

# UNIFIED FACILITIES CRITERIA (UFC)

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## NON-PERMANENT DOD FACILITIES IN SUPPORT OF MILITARY OPERATIONS



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## UNIFIED FACILITIES CRITERIA (UFC)

### NON-PERMANENT DOD FACILITIES IN SUPPORT OF MILITARY OPERATIONS

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Indicate the preparing activity beside the Service responsible for preparing the document.

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by \1\ ... /1/)

Change No.	Date	Location
1	16 May 22	4-4.5.5 Updated language.
2	01 Sep 22	2-2.6.5, 3-4.1, and 4-4.1 Updated language.

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This UFC supersedes UFC 1-201-01, dated 01 January 2013.

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## FOREWORD

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

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

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

- Whole Building Design Guide web site <http://www.wbdg.org/ffc/dod>.

Refer to UFC 1-200-01, *DoD Building Code*, for implementation of new issuances on projects.

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**UNIFIED FACILITIES CRITERIA (UFC)  
REVISION SUMMARY SHEET**

**Document:** UFC 1-201-01, *NON-PERMANENT DOD FACILITIES IN SUPPORT OF MILITARY OPERATIONS*

**Superseding:** UFC 1-201-01 dated 1 January 2013

**Description:** This UFC provides life safety and habitability-related design requirements for non-permanent facilities designed and constructed for use by the Department of Defense (DoD) in support of military operations.

**Reasons for Document:**

- This UFC was developed to establish the minimum requirements for the Life Safety and Habitability aspects of non-permanent facilities in support of military operations.

**Impact:**

- The criteria established in this UFC may result in Doctrine, Organization, Training, Material, Leadership and Education, Personnel, Facilities, and Policy (DOTMLPF-P) impacts across the Services. Services should conduct DOTMLPF-P analysis to determine the impacts on their ability to execute construction in support of military operations.
- Review of standard facility designs for compliance with criteria in this UFC.

**Unification Issues**

There are no unification issues in this document.

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## CHAPTER 1 INTRODUCTION

### 1-1 BACKGROUND.

This UFC was developed in response to US Code Title 10, "Policy and Requirements to Ensure the Safety of Facilities, Infrastructure, and Equipment for Military Operations", cited below for clarity and information.

It shall be the policy of the Department of Defense that facilities, infrastructure, and equipment that are intended for use by military or civilian personnel of the Department in current or future military operations should be inspected for safety and habitability prior to such use, and that such facilities shall be brought into compliance with generally accepted standards for the safety and health of personnel to the maximum extent practicable and consistent with the requirements of military operations and the best interests of the Department of Defense, to minimize the safety and health risk posed to such personnel.

US Code Title 10 requires addressing the following:

- Fire protection
- Structural integrity
- Electrical systems
- Plumbing
- Water treatment
- Waste disposal
- Telecommunications networks

### 1-2 PURPOSE AND SCOPE.

Consistent with the requirements of Public Law 111-84 Section 807 this UFC establishes the minimum design criteria for the following areas:

- Fire protection
- Structural integrity
- Electrical systems
- Plumbing and mechanical systems
- Water treatment, storage and distribution
- Wastewater collection and treatment
- Telecommunications networks

#### 1-2.2 Exceptions and Exclusions.

The following exceptions and exclusions apply.

### **1-2.1.1 Ammunition and Explosives Safety.**

This document does not contain requirements for explosives safety.

All facilities that involve DoD Ammunition and Explosives (AE) storage, handling, maintenance, manufacture or disposal, as well as any facilities within the Explosives Safety Quantity Distance (ESQD) arcs of AE facilities, must comply with the minimum DoD explosives safety criteria given in DoD Manual 6055.09-M, as implemented in DA PAM 385-64 (Army), NAVSEA OP5 (Navy and Marine Corps), and AFMAN 91-201 (Air Force). DoD facilities exposed to potential explosion effects from AE belonging to other nations are also required to meet DoD and Service explosives safety criteria.

It is essential that the planning and design of new facilities and occupation and renovation of existing AE-related facilities or any facilities within ESQD arcs be accomplished in close coordination with knowledgeable explosives safety professionals in theater or with the Services' explosives safety centers. This coordination should occur as early as possible in the planning/design process to avoid issues/problems and ensure compliance.

All facility construction or use within ESQD arcs requires review for compliance with explosives safety criteria and must have either an approved explosives safety site plan or an approved explosives safety deviation. Refer to the DoD and Service documents mentioned above for further guidance in this area.

### **1-2.1.2 Antiterrorism / Force Protection.**

Expeditionary structure stand-off distances are incorporated from Chapter 4, UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings. All other antiterrorism and force protection requirements are excluded for initial and temporary construction. Semi-permanent construction follows the complete requirements of UFC 4-010-01.

The mass notification system must comply with the requirements of UFC 4-010-01 (*DOD Minimum Antiterrorism Requirements for Buildings*) excluding the requirement for remote activation and the requirements of UFC 4-021-01.

### **1-2.1.3 Accessibility.**

Facilities for use in military operations are designed for combat capable, able-bodied personnel. However, special use facilities, such as medical facilities, may employ more stringent requirements IAW (In Acceptance With) "Accessibility" requirements in UFC 1-200-01.

### **1-2.1.4 Solid Waste Disposal.**

Solid waste disposal is addressed in UFC 3-240-11 Landfills In Support Of Military Operations.

The following disposal functions, must comply with the respective chapters from TM 3-34.56, MCIP 4-11.01 Waste Management for Deployed Forces:

- Non-hazardous Solid Waste
- Hazardous and Special Waste
- Medical Waste

Regulated hazardous and medical waste disposal facilities must reference host-nation final governing standards (FGS) or where the FGS does not exist, then the Overseas Environmental Baseline Guidance Document (OEBGD) prevails (DOD 4715.05-G).

### **1-3 APPLICABILITY.**

This UFC applies to all DoD components involved with planning, design, construction and renovation of non-permanent facilities, both new construction and renovations to non-permanent facilities (where the renovation does not convert the facility to permanent), used by US military and DoD civilian personnel in support of Military Operations, actions with written Operation Orders (OPORDS), examples include Kinetic, Disaster Recovery, Humanitarian Assistance, Defense Support to Civil Authorities, etc. See JP 3-0 and JP 3-34 for more complete definition, description and guidance on operations. This UFC establishes the minimum requirements for initial, temporary, and semi-permanent construction levels.

#### **1-3.1 Waivers and exemptions.**

Section 807 of Public Law 111-84, "Policy and Requirements to Ensure the Safety of Facilities, Infrastructure, and Equipment for Military Operations" required the Department of Defense to establish minimum design criteria for the safety and health of military or civilian personnel of the Department of Defense.

Waivers are for the facility design to not comply with the requirements of this UFC for a period of time as designated by the approval authority. This time period allows for use of the facility, with mitigating measures in place, while awaiting full compliance. Treat waivers considered for an indefinite period of time as exemptions and follow the exemption approval process. An exemption provides authority to deviate from a UFC requirement indefinitely.

The procedures and requirements for the submission of a waiver are described in MIL-STD 3007, Appendix A. Lack of funds is not considered sufficient justification for a waiver.

In accordance with DFAR Clause 246.270-3, the combatant commander may waive compliance when it is impracticable to comply with such standards under prevailing operational conditions. Any waiver for reasons other than operational conditions must be approved by the appropriate Service Chief Engineer as outlined in MIL-STD- 3007.

### 1-3.2 Standard Designs

Standard designs are available for the construction of non-permanent facilities. These standard designs accommodate a wide range of site conditions, missions and other parameters. The use of these designs is encouraged when the project requirements can be met by the standard design.

The review of these standard designs should be completed prior to embarking upon the design of a unique non-permanent facility.

Standard Designs are available from the following sources:

- Center of Standardization for Non-Permanent Facilities (US Army Corps of Engineers, CETAM-DP-EX) <https://mrsi.dren.army.mil/cos/tam/>
- Joint Construction Management System (JCMS) <https://jcms.army.mil> requires a CAC

### 1-4 GENERAL BUILDING REQUIREMENTS.

Comply with 1-3.5.1 of UFC 1-200-01, *DoD Building Code*. UFC 1-200-01 provides general building requirements and overarching criteria, establishing the use of consensus building codes and standards, establishing criteria implementation rules and protocols (including core UFC), and identifying unique military criteria.

The requirements of the UFC sections cited in this document are mandatory. Other UFCs may be used as guidance but are not mandatory.

This document must be used in conjunction with Status of Forces Agreements (SOFA), bilateral agreements, and other Host Nation (HN) agreements.

#### 1-4.1 Facility Design.

Facility Design efforts must be performed by Qualified Personnel.

#### 1-4.2 Alterations to Facility Designs.

##### 1-4.2.1 Standard designs for temporary facilities (Chapter 3)

Construction by military personnel - Any modification requires review and approval by qualified personnel in the discipline applicable to the feature being modified

AND

Notification of the designer of record

Construction by contractor personnel - any modifications require approval by the Contracting Officer or the Contracting Officer's representative."

AND

Notification of the designer of record

#### **1-4.2.2 Standard designs for Semi-permanent facilities (Chapter 4)**

The Designer of Record for a Facility Design must review and approve all alterations, outside of the parameters identified in the design prior to implementation.

#### **1-4.3 Corrosion Protection.**

Provide durability and protection from corrosive environments for systems, components, and connections required by this UFC appropriate for the life expectancy of the facility.

Protection and surface finishing will be as indicated in drawings, specifications, and/or contracts as applicable for semi-permanent facilities.

If included, DoDI 5000.67 Prevention and Mitigation of Corrosion on DoD Military Equipment and Infrastructure directs that trade-off decisions include cost, useful service life, and effectiveness.

#### **1-4.4 Alternative Design Approaches.**

Alternative design approaches that comply with the criteria in this UFC are encouraged.

#### **1-4.5 Fuel Systems.**

Follow approved technical manuals or manufacturer instructions.

#### **1-4.6 Water Treatment, Storage, and Distribution.**

Design and operate all potable water (drinking water) facilities and systems to ensure protection of health and safety. Requirements for systems may be addressed in COCOM or coalition guidance or international agreements.

Army, Navy, Marine Corps must comply with the respective chapters from ATP 4-44/MCRP 3-17.7Q Water Support Operations and NTRP 4-04.2.13/FM 3-34.469/AFMAN 32-1072, Water-Well Drilling Operations:

- Water Treatment
- Water Storage, Distribution and Issue

Air Force must comply with the respective chapters from AF TTP 3-32.33 V1.

