

# **TRI-SERVICE FIRE PROTECTION ENGINEERING WORKING GROUP (TSFPEWG) GUIDE**

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## **AIR FORCE FIRE PROTECTION ENGINEERING CRITERIA AND TECHNICAL GUIDANCE FOR MISSION CONTINUITY OF ELECTRONIC, INFORMATION TECHNOLOGY, AND TELECOMMUNICATIONS EQUIPMENT INSTALLATIONS**



**TRI-SERVICE FIRE PROTECTION ENGINEERING WORKING GROUP GUIDE  
(TSFPEWG G)**

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**This TSFPEWG Guide supersedes Air Force ETL 01-18, *Fire Protection Engineering Criteria – Electronic Equipment Installations*, dated 24 October 2001**

## **FOREWORD**

This Tri-Service Fire Protection Engineering Working Group Guide supplements guidance found in other Unified Facilities Criteria, Unified Facilities Guide Specifications, Defense Logistics Agency Specifications, and Service-specific publications. All construction outside of the United States is 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 most stringent of the TSPWG Guide, the SOFA, the HNFA, and the BIA, as applicable. The information in this guide is referenced in technical publications found on the Whole Building Design Guide. It is not intended to take the place of Service-specific doctrine, technical orders (TOs), field manuals, technical manuals, handbooks, Tactic Techniques or Procedures (TTPs), or contract specifications but should be used along with these to help ensure electronic equipment protection features meet mission requirements.

TSPWG Guides 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, maintenance, repair, or operations. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and the Air Force Civil Engineer Center (AFCEC) are responsible for administration of this document. Technical content of this TSPPEWG Guide is the responsibility of AFCEC/COSM, Fire Protection Engineering Team. Defense agencies should contact the preparing activity for document interpretation at [afcec.rbc@us.af.mil](mailto:afcec.rbc@us.af.mil). Send recommended changes with supporting rationale to the respective Service TSPPEWG member, AFCEC/COSM, 139 Barnes Drive, Suite 1, Tyndall AFB, FL 32403-5319, [afcec.rbc@us.af.mil](mailto:afcec.rbc@us.af.mil).

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**TRI-SERVICE FIRE PROTECTION ENGINEERING WORKING GROUP GUIDE  
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NEW SUMMARY SHEET**

**Document:** TSFPEWG G 3-600-01.01-18, *Air Force Fire Protection Engineering Criteria and Technical Guidance for Mission Continuity of Electronic, Information Technology, and Telecommunications Equipment Installations*

**Superseding:** ETL 01-18, *Fire Protection Engineering Criteria – Electronic Equipment Installations*, 24 October 2001

**Description:** This guide provides detailed fire protection engineering guidance for protecting electronic equipment in facilities.

**Reasons for Document:** \1\ The detailed technical guidance in this guide supplements the general criteria in UFC 3-600-01, *Fire Protection Engineering for Facilities*, paragraph 4-12, “Electronic Equipment Areas.” /1/ This guide provides a process for determining the mission continuity importance of electronic equipment. \1\ This guide provides detailed recommended protection features for Air Force facilities containing electronic equipment, including, but not limited to, command and control, flight control, weapons control, missile control, intelligence, data, and telecommunications. /1/

**Impact:** There is no cost impact.

**Unification Issues:** This guide has been issued for immediate use by the Air Force to replace ETL 01-18. The guide brings the Air Force into unified compliance with UFC 3-600-01, paragraph 4-12, “Electronic Equipment Areas.” Other Services and DoD agencies may review this guide to determine applicability to their activities.

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## CHAPTER 1 INTRODUCTION

### 1-1 PURPOSE AND SCOPE.

**1-1.1** \1\ This guide details recommended supplemental protection features for Air Force facilities containing electronic equipment, including, but not limited to, command and control, flight control, weapons control, missile control, intelligence, data, and telecommunications. /1/ It applies to all new construction, renovation, modernization, and rehabilitation of facilities for all electronic equipment installations. Facilities that contain mission-essential and mission-critical information technology equipment are provided with gradually increasing layers of fire protection features to provide the greatest opportunity to protect the equipment and retain mission continuity.

**1-1.2** \1\ This guidance supplements the general criteria in UFC 3-600-01, *Fire Protection Engineering for Facilities - Electronic Equipment Areas*. /1/ It amends Chapters 2 through 9 of ANSI/TIA-942-B, *Telecommunications Infrastructure Standard for Data Centers*, related to fire protection.

### 1-2 APPLICABILITY.

\1\ This guide applies to the Air Force and provides detailed recommendations to supplement the requirements of UFC 3-600-01, paragraph 4-12, "Electronic Equipment Areas." /1/ Other Services and DoD agencies should consult with the Service Authority Having Jurisdiction (AHJ) identified in UFC 3-600-01, paragraph 2-12, "Authority Having Jurisdiction (AHJ)," before using this guide.

### 1-3 GENERAL BUILDING REQUIREMENTS.

UFC 1-200-01, *DoD Building Code*, provides applicability of model building codes and government-unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. \1\ Use this guide to supplement UFC 1-200-01, UFC 3-600-01, and the referenced UFCs and government criteria herein. /1/

### 1-4 COMMERCIAL INDUSTRY PRACTICES.

This guide is based on current North American and European commercial industry practices. American National Standards Institute (ANSI), European Union (EU), and numerous private standards were reviewed for best practices. The single critical lesson found throughout the standards is that all elements (structure, power, cooling, security, fire, operations, hardware and software) of the infrastructure envelope function in concert or the desired reliability will not be achieved. Regardless of the financial investment in any individual element, the element having the lowest reliability will establish the overall reliability of the whole information technology system.

## 1-5 CLASSIFICATION OF EQUIPMENT.

Information technology electronic equipment, for the purpose of DoD fire protection, is divided into incidental equipment and two classifications of mission equipment. DoDI 8580.1, *Information Assurance (IA) in the Defense Acquisition System*, designates the two classes of mission information technology equipment as “mission-essential” and “mission-critical,” based on guidance in 40 USC § 1101.

**1-5.1** Incidental equipment includes the general equipment typically found in offices, including desktop and laptop computers and associated peripherals. Incidental equipment often includes local servers and switches; such equipment may have dedicated cooling or limited power conditioning continuation interfacing equipment (PCCIE) capability. It includes general-use phones and phone switching equipment. Incidental equipment is typically not provided with dedicated redundant power, cooling, and other infrastructure features. The presence of incidental equipment does not generate a requirement for any unique or additional fire protection features other than what is required by UFC 3-600-01 for basic facility/occupancy. Installation of new incidental equipment in an existing facility does not generate new facility requirements.

**1-5.2** Mission-essential equipment and mission-critical equipment are identified in DoDI 8580.1 based on the criteria in 40 USC § 1101, *Definitions*, and 44 USC § 3502, *Planned Public Works*. DoDI 8580.1 further differentiates mission-essential and mission-critical based on mission impact by assigning a mission assurance category (MAC): MAC I, MAC II, and MAC III. MAC I represents the highest required reliability/availability and MAC III represents the least required reliability/availability. All electronic equipment, in accordance with DoDI 8580.1, is formally assigned both a mission identification classification and a MAC category.

**1-5.2.1** System program managers or users provide the mission identification classification and the MAC category to facility engineers to ensure the facility infrastructure, including fire protection features, meets the mission assurance goals.

**1-5.2.2** The equipment with the highest mission identification classification and highest MAC category establishes the fire protection requirements within an area. All equipment in that area, including incidental equipment and lower category MAC equipment, is protected at the higher fire protection requirements required for that area.

**1-5.2.3** This guide establishes three increasing levels of fire protection features to provide appropriate fire protection for all classifications and categories of mission equipment. These fire protection levels are identified as: (1) Mission-Essential/MAC III; (2 and 3) Mission-Essential/MAC II and Mission-Critical/MAC II; and (4) Mission-Critical/MAC I. Each successive level of fire protection incorporates and builds upon the preceding level.

**1-5.3** In the absence of a formally assigned mission identification and MAC category in accordance with DoDI 8580.1, it is the mission program executive’s responsibility to assign an appropriate mission identification and MAC category to ensure mission continuity.

**1-5.4** Equipment without a mission identification classification and MAC category is considered incidental equipment. No additional protection for the electronic equipment is needed beyond the basic requirement for the occupancy as indicated in UFC 3-600-01.

Appendix A is a guide to estimate the mission identification classification and MAC category in the absence of formally assigned ratings. There will be situations where legacy equipment was acquired before mission identification classification and MAC category were assigned. In these cases, it will be necessary to reverse-engineer the appropriate ratings. The process discussed in Appendix A will help users determine approximate mission identification and MAC ratings based on the features provided.

**1-6 ACREDITED/CERTIFIED DESIGNS AND FACILITIES.**

Designs and facilities which have been certified by an accredited independent third party as complying with a specific ANSI/TIA-942-B rating level will be considered as compliant with UFC 3-600-01 and this guide for the appropriated mission/MAC categories in paragraph 1-5.2.3.

**1-7 REFERENCES.**

Appendix C contains a list of references used in this guide. The publication date of the code or standard is not included in this guide. Unless otherwise specified, the most recent edition of the referenced publication applies.

