not redundant) to automatic sprinkler systems to allow occupants to better defend-in-place as necessary.

DoD also employs special-purpose (not general-purpose) PFE in the following areas or facilities regardless of sprinkler protection:

- Electronics areas (computer rooms, telecom rooms)
- Metal working areas
- Commercial cooking areas
- Wheeled flight-line fire extinguishers along the flight-line or in hangars when these extinguishers are specifically identified in NFPA or Service-specific technical guidance.
- Elevator machine rooms
- Laboratory areas
- Animal housing areas or facilities
- Marine terminals, piers, and wharves
- Ammonium nitrate storage, use, and handling areas
- Areas for manufacturing, processing, and handling of combustible particulate solids
- Subterranean spaces

Furthermore, DoD provides general-purpose PFE in the following types of buildings that do not usually have sprinkler protection: single-story facilities of non-combustible (concrete and steel) construction that are less than 15,000 square feet, and single-story facilities of combustible construction that are less than 5,000 square feet.

(4) A list of high-risk types of buildings that would benefit from redundant fire suppression that include risks to personnel or egress concerns

As described previously, the Department considers only medical and detention facilities to warrant the provision of general purpose PFE in addition to automatic sprinkler protection on the basis of facility class or type. However, DoD criteria allow building occupants to require both general-purpose PFE and automatic sprinkler systems for other types of facilities on a case-by-case basis. The preeminent example of this is the Pentagon building, which is provisioned with general purpose PFE in addition to complete sprinkler protection.

(5) Specific to on-base housing, what, if any, fire extinguishers are supplied for cooking areas by either the Department or private contractors

There are no Department requirements for the provision of PFE in on-base housing, either government- owned or privatized. In general, DoD seeks to avoid the perception that occupants should remain in a fire situation to suppress the fire. Although housing privatization project companies which own and operate on-base housing may supply PFE in accordance with local codes or on their own initiative, DoD does not track this information.

(6) Recommendations, including a timeline, on how to implement redundant fire suppression mechanisms and what changes to the UFC would be required.

As described previously, DoD has revised its criteria in response to section 2861 of Public Law 116-92 to fully align with NFPA requirements regarding installation of general-purpose PFE. NFPA requires broader provision of general-purpose PFE than did the previous DoD criteria, and this will immediately impact new construction and major renovation projects that fall under the expanded requirement. However, the Department has not yet formulated any plans to retrofit existing facilities that are impacted by the expanded requirement for general-purpose PFE, and any such plans will be subject to perceived risks and funding priorities.

Beyond the new expansion of general-purpose PFE requirements, the Department has no plans or recommendations for provision of additional general-purpose PFE or adoption of more expansive requirements for redundant fire suppression in Unified Facilities Criteria.