#### **1-4.7 Structural / Seismic.**

Where site specific information is unknown, the following may be considered:

- Occupancy Category II

- Soil Site Class: D
- Mapped Seismic Spectral Response Coefficients:  $S_s=0.64g$  /  $S_1=0.18g$

#### **1-4.8 Equipment Used as Facilities.**

Equipment (such as tents and prepackaged structures requisitioned through the supply system (*Department of Defense Dictionary of Military and Associated Terms*)), Table of Organizational Equipment, Commercial off the Shelf procurements, Relocatable Buildings, and all DOD program of record solutions will be deployed IAW all relevant manufacture specifications, technical manuals and bulletins, and with regard to the requirements of this UFC

#### **1-4.9 Quality Management.**

Combatant/Service Component Commands must establish and maintain a Quality Management (QM) system through the duration of the project life cycle to ensure that facilities comply with the requirements of this UFC.

#### **1-4.10 Facility Data Placards.**

Include a data plate on entry doors for all buildings. Data plates must include: year of construction, facility construction level, occupancy type (per basis of design or per NFPA 101 Chapter 6),

Update the data plate when the intended use of the building changes and/or to include building modifications.

See Appendix D for data plate example.

#### **1-4.11 Inspections.**

Inspect buildings prior to initial occupancy, at unit transfer, or when reaching buildings initial design life. Inspections must follow UFC 1-201-02 Assessment of Existing Facilities for Use in Military Operations.

### **1-5 CYBERSECURITY.**

All control systems (including systems separate from an energy management control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.

### **1-6 GLOSSARY.**

APPENDIX B-1 contains acronyms.

The authorities for the definition are included where applicable.

**1-6.1 Authority Having Jurisdiction/Building Official/Code Official.**

The terms above as used in the codes and standards referenced in this UFC are the stated entities as defined in UFC 1-200-01 1-5.

**1-6.2 Billeting.**

Any building or portion of a building, regardless of population density, in which 11 or more unaccompanied DoD personnel are routinely housed, including Temporary Lodging Facilities and military family housing permanently converted to unaccompanied housing. Billeting also applies to expeditionary structures with similar populations and functions. (UFC 4-010-01).

Billeting does not include sleeping spaces in facilities with 24 hour operations such as HQ, TOCs, JOCs or Air Terminals.

**1-6.3 Base Operating Support Integrator (BOS-I).**

BOS-I is responsible for planning and synchronizing the efficient application of resources and contracting to facilitate unity of effort and the coordination of sustainment functions at designated contingency locations (JP 4-0).

**1-6.4 Building.**

A structure, usually enclosed by walls and a roof, constructed to provide support or shelter for an intended occupancy. Note that other structures, such as canopies, are not considered buildings for the purposes of these standards. (UFC 4-010-01).

**1-6.5 Designer of Record**

The entity that performed the original design and maintains ownership of the design. This is noted in the title block of the design drawings.

**1-6.6 Exemption.**

An exemption provides authority to deviate from a UFC requirement indefinitely.

**1-6.7 Facility.**

A real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land (*Department of Defense Dictionary of Military and Associated Terms*).

**1-6.8 Facility Construction Levels.**

**1-6.8.1 Organic construction level.**

Organic construction level is a subset of the Initial construction level.

Intended for use up to 90 days, it may be used for up to six months. See JP 3-34.

**1-6.8.2 Initial construction level.**

Initial construction level is intended for immediate use by units upon arrival in theater for up to twenty-four months. See JP 3-34.

**1-6.8.3 Temporary construction level.**

Temporary construction level buildings and facilities are designed and constructed to serve a life expectancy of five years or less. See JP 3-34.

**1-6.8.4 Semi-Permanent construction level.**

Buildings and facilities designed and constructed to serve a life expectancy of less than 10 years. With maintenance and upkeep of critical building systems, the life expectancy of a facility can be extended to 25 years. See JP 3-34.

**1-6.9 Occupancy Type.**

The category description of a facility based on the usage.

**1-6.10 Qualified Personnel.**

A professionally registered technical expert.

**1-6.11 Range of Military Operations.**

The military instrument of national power can be used in a wide variety of ways that vary in purpose, scale, risk, and combat intensity. These various ways can be understood to occur across a continuum of conflict ranging from peace to war. (JP 1).

**1-6.12 Structure Group**

A cluster of independent structures, including tents, trailers, containerized housing units, or similar construction typically occupied by 200 or fewer personnel except in the case of the DEPMEDS (Deployable Medical Systems).

**1-6.13 Waiver.**

A waiver provides authority to deviate from an UFC requirement for no more than twelve months or for a length of time as designated by the approval authority

**1-7 REFERENCES.**

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



## CHAPTER 2 INITIAL FACILITY CONSTRUCTION LEVEL

### 2-1 APPLICABILITY.

The Initial Construction Level encompasses two sublevels defined in Joint Publication (JP) 3-34 Joint Engineer Operations:

Organic – intended for use up to 3 months (90 days) which can be extended to a maximum of 6 months (180 days).

Initial – Structures with an expected use not to exceed 24 months (2 years)

Construction requirements for Initial Facility Construction Level rely primarily on manufacturers' instructions provided with Government-approved systems, Service-specific Field Manuals, and Handbooks developed for pre-packaged assemblies and equipment. This Chapter addresses requirements that affect life safety and health of personnel when establishing base operations. Typical to transient mission activities, it may require system upgrades or replacement by more substantial or durable facilities during the course of operations.

#### 2-1.1 Organic Construction Level.

The Organic construction level is a subset of the Initial construction level intended for use up to 90 days, it may be used for up to six months. See JP 3-34.

Organic equipment is a program of record system provided under a unit's table of authorized distribution allowances. Organic Facility construction must follow manufacturers' instructions, Service-specific Manuals and Handbooks developed for pre-packaged assemblies and equipment.

#### 2-1.2 Initial Construction Level.

The Initial construction level is intended for immediate use by units upon arrival in theater for up to twenty-four months. See JP 3-34.

Fabric shelters are Initial construction level facilities.

Container Housing units are Initial level facilities, unless specifically designed to a higher construction level.

### 2-2 PRIMARY CRITERIA.

The following sections must be used as criteria for organic and initial facility construction. Where conflicts existing between the UFCs, other industry codes and standards, this UFC takes precedence.

For unit organic tentage used in establishing base operations, comply with Sections 2-2.1 thru 2-2.14 of this document.

## **2-2.1 CIVIL/SITE.**

The requirements for site water treatment, storage and distribution, and waste disposal may be included in Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA) and as required by the Military Command having jurisdiction over the operation. The information below is a listing of some, but not necessarily all of those requirements. It is the responsibility of the user to determine which criteria are to be utilized for the operation.

## **2-2.2 Stormwater.**

Locate facilities and equipment away from areas subject to stormwater runoff and flooding. Avoid low lying, tidal, and tributary areas. Consider adjacent facilities or functional areas when planning stormwater runoff control. Control water flow with surface drainage and trenches. When available, place surface laid / shallow buried culverts.

## **2-2.3 Structural.**

Follow manufacturers' instructions for Government-approved systems for assembly of pre-packaged shelters in theater. The authority for Government-approved shelter systems is the Joint Committee on Tactical Shelters (JOCOTAS).

## **2-2.4 Electrical.**

Follow manufacturers' instructions for installation of Government-approved pre-packaged electrical equipment in theater.

If pre-packaged systems are not available:

- Comply with the requirements of UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-2, "General Electrical Requirements".
- Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-12, "Grounding, Bonding, and Static Protection".
- Comply with UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-14, "Distribution System Grounding".

### **2-2.4.2 Grounding.**

Ground all electrical systems in accordance with manufacturer recommendations.

### **2-2.4.3 Power Cable Installation.**

Surface lay or protect cables from vehicular and foot traffic over power cables where appropriate.

#### **2-2.4.4 Circuit Lockout Requirements.**

Follow manufacturers' instructions for installation of Government-approved pre-packaged electrical equipment in theater.

Non-government pre-packaged circuit breakers, disconnect switches, and other devices that are electrical energy isolating must be lockable or protected from unauthorized access.

#### **2-2.5 Plumbing and Mechanical.**

##### **2-2.5.1 Water Treatment, Storage, and Distribution.**

Design and operate all potable water (drinking water) facilities and systems to ensure protection of health and safety. Requirements for systems may be addressed in COCOM or coalition guidance or international agreements.

Army, Navy, Marine Corps must comply with the respective chapters from ATP 4-44/MCRP 3-17.7Q Water Support Operations and NTRP 4-04.2.13/FM 3-34.469/AFMAN 32-1072, Water-Well Drilling Operations:

- Water Treatment
- Air Force must comply with the respective chapters from AF TTP 3-32.33 V1.

##### **2-2.5.2 Waste Water.**

All waste water facilities and systems must be designed and operated to ensure protection of health and safety. Requirements for systems may be addressed in international agreements, COCOM or coalition guidance.

##### **2-2.5.3 Heating, Ventilating and Air-Conditioning (HVAC).**

Install ventilation and environmental control systems in accordance with manufacturers' instructions and service technical manuals for pre-packaged heating, ventilating, and air-conditioning (HVAC) systems.

#### **2-2.6 Fire Protection.**

The overarching requirement is for Life Safety.

Property Protection is a consideration only if specifically required by the facility owning entity.

Fire protection requirements for Initial Construction Level assume no active fire protection or site water supplies are to be provided.

Provide an alarm initiating device at each exit by either:

- a. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.

OR

- b. Combined standalone sounder and strobe battery powered push button stations with interconnection capability.

#### **2-2.6.1 Allowable Area / Population.**

No more than 200 persons shall be located within a billeting structure group. Occupant loads for this determination must be calculated based on the number of beds.

See UFC 4-010-01 for antiterrorism/force protection requirements related to space separation.

#### **2-2.6.2 Structure Separation.**

Where this document uses the term structure group, this is defined as a cluster of independent structures, including tents, trailers, containerized housing units, or similar construction.

Separation of structures within structure groups consisting of fabric structures, containers, trailers, or similar structures must comply with the following:

- a. The minimum separation between individual structures within a row of a billeting structure group consisting of fabric structures must be 12 ft (3.7 m).
- b. The minimum separation between rows of structures within a billeting structure group must be 30 ft (9.1 m). This distance may be used for vehicle traffic, but must not be used for vehicle parking, storage, or vegetation other than a lawn.
- c. The minimum separation between billeting structure groups must be 59 ft (18 m). The separation distance may be used for vehicle traffic (including emergency response vehicles), but must not be used for vehicle parking, storage or vegetation other than a lawn.
- d. The minimum separation between billeting structure groups and other structures must be 100 ft (30.5 m). The separation distance may be used for vehicle traffic (including emergency response vehicles), but must not be used for vehicle parking, storage or vegetation other than a lawn.