**1-8 GLOSSARY.**

Appendix D contains acronyms, abbreviations, and terms.

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**CHAPTER 2 PROTECTION FOR MISSION-ESSENTIAL/MAC III****2-1 OVERVIEW.**

Facilities containing areas or rooms with mission-essential/MAC III equipment (i.e., least required reliability/availability) conform to the ANSI/TIA-942-B Rated 1 fire protection requirement, except as indicated in this chapter. The guidance in this chapter modifies the ANSI/TIA-942-B Rated 1 criteria to meet DoD requirements; however, if conflicts exist, the guidance in this chapter takes precedence over ANSI/TIA-942-B.

**2-2 FACILITY CONSTRUCTION.**

**2-2.1** Information technology equipment areas and rooms are separated from adjacent spaces/occupancies within the facility. Technical spaces and infrastructure support spaces are separated by fire-resistance rated wall and floor/ceiling assemblies as specified in UFC 3-600-01 and this guide. DoD and commercial data confirm fires that damage information technology equipment often begin in building areas outside of the information technology equipment space. Fire and smoke can easily spread to the information technology equipment space if these areas are not compartmentalized by fire-resistance rated walls and floors.

**2-2.2** Avoid locating information technology equipment in rooms directly above, below, or adjacent to areas identified in NFPA 101, *Life Safety Code*<sup>®</sup>, Section 38.3.2, "Protection from Hazards." Avoid locating information technology equipment below restrooms, shower rooms, food preparation areas, sculleries, and mechanical rooms.

**2-2.2.1** Common walls between MAC III information technology equipment and infrastructure support spaces (including spaces with only incidental equipment) are rated at no less than 1-hour fire resistance.

**2-2.2.2** Common walls between redundant MAC III information technology equipment are rated at no less than 1-hour fire resistance.

**2-2.2.3** Common walls between MAC III information technology equipment areas and adjacent support room(s) of MAC III level are not required to be rated unless the adjacent areas provide mission redundancy.

**2-2.2.4** Common walls between MAC III areas and MAC II areas are rated at no less than 1-hour fire resistance.

**2-2.2.5** Common walls between MAC III areas and MAC I areas are rated at no less than 2-hour fire resistance.

**2-2.3** Fire-resistance rated wall assemblies must comply with the requirements of UFC 3-600-01 for fire-resistive wall assemblies. Fire-resistive walls extend from the structural floor to the structural ceiling/roof above. Opening protectives in fire-resistance rated construction are provided in accordance with UFC 3-600-01 and as indicated in the following paragraphs.

**2-2.3.1** Where rated fire or smoke doors are provided, they are self- or automatic closing.

**2-2.3.2** Where rated shutters are provided, they are automatic closing.

**2-2.3.3** Openings for air-handling ductwork or air movement in the fire-resistance rated construction provided for the information technology equipment areas and rooms are provided with automatic fire and smoke dampers. Dampers are provided in accordance with NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*. The NFPA 90A/*International Building Code (IBC)/International Mechanical Code (IMC)* allowance for omitting fire and smoke dampers in 1-hour fire rated construction when the building is fully sprinklered does not apply to 1-hour fire rated construction enclosing technical areas. Automatic resetting dampers are required.

**2-2.3.4** All other penetrations, such as piping, conduit, and wiring that pass through fire-resistance rated construction, are protected with a fire-stopping material or system with at least the same hourly rating of the construction penetrated. The fire-stopping material or system is listed by Underwriters Laboratories (UL), FM Global, or a nationally recognized testing laboratory (NRTL).

## **2-3 INTERIOR FINISH.**

**2-3.1** Interior wall and ceiling finishes have a Class A or B rating as defined in NFPA 101.

**2-3.2** Interior floor finishes have a Class I or II rating as defined in NFPA 101.

## **2-4 FIRE ALARM.**

**2-4.1** Provide a fully addressable voice notification fire alarm control unit. The unit is capable of providing multiple different notification messages, and, in those facilities with multiple separated information technology areas, capable of providing unique specific messages to specific areas. The unit is capable of providing paging and emergency action mass notification messaging as detailed in UFC 3-600-01 and UFC 4-021-01, *Design and O&M: Mass Notification Systems*. UFC 3-600-01, Appendix E, includes recommended voice notification messages and Appendix B of this guide contains additional recommended voice notification messages adapted to the guidance herein.

**2-4.2** Fire alarm notification signals (including trouble and supervisory signals) report to a continuously occupied location and to the installation fire alarm receiving location.

**2-4.3** The integrity of automatic shutdown device controls is supervised by the facility fire alarm system.

**2-4.4** Shielded enclosures or sensitive compartmented information facilities (SCIF) rooms are provided with electronic isolation or other countermeasures for

electronic emanations from the fire alarm system as detailed in UFC 4-010-05, *Sensitive Compartmented Information Facilities Planning, Design, and Construction*.

**2-4.5** The fire alarm and subcomponents are powered from the power supply for fire protection systems as detailed in UFC 3-520-01, *Interior Electrical Systems*.

## **2-5 SPRINKLER PROTECTION.**

**2-5.1** Information technology equipment areas and rooms containing mission-essential or mission-critical equipment are located in facilities protected with complete coverage throughout by an automatic sprinkler system designed and constructed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and UFC 3-600-01. Halogenated agents, carbon dioxide, dry-pipe sprinklers, and wet/dry chemical fire suppression systems must not be installed in information technology/electronics equipment areas or rooms.

**2-5.2** A pre-action water sprinkler system or a clean agent gaseous fire suppression system may be used as an alternative to the wet-pipe sprinkler system for high-voltage electrical substation spaces and control/relay rooms located within the facility with the approval of the component fire protection engineer (CFPE) (AFCEC/COSM).

**Note:** A pre-action water sprinkler system may be used as an alternative to a wet-pipe sprinkler system for mission-critical/MAC I electronic equipment spaces. (See Chapter 4.)

### **2-5.3 Sprinkler Protection Minimum Additional Features.**

**2-5.3.1** The sprinkler system serving the information technology equipment area or room sprinklers are supplied by a separate sprinkler riser or supplied as a separate supervised zone with a dedicated water flow detection device. The riser or zone control valves are located outside of the space and readily accessible to emergency responders. Sprinkler activation and supervisory notifications are distinctly indicated at the fire alarm receiving location.

**2-5.3.2** Listed quick-response sprinklers are installed throughout the information technology equipment area and room, including areas with data storage.

**2-5.3.3** In all smooth ceiling areas, install fully concealed sprinklers. In areas with open ceilings or where sprinklers and piping are exposed, install protected sprinkler heads, sprinklers with head guards/cages, or institutional-type sprinkler heads.

**2-5.3.4** Activation of the automatic sprinkler system within the information technology equipment room automatically disconnects power to the electronic equipment systems. Only activation of the automatic sprinkler is allowed to automatically disconnect power to the electronic equipment.

**2-5.3.5** Activation of the automatic sprinkler system within an information technology equipment room should not shut down equipment cooling systems in the

affected information technology equipment room (i.e., self-contained cooling systems inside that room or systems dedicated to supplying only that room).

**2-5.3.6** If a ceiling is installed as a portion of a hot-cold aisle containment system, sprinklers are installed beneath that ceiling.

## 2-6 FIRE DETECTION.

**2-6.1** Smoke detection is provided. The fire detection features are provided and installed in accordance with NFPA 72, *National Fire Alarm and Signaling Code*, and UFC 3-600-01.

**2-6.2** Activation of a single smoke detector causes visual and audible notifications within the information technology equipment area or room and transmits a fire alarm notification to the fire alarm receiving center (e.g., fire station, central alarm station).

**2-6.3** Activation of a single smoke detector within the information technology room should not initiate a general building fire evacuation alarm.

**Note:** This is the time for operator investigation and action to determine if there is an actual mission continuity risk.

**2-6.4** Activation of a second smoke detector activates the smoke exhaust system (except as otherwise specified in this guide) within the information technology equipment room/space and initiates a general building fire evacuation alarm.

## 2-7 LEAK DETECTION.

**2-7.1** FM Global Loss Prevention Data Sheet 5-32, *Electronic Data Processing Systems*, and ANSI/TIA-942-B recognize the effectiveness of providing a way to manage water within an information technology equipment room. Providing drainage in the information technology equipment room can also help protect equipment. The addition of leak detection can be a key factor in maintaining uninterrupted operation. Provide water/moisture sensors in the following locations:

- Information technology equipment room
  - Near heating, ventilation, air-conditioning (HVAC) equipment using chilled or heated liquids for heat transfer
  - Near liquid equipment cooling systems
  - Above the ceiling when there is overhead liquid utility distribution, including chilled water, utility water, sanitary collection piping, sprinkler water, refrigerants, and roof and floor drains



**Note:** Water/moisture sensors are not needed if there is no ceiling (i.e., the overhead is open to the underside of the floor/roof assembly above).

- All raised floor or subfloor areas

**2-7.2** The water/moisture sensors provide detection indication to the system operators of a potential mission continuity risk. Water/moisture sensors may be part of the environmental and utility monitoring systems. In the absence of an environmental and utility monitoring system, a separate water/moisture sensing system may be supervised by the fire alarm system, but must still provide a distinct indication to the system operators and fire alarm center and not activate a general evacuation signal within the building.

## 2-8 **EQUIPMENT COOLING SYSTEMS.**

**2-8.1** Forced-air cooling systems typically use traditional HVAC equipment or computer room air conditioning (CRAC) units to move large volumes of low-temperature air within the information technology equipment room and through the information technology equipment. Section 2-8 does not apply to forced-air fans located within and integral to the equipment racks. Provide the following features:

**2-8.1.1.** Smoke detectors listed for use in air distribution systems are installed in all air-handling systems providing equipment cooling regardless of the volume of air moving through the system. Smoke detectors in air handler/air-handling systems typically will be part of the environmental and utility monitoring systems controls. In the absence of such a system, the smoke detectors may be supervised by the fire alarm system but still provide a distinct indication to the system operators in the room, to a continuously occupied location, and to the installation fire alarm receiving location.

**2-8.1.2** Automatic smoke and fire dampers are supervised by the facility fire alarm system in accordance with NFPA 72.

**2-8.1.3** Air-handlers (individual units) providing equipment cooling will automatically shut down upon activation of the smoke detector in the air-handler as required in either NFPA 90A or the IMC. All associated fire and smoke dampers close when the air-handler automatically shuts down. Dampers automatically restore to their normal operating position when the air-handler is re-energized. Smoke detector shutdown of an air-handler should not initiate a fire evacuation alarm.

**2-8.1.4** Interlock air-handling systems will disconnect power to the information technology electronic equipment systems upon loss of the minimum cooling capacity required by the information technology electronic equipment.

**Note:** Loss of equipment cooling can generate ceiling and room temperatures exceeding even those temperatures expected in a fire. This can result in significant electronic equipment damage and also lead to the activation of gaseous fire suppression systems or automatic sprinkler systems.

**2-8.1.5** Air-handling systems providing equipment cooling do not automatically shut down upon activation of the fire sprinkler system within the information technology equipment room.

**2-8.1.6** Air filters for use in air-conditioning systems have a Class 1 rating in accordance with UL 900, *Standard for Air Filter Units*.

**2-8.2** Other equipment cooling systems and temperature control features such as chilled water, refrigerants, heat exchange fluids, compressed air, inert gases, drop curtains, and retractable ceilings are evolving technologies to address the exponentially increasing thermal loads generated in information technology equipment. Consult AFCEC/CO prior to implementing these technologies in new facilities or modification projects supporting mission-essential and mission-critical information technology equipment.

## 2-9 **TECHNICAL POWER DISCONNECT.**

Technical power disconnects are provided for all electronic equipment in the information technology room. The disconnect method may be for simultaneous disconnection of all electronic equipment in the room or by individual disconnection of zones within the room/space. (See NFPA 70, *National Electrical Code*<sup>®</sup> [NEC], Article 645.10.)

**2-9.1** Technical power disconnection means comply with NFPA 70, Article 645.10(B) for critical operations data systems in all continuously occupied applications. Procedures in NFPA 70, Article 645.10(B)(1), are permanently posted at the power disconnect location, at the system operator's location, and at the primary egress point from the space. A copy of procedures is provided to the responsible fire emergency service organization. Procedures are jointly exercised at a mutually agreed time, but not less than annually.

**2-9.2** Technical power disconnecting means and location comply with NFPA 70, Article 645.10(A), for those facilities not continuously occupied.

**2-9.2.1** The remote disconnect is at a jointly approved location readily accessible to fire emergency service responders. The information technology equipment operators and the responsible fire emergency service organization jointly approve the location.

**2-9.2.2** Remote disconnect switches are double-action style and fully enclosed within tamper covers. Key-operated remote disconnect switches using an approved emergency key control system are allowed.

## 2-10 **EQUIPMENT AND UTILITY ARRANGEMENTS.**

Do not locate utilities serving areas other than the information technology rooms above the information technology rooms, including heating and cooling systems, hot-cold water distribution, waste collection piping, roof drains, fire sprinkler feed, and cross mains. Only the utilities directly serving the information technology rooms are permitted to pass above the space.

**2-11 CABLE AND WIRING.**

**2-11.1** Power supply wiring, equipment interconnecting wiring, and grounding of information technology equipment comply with NFPA 70, Article 645. Only non-combustible conduit as specified in NFPA 70 is permitted within information technology equipment rooms.

**2-11.2** Communications and interconnecting cable and wiring between components in the information technology equipment room and other areas of the facility or other facilities comply with NFPA 70, Articles 725, 760, 800, and 830. Listing markings are visible on the cable jacket/wiring insulation.

**2-11.3** Power and communication cabling installed in spaces above ceilings or below raised floors are plenum rated or installed in non-combustible conduit in accordance with NFPA 70, Article 645.

**2-11.4** Renovation, modernization, or rehabilitation projects for existing facilities that contain non-plenum rated cable not enclosed in non-combustible conduit or that contain combustible conduit:

**2-11.4.1** Document the condition as a fire safety deficiency in accordance with AFI 32-10141, *Programming and Planning Fire Protection Safety Deficiency Correction Projects*.

**2-11.4.2** Develop a corrective action plan to replace all non-plenum rated cable and combustible conduit within a five-year period; or

**2-11.4.3** Install a clean agent fire suppression system provided in accordance with paragraph 4-3. Where a cable or conduit deficiency is solely under a raised floor, it is acceptable to provide the clean agent fire suppression system only below the raised floor. Where a cable or conduit deficiency is not solely under a raised floor, the clean agent fire suppression system protects the entire room/space, including above a suspended ceiling and below a raised floor.

**2-12 RAISED FLOORS.**

Raised floor systems, including structural supports and decking, are made of noncombustible materials.

**2-13 SMOKE EXHAUST SYSTEM.**

**2-13.1** Provide a smoke exhaust system to remove smoke from the information technology equipment room to the exterior of the facility unless the room has a door opening directly to the outside. Rooms provided with doors opening directly to the outside may utilize pre-positioned portable air fans in lieu of a permanently installed smoke exhaust system meeting the guidance of this chapter. The smoke exhaust system is designed to minimize damage to the information technology equipment from corrosive action by smoke and other byproducts of the fire.

**2-13.2** Exhaust is sized to provide a minimum smoke layer interface height or minimum smoke concentration in accordance with NFPA 92B, *Standard for Smoke Management Systems in Malls, Atria, and Large Spaces*. Make-up air for the exhaust is sized less than the exhaust in order to limit smoke spread to adjacent spaces in accordance with the minimum pressure differential specified by NFPA 92A, *Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences* (12 pascals [0.05 inch of water, gauge]) with respect to adjacent spaces).

**2-13.3** The smoke exhaust systems have a dedicated exhaust separate from the normal air-handling equipment provided for the information technology equipment room. Make-up air supply may be provided via dedicated equipment or the normal air-handling equipment, with make-up air being brought in at a height lower than the design smoke layer interface.

**2-13.4** The smoke exhaust system is controlled by the facility fire alarm system. Activation of the smoke exhaust system occurs on activation of two or more smoke detectors within the information technology electronic equipment space, sprinkler system activation within the information technology electronic equipment space, or by manual exhaust system activation at a location outside the information technology room. When the information technology electronic equipment space is provided with a clean agent supplemental fire suppression system, activation of the smoke exhaust system is by manual means only. Manual smoke evacuation control stations are distinctively different from fire alarm initiation stations (e.g., a pull station marked with "FIRE"). The word "FIRE" does not appear on the manual smoke evacuation control station. Manual smoke evacuation control stations are fully enclosed within an approved tamper cover. Key-operated remote switches using an approved emergency key control system are permitted.

**2-13.4.1** The smoke exhaust system includes these features:

**2-13.4.1.1** Automatic smoke and fire dampers isolate the information technology equipment area and room from the remainder of the facility.

**2-13.4.1.2** The system is manually deactivated using a key-operated switch at a location outside the information technology equipment room.

**2-13.4.1.3** The system is powered from the power supply for fire protection systems as detailed in UFC 3-520-01.

## **2-14 FIRE EXTINGUISHERS.**

**2-14.1** Listed Class C carbon dioxide, clean agent, or water mist fire extinguishers located in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*, are provided within the information technology equipment area room(s). Portable fire extinguishers for the rest of the facility comply with UFC 3-600-01.

**2-14.2** Listed Class A extinguishers with a minimum rating of “2-A,” located in accordance with NFPA 10, are provided where ordinary combustibles are located within the information technology equipment rooms.

**2-14.3** Extinguishers with multiple ratings that include “C” and “2-A” at a minimum are acceptable.

**2-14.4** In OCONUS locations, host nation listed extinguishers with equivalent ratings are allowed.

**2-14.5** Dry and wet chemical agent fire extinguishers are prohibited.

**2-14.6** Listed/approved wall-mounted cabinets are provided for storage of and ready access to the fire extinguishers. OCONUS host nation listed/approved stands/mounts are permitted in the absence of host nation wall cabinets.

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## CHAPTER 3 PROTECTION FOR MISSION-ESSENTIAL/MAC II AND MISSION-CRITICAL/MAC II SPACES

### 3-1 OVERVIEW.

Facilities containing information technology equipment areas or rooms with mission-essential/MAC II or mission-critical/MAC II equipment conform to the ANSI/TIA-942-B 2/3 Rated fire protection except as indicated in this chapter. The guidance in this chapter is intended to modify the ANSI/TIA-942-B 2/3 Rated criteria to meet DoD mission needs; however, if conflicts exist, the guidance in this chapter take precedence over ANSI/TIA-942-B.