#### **2-2.6.3 Use of Revetments.**

See UFC 4-010-01 for a diagram of the space separation requirements. If the space separations between individual structures given above cannot be achieved due to existing site constraints, then revetments may be used to reduce allowable separation distances between structures. Revetments may consist of engineered hardened walls, concrete barriers, HESCO type barriers, or similar separating barriers. Revetments

adjacent to tents or other structures must be at least as tall as the height of the tent wall, or the lower eave of the building. In the event revetments are provided, adjacent structures need to be separated as stated in UFC 4-010-01.

#### **2-2.6.4 Fire Safety Analysis for Constrained Sites**

If site constraints do not permit compliance with the above space separation requirements, a fire-safety analysis must be done. This evaluation must be performed or reviewed by the Unit Safety Officer and this analysis must be approved by the first O-6 level officer in the chain of command.

#### **2-2.6.5 Interior Finishes / Fabric Coverings**

Fabric coverings for tents or membrane structures must be in accordance with NFPA 701 requirements. Typically, compliance with NFPA 701 is achieved using fire retardant chemically treated fabrics.

Other structures must comply with NFPA 101 requirements. Compliance with NFPA 101 can be achieved using painted or unpainted finishes of concrete masonry units, gypsum wallboard, sheet metal, or 3/8-inch (9.5 mm) plywood. Fabric covering or textile coverings must be fire retardant as established by the manufacturer through testing in accordance with NFPA requirements.

Use or installation of exposed Urethane foam or other exposed plastic insulations on walls or ceilings is not allowed. Use of pre-insulated panels (with any surface – metal, wood, plastic or other) containing foam insulation is not allowed.

#### **2-2.6.6 Fire Extinguishers.**

All facilities must be provided with listed portable fire extinguishers consistent with the occupancy of the facility (see NFPA 10, Standard for Portable Fire Extinguishers). If traditional listed/approved extinguishers are not available, the use of extinguishers with equivalent rating from EU, Asian, or other countries is permitted.

#### **2-2.7 Telecommunications.**

- Army requirements are contained in FM 4-20.07, paragraphs 2-79 and 4-25.
- Air Force requirements are in AFH 10-222, Volume 1, Table 2.8, and Attachment 6.
- Navy/Marine Corps must follow assembly instructions for installation of pre-packaged equipment in theater.
- If pre-packaged systems are not available and when fabricating a grounding system from components:
- Follow UFC 3-580-01, *Telecommunications Interior Infrastructure Planning and Design*, Section 2-9, “Grounding, Bonding and Static Protection”.

- Follow UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, *Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises*.
- Follow UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, *Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments*.
- Follow UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, *Grounding, Bonding, and Shielding For Electronic Equipments and Facilities*.

**2-2.8 Cybersecurity.**

All control systems (including systems separate from an energy management control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.

CANCELLED

## CHAPTER 3 TEMPORARY FACILITY CONSTRUCTION LEVEL

### 3-1 APPLICABILITY.

The Temporary Facility Construction level applies to structures with an expected use not to exceed 60 months (5 years) and a design life up to 60 months (5 years).

### 3-2 CIVIL.

The requirements for site water treatment, storage and distribution, and waste disposal may be included in Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA) and as required by the Military Command having jurisdiction over the operation. The information below is a listing of some, but not necessarily all of those requirements. It is the responsibility of the service component engineer staff to determine which criteria are to be utilized for the operation.

#### 3-2.1 Potable Water Supply Source Selection and Testing.

Use TB MED 577, Sanitary Control and Surveillance of Field Water Supplies, Chapter 5 “Water Source Selection and Basic Testing for Potability”, Chapter 6 “Advanced Water Surveillance and Testing”, Chapter 7 “Evaluation of Field Tests and Analytical Results (Health Guidelines)” for water supply source selection and testing. Use UFC 3-230-03A, Water Supply, Chapter 5, “Groundwater Supplies” for construction of wells for groundwater supplies.

#### 3-2.2 Potable Water Treatment and Disinfection.

All drinking water facilities and systems must be designed and operated to ensure protection of personnel health and safety. The environmental annex (i.e., Annex L) of the applicable CCMD OPLAN/OPORD must be reviewed and updated as required to ensure appropriate force health protection standards for drinking water are included. Additional criteria may be applied in accordance with COCOM guidance, any applicable DoD policies, or international agreements. Facilities must also comply with TB MED 577, Chapter 9 Water Treatment and Disinfection, for potable water treatment and disinfection.

#### 3-2.3 Gray Water Collection and Disposal.

Use Army FM 4-20.07, Chapter 2, Section I, “Gray Water Collection and Disposal”; Army FM 4-20.07, Chapter 3, Section II, “Gray Water Collection Subsystem”; AFH 10-222, Volume 4, Section 2.8, “Wastewater”; and AFH 10-222, Volume 4, Section 3.4.1, “Gray Water”.

#### 3-2.4 Black Water Collection and Disposal.

Use Army FM 4-20.07, Chapter 2, Section I, “Black Water Disposal”; AFH 10-222, Volume 4, Section 2.8, “Wastewater”; and AFH 10-222, Volume 4, Section 3.4.2, “Black Water”.

### **3-2.5 Stormwater.**

Locate facilities and equipment away from areas subject to stormwater runoff and flooding.

### **3-2.6 Design Documentation**

#### **3-2.6.1 Civil Submittals**

Drawings: Site plan showing location of water source supply, sanitary sewer facilities, solid waste disposal areas, and all other facilities critical to life safety and health.

Calculations: Showing compliance with potable water testing requirements contained in referenced standards.

### **3-3 STRUCTURAL SYSTEMS.**

#### **3-3.1 Structural Design.**

Structural Design must be in accordance with the International Building Code (IBC), Chapters 16, 17, 18, 19, 20, 21, 22, and 23 as modified by the Unified Facilities Criteria 3-301-01 Structural Engineering, except as modified herein.

##### **3-3.1.1 Serviceability [Supplement].**

Frame drift discussed in UFC 3-301-01 Section 2-1.2.1 need not be limited to prevent damage to non-structural elements provided any damage sustained does not create unsafe conditions for personnel in or around the structure.

##### **3-3.1.2 Deflections [Replacement].**

Modify UFC 3-301-01 Sections 2-1.2.2 and 2-1.2.3 as follows: Deflections of structural members may exceed the limitations of IBC Sections 1604.3.2 through 1604.3.5, Table 1604.3, and Table 2-1 of UFC 3-301-01 provided: (1) The increased deflection does not cause excessive rotations in connections at ends of members that could result in connection failure or, (2) The increased deflection does not create an unsafe condition where finishes or other non-structural items could become dislodged and fall on personnel. Under no circumstances are member deflections to exceed  $L/120$  where  $L$  is the member span in inches. Members supporting mission critical equipment sensitive to excessive member deflection or vibration must be designed to meet equipment requirements.

##### **3-3.1.3 Live Loads [Supplement].**

It is not permissible to design structures for live loads less than those shown in UFC 3-301-01 Table D-1 or IBC Table 1607.1. Additionally, the minimum design uniform floor live load is 50 psf (245 kg/m<sup>2</sup>), even if the occupancy classification for these codes



allows a lower value. Similarly, for site specific designs, the minimum design uniform roof live load is 20 psf (98 kg/m<sup>2</sup>), even if the location map allows a lower value.

Live load reductions are not permissible.

Dead Load shall be computed from material weights and partitions, safes, equipment, etc.

#### **3-3.1.4 Wind Loads [Supplement].**

It is permissible to multiply the basic wind speed,  $V$ , as identified in UFC 3-301-01, by a reduction factor of 0.78 for structures that meet the definition of temporary construction except in regions defined as Hurricane Prone Regions.

Site Specific:

- Values in UFC 1-301-01 section 1609.1.1.

Unrestricted:

With a minimum of:

- Basic wind speed (3-sec gust) 95 mph (153 km/hr)
- Exposure category C
- Importance factor  $I_w = 1.0$

#### **3-3.1.5 Earthquake Loads [Supplement].**

For structures that meet the definition of temporary construction, it is permissible to multiply design loads calculated per the above referenced code sections by a reduction factor of 0.6 for structures that meet the following requirements:

1. For Risk Category I, II, or III structures,  $S_s$  does not exceed 0.55 and  $S_1$  does not exceed 0.13.
2. For Risk Category IV structures,  $S_s$  does not exceed 0.32 and  $S_1$  does not exceed 0.08.

Site Specific:

- Within the United States use IBC Section 1613
- Outside the United States use IBC Section 1613

Unrestricted:

- Within the United States use IBC Section 1613
- Outside the United States use IBC Section 1613

With a minimum of:

- For Risk category I, II, III or IV structures,
- Short period acceleration  $S_s = 0.55g$
- One second acceleration  $S_1 = 0.13g$
- Site class (assumed) D
- Importance factor  $I_e = 1.0$

### **3-3.1.6 Structural Test and Special Inspections [Revision].**

Delete IBC Chapter 17 Structural Tests and Special Inspections. The DOR must delineate all testing and inspection requirements in the construction drawings or specifications to ensure performance of the structural system. The DOR is responsible to provide an appropriate design in which the testing and inspection requirements specified in IBC Sections 1713, 1714, and 1715 can be met based on field capability and resources. Testing and inspections should include, but not be limited to, the following:

The UFC indicates the DOR must specify, however does not indicate limits of QC, nor any QA for the manufacturing process.

1. All Materials: Inspection of suitable sub-surface conditions. Visual inspection of member sizes, locations, spacing, and configuration. Visual inspection of splice/cold joint locations, connections, and adequate bearing.
2. Wood structures: In addition to the inspections for All Materials also perform visual inspection of connector (e.g. nails, screws, bolts) sizes, spacing and locations. Visual inspection of size and location of plate connections. Visual inspection of all straps, hold downs, and connection hardware. Visual inspection of overlapping lengths at splices. Visual inspection of member material grades. Visual inspection of sheathing thickness, sheathing material grades, shear wall locations, and cross bracing.
3. Masonry: In addition to the inspections for All Materials also perform visual inspection of grout placement. Visual inspection of reinforcing steel sizes, locations, clearances, configuration, embedment, and splice lengths. Grout cylinder compression tests, CMU compression tests, and verification of mortar and grout proportions.
4. Steel: In addition to the inspections for All Materials also perform visual inspection of deck profiles, diaphragm sizes and locations, and diaphragm connections. Visual inspection of completed welds. Visual inspection of connector (e.g. bolts, screws) number and patterns, and connector sizes. Inspection confirming proper tightening of the nuts. Visual inspection of cross bracing.

5. Concrete: In addition to the inspections for All Materials also perform visual inspection of formwork. Visual inspection of reinforcing steel sizes, locations, clearances, configuration, embedment, and splice lengths. Concrete anchors and embed sizes and locations. Concrete cylinder compression test, and water/cement ratio measurement.

### **3-3.1.7 Geotechnical Investigations, General [Supplement].**

Add exception: The DOR or qualified DoD personnel must accept simplified geotechnical investigations in lieu of the full requirements of sections 1803.3 through for one-story, simple span structures without basements that bear on shallow foundations and meet the following requirements:

1. For Risk Category I, II, or III structures,  $S_s$  does not exceed 0.55 and  $S_1$  does not exceed 0.13.
2. For Risk Category IV structures,  $S_s$  does not exceed 0.55 and  $S_1$  does not exceed 0.13.

In the absence of a Geotechnical Report, the DOR must design foundations for presumptive bearing capacities per IBC Section 1806.

### **3-3.1.8 Reporting [Supplement].**

The DOR must stipulate the required items, if any, to be included in a written report of the geotechnical investigations, which need not include any or all of IBC Section 1803.6, items 1 through 10.

### **3-3.1.9 Permanent Wood Foundation Systems [Supplement].**

Delete preservative treatment requirements except in regions with a known significant risk of destructive insect infestations.

### **3-3.1.10 Foundations [Supplement].**

Modify second sentence to read, "Deflection and racking of the supported structure must be limited to that which will not compromise the strength or stability of the structure."

### **3-3.1.11 Frost Protection [Supplement].**

Add exception: One-story, simple span structures that bear on shallow foundations need not be protected.

### **3-3.1.12 Timber Footings [Supplement].**

Delete preservative treatment requirements except in regions with a known significant risk of destructive insect infestations.

**3-3.1.13 Durability Requirements [Delete].**

Delete IBC Section 1904.

**3-3.1.14 Corrosive Environments [Delete].**

Delete UFC 3-301-01 and IBC Section 1907.7.6.

**3-3.1.15 Protection [Delete].**

Delete IBC Section 2203.2.

**3-3.1.16 Bolting [Delete].**

Delete UFC 3-301-01.

**3-3.1.17 General [Supplement].**

Delete UFC 3-301-01. Members supporting mission critical equipment sensitive to excessive vibration must be designed to meet equipment requirements.

**3-3.1.18 Steel Structures in Corrosive Environments [Supplement].**

Delete UFC 3-301-01 except for steel sections with elements thinner than 3/8".

**3-3.1.19 Floor Vibrations [Supplement].**

Delete UFC 3-301-01. Members supporting mission critical equipment sensitive to excessive vibration must be designed to meet equipment requirements.

**3-3.1.20 Protection Against Decay and Termites [Delete].**

Delete UFC 3-301-01 section except in regions with a known significant risk of destructive insect infestations.

**3-3.2 Design Documentation**

Provide as a minimum:

- Drawings:
  - General Notes
  - Inspection Requirements
  - Foundation Plans
  - Framing Plans, all levels

- Roof Framing Plans
- Details
- Schedules as required (footings, columns, beams, shear walls)
- Calculations:
  - Basis of Design; summary of applicable codes, live loading, snow loading, wind and seismic loads, and dead load assumptions Gravity design; design of floor and roof framing members - beams, slabs, joists, decks, composite slabs, etc.
  - Column and bearing wall design
  - Foundation design
  - Lateral design; design of diaphragms and collectors, distribution of loads to lateral forces resisting elements (frames, walls), design of shear walls, moment frames, and braced frames, design of foundations at lateral force resisting elements, design of hold downs, straps, etc.
  - Design for AT/FP; confirm setbacks, wall construction types, and progressive collapse mitigation design requirements, check window designs, jambs and sills for AT/FP window loading requirements
- Additional Requirements:
  - Load combinations used
  - Materials used with properties and section properties
  - Connection design and details – bolted and welded
  - Wind load analysis applied to structure
  - Seismic load analysis
  - Serviceability check (deflections and overturning)
  - Wall panel design (building envelope) and connection to superstructure
  - Stated structure life-span
  - Erection plan(s)

### **3-4 FIRE PROTECTION.**

The overarching requirement is for Life Safety.

Property Protection is a consideration only if specifically required by the facility owning entity.

The intent of this document is to provide buildings that are limited in size (overall building height and floor area) so as to not require installed active fire protection or fire alarm systems, except where explicitly required by the criteria of an allowable occupancy in this UFC.

Any installed fire alarm system shall be a local alarm only and shall not require visual appliances (strobes), unless specifically required by the facility owning entity.

An acceptable alternate local alarm system:

- Consisting of an alarm initiating device at each exit by either:
  - Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.

OR

- Combined standalone sounder and strobe battery powered push button stations with interconnection capability.

#### **3-4.1 General requirements**

Use of Spray Plastic Foam Insulation (SPFI) is not allowed. Use of pre-insulated panels (with any surface – metal, wood, plastic or other) containing foam insulation is not allowed. /2/

##### **3-4.1.1 Mission Critical Facilities**

For mission critical facilities, see Figure E-1 in Appendix E for a decision tree with guidance on protection of assets for these facilities.

##### **3-4.1.2 Antiterrorism Separation Distance**

Refer to UFC 4-010-01 for antiterrorism/force protection requirements related to space separation compliance.

For all buildings, provide access to at least one side of any building for the largest emergency response vehicle serving the site.

### **3-4.1.3 Unenclosed Vertical Openings**

Unenclosed vertical openings are generally not permitted. Vertical openings include but are not limited to atriums, stairways; hoist ways for elevators, dumbwaiters, or inclined and vertical conveyors (escalators); shafts used for light, ventilation or building services.

Mezzanines shall comply with requirements for mezzanines herein and in IBC Chapter 5, General Building Heights and Areas, and are not treated as vertical openings.

All vertical openings shall be enclosed or protected with shafts constructed as fire barriers as called for by the IBC Chapter 7, Fire and Smoke Protection Features, or NFPA 101 Chapters 7, Means of Egress, and 8, Features of Fire Protection, for the fire resistance rating of the barrier.

Any planned unenclosed vertical opening needs to be approved by the AHJ.

### **3-4.2 Construction Level and Space Separation Requirements per Occupancy.**

Classifications of buildings within this section are based on occupancy. As defined by NFPA 101, Chapter 3, Definitions, the occupancy is the purpose for which a building or other structure, or part thereof, is used or intended to be used. The occupant load of these areas is calculated per NFPA 101, Chapter 7, Means of Egress.

#### **3-4.2.1 Fire Separation Distance**

This document provides requirements for allowable fire separations between structures by occupancy classification.

#### **3-4.2.2 Area Limits**

Area limits stated within this UFC are for a stand-alone building as defined in the IBC Chapter 5, General Building Heights and Areas. If larger building areas than stated herein are needed to meet the needs of users, then the following guidance is provided to facilitate the construction of buildings with larger areas, in order of preference:

1. Provide fire separation distance between separate structures in accordance with IBC Chapter 6, Types of Construction, requirements for fire separation between buildings.
2. Provide pedestrian walkways between buildings individually compliant with IBC Chapter 31, Special Construction, fire separation requirements to provide separate buildings interconnected with enclosed, conditioned walkways.
3. Provide fire rated exterior walls or fire walls between buildings in accordance with IBC Chapter 6, Types of Construction, requirements.

4. Provide buildings of an area or height to require fixed fire protection systems in accordance with IBC Chapter 5, General Building Heights and Areas requirements, and provide these fixed protection systems.

### **3-4.3 Assembly Occupancy**

Assembly occupancy is an occupancy used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation or similar uses; or used as a special amusement building, regardless of occupant load. Assembly occupancies include but are not limited to: dining facilities, clubs, chapels, conference rooms, and morale welfare, and fitness centers for general personnel use.

#### **3-4.3.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings must be limited to one story high.
  - i. Buildings constructed of combustible construction must be limited to 6,000 sq. ft. (557 sq. m.) in area.
  - ii. Buildings constructed of non-combustible or fire-resistive construction must be limited to 9,500 sq. ft. (883 sq. m.) in area.
- b. Buildings must be provided with a sprinkler system designed in accordance with the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with IBC Chapter 5, General Building Heights and Areas, limits on building areas. Building height must be limited to 2 stories.

#### **3-4.3.2 Building Separation.**

Buildings must be separated from other buildings by one of the following options (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. The clear space may be used for vehicle roadways or pedestrian walkways, but not for parking, storage or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided due to site constraints, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.



- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Adjacent buildings must be separated by at least twice the height of the taller building.

#### **3-4.3.3 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 12, New Assembly Occupancies, for egress, except as follows:

- a. For buildings without sprinkler protection in accordance with this document, provide exits 100% above the number required by NFPA 101, Chapters 7, Means of Egress, and 12, New Assembly Occupancies. Exits must be evenly distributed along at least three sides of the building.

#### **3-4.3.4 Fire Alarm System**

Provide local fire alarm notification throughout the space for evacuation in the event of an emergency. The fire alarm notification system must be activated by manual stations at each exit. The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with NFPA 72 requirements.

#### **3-4.3.5 Kitchen Requirements.**

Provide an exhaust hood with a listed kitchen hood fire protection system for any commercial-type cooking operation.

Provide one-hour rated fire barrier separation between any cooking/serving operations and the seating area(s).

#### **3-4.4 Business Occupancy.**

Business occupancy is an occupancy used for the transaction of business other than mercantile. Business occupancies include the following: general offices and administrative facilities, outpatient clinics, doctors' offices, detention facilities, and fitness centers that are located within an office, solely for office personnel use (no public or common use).

Business Occupancy can include sleeping spaces in facilities with 24 hour operations such as HQ, TOCs, JOCs or Air Terminals.

#### **3-4.4.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings must be limited to 3 stories above grade.
  - i. Buildings constructed of combustible construction must be limited to 9,000 sq. ft. (836 sq. m.) per floor.
  - ii. Buildings constructed of non-combustible or fire-resistive construction must be limited to 23,000 sq. ft. (2,137 sq. m.) per floor.
- b. Buildings must be provided with a sprinkler system designed in accordance with the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with 2009 IBC Chapter 5, General Building Heights and Areas, limits on floor areas. Building height must be limited to 3 stories.

#### **3-4.4.2 Building Separation.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings within the same contingency compound. A clear space of 100 ft. (30.5 m) must be provided between the building and other buildings not associated with the contingency compound. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.
  - ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Buildings must be separated by at least twice the height of the taller building.

Comply with NFPA 101, Chapters 7 and 38, for egress except that all exits, including grade level exit doors, exit stairs, and fire-rated exit passageways must discharge directly to the exterior to public ways.

#### **3-4.4.3 Fire Alarm System.**

Provide local fire alarm notification throughout the space where any of the following conditions occur:

- a. Levels of the building located on other than grade level exceed 5,000 sq. ft. (465 sq. m.) per floor.
- b. The total area of all floors exceeds 30,000 sq. ft. (2,787 sq. m.).