Follow the guidance in Chapter 2 as modified by this chapter.

### 3-2 FACILITY CONSTRUCTION.

Mission-essential/MAC II and mission-critical/MAC II information technology equipment is located in buildings of non-combustible construction (IBC Type I or Type II construction).

**3-2.1** Common walls between MAC II information technology equipment and infrastructure support spaces (including spaces with only incidental equipment) are rated at no less than 1-hour fire resistance.

**3-2.2.** Common walls between redundant MAC II information technology equipment are rated at no less than 1-hour fire resistance.

**3-2.3** Common walls between MAC II information technology equipment areas and adjacent support room(s) of the same MAC II level are rated at no less than 1-hour fire resistance.

**3-2.4** Common walls between MAC II areas and MAC I levels are rated at no less than 2-hour fire resistance.

### 3-3 FIRE DETECTION.

A very early warning smoke detection system complying with NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*, and UFC 3-600-01 is provided for information technology equipment areas and rooms. The very early warning smoke detection system is either an air aspirating-type, very early warning detection system or an intelligent high-sensitivity, photoelectric-type, spot-detection system. The system is provided and installed in accordance with NFPA 72 and UFC 3-600-01.

#### 3-3.1 Smoke Detection System Threshold Levels.

The smoke detection system has a minimum of two programmable detection threshold levels and is provided within the sensitivity limits in addition to normal trouble and

supervisory signals. The detection threshold levels are field-selectable within the sensitivity limits. The threshold levels for the installed detection systems are as follows:

**3-3.1.1 Alert Sensitivity.**

Alert sensitivity is no greater than 0.2 percent obscuration per foot (0.62 percent obscuration per meter). This is the more-sensitive setting, with the detector not activating at smoke levels below this sensitivity level.

**3-3.1.2 Alarm Sensitivity.**

Alarm sensitivity is no greater than 1.0 percent obscuration per foot (3.1 percent obscuration per meter). This is the less-sensitive setting, with the detector actuating an alarm condition at all smoke levels at or above this sensitivity level.

**3-3.1.3 Additional Detection Levels.**

The detection system may provide additional detection levels within its designed operating range to initiate any actions. The user may use such to activate notifications in addition to those listed in paragraph 3-3.3.

**3-3.2 Smoke Detector Locations.**

Provide and locate smoke detection air sampling ports or high-sensitivity spot smoke detection in accordance with the manufacturer's listing and NFPA 76.

**3-3.2.1 Ceilings.**

Provide smoke detection at the ceiling level throughout the information technology equipment area and room.

**3-3.2.1.1 Coverage.**

Maximum coverage area of each air-sampling port or high-sensitivity spot detector will not exceed 200 square feet (18.6 square meters).

**3-3.2.1.2 Spacing.**

Spacing is adjusted for areas subject to return air flow, areas subject to maximum air flow from ventilation systems, aisle containment systems, and for special conditions in the room in accordance with the manufacturer's listing.

**3-3.2.2 Raised Floors.**

Smoke detection is not needed below raised floors when cable and wiring below the raised floors meets the guidance in paragraph 2-11 and the space below the raised floor is not utilized by the ventilation system to circulate air to or from rooms of the facility other than the information technology equipment room.



### **3-3.2.3 Suspended Ceilings.**

Smoke detection is not needed above suspended ceilings when cable and wiring above the suspended ceilings meet the guidance in paragraph 2-11 and the space above the suspended ceiling is not utilized by the ventilation system to circulate air to or from rooms of the facility other than the information technology equipment room.

### **3-3.3 Threshold Actions (Occupied Facilities).**

At the smoke detection threshold levels, the following actions occur:

**3-3.3.1** The Alert detection level activates visual and audible notifications within the information technology equipment area or room. It is clear to the information technology equipment operator the location/area within the space where the smoke was detected without having to leave the operator's normal work area. The information is delivered in a manner the operator can understand to begin immediate action to correct the abnormality. The intent is to notify the system operators of a potential urgent condition while man-in-the-loop actions can mitigate or correct the condition.

**Note:** Activation of the Alert detection level should not initiate a general building evacuation alarm.

**3-3.3.2** The Alarm detection level transmits an alarm to the fire alarm receiving center (e.g., fire station, central alarm station); activates distinctly different notifications in the information technology area; initiates a general building evacuation alarm; and activates the smoke exhaust system (except as otherwise indicated in this guide).

**3-3.3.3** If an intermediate detection level between the Alert and Alarm detection levels is utilized, the intermediate detection level should activate visual and audible notifications in a continuously occupied location (e.g., security office, central office, command function) and activate distinctly different notifications in the information technology equipment area. The intent of the intermediate detection level notification to the continuously occupied location is to begin a plan to advise management of a deteriorating condition within the information technology space. Activation of an automated notification system in addition to or in the absence of a continuously occupied location is recommended.

### **3-3.4 Threshold Actions (Unoccupied Facilities).**

For unoccupied information technology facilities, the following actions occur at the smoke detection levels. These changes will not fully compensate for the absence of personnel in the facility that would ensure mission availability/reliability, but the changes will help minimize equipment losses.

**3-3.4.1** The Alert detection level causes visual and audible notifications within the information technology equipment area or room to activate; transmits a notification signal to a continuously occupied location (e.g., security office, central office, command function); and transmits a trouble signal to the fire alarm receiving center. The intent of

the notification to the continuously occupied location is to initiate action to alert management of a deteriorating condition within the information technology space.

**3-3.4.2** The Alarm detection level transmits an alarm to the fire alarm receiving center (e.g., fire station, central alarm station); activates visual and audible notifications in the continuously occupied location; activates distinctly different notifications in the information technology area; and activates the smoke exhaust system (except as otherwise indicated in this guide). The Alarm detection level also initiates a general building evacuation alarm in those facilities required by UFC 3-600-01 to provide a fire alarm evacuation system.

## CHAPTER 4 PROTECTION FOR MISSION-CRITICAL/MAC I ELECTRONIC EQUIPMENT SPACES

### 4-1 OVERVIEW.

Facilities containing areas or rooms with mission-critical/MAC I equipment conform to the fire protection requirements of ANSI/TIA-942-B for 3/4 Rated locations except as indicated in this chapter. This chapter modifies the ANSI/TIA-942-B 3/4 Rated criteria to meet DoD mission needs; however, if conflicts exist, this chapter take precedence.

Follow the guidance in Chapter 2 and Chapter 3 as modified by this chapter.

### 4-2 FACILITY CONSTRUCTION.

**4-2.1** Mission-critical/MAC I information technology equipment is located in buildings of non-combustible construction (IBC Type I construction).

**4-2.1.1** Common walls between MAC I information technology equipment and infrastructure support spaces (including spaces with only incidental equipment) are rated at no less than 2-hour fire resistance.

**4-2.1.2** Common walls between redundant MAC I information technology equipment are rated at no less than 2-hour fire resistance.

**4-2.1.3** Common wall(s) between MAC I information technology equipment areas and adjacent support room(s) of the same MAC I rating are not less than 1-hour fire resistance unless the adjacent areas provide mission redundancy.

### 4-3 CLEAN AGENT SUPPLEMENTAL FIRE SUPPRESSION.

**4-3.1** In addition to the fire suppression features in Chapter 2 and Chapter 3, install a clean agent supplemental fire suppression system for the information technology equipment room(s). The system and clean agent comply with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*. Procurement of the clean agent complies with amendments to 81 FR 30429, *Federal Acquisition Regulation: High Global Warming Potential Hydrofluorocarbons*. The clean agent fire suppression system is not an alternative to any of the minimum protective features.

**4-3.1.1** NFPA 2001 includes a number of different chemical agents, some of which have been commercialized with listed delivery systems and others allowed by the standard but not commercialized and therefore do not have listed delivery systems. Only clean agents with listed delivery systems are used.

**4-3.1.2** Some clean fire suppression agents in NFPA 2001 have production or use phase-out dates established by regulatory bodies for environmental concerns with ozone-depletion and/or greenhouse gas accumulation. No new systems using clean agents with an established production or use phase-out date are installed. Existing systems using a clean agent with a production or use phase-out date may be

maintained, repaired, re-serviced, modernized, renovated, upgraded, or expanded within the limits of the production or phase-out regulations and the service life of the existing components.

**4-3.1.3** The clean agent supplemental fire suppression systems protect the entire room/space, including above a suspended ceiling and below a raised floor and within hot/cold aisle containments.

**4-3.1.4** A separate listed releasing control unit controls the system. The releasing unit reports activation, trouble, and supervisory indication through the facility fire alarm control unit.

**4-3.1.5** Manual system activation of the clean agent supplemental fire suppression system is available at manual stations located adjacent to each required egress door. Clean agent manual activation stations are located inside the room near the egress door but on the opposite side of the door from any manual fire alarm initiation stations (e.g., a pull station marked with "FIRE"). This will minimize the potential of an occupant inadvertently activating the clean agent fire supplemental fire suppression system when they intended only to initiate the building fire alarm.