The notification system must be activated at each exit by either:

- Manual pull stations  
OR
- Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- Combined standalone sounder and strobe battery powered push button stations.

The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with the installation requirements of NFPA 72.

#### **3-4.4.4 Detention Facilities.**

Detention Facilities are classified as Business Occupancy with special population requirements. Detention facilities are those buildings and structures where persons are under restraint or where security is closely supervised and are not capable of self-preservation because the conditions of confinement are not under their control (i.e. they require assistance by the facility's staff to reach safety in an emergency situation). For occupancy classification purposes the population refers only to the number of persons being secured or restrained. The number of guests or staff is not counted.

##### **3-4.4.4.1 Detention Facilities Allowable Population.**

The allowable population of a detention facility, building or structure is no more than five (5) persons who are under restraint or security.

##### **3-4.4.4.2 Detention Facilities Fire Separation Distance.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings within the same contingency compound. A clear space of 100 ft. (30.5 m) must be provided between the building and other buildings not associated with the contingency compound. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided, one of the following must be provided:

- i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.
- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Buildings must be separated by at least twice the height of the taller building.

#### **3-4.4.5 Fire Alarm System**

The fire alarm notification system must be activated at each exit by either:

- a. Manual pull stations  
OR
- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- c. Combined standalone sounder and strobe battery powered push button stations

The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with the installation requirements of NFPA 72.

#### **3-4.5 Industrial Occupancy.**

A factory-industrial occupancy is an occupancy in which products are manufactured or in which processing, assembling, mixing, packaging, finishing, decorating, or repair operations are conducted. This occupancy includes factories, laundries, power plants, maintenance shops, and pumping stations.

##### **3-4.5.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings constructed of combustible construction must be limited to 8,500 sq. ft (790 sq. m.) and one story above grade.
- b. Buildings constructed of non-combustible or fire-resistive construction must be limited to 15,500 sq. ft. (1,440 sq. m.) per floor and two stories above grade.
- c. Buildings must be provided with a sprinkler system designed in accordance with NFPA 13. Buildings provided with this protection must be

constructed in accordance with IBC Chapter 5, General Building Heights and Areas, requirements for floor areas and heights.

### **3-4.5.2 Building Separation.**

Buildings must be provided fire separation from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distance as noted in Option (a) cannot be provided, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC requirements.
  - ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other approved type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Fire separation distance between these buildings must be at least twice the height of the taller building.

### **3-4.5.3 Fire Alarm System**

The fire alarm notification system must be activated at each exit by either:

- a. Manual pull stations  
OR
- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- c. Combined standalone sounder and strobe battery powered push button stations

The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with the installation requirements of NFPA 72.

### **3-4.5.4 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 40, Industrial Occupancies, for egress in accordance with one of the following options (a or b):

- a. Provide a minimum of two means of egress from every story or section, and not less than one exit shall be reached without traversing another story  
OR
- b. Provide a single means of egress from any story or section in low and ordinary hazard industrial occupancies, provided that the exit can be reached within the distance permitted as a common path of travel.

**3-4.5.5 Mezzanines.**

Mezzanines within industrial buildings cannot be used for normally occupied spaces (such as offices). Mezzanines must be limited to storage rooms and/or mechanical/electrical rooms only.

**3-4.5.6 Fire Alarm System.**

Provide local fire alarm notification throughout the space where a floor area more than 7500 sq. ft. (697 sq. m.) is located above or below grade, or if the total building area of all floors exceeds 30,000 sq. ft. (2,787 sq. m.). The fire alarm notification system must be activated by manual stations at each exit. The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must be installed in accordance with NFPA 72.

**3-4.5.7 Hazardous Areas.**

Hazardous areas such as flammable painting operations, combustible dust producing operations, areas with combustible hydraulic fluid systems over 100 gallons (379 liters), or other industrial operations with significant flammable liquid or gas storage and/or use must be protected by one of the following (a or b):

- a. Provided protection in accordance with NFPA 13, 30, and 101 requirements.
- b. These areas must be located in buildings with a minimum 100 ft (30.5 m) fire separation distance from adjacent buildings.

**3-4.6 Residential Occupancy.**

The residential occupancy is defined as an occupancy that provides sleeping accommodations for purposes other than health care or detention and correctional. Residential occupancies include one- and two-family dwellings, dormitories, barracks, billeting, Bachelor Enlisted Quarters and Bachelor Officer's Quarters, apartment buildings, relocatable buildings and converted shipping containers.

Residential Occupancy does not include sleeping spaces in facilities with 24 hour operations such as Headquarters (HQs), Tactical Operations Center (TOCs), Joint Operation Centers (JOCs), Air Terminals or any other facility with 24 hour operations.

### **3-4.6.1 Building Construction.**

Buildings must be constructed in accordance with one of the following requirements (a or b):

- a. Buildings constructed of combustible construction must be limited to 7,000 sq. ft. (650 sq. m.) per floor, and 2 stories in height.
  - i. Buildings constructed of non-combustible construction must be limited to 15,000 sq. ft. (1,394 sq. m.) per floor, and 4 stories in height.
- b. Buildings must be provided with a sprinkler system designed in accordance with NFPA 13R and the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with IBC Chapter 5, General Building Heights and Areas, requirements for floor areas. Building heights must be limited to 4 stories.

### **3-4.6.2 Building Separation.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided due to site constraints, one of the following must be provided (i, ii or iii):
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.
  - ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Fire separation distance must be at least twice the height of the taller building.
  - iii. The residential building must be provided with sprinkler protection by a system designed in accordance with NFPA 13R and the fire sprinkler requirements of this document.

### **3-4.6.3 Fire/Smoke Alarms.**

Multiple station type smoke alarms must be provided throughout each room of the living quarters. Actuation of any smoke alarm must cause all smoke alarms within the living unit to generate an audible signal.

A manual fire alarm system must be provided throughout each building, with notification appliances provided in each living unit.

The fire alarm notification system must be activated at each exit by either:

- a. Manual pull stations  
OR
- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- c. Combined standalone sounder and strobe battery powered push button stations

### **3-4.6.4 Range-Top Extinguishing Systems.**

For all living units with residential range-top cooking units, an approved residential range-top extinguishing system must be provided. Actuation of the residential range-top extinguishing system must cause a general building alarm, and automatically shut off all sources of fuel and electrical power to the cooking unit.

### **3-4.6.5 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 28, New Hotels and Dormitories, for egress, except as modified below:

Means of egress from sleeping rooms must be provided in accordance with one of the following (a or b):

- a. A secondary means of escape must be provided, consisting of a door or window readily operable from inside with no special tools or knowledge. The window must be sized at a minimum of 5.7 sq. ft. (0.53 sq. m.) with a width of at least 20 inches (508 mm) and an open height of at least 24 inches (610 mm). The secondary means of escape must be located on a different exterior wall than the main entrance door to the sleeping room.
- b. For sleeping rooms where it is not practical to provide a secondary means of escape as noted in (a), the following must be provided (i and ii):
  - i. Walls between sleeping rooms must be rated at a minimum of 30 minutes.



- ii. Sprinkler protection must be provided throughout the building installed in accordance with NFPA 13R or NFPA 13D requirements.

### **3-4.7 Aircraft Hangars.**

Aircraft hangars must be protected as follows:

- a. Single hangars over 15,000 sq. ft. (1,394 sq. m.) must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".
- b. Multiple hangars less than 15,000 sq. ft. (1,394 sq. m.) per hangar, that are separated by less than 50 ft. (15.2 m.) from each other, must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".
- c. Any hangar within 100 ft. (30.5 m.) of a normally occupied structure (office, shop, lodging building, etc) must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".

#### **3-4.7.1 Fire Alarm System**

The fire alarm notification system must be activated at each exit by either:

- a. Manual pull stations  
OR
- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- c. Combined standalone sounder and strobe battery powered push button stations

### **3-4.8 Fuel Depots (Petroleum, Oil and Lubricants (POL) and Hazardous Material Storage Areas)**

#### **3-4.8.1 Fixed POL Storage**

Fixed POL installations, including cut and cover type tanks, must comply with UFC 3-460-01.

#### **3-4.8.2 Hazardous Materials and Hazardous Waste Storage**

Hazardous materials and hazardous waste must be protected in accordance with UFC 3-600-01.

### **3-4.8.3 Flammable Liquid Storage**

Flammable liquid storage tanks must be located as follows:

- a. Above-ground tanks containing liquids with flash points less than 100 degrees F (38 degrees C) (gasoline, most solvents) must be separated from adjacent tanks or important buildings by 100 ft. (30.5 m.) or one tank diameter, whichever is greater.
- b. Above-ground tanks containing liquids with flash points over 100 degrees F (38 degrees C) (typical diesel fuel and fuel oil) and more than 50,000 gallons (189,270 liters) must be separated from important buildings by 100 ft. (30.5 m.).
- c. Above-ground tanks containing liquids with flash points over 100 degrees F (38 degrees C) and less than 50,000 gallons (189,270 liters) must be separated from important buildings by a minimum of 60 ft. (18.3 m.).
- d. Underground storage tanks and bladders must be separated from adjacent underground tanks or important buildings by a minimum of 25 ft. (7.6 m.). Each underground bladder or tank must be provided an independent berm sized for containment of the largest tank's volume.
- e. All flammable liquid tanks must be provided with fire response vehicle access within one tank diameter of the tank on at least one side.

### **3-4.9 Mixed-use Occupancies and Co-locating of Occupancies.**

Residential occupancies with accommodations for more than 10 persons must be located in separate buildings from dining, offices, and recreational occupancies. Dining, offices, and recreational occupancies may be co-located in a single building.

Conference rooms, lunch rooms, gymnasiums, or other assembly spaces located within a business or other occupancy may have an occupant load of up to 49 persons in a single space without the facility being considered a mixed-use occupancy. Occupant loads shall be calculated using NFPA 101 Chapter 7, Means of Egress.

Comply with NFPA 101 Chapter 6, Classification of Occupancy and Hazard of Contents, requirements for occupancy classifications and egress related to mixed-use occupancies and with IBC Chapter 5, General building Heights and Areas, for all other requirements related to mixed-use occupancies.

### **3-4.10 Medical Facilities.**

Medical facilities are those that house inpatients. Refer to the applicable Service Medical Group for guidance in constructing medical facilities. These facilities will require a fire sprinkler system.