**Note:** Manual fire alarm pull stations are not mandated inside information technology rooms unless the room has a door that exits directly to the outside of the building.

**4-3.1.5.1** When there is an operator's control location within the information technology system room, a clean agent manual system activation station is provided within 5 feet (1.5 meters) and accessible from the operator's control location.

**4-3.1.5.2** A clean agent manual system activation station may be provided outside the protected area if the location is under the exclusive control of the mission operator. Key-operated remote clean agent system activation stations using approved emergency key control systems are allowed.

**4-3.1.5.3** Clean agent manual activation stations are distinctively different from manual fire alarm initiation stations and the word "FIRE" must not appear on the clean agent manual activation stations.

**4-3.1.5.4** Clean agent manual activation stations are fully enclosed within an approved tamper cover.

**4-3.1.6** Clean agent automatic system activation is initiated by the Alarm detection level of the very early warning smoke detection system. (See paragraph 3-3.)

**4-3.1.7** The space below a raised floor is always included in the discharge volume unless a separate system is designed for the raised floor space. Only specify agent discharge piping below the raised floor when indicated in NFPA 2001.

**4-3.1.8** Clean agent system activation does not disconnect technical power or activate the smoke exhaust system.

**4-3.1.9** Clean agent system activation shuts down any equipment cooling system where the air flow passes outside of the clean agent discharge envelope/volume and closes all associated fire and smoke dampers. Equipment cooling system(s) with airflow completely within the discharge envelope/volume continue to operate.

**Note:** Electronic equipment shutdown may comply with paragraph 2-8 to prevent equipment and room overheating and possible sprinkler system activation.

**4-3.1.10** Clean agent system activation shuts down any non-self-contained equipment cooling HVAC systems and closes all non-self-contained equipment cooling fire and smoke dampers.

**4-3.2** Water mist or hybrid (water-inert gas) systems may be used as an alternative to the clean agent systems with CFPE (AFCEC/COSM) approval. Water mist systems comply with NFPA 750, *Standard on Water Mist Fire Protection Systems*. Hybrid (water-inert gas) systems comply with the manufacturer's listed design and installation guidance.

**4-3.3** Clean agent water mist and hybrid (water-inert gas) systems are designed by a fire protection engineer qualified in accordance with UFC 3-600-01.

#### 4-4 **SMOKE EXHAUST SYSTEM.**

Activation of the smoke exhaust system occurs only by manual activation at a location outside of the information technology room.

#### 4-5 **PRE-ACTION SPRINKLER PROTECTION.**

**4-5.1** A single-interlock pre-action sprinkler system or a double-interlock sprinkler system may be installed in lieu of a wet-pipe sprinkler system when authorized by the base civil engineer/installation fire marshal.

**Note:** Additional preventative maintenance requirements are incurred when using a pre-action sprinkler system. See UFC 3-601-02, *Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems*.

**4-5.2** The pre-action sprinkler system is actuated by a dedicated very early warning smoke detection system separate from the air sampling-type very early warning smoke detection system already required for the information technology equipment rooms. (See UFC 3-600-01, paragraph 4-12.3.)

**4-5.3** The dedicated very early warning smoke detection system for the pre-action sprinkler system is either an air aspirating-type, very early warning detection system or an intelligent high-sensitivity, photoelectric-type, spot-detection system. Heat detectors or standard-response smoke detectors are not be used for actuation of the pre-action sprinkler system.

- 4-5.4** The dedicated very early warning smoke detection system for the pre-action sprinkler system provides at least two detection thresholds.
- 4-5.4.1** The dedicated very early warning smoke detection system for the pre-action sprinkler system provides an alert signal to a constantly attended location when the first detection threshold is reached and provides a local visual and audible alarm within the information technology equipment room.
- 4-5.4.2** The dedicated very early warning smoke detection system for the pre-action sprinkler system provides an alarm signal to the building fire alarm control unit when the second detection threshold is reached.
- 4-5.4.3** For single-interlock pre-action sprinkler systems, the second detection threshold of the dedicated very early warning smoke detection system for the pre-action sprinkler system is used to actuate the pre-action system control valve.
- 4-5.4.4** For double-interlock pre-action sprinkler systems, the second detection threshold of the dedicated very early warning smoke detection system for the pre-action sprinkler system is one of the two initiating conditions necessary to actuate the pre-action system control valve.
- 4-5.5** The pre-action sprinkler system serving the information technology equipment area or room sprinklers are supplied by a separate sprinkler riser or supplied as a separate supervised zone with a dedicated water flow detection device. The riser or zone control valves are located outside of the space and readily accessible to emergency responders. Sprinkler activation and valve supervisory notifications are distinctly indicated at the fire alarm receiving location.
- 4-5.6** Initiation of water flow from the sprinkler heads of the pre-action sprinkler system within the information technology equipment room must automatically disconnect power to the electronic equipment systems. Initial charging of the pre-action system should not disconnect power to the electronic equipment.
- 4-5.7** Initiation of water flow within an information technology equipment room should not shut down equipment cooling systems in the affected information technology equipment room (i.e., self-contained cooling systems inside that room or systems dedicated to supplying only that room).
- 4-5.8** Sprinkler design demand for the pre-action sprinkler system is based on a wet system for single-interlock pre-action sprinkler systems and based on a dry system for double-interlock pre-action sprinkler systems.
- 4-5.9** Listed quick-response sprinklers are installed throughout the information technology equipment area and room, including areas with data storage.
- 4-5.10** Provide a 2-inch (50-millimeter) -diameter test discharge line located above (downstream from) the pre-action sprinkler valve assembly for trip testing of the pre-action valve.

- 4-5.10.1** Install a normally closed indicating valve with supervision on the test discharge line to be used for trip testing of the pre-action valve.
- 4-5.10.2** Install a normally open indicating valve with supervision on the system riser above (downstream from) the location of the test discharge line. Shutting this valve allows for trip testing of the pre-action valve without introducing water into the system past this valve.
- 4-5.11** Install fully concealed sprinklers in all smooth ceiling areas. In areas with open ceilings or where sprinklers and piping are exposed, install protected sprinkler heads, sprinklers with head guards/cages, or institutional-type sprinkler heads.
- 4-5.12** Pre--action sprinkler systems always utilize nitrogen in lieu of air in accordance with UFC 3-600-01.
- 4-5.13** If a ceiling is installed as a portion of a hot/cold aisle containment system, sprinklers are installed beneath that ceiling.

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## CHAPTER 5 PROTECTION FOR MISSION-ESSENTIAL AND MISSION-CRITICAL EQUIPMENT SPACES IN REMOTE FACILITIES

### 5-1 OVERVIEW.

This chapter provides guidance for remote unoccupied facilities with information technology equipment areas or rooms with equipment designated as mission-essential (MAC III and MAC II) or mission-critical (MAC II and MAC I).

**5-1.1** Continuously occupied remote facilities follow the guidance of Chapter 2, Chapter 3, or Chapter 4, as appropriate, in lieu of this chapter.

**5-1.2** Remote facilities not continuously occupied are protected in accordance with Chapter 4, except as modified by this chapter.

**5-1.3** Remote facilities should be single-purpose, dedicated exclusively to a single information technology mission as recommended by NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, and ANSI/TIA-942-B. This will improve the anticipated reliability of the facility and minimize anticipated downtime hours.

### 5-2 FACILITY CONSTRUCTION.

**5-2.1** Mission-critical/MAC II and MAC I information technology equipment is located in buildings of non-combustible construction with a minimum 2-hour fire resistance (IBC Type I construction).

**5-2.2** Mission-essential/MAC III and MAC II information technology equipment is located in buildings of non-combustible construction (IBC Type I or Type II construction).

**5-2.2.1** Use minimum 2-hour fire resistance (IBC Type I) construction for mission-essential/MAC III and MAC II information technology equipment located in remote buildings permitted by paragraph 5-6 to not be protected by an automatic sprinkler system.

**5-2.2.2** When practicable, use minimum 2-hour fire-resistance (IBC Type I) construction for mission-essential/MAC III and MAC II information technology equipment located in remote buildings protected by an automatic sprinkler system in accordance with paragraph 5-6.

**5-2.3** Construction meets not less than International Wildland-Urban Interface Code (IWUIC) requirements for Class 1 ignition-resistant construction.

**5-2.4** Supporting elements such as generators and cooling equipment should be physically separated from the information technology equipment to the greatest extent practicable.

**5-3 FIRE RATED CONSTRUCTION.**

**5-3.1** Remote facilities with mission-critical/MAC II and MAC I information technology equipment areas and rooms are separated from adjacent spaces/occupancies and from operationally distinct adjacent information technology equipment rooms in the facility by a minimum of 2-hour fire-resistance rated wall and/or floor/ceiling assemblies.

**5-3.2** Remote facilities with mission-essential/MAC III and MAC II information technology equipment areas and rooms are separated from adjacent spaces/occupancies and from operationally distinct adjacent information technology equipment rooms in the facility by a minimum of 1-hour fire-resistance rated wall and/or floor/ceiling assemblies.

**5-3.3** Redundant electronic equipment, if provided, at the same location are physically located to minimize the potential for damage from a single event damaging both primary and redundant equipment. The most effective protection is to physically separate redundant equipment items from each other to the greatest extent practicable.

**5-4 RURAL/WILD LAND INTERFACE ZONES**

**5-4.1** Comply with UFC 3-600-01, paragraph 1-12.10, "Rural, Remote, and Range Locations," and paragraph 4-40, "Ranges and Remote Locations," and with the IWUIC.

**5-4.2** Provide and maintain a defensible space/zone around the remote facility that is free of appreciable amounts of combustible vegetation. The zone is not less than 1.5 times the minimum recommended defensible space/zone in the IWUIC.

**5-4.3** Provide a reduced fuel space/zone per the IWUIC extending outward from the defensible space/zone boundary not less than 90 feet (27 meters).

**5-5 FIRE DETECTION.**

**5-5.1** The Alarm detection level transmits a distinctively different notification (e.g., fire alarm signal) to the continuously occupied location or automated notification system, and transmits a fire alarm to the fire alarm receiving center (e.g., fire station, central alarm station). The Alarm detection level initiates a general building evacuation alarm in those facilities required by UFC 3-600-01 to provide a fire alarm evacuation system. Additionally, the Alarm detection level activates the smoke exhaust system, unless a clean agent fire suppression system is provided

**5-5.2** The continuously occupied location discussed in this chapter may be located at another facility where an organization receives normal, non-fire-system-related data from the unoccupied facility. Use of separate fire alarm transmission equipment complying with NFPA 72 is not necessary.

**5-6 FIRE SUPPRESSION.**

**5-6.1** Provide automatic sprinkler protection in accordance with paragraph 2-5 when adequate supporting utilities are present. It is permitted to provide a pre-action sprinkler system as an alternative to a wet-pipe sprinkler system in accordance with paragraph 4-5 for mission-critical/MAC II and MAC I information technology spaces in remote facilities. If supporting utilities are not adequate, refer to paragraph 5-2 for features of remote facility construction required in lieu of automatic sprinkler protection.

**5-6.2** Provide a clean agent fire suppression system in accordance with paragraph 4-3 for mission-critical information technology spaces in remote facilities.

**5-6.3** Provide clean agent fire suppression in dedicated support spaces for electrical generators and similar support equipment for mission-critical information technology remote facilities. The agent discharge is initiated by heat detection in these spaces.

**5-6.4** If the supporting utilities are not suitable to provide automatic sprinkler protection to mission-essential information technology remote facilities, provide a clean agent fire suppression system for mission-essential information technology spaces in accordance with paragraph 4-3.

**5-6.5** If the supporting utilities are not suitable to provide automatic sprinkler protection to mission-essential information technology remote facilities, provide a clean agent fire suppression system for electrical power generators and similar support equipment. The agent discharge is initiated by heat detection in these spaces.

**5-6.6** A clean agent fire suppression system not otherwise indicated by this guide may be provided for mission-essential information technology remote facilities with the approval of the CFPE (AFCEC/COSM).

**5-6.7** In shared remote facilities with other unrelated occupants and missions, an engineering risk analysis is needed to determine appropriate protective features needed to achieve an acceptable level of mission assurance. The risk analysis is approved by the facility user, installation engineering flight, and the CFPE (AFCEC/COSM).

**5-6.8** The fire suppression systems for the remote facility provide fire alarm indication to the same continuously occupied location where air sampling-type detector signals are sent. The same method of signal transmission is used.

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## CHAPTER 6 MODULAR DATA CENTERS USED FOR MISSION-ESSENTIAL AND MISSION-CRITICAL EQUIPMENT SPACES

### 6-1 OVERVIEW.

Modular facilities complying with NFPA 70, Article 646, should be limited in use for information technology equipment with mission-essential/MAC III or MAC II ratings but may be used for mission-critical/MAC II or MAC I equipment when operationally necessary and the lower level of reliability is accepted for the mission. The guidance in this chapter modifies ANSI/TIA-942-B 1/2 Rated criteria to meet DoD mission needs; however, if conflicts exist, this chapter takes precedence.

Comply with the guidance in Chapter 2 as modified by this chapter.

### 6-2 FACILITY LOCATION.

**6-2.1** The minimum separation between modular data centers located outside all other structures is 30 feet (9 meters), with a clear zone of 10 feet (3 meters) immediately adjacent to the modular data center. The clear zone cannot be used for storage and be cleared of vegetation (a maintained lawn is permitted). The clear zone may be used as a street or driveway but not for vehicle parking.

**6-2.2** Weather coverings (e.g., sunshade) placed over modular data centers are of non-combustible materials but do not require a fire detection or suppression system. Any permanent electrical devices or equipment (receptacles, lighting, or other similar devices) installed on the weather covering comply with the requirements of NFPA 70.

**6-2.3** Modular data centers may be located within an enclosing building when all the following features are provided:

**6-2.3.1** The modular data center is protected by an automatic sprinkler system or clean agent fire suppression system.

**6-2.3.2** The enclosing building is fully protected by an automatic sprinkler system.

**6-2.3.3** The fire alarm system of the modular data center receives alarm signals from the fire alarm system of the enclosing building and provides notification to occupants of the modular data center. Transmission of fire alarm signals from the modular data center to the enclosing building is desirable but not required.

**6-2.3.4** The fire alarm system of the modular data center transmits fire alarm and other signals to the fire alarm receiving center (e.g., fire station, central alarm station) as required by UFC 3-600-01.

**6-2.4** Modular data centers in remote locations comply with paragraph 5-4.

6-3           **FIRE ALARM.**

Comply with paragraphs 6-2.3.3 and 6-2.3.4 when applicable.

6-4           **FIRE SUPPRESSION.**

**6-4.1**           A clean agent fire suppression system in accordance with paragraph 4-3 is not required but may be provided for mission-essential equipment in modular data centers with the approval of AFCEC/CO.

**6-4.2**           Provide a clean agent fire suppression system in accordance with paragraph 4-3 for mission-critical equipment in modular data centers.

**6-4.3**           Comply with paragraphs 6-2.3.1 and 6-2.3.2 when applicable.

6-5           **FIRE ALARM DETECTION.**

**6-5.1**           Comply with paragraph 2-4 for mission-essential equipment in modular data centers.

**6-5.2**           Comply with paragraph 3-3 for mission-critical equipment in modular data centers.

6-6           **EQUIPMENT COOLING SYSTEMS.**

Comply with paragraphs 2-8.1.3 through 2-8.1.6.

6-7           **CABLE AND WIRING.**

Comply with NFPA 70, Article 646, in lieu of paragraph 2-11.

## APPENDIX A GUIDANCE TO DETERMINE INFORMATION TECHNOLOGY EQUIPMENT CLASSIFICATION

### A-1 CLASSIFICATION.

**A-1.1** Nearly all electronic equipment is in some manner also information technology equipment. DoDI 8580.1 establishes two broad classifications of information technology equipment: mission-essential, which includes a very wide swath of equipment under the 40 USC § 11101 definition for “information technology”; and mission-critical, which includes information technology that also meets the 40 USC § 11103 definition for “national security system.” DoDI 8580.1 further requires information technology equipment to be assigned a mission assurance category (MAC) I, II, or III, with MAC I indicating equipment with the greatest availability/reliability.

**A-1.2** Since the DoDI 8580.1 rating system is already required for program managers, users, and operators of information technology equipment and since it identifies mission importance to the war-fighting mission, the CFPE (AFCEC/COSM) is using this rating system as a guide to provide fire protection features that support the information technology equipment’s war-fighting mission.

**A-1.3** DoDI 8580.1 was published in calendar year 2004; therefore, equipment acquired in fiscal year 2007 and beyond have a mission identification classification and MAC category assigned. Program managers and users should be able to locate documentation of the assigned ratings. For example, the new consolidated installation data center (known as Department of Defense Installation Service Node [ISN]/Installation Process Node [IPN]) is a mission-essential/MAC II and would use the guidance in Chapter 3) Applying this guidance to new missions and new equipment beddowns should be relatively easy and straightforward.

**A-1.4** In the absence of an assigned mission identification classification and MAC category, designation of mission identification classification and the MAC category is made by a component head, a combatant commander, the program executive, system program office (SPO) commander or MAJCOM A# office. For example, a financial management information technology system might be considered a mission-critical or a mission-essential information technology system as defined by the Under Secretary of Defense (Comptroller) (USD(C)/CFO). A "mission-critical information technology system" has the same meaning as a "mission-critical information system" (DoDI 8580.1).

### A-2 LEGACY SYSTEMS.

Determining the appropriate fire protection features for facilities with legacy systems can be difficult, especially if a user becomes overly focused on the importance of successfully accomplishing an installation-specific mission as compared to the importance that mission has in supporting DoD global warfighting capability. By applying reverse engineering and comparing installed fire protection features to the guidance in this guide, an approximation of the mission identification classification and the MAC category can be obtained for the legacy system. However, fire protection features are

just one subsystem of the integrated infrastructure systems that support the information technology equipment. The reverse-engineered mission identification classification and MAC category ratings should then be adjusted based on other considerations related to the importance of the facility in supporting the DoD global warfighting capability. Enhancements to fire protection and other infrastructure systems should be planned when the reverse-engineered mission identification classification and MAC category ratings are found to be inadequate.