### **3-4.11 Sprinkler System Design Criteria.**

#### **3-4.11.1 Non-Residential Buildings**

For the purposes of non-residential military facilities in the temporary or semi-permanent construction level, NFPA 13 serves as the sprinkler standard for sprinkler systems. In situations where it may not be possible to construct systems meeting the requirements of NFPA 13 related to water storage volume, the number of design sprinklers from NFPA 13R and an amended water supply duration may be used in lieu of the NFPA 13 requirements for non-storage buildings or non-hazardous occupancies.

NFPA 13R requires that all (or 4 at most if more than 4 exist in compartment) sprinklers in the hydraulically most remote compartment must be able to operate at the required density for 30 minutes. For the purposes of this document, the water supply must be required to supply sprinklers for 20 minutes, with a maximum supply volume of 2,000 gallons (7,571 liters) of water (based on 4 sprinklers operating at 25 gpm for 20 minutes).

For non-residential buildings, all other aspects of sprinkler installation, including scope of sprinkler system coverage and installation standard must be per NFPA 13.

#### **3-4.11.2 Non-Residential Buildings**

For the purposes of non-residential military facilities in the temporary or semi-permanent construction level, NFPA 13 serves as the sprinkler standard for sprinkler systems. In situations where it may not be possible to construct systems meeting the requirements of NFPA 13 related to water storage volume, the number of design sprinklers from NFPA 13R and an amended water supply duration may be used in lieu of the NFPA 13 requirements for non-storage buildings or non-hazardous occupancies.

NFPA 13R requires that all (or 4 at most if more than 4 exist in compartment) sprinklers in the hydraulically most remote compartment must be able to operate at the required density for 30 minutes. For the purposes of this document, the water supply must be required to supply sprinklers for 20 minutes, with a maximum supply volume of 2,000 gallons (7,571 liters) of water (based on 4 sprinklers operating at 25 gpm for 20 minutes).

For non-residential buildings, all other aspects of sprinkler installation, including scope of sprinkler system coverage and installation standard must be per NFPA 13.

#### **3-4.11.3 Residential Buildings.**

For residential buildings requiring sprinkler protection, sprinkler systems must be designed per NFPA 13R and this section, or NFPA 13D as applicable.

### **3-4.12 Design Documentation**

- Drawing / Narrative Basis of Design (can be combined)

- A fire protection summary is required for all designs. Provide a summary discussing the following minimum fire protection provisions:
- Building code analysis summary drawing (i.e., type of construction, height and area limitations, and building separation or exposure protection),
- Classification of occupancy, mixed use requirements, any hazardous areas,
- Requirements for fire and smoke barriers, fire rated walls,
- Life safety plan showing locations of fire rated walls, egress paths, travel distances, and emergency response vehicle access,
- Fire protection plan (include type of system and location of equipment), and water supply information (if system is required),
- Fire alarm system (and mass notification system if integrated into the fire alarm) plan showing type of system and location of equipment, indicating reporting method to a central station/base location (if system is required),
- Interior finish ratings required and provided
- Coordination with security and antiterrorism requirements.

### **3-5 PLUMBING AND MECHANICAL SYSTEMS.**

Provide interior spaces intended for occupancy with ventilation by natural or mechanical means in accordance with the International Mechanical Code (IMC), Chapter 4, "Ventilation".

Recommend interior spaces intended for occupancy be provided with active or passive air-conditioning systems capable of maintaining the spaces at an ASHRAE effective maximum temperature of 93 degrees Fahrenheit (33.9 deg. C), and effective minimum temperature of 60 degrees Fahrenheit (15.5 deg. C).

#### **3-5.1 Requirements for Specific Systems.**

The requirements listed below in the remainder of this section are additional life safety and habitability requirements that must be incorporated if these features are included in order to meet the functional requirements as defined by the COCOM.

#### **3-5.2 Engineering Weather Data.**

Follow UFC 3-400-02, Design: Engineering Weather Data.

#### **3-5.3 HVAC Systems and Controls.**

Follow IMC Chapter titled "General Regulations".

### **3-5.4 Exhaust Systems.**

Follow IMC Chapter 5, Exhaust Systems.

### **3-5.5 Noise.**

Noise levels shall not exceed the permissible exposures of 29 CFR 1910.95, Table G-16.

### **3-5.6 Plumbing - Introduction and Administration.**

Follow UFC 3-420-01, *Plumbing Systems*, Section titled "Purpose and Scope," through Section titled "Primary Voluntary Consensus Standard Reference," and Section titled "Conflicts in Criteria."

Requirements in UFC 3-420-01, Section titled "Energy Efficiency in Water Conservation" and Section titled "Reliability" do not apply; however, consideration must be given to resource conservation where and when practical. See paragraph 1-11 of this UFC, "Resource Conservation." Follow UFC 3-420-01, Section titled "Piping Arrangement." Piping is not required to be concealed or painted.

Follow UFC 3-420-01, Appendix A: IPC Chapter 1 "Administration" Supplements, Item A, Delete Chapter 1 in its entirety.

Follow UFC 3-420-01, Appendix A: IPC Chapter 2 "Definitions" Supplements.

### **3-5.7 Plumbing - General Regulations.**

Follow the International Plumbing Code (IPC), Chapter 3, General Regulations, with the following exceptions:

- Section Titled, "Protection Against Contact": does not apply
- Section Titled, "Protection Against Physical Damage": does not apply
- Section Titled, "Equipment Efficiencies": does not apply
- Section Titled.1, "Condensate Disposal": does not apply with the exception of the last sentence that does apply (i.e., "Condensate cannot discharge into a street, alley, or other areas so as to cause a nuisance").
- Section Titled, "Drain Pipe Materials and Sizes": does not apply; instead refer to IPC Table 314.2.2, Condensate Drain Sizing, for condensate drain sizing.
- Section Titled, "Auxiliary and Secondary Drain Systems": does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item F, Section 305.6 Freezing, with the exception of the third, fourth, and fifth sentences regarding piping freeze protection that do not apply.

- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item G, Section 305.6.1 Sewer Depth, with the following revision: Revise to state: "Replace with the following: 'Building sewers must be installed not less than 6 inches (150 mm) below the frost line.'"
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item H, Section 312.4 Drainage and Vent Final Test, with the following revision: Revise to state "Add after the last sentence: 'A peppermint test may be accepted as a final test for the drainage and vent systems, provided the contractor submits a testing procedure for approval.'"

### **3-5.8 Plumbing Fixtures.**

Follow the International Plumbing Code, Chapter 4, Fixtures, Faucets, and Fixture Fittings, with the following exceptions:

- Section Titled, "Minimum Plumbing Facilities": does not apply. Instead provide a minimum of one water closet and one showerhead for every 20 occupants and a maximum of one water closet and one showerhead for every 10 occupants.
- Section Titled, "Accessible Plumbing Facilities": does not apply except for special use facilities, such as medical, where more stringent standards may apply.
- Section Titled, "Setting": does not apply
- Section Titled.1, "Floor Flanges": does not apply
- Section Titled.3, "Securing Wall-hung Water Closet Bowls": does not apply
- Section Titled, "Water-tight Joints": does not apply
- Section Titled, "Plumbing in Mental Health Centers": does not apply
- Section Titled.1, "Connection of Overflows": does not apply
- Section Titled, "Slip Joint Connections": does not apply
- Section Titled, "Design and Installation of Plumbing Fixtures": does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 4 "Fixtures, Faucets, and Fixture Fittings" Supplements, Item A, Section 401.2 Prohibited fixtures and connections, Item J, Add "Section 411.3 Design guidance for emergency shower and eyewash stations", Item K, Add "Section 412.5 Required locations and construction", and Item L, Add "Section 412.6 Floor drains for emergency shower and eyewash stations".

### 3-5.9 Water Heaters.

Follow the International Plumbing Code, Chapter 5, Water Heaters, with the following exceptions:

- Section 501.2, "Water Heater as a Space Heater": does not apply
- Section 502.3, "Water Heaters Installed in Attics": does not apply
- Section 503, "Connections": does not apply
- Section 505, "Insulation": does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 5 "Water Heaters" Supplements, Item H, Add "Section 506 Sizing Hot Water Systems, 506.1 Sizing Calculations" with the following revision: Revise to state: "Design in accordance with American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook – *HVAC Applications*, Chapter 49 'Service Water Heating'; and in accordance with ASHRAE Standard 90.1, *Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings*. Size hot water system and set service water heater (SWH) storage temperature set point for not less than 140°F (60°C) to limit the potential for growth of Legionella pneumophila. Provide a hot water and cold water blending, tempering valve immediately downstream of the SWH storage tank to provide anti-scalding protection. Provide a balanced-pressure-type tempering valve. Set the blending valve to deliver 110°F (43°C) water to the fixtures except where higher temperatures are required by specialized equipment".

### 3-5.10 Water Supply and Distribution.

Follow the International Plumbing Code Chapter 6, Water Supply and Distribution, with the following exceptions:

- Section 604.10, "Gridded and Parallel Water Distribution Systems": does not apply
- Section 604.11, "Individual Pressure Balancing In-line Valves for Individual Fixture Fittings": does not apply
- Section 608.8.3, "Size": does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 6 "Water Supply and Distribution" Supplements, Item B, Add "Section 602.2.1 Non-potable water exception", Item J, Add "Section 607.1.1 Legionella Pneumophila (Legionnaire's Disease)", Item M, Section 608.1 "General", and Item N, Section 611.2 "Reverse osmosis systems".

### 3-5.11 Sanitary Drainage.

- Follow International Plumbing Code, Chapter 7, "Sanitary Drainage".

- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 7, “Sanitary Drainage Supplements”, Item B, Section 712.3.2 “Sump Pit”, and Item D, Section 712.3.6 “Controls”.

### **3-5.12 Indirect/ Special Waste.**

Follow International Plumbing Code, Chapter 8, “Indirect/Special Waste”.

### **3-5.13 Vents.**

Follow International Plumbing Code, Chapter 9, “Vents”.

### **3-5.14 Traps, Interceptors, and Separators.**

Follow International Plumbing Code, Chapter 10, “Traps, Interceptors, and Separators”, with the following exceptions:

- Section 1002.4, “Trap Seals”: applies with the exception of the second sentence that does not apply (i.e. “Where a trap seal is subject to loss by evaporation, a trap seal primer valve must be installed”).
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 10, “Interceptors and Separators Supplements”; Item A, Section 1002.4, “Trap Seals”.

### **3-5.15 Storm Drainage.**

Follow International Plumbing Code, Chapter 11, “Storm Drainage”.

Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 11 “Storm Drainage” Supplements, Item B, Section 1104.2, “Combining Storm with Sanitary Drainage”, and Item C, Add “Section 1104.4 Insulation of rainwater conductors”.

### **3-5.16 Special Piping and Storage Systems.**

Follow UFC 4-510-01, *Design: Medical Military Facilities*, Section titled “Medical Gas Systems” for medical gas and vacuum systems.