**APPENDIX B RECOMMENDED FIRE ALARM AND EMERGENCY  
NOTIFICATION MESSAGES**

**B-1 INTRODUCTION.**

UFC 3-600-01, Appendix E, "Recommended Fire Alarm and Emergency Notification Messages," includes general paging, fire, and mass notification messages and alert tones. The following are specific messages applicable to information technology equipment rooms/spaces in this guide.

**B-2 MESSAGE WITHIN THE INFORMATION TECHNOLOGY EQUIPMENT ROOM FOR SINGLE ACTIVATION OF A SMOKE DETECTOR (CHAPTER 2).**

**B-2.1** Audible (audible sequence continues to repeat for not less than 180 seconds) in the following sequence:

a. Alert sound – four pulse chime – 575 Hz, four 0.5-second pulses separated by 0.5 second followed by a 1.5-second delay (repeat two cycles).

b. Announcement: Voice – American Female Voice (repeat two cycles):

"SMOKE HAS BEEN DETECTED AT [location in the room/space]. TAKE IMMEDIATE ACTION TO PREVENT MISSION INTERRUPTION."

**B-2.2** Visual [visual flash/operate until system is reset]:

- Clear strobe or other listed Clear appliance; or
- Textual message signs (if provided).

**B-3 MESSAGE WITHIN THE INFORMATION TECHNOLOGY EQUIPMENT ROOM FOR THE ALERT DETECTION LEVEL OF THE VERY EARLY WARNING SMOKE DETECTION SYSTEM (CHAPTERS 3, 4, AND 5).**

**B-3.1** Audible [audible sequence continues to repeat for not less than 180 seconds] in the following sequence:

a. Alert sound – four pulse chime – 575 Hz, four 0.5-second pulses separated by 0.5 second followed by a 1.5-second delay (repeat two cycles).

b. Announcement: Voice – American Female Voice (repeat two cycles):

"SMOKE HAS BEEN DETECTED AT [location in the room/space]. TAKE IMMEDIATE ACTION TO PREVENT MISSION INTERRUPTION."

**B-3.2** Visual [visual flash/operate until system is reset]:

- Clear strobe or other listed Clear appliance; or
- Textual message signs (if provided).

**B-4 OPTIONAL MESSAGE WITHIN THE INFORMATION TECHNOLOGY EQUIPMENT ROOM FOR THE INTERMEDIATE DETECTION LEVEL OF THE VERY EARLY WARNING SMOKE DETECTION SYSTEM (IF USED) (CHAPTERS 3 AND 4).**

**B-4.1** Audible [audible sequence continues to repeat for not less than 180 seconds] in the following sequence:

- a. Alert sound – four pulse chime – 575 Hz, four 0.5-second pulses separated by 0.5 second followed by a 1.5-second delay (repeat two cycles).

- b. Announcement: Voice – American Female Voice (repeat two cycles):

“ALERT, ALERT, INCREASING SMOKE HAS BEEN DETECTED AT [location in the room/space]. TAKE IMMEDIATE ACTION TO PREVENT MISSION INTERRUPTION, ALERT, ALERT.”

**B-4.2** Visual [visual flash/operate until system is reset]:

- Clear strobe or other listed Clear appliance; or
- Textual message signs (if provided).

**B-5 GENERAL MESSAGES FOR CLEAN AGENT ACTIVATION WITHIN THE INFORMATION TECHNOLOGY EQUIPMENT ROOM (CHAPTER 4).**

**B-5.1** Audible [audible sequence continues to repeat for not less than 180 seconds] in the following sequence:

- a. Alert sound – NFPA temporal whoop - 422–775 Hz upward sweep over 850 ms for three pulses separated by 1 second followed by a 1.5-second delay (repeat two cycles).

- b. Announcement: Voice – American Male Voice (repeat two cycles):

“A FIRE EMERGENCY HAS OCCURRED IN THE [DATA CENTER or other location identifier]; THE GAS IS SAFE TO BREATHE WHILE EXITING; PLEASE LEAVE THE BUILDING BY THE NEAREST EXIT AND REPORT TO YOUR ASSEMBLY LOCATION.”

Optional message for information technology spaces located above the level of egress served by elevators:

“A FIRE EMERGENCY HAS OCCURRED IN THE [DATA CENTER or other location identifier]; THE GAS IS SAFE TO BREATHE WHILE

EXITING; PLEASE LEAVE THE BUILDING BY THE NEAREST EXIT; DO NOT USE THE ELEVATORS AND REPORT TO YOUR ASSEMBLY LOCATION.”

**B-5.2** Visual [visual flash/operate until system is reset]:

- Clear strobe or other listed Clear appliance; or
- Textual message signs (if provided).

**B-6 GENERAL MESSAGES FOR SPRINKLER ACTIVATION, FIRE ALARM PULL STATION, OR ALARM DETECTION LEVEL OF SMOKE INSIDE THE INFORMATION TECHNOLOGY EQUIPMENT ROOM (ALL CHAPTERS).**

**B-6.1** Audible [audible sequence continues to repeat for not less than 180 seconds] in the following sequence:

- a. Alert sound – NFPA temporal whoop - 422–775 Hz upward sweep over 850 ms for three pulses separated by 1 second followed by a 1.5-second delay (repeat two cycles).

- b. Announcement: Voice – American Male Voice (repeat two cycles):

“A FIRE EMERGENCY HAS OCCURRED IN THE [DATA CENTER or other location identifier]; PLEASE LEAVE THE BUILDING BY THE NEAREST EXIT AND REPORT TO YOUR ASSEMBLY LOCATION.”

Optional message for information technology space located above the level of exit discharge served by elevators:

“A FIRE EMERGENCY HAS OCCURRED IN THE [DATA CENTER or other location identifier]; PLEASE LEAVE THE BUILDING BY THE NEAREST EXIT; DO NOT USE THE ELEVATORS AND REPORT TO YOUR ASSEMBLY LOCATION.”

**B-6.2** Visual [visual flash/operate until system is reset]:

- Clear strobe or other listed Clear appliance; or
- Textual message signs (if provided).

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**APPENDIX C REFERENCES****PUBLIC LAW**

<https://www.law.cornell.edu/uscode/text/40>

40 USC § 11101, *Definitions*

40 USC § 11103, *Applicability to national security systems*

44 USC § 3502, *Planned public works*

**FEDERAL ACQUISITION REGULATION**

81 FR 30429, *Federal Acquisition Regulation: High Global Warming Potential Hydrofluorocarbons*, <https://www.govinfo.gov/app/details/FR-2016-05-16/2016-10998>

**DEPARTMENT OF DEFENSE**

DoDI 8580.1, *Information Assurance (IA) in the Defense Acquisition System*  
<https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/858001p.pdf>

UFC 1-200-01, *DoD Building Code*, <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 3-520-01, *Interior Electrical Systems*, <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 3-600-01, *Fire Protection Engineering for Facilities*,  
<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 3-601-02, *Operations and Maintenance: Inspection, Testing, and Maintenance of Fire Protection Systems*, <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 4-010-05, *Sensitive Compartmented Information Facilities Planning, Design, and Construction*, <https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 4-021-01, *Design and O&M: Mass Notification Systems*,  
<http://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

**AIR FORCE**

AFI 32-10141, *Programming and Planning Fire Protection Safety Deficiency Correction Projects*, <https://www.e-publishing.af.mil/>

**FM GLOBAL LOSS PREVENTION**

Data Sheet 5-32, *Data Centers and Related Facilities*,  
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>

**INTERNATIONAL CODE COUNCIL**

<https://codes.iccsafe.org/>

*International Building Code® (IBC)*

*International Mechanical Code® (IMC)*

*International Wildland-Urban Interface Code (IWUIC)*

**NATIONAL FIRE PROTECTION ASSOCIATION**

<https://www.nfpa.org/>

NFPA 10, *Standard for Portable Fire Extinguishers*

NFPA 13, *Standard for the Installation of Sprinkler Systems*

NFPA 70, *National Electrical Code®*

NFPA 72, *National Fire Alarm and Signaling Code*

NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*

NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*

NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*

NFPA 92A, *Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences*

NFPA 92B, *Standard for Smoke Management Systems in Malls, Atria, and Large Spaces*

NFPA 101, *Life Safety Code®*

NFPA 750, *Standard on Water Mist Fire Protection Systems*

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*

**TELECOMMUNICATIONS INDUSTRY ASSOCIATION**

ANSI/TIA-942-B, *Telecommunications Infrastructure Standard for Data Centers*,  
<https://tiaonline.org/standard/tia-942/>

**UNDERWRITER'S LABORATORY**

UL 900, *Standard for Air Filter Units*,  
[https://standardscatalog.ul.com/standards/en/standard\\_900\\_8](https://standardscatalog.ul.com/standards/en/standard_900_8)

## APPENDIX D GLOSSARY

**D-1 ACRONYMS**

AFCEC	Air Force Civil Engineer Center
AFCEC/CO	Air Force Civil Engineer Center, Operations Directorate
AFI	Air Force Instruction
ANSI	American National Standards Institute
CFPE	Component Fire Protection Engineer
DoD	Department of Defense
DoDI	Department of Defense Instruction
HVAC	heating, ventilation, and air conditioning
Hz	hertz
IBC	International Building Code
IMC	International Mechanical Code
IWUIC	International Wildland-Urban Interface Code
MAC	Mission Assurance Category
ms	millisecond
NFPA	National Fire Protection Association
OCONUS	outside the continental United States
TIA	Telecommunications Industry Association
UFC	Unified Facilities Criteria
UL	Underwriters Laboratories
USC	United States Code

**D-2 TERMS.**

**Alternative:** For purposes of this guide, “alternative” refers to providing a substitute fire protection system to protect a room containing information technology equipment in lieu of what is required.

**Continuously occupied location:** A location with trained operators who are present 24/7/365 and who have management and operational responsibility for initiating emergency actions in response to abnormal/emergency conditions within a mission-essential or mission-critical information technology facility/space.

**Electronic equipment:** Electronic equipment installations include major automatic data processing (ADP) areas, communication centers, command and control systems, and other important mission systems. Refer to the definitions of **incidental electronic equipment**, **mission-essential information system**, and **mission-critical information system** for further clarification.

**Incidental equipment:** Electronic equipment used for the majority of administrative or routine operational functions. The loss of this equipment due to fire or other causes would be inconvenient but a work-around could easily be put into place. Electronic equipment typically designated as incidental equipment includes, but is not limited to, desktop-style personal computers; printers, plotters, and scanners; facsimile machines and copy machines; typewriters and office-use electronic accessories; telephones; and video conferencing centers.

**Information system:** A discrete set of information resources organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information. (See 40 USC § 3502(8).)

**Information technology:** “The term information technology:

(a) with respect to an executive agency means any equipment or interconnected system or subsystem of equipment, used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency, if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency that requires the use:

(i) of that equipment; or

(ii) of that equipment to a significant extent in the performance of a service or the furnishing of a product;

(b) Includes computers, ancillary equipment (including imaging peripherals, input, output, and storage devices necessary for security and surveillance), peripheral equipment designed to be controlled by the central processing unit of a computer, software, firmware and similar procedures, services (including support services), and related resources; but

(c) Does not include any equipment acquired by a federal contractor incidental to a federal contract.” (Extracted from 40 USC § 11101.)



**Listed:** The term used in NFPA 101, *Life Safety Code*®, to identify equipment, materials, or services that are published in a list by an organization acceptable to the authority having jurisdiction (AHJ) and where the organization is concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**Mission Assurance Category (MAC):** (DoDI 8580.1) Applicable to DoD information systems, the mission assurance category reflects the importance of information relative to the achievement of DOD goals and objectives, particularly the warfighters' combat mission. Mission assurance categories are primarily used to determine the mission need for availability and integrity. DoD has three defined mission assurance categories:

**Mission Assurance Category I (MAC I):** Systems-handling information that is vital to the operational readiness or mission effectiveness of deployed and contingency forces in terms of both content and timeliness. The consequences of loss of integrity or availability of a MAC I system are unacceptable and could include the immediate and sustained loss of mission effectiveness. MAC I systems require the most stringent protection measures.

**Mission Assurance Category II (MAC II):** Systems-handling information that is important to the support of deployed and contingency forces. The consequences of loss of integrity are unacceptable. Loss of availability is difficult to deal with and can only be tolerated for a short time. The consequences could include delay or degradation in providing important support services or commodities that may seriously impact mission effectiveness or operational readiness. MAC II systems require additional safeguards beyond best practices to ensure adequate assurance.

**Mission Assurance Category III (MAC III):** Systems-handling information that is necessary for the conduct of day-to-day business but does not materially affect support to deployed or contingency forces in the short term. The consequences of loss of integrity or availability can be tolerated or overcome without significant impacts on mission effectiveness or operational readiness. The consequences could include the delay or degradation of services or commodities enabling routine activities. MAC III systems require protective measures, techniques, or procedures generally commensurate with commercial best practices.

**Mission-critical information system:** A system that meets the definitions of "information system" in 40 USC § 11101 and "national security system" in 40 USC § 11103, *Applicability to national security system*, the loss of which would cause the stoppage of warfighter operations or direct mission support of warfighter operations. This electronic equipment has a direct immediate impact on combat mission capabilities, including equipment integral to combat mission assets or used in direct control of these assets. To provide optimum protection for this equipment, it should be

located in a designated information technology equipment room. Occasionally, individual or a few items of mission-critical equipment may be located in communications closets or small rooms if provided with the minimum required fire protection features in accordance with UFC 3-600-01 for electronic equipment installations; however, it is important to ensure the system design will permit failure of a single piece of equipment or failure at a single cable routing location without disabling mission-critical functions. Often, this equipment is of such high importance that duplicate online electronic backup capability is provided. When this duplicate capability is provided at physically separated locations, completion of a special fire protection analysis may be required. Examples of the functions involving mission-critical equipment include:

- Command, control, communication, and intelligence functions that order the launch and recovery of tactical or strategic assets essential to the defense of the United States and its allies. Most DoD mission-critical equipment is involved in accomplishing these functions.
- Command, control, communication, and intelligence functions necessary for implementation of wartime operational plans.
- Direct flight/mission control functions.

**Note:** The designation of mission-critical is made by a component head, a combatant commander, or their designee. For example, a financial management information technology system might be considered a mission-critical or a mission-essential information technology system as defined by the Under Secretary of Defense (Comptroller) (USD(C)/CFO). A "mission-critical information technology system" has the same meaning as a "mission-critical information system." (DoDI 8580.1)

**Mission-essential information system:** A system that meets the definition of "information system" in 40 USC § 11101, that the acquiring Component Head or designee determines is basic and necessary for the accomplishment of the organizational mission. Electronic equipment whose function is important to the operations of an individual unit, a single base, or to multiple DoD bases but will not have a direct and immediate impact on combat mission capability is mission-essential. Optimum protection is provided for this equipment if it is located in a designated information technology equipment room.

**Note:** The designation of mission-essential is made by a component head, a combatant commander, or their designee. For example, a financial management information technology system might be considered a mission-essential or a mission-critical information technology system as defined by the USD (Comptroller) (USD(C)/CFO). A "mission-essential information technology system" has the same meaning as a "mission-essential information system." (DoDI 8580.1)

**Modular data center:** A prefabricated unit consisting of an outer enclosure housing information technology equipment and incorporating various support equipment such as

electrical and ventilation systems. These prefabricated units are also commonly referred to as “containerized data centers.” Refer to NFPA 70, *National Electrical Code*, Article 646, for additional information.

**National security system:** “A telecommunications or information system operated by the Federal Government, the function, operation, or use of which:

- (a) involves intelligence activities;
- (b) involves cryptologic activities related to national security;
- (c) involves command and control of military forces;
- (d) involves equipment that is an integral part of a weapon or weapons system; or
- (e) is critical to the direct fulfillment of military or intelligence missions, but does not include a system to be used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications).” (Extracted from 40 USC § 11103.)

**Occupied:** A room/space where persons qualified to take actions to mitigate abnormal conditions are present or immediately available within the building 24/7/365.

**Plenum rated cable:** Cables listed as being suitable for use in ducts, plenum, and other spaces used for environmental air and be listed as having adequate fire-resistant and low smoke-producing characteristics.

**Port:** An orifice, such as a sampling hole in an air-sampling-type smoke detector pipe network, which receives stimulus.

**Rating:** ANSI/TIA-942-B describes four Rating levels in which data centers can be classified. Below are the high-level descriptions of each Rating level. Detailed specifications are in ANSI/TIA-942-B.

- **Rated 1: Basic Site Infrastructure.** A data center with single capacity components and a single, non-redundant distribution path serving the computer equipment. It has limited protection against physical events. It has no redundancy.
- **Rated 2: Redundant Capacity Component Site Infrastructure.** A data center with redundant capacity components and a single, non-redundant distribution path serving the computer equipment. It has improved protection against physical events.
- **Rated 3: Concurrently Maintainable Site Infrastructure.** A data center with redundant capacity components and multiple independent distribution paths serving the computer equipment. Typically, only one distribution path serves the computer equipment at any time. The site is concurrently

maintainable, which means that each and every capacity component, including elements which are part of the distribution path, can be removed/replaced/serviced on a planned basis without disrupting the information and communication technology (ICT) capabilities to the end-user. It has protection against most physical events.

- **Rated 4: Fault Tolerant Site Infrastructure.** A data center with redundant capacity components and multiple independent distribution paths serving the computer equipment which are all active. The data center allows concurrent maintainability and one (1) fault anywhere in the installation without causing downtime. It has protection against almost all physical events.

**Remote facility:** A room or facility located in a geographically remote or isolated area or located in an area where considerable delay will occur in the fire emergency service response to a fire emergency. Such areas often have water supply sources insufficient to supply a facility's automatic sprinkler system.

**Sensor:** A device, such as a photoelectric cell, that receives and responds to stimulus.

**Supplemental:** For purposes of this guide, "supplemental" refers to providing an additional fire protection system to protect a room containing information technology equipment in addition to what is required. The system will not be considered as a substitute for a required system.

**Unoccupied:** A room, space, or facility where qualified personnel are not present or immediately available on a 24/7/365 basis to mitigate abnormal conditions developing within the room/space/facility. A delay is possible at times such that emergency services responders are expected to arrive at the information technology equipment location before qualified personnel.