### **3-5.17 Gray Water Recycling Systems.**

Follow International Plumbing Code, Appendix C, “Gray Water Recycling Systems”, Sections C101 and C102.

### **3-5.18 Emergency Shower and Eyewash Stations.**

Follow UFC 3-420-01, Appendix D, “Design Guidance for Emergency Shower and Eyewash Stations”.



**3-5.19 Structural Safety.**

Follow International Plumbing Code, Appendix F, “Structural Safety”.

**3-5.20 Compressed Air Systems.**

Follow Compressed Air and Gas Institute’s *Compressed Air and Gas Handbook* and ASME Boiler and Pressure Vessel Codes.

**3-5.21 Fuel Oil Piping and Storage.**

Follow requirements in IMC Chapter 13 for fuel storage and piping supporting building systems.

**3-5.22 Boilers, Water Heaters, and Pressure Vessels.**

Follow requirements in IMC Chapter 10 for facilities that are provided with boilers or water heaters, and pressure vessels.

**3-5.23 Refrigeration.**

Follow requirements in IMC Chapter 11 for facilities that are provided with refrigerant systems.

**3-5.24 Design Documentation**

Drawings:

- Natural ventilation - Floor plans showing the layout of the ventilation system, dimensions of openings and associated equipment, and the means of controlling the system.
- Mechanical ventilation - Floor plans showing the layout of the ventilation system, equipment schedules and details, schematic diagrams, and control sequences and diagrams.

Calculations based on facility function and local climatic conditions:

- Natural ventilation – Calculations showing ventilation opening areas.
- Mechanical ventilation – Calculations showing required ventilation air quantities based on facility occupancy.
- For any specific systems as defined in Section 3-4.1.1, Requirements for Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-4, “Calculations”, and Chapter 3-5, “Drawings”, and Plumbing System documentation per UFC 3-420-01, Chapter 1-10.2, “Calculations”, and Chapter 1-11, “Drawings”.

### **3-6 ELECTRICAL SYSTEMS.**

#### **3-6.1 Hazardous Material and Waste.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 2-1.1, "Hazardous Materials and Waste, and Controlled Materials".

#### **3-6.2 Arc Flash Analysis.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, "Electrical Calculations Overview", with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.6, "Arc Flash Analysis".

Comply with the requirements of UFC 3-501-01, Section 2-1.12, "Arc Flash Warning Labels".

#### **3-6.3 Short Circuit Analysis.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, "Electrical Calculations Overview", with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.4, "Short Circuit Analysis".

#### **3-6.4 Lightning Protection.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, "Electrical Calculations Overview", with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.15, "Lightning Protection Calculations".

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-14, "Lightning Protection Systems".

#### **3-6.5 Service Entrance and Distribution Equipment.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-2, "Service Entrance and Distribution Equipment", third paragraph. First, second and fourth paragraphs are not applicable.

**3-6.6 Circuit Lockout Requirements.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-2.9, "Circuit Lockout Requirements".

**3-6.7 Raceway and Wiring.**

Comply with the latest edition of NFPA 70, *National Electrical Code*, Chapter 2, "Wiring and Protection"; Chapter 3, "Wiring Methods and Materials"; and Chapter 4, "Equipment for General Use".

**3-6.8 Emergency and Exit Lighting.**

Comply with the requirements of UFC 3-530-01, *Interior and Exterior Lighting Systems and Controls, Appendix B Best Practices: Interior, "Emergency and Exit Lighting"*.

**3-6.9 General Electrical Requirements.**

Comply with the requirements of UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-2, "General Electrical Requirements".

**3-6.10 Configuration for Pad-mounted Distribution Transformers, Switchgears, and Sectionalizing Termination Cabinets.**

Use dead-front construction for pad-mounted distribution transformers, switchgears, and sectionalizing termination cabinets unless not available within system parameters.

In rare cases when "live-front construction" is required due to equipment ratings (available system fault current values), obtain approval from the authority having jurisdiction.

**3-6.11 Distribution System Grounding.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-12, "Grounding, Bonding, and Static Protection".

Comply with UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-14, "Distribution System Grounding".

**3-6.12 Fire Protection System for Oil-filled Equipment.**

Comply with the requirements of UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-19, "Fire Protection Considerations".

**3-6.13 Underground Structures (Manholes and Handholes).**

Where required, power and communication systems must be in separate manholes.

### **3-6.14 Emergency and Standby Power Systems.**

Comply with the requirements of International Building Code (IBC) latest edition, Chapter 27, Electrical, Section 2702, with the exception of the following subsections: 2702.2.8, Semiconductor Fabrication Facilities; 2702.2.9, Membrane Structures; 2702.2.14, Covered Mall Buildings; and 2402.2.18, Airport Traffic Control Towers.

Comply with the requirements of UFC 3-520-01 *Interior Electrical Systems*, Section 3-8, "Emergency Generators".

### **3-6.15 Design Documentation.**

Provide as a minimum:

- Drawings

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-3, "Drawing Requirements", and the following subsections:

- Section 3-3.2, "Site Plans"
- Section 3-3.9, "Lightning Protection Plans"
- Section 3-3.11, "Power One-line/Riser Diagrams"
- Section 3-3.18, "Grounding Diagram"
- Calculations

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, for the following calculations:

- Section 3-2.4, "Short Circuit Analysis"
- Section 3-2.6, "Arc Flash Analyses"
- Section 3-2.15, "Lightning Protection Calculations"

## **3-7 TELECOMMUNICATIONS SYSTEMS.**

### **3-7.1 Grounding and Bonding.**

Follow UFC 3-580-01, Telecommunications Interior Infrastructure Planning and Design, Section 2-9, "Grounding, Bonding and Static Protection".

Follow UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

Follow UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications- Electronics Facilities and Equipments.

Follow UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities.

**3-7.2 CYBERSECURITY.**

All control systems (including systems separate from an energy management control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.

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## CHAPTER 4 SEMI-PERMANENT FACILITY CONSTRUCTION LEVEL

### 4-1 APPLICABILITY.

Buildings and facilities designed and constructed to serve a life expectancy of less than 10 years (120 months). With maintenance and upkeep of critical building systems, the life expectancy of a facility can be extended to 25 years (300 months). See JP 3-34.

### 4-2 CIVIL.

The requirements for site water treatment, storage and distribution, and waste disposal may be included in Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA) and as required by the Military Command having jurisdiction over the operation. The information below is a listing of some, but not necessarily all of those requirements. It is the responsibility of the service component engineer staff to determine which criteria are to be utilized for the operation.

#### 4-2.1 Potable Water Supply Source Selection and Testing.

Use TB MED 577, *Sanitary Control and Surveillance of Field Water Supplies, Chapter 5* "Water Source Selection and Basic Testing for Potability", Chapter 6 "Advanced Water Surveillance and Testing", Chapter 7 "Evaluation of Field Tests and Analytical Results (Health Guidelines)" for water supply source selection and testing. Use UFC 3-230-03A, *Water Supply, Chapter 5, "Groundwater Supplies"* for construction of wells for groundwater supplies.

#### 4-2.2 Potable Water Treatment and Disinfection.

All drinking water facilities and systems must be designed and operated to ensure protection of personnel health and safety. The environmental annex (i.e., Annex L) of the applicable CCMD OPLAN/OPORD must be reviewed and updated as required to ensure appropriate force health protection standards for drinking water are included. Additional criteria may be applied in accordance with COCOM guidance, any applicable DoD policies, or international agreements. Facilities must also comply with TB MED 577, Chapter 9 Water Treatment and Disinfection, for potable water treatment and disinfection.

#### 4-2.3 Gray Water Collection and Disposal.

Use Army FM 4-20.07, Chapter 2, Section I, "Gray Water Collection and Disposal"; Army FM 4-20.07, Chapter 3, Section II, "Gray Water Collection Subsystem"; AFH 10-222, Volume 4, Section 2.8, "Wastewater"; and AFH 10-222, Volume 4, Section 3.4.1, "Gray Water".

#### **4-2.4 Black Water Collection and Disposal.**

Use Army FM 4-20.07, Chapter 2, Section I, “Black Water Disposal”; AFH 10-222, Volume 4, Section 2.8, “Wastewater”; and AFH 10-222, Volume 4, Section 3.4.2, “Black Water”.

#### **4-2.5 Semi-Permanent Wastewater Treatment System.**

If a wastewater treatment system is to be constructed to support facilities, use UFC 3-240-04A, *Wastewater Collection*, for wastewater collection, and use UFC 3-240-09FA, *Domestic Wastewater Treatment*, for wastewater treatment.

#### **4-2.6 Stormwater.**

Locate facilities and equipment away from areas subject to stormwater runoff and flooding.

#### **4-2.7 Design Documentation.**

Drawings: Site plan showing location of water source supply, sanitary sewer facilities, solid waste disposal areas, and all other facilities critical to life safety and health.

Calculations: Showing compliance with potable water testing requirements contained in referenced standards.

### **4-3 STRUCTURAL SYSTEMS.**

#### **4-3.1 Structural Design.**

Structural Design must be in accordance with the International Building Code (IBC), Chapters 16, 17, 18, 19, 20, 21, 22, and 23 as modified by the Unified Facilities Criteria 3-301-01 *Structural Engineering*.

##### **4-3.1.1 1604.3 Serviceability [Supplement].**

Frame drift discussed in UFC 3-301-01 Section 2-1.2.1 need not be limited to prevent damage to non-structural elements provided any damage sustained does not create unsafe conditions for personnel in or around the structure.

##### **4-3.1.2 1604.3.1 Deflections [Replacement].**

Modify UFC 3-301-01 Sections 2-1.2.2 and 2-1.2.3 as follows: Deflections of structural members may exceed the limitations of IBC Sections 1604.3.2 through 1604.3.5, Table 1604.3, and Table 2-1 of UFC 3-301-01 provided: (1) The increased deflection does not cause excessive rotations in connections at ends of members that could result in connection failure or, (2) The increased deflection does not create an unsafe condition where finishes or other non-structural items could become dislodged and fall on personnel. Under no circumstances are member deflections to exceed  $L/120$  where  $L$  is



the member span in inches. Members supporting mission critical equipment sensitive to excessive member deflection or vibration must be designed to meet equipment requirements.

#### **4-3.1.3 1607 Live Loads [Supplement].**

It is not permissible to design structures for live loads less than those shown in UFC 3-301-01 Table D-1 or IBC Table 1607.1

Additionally, use the following minimum design loads:

- Reference UFC 3-301-01 Table D-1 with no live load reduction, or Floor minimum 100 psf for 1st floor loads (490 kg/m<sup>2</sup>) more stringent than table G-1, minimum 50 psf for 2nd floor loads (245 kg/m<sup>2</sup>)
- Roof Live Load as required by the facility location but not less than 20 psf (98 kg/m<sup>2</sup>)
- Snow Load as required by the facility location but not less than 50 psf (245 kg/m<sup>2</sup>)
- Dead Load shall be computed from material weights and partitions, safes, equipment, etc.

Live Load reductions are not permissible.

#### **4-3.1.4 1609 Wind Loads [Supplement].**

Site Specific:

- Values in UFC 1-301-01 section 1609.1.1

Unrestricted:

- Basic wind speed (3-sec gust) 110 mph (177km/hr)
- Exposure category C
- Importance factor  $I_w = 1.0$

#### **4-3.1.5 1613 Earthquake Loads [Supplement].**

1. For Risk Category I, II, or III structures,  $S_s$  does not exceed 0.55 and  $S_1$  does not exceed 0.13.
2. For Risk Category IV structures,  $S_s$  does not exceed 0.32 and  $S_1$  does not exceed 0.08.

Site Specific:

- Within the United States use IBC Section 1613
- Outside the United States use IBC Section 1613

Unrestricted:

- Within the United States use IBC Section 1613
- Outside the United States use IBC Section 1613

With a minimum of:

- For Risk category I, II, III or IV structures,
- Short period acceleration  $S_s = 0.55g$
- One second acceleration  $S_1 = 0.13g$
- Site class (assumed) D
- Importance factor  $I_e = 1.0$

#### **4-3.1.6 Structural Test and Special Inspections [Revision].**

Delete IBC Chapter 17 Structural Tests and Special Inspections. The DOR must delineate all testing and inspection requirements in the construction drawings or specifications to ensure performance of the structural system. The DOR is responsible to provide an appropriate design in which the testing and inspection requirements specified in IBC Sections 1713, 1714, and 1715 can be met based on field capability and resources. Testing and inspections should include, but not be limited to, the following:

1. All Materials: Inspection of suitable sub-surface conditions. Visual inspection of member sizes, locations, spacing, and configuration. Visual inspection of splice/cold joint locations, connections, and adequate bearing.
2. Wood structures: In addition to the inspections for All Materials also perform visual inspection of connector (e.g. nails, screws, bolts) sizes, spacing and locations. Visual inspection of size and location of plate connections. Visual inspection of all straps, hold downs, and connection hardware. Visual inspection of overlapping lengths at splices. Visual inspection of member material grades. Visual inspection of sheathing thickness, sheathing material grades, shear wall locations, and cross bracing.
3. Masonry: In addition to the inspections for All Materials also perform visual inspection of grout placement. Visual inspection of reinforcing steel sizes, locations, clearances, configuration, embedment, and splice lengths. Grout cylinder compression tests, CMU compression tests, and verification of mortar and grout proportions.
4. Steel: In addition to the inspections for All Materials also perform visual inspection of deck profiles, diaphragm sizes and locations, and diaphragm connections. Visual inspection of completed welds. Visual inspection of connector (e.g. bolts, screws) number and patterns, and connector sizes.

Inspection confirming proper tightening of the nuts. Visual inspection of cross bracing.

5. Concrete: In addition to the inspections for All Materials also perform visual inspection of formwork. Visual inspection of reinforcing steel sizes, locations, clearances, configuration, embedment, and splice lengths. Concrete anchors and embed sizes and locations. Concrete cylinder compression test, and water/cement ratio measurement.

#### **4-3.1.7 1803.1 Geotechnical Investigations, General [Supplement].**

Add exception: The DOR or qualified DoD personnel must accept simplified geotechnical investigations in lieu of the full requirements of sections 1803.3 through for one-story, simple span structures without basements that bear on shallow foundations and meet the following requirements:

1. For Occupancy Category I, II, or III structures,  $S_s$  does not exceed 0.55 and  $S_1$  does not exceed 0.13.
2. For Occupancy Category IV structures,  $S_s$  does not exceed 0.32 and  $S_1$  does not exceed 0.08.

In the absence of a Geotechnical Report, the DOR must design foundations for presumptive bearing capacities per IBC Section 1806.

#### **4-3.1.8 1803.6 Reporting [Supplement].**

The DOR must stipulate the required items, if any, to be included in a written report of the geotechnical investigations, which need not include any or all of IBC Section 1803.6, items 1 through 10.

#### **4-3.1.9 1808.6.1 Foundations [Supplement].**

Modify second sentence to read, "Deflection and racking of the supported structure must be limited to that which will not compromise the strength or serviceability of the structure."

#### **4-3.1.10 1809.5 Frost Protection [Supplement].**

Add exception: One-story, simple span structures that bear on shallow foundations need not be protected.

#### **4-3.1.11 1904 Durability Requirements [Delete].**

Delete IBC Section 1904.

#### **4-3.1.12 1907.7.6 Corrosive Environments [Delete].**

Delete UFC 3-301-01 Section 2-4.2.1 and IBC Section 1907.7.6.

**4-3.1.13 2203.2 Protection [Delete].**

Delete IBC Section 2203.2.

**4-3.1.14 2204.2 Bolting [Delete].**

Delete UFC 3-301-01 Section 2-6.1.1.

**4-3.1.15 2205.1 General [Supplement].**

Delete UFC 3-301-01 Section 2-6.2.1. Members supporting mission critical equipment sensitive to excessive vibration must be designed to meet equipment requirements.

**4-3.1.16 2205.4 Steel Structures in Corrosive Environments [Supplement].**

Delete UFC 3-301-01 Section 2-6.2.2 except for steel sections with elements thinner than 3/8".

**4-3.1.17 2210.8 Floor Vibrations [Supplement].**

Delete UFC 3-301-01 Section 2-6.4.3. Members supporting mission critical equipment sensitive to excessive vibration must be designed to meet equipment requirements.

**4-3.1.18 2304.11 Protection Against Decay and Termites [Delete].**

Delete section except in regions with a known significant risk of destructive insect infestations.

**4-3.1.19 Semi-Permanent Construction Level Requirements.**

Structural Design must be in accordance with the International Building Code (IBC), Chapters 16, 17, 18, 19, 20, 21, 22, and 23, and UFC 3-301-01 *Structural Engineering*.

**4-3.1.20 Structural Test and Special Inspections [Revision].**

Comply with testing and inspection requirements in Section 3-2.1.7 of this document.

**4-3.2 Design Documentation.**

Provide as a minimum:

- Drawings:
  - General Notes
  - Inspection Requirements
  - Foundation Plans

- Framing Plans, all levels
- Roof framing plans
- Details
- Schedules as required for footings, columns, beams, shear walls)
- Calculations:
  - Basis of Design: summary of applicable codes, live loading, snow loading, wind and seismic loading, dead load assumptions, gravity design, design of floor and roof framing members – beams, slabs, joist, decks, composite slabs, etc.
  - Column and bearing wall design
  - Foundation design
  - Lateral design: design of diaphragms and collectors, distribution of loads to lateral forces resisting elements (frames, walls), design of shear walls, moment frames, and braced frames, design of foundations at lateral force resisting elements, design of hold downs, straps, etc.
  - Design for AT/FP: confirm setbacks, wall construction types, and progressive collapse mitigation design requirements, check window designs, jambs and sills for AT/FP window loading requirements.
  - Load combinations used
  - Materials used with properties and section properties
  - Connection design and details – bolted and welded
  - Wind load analysis applied to structure
  - Seismic load analysis
  - Serviceability check (deflections and overturning)
  - Wall panel design (building envelop) and connection to superstructure
  - Stated structure life-span
  - Erection plan(s)

#### **4-4 FIRE PROTECTION.**

The overarching requirement is for Life Safety.

Property Protection is a consideration only if specifically required by the facility owning entity.

The intent of this document is to provide buildings that are limited in size (overall building height and floor area) so as to not require installed active fire protection or fire alarm systems, except where explicitly required by the criteria of an allowable occupancy in this UFC.

Any installed fire alarm system shall be a local alarm only and shall not require visual appliances (strobes), unless specifically required by the facility owning entity.

An acceptable alternate local alarm system:

- a. Consisting of an alarm initiating device at each exit by either:
  - i. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.

OR

- b. Combined standalone sounder and strobe battery powered push button stations with interconnection capability.

##### **4-4.1 General requirements.**

Use of Spray Plastic Foam Insulation (SPFI) is not allowed, except for commercially procured insulated metal roof panels. ~~Use of pre-insulated panels (with any surface – metal, wood, plastic or other) containing foam insulation is not allowed.~~ */2/*

##### **4-4.1.1 Mission Critical Facilities.**

For mission critical facilities, see Figure E-1 in Appendix E for a decision tree with guidance on protection of assets for these facilities.

##### **4-4.1.2 Antiterrorism Separation Distance.**

Refer to UFC 4-010-01 for antiterrorism/force protection requirements related to space separation compliance.

For all buildings, provide access to at least one side of any building for the largest emergency response vehicle serving the site.

#### **4-4.1.3 Unenclosed Vertical Openings.**

Unenclosed vertical openings are generally not permitted. Vertical openings include but are not limited to atriums, stairways; hoist ways for elevators, dumbwaiters, or inclined and vertical conveyors (escalators); shafts used for light, ventilation or building services.

Mezzanines shall comply with requirements for mezzanines herein and in IBC Chapter 5, General Building Heights and Areas, and are not treated as vertical openings.

All vertical openings shall be enclosed or protected with shafts constructed as fire barriers as called for by the IBC Chapter 7, Fire and Smoke Protection Features, or NFPA 101 Chapters 7, Means of Egress, and 8, Features of Fire Protection, for the fire resistance rating of the barrier.

Any planned unenclosed vertical opening needs to be approved by the AHJ.

#### **4-4.2 Construction Level Requirements and Space Separation Requirements per Occupancy.**

Classifications of buildings within this section are based on occupancy. As defined by NFPA 101, Chapter 3, Definitions, the occupancy is the purpose for which a building or other structure, or part thereof, is used or intended to be used. The occupant load of these areas is calculated per NFPA 101, Chapter 7, Means of Egress.

##### **4-4.2.1 Fire Separation Distance.**

This document provides requirements for allowable fire separations between structures by occupancy classification.

##### **4-4.2.2 Area Limits.**

Area limits stated within this UFC are for a stand-alone building as defined in the IBC Chapter 5, General Building Heights and Areas. If larger building areas than stated herein are needed to meet the needs of users, then the following guidance is provided to facilitate the construction of buildings with larger areas, in order of preference:

1. Provide fire separation distance between separate structures in accordance with IBC Chapter 6, Types of Construction, requirements for fire separation between buildings.
2. Provide pedestrian walkways between buildings individually compliant with IBC Chapter 31, Special Construction, fire separation requirements to provide separate buildings interconnected with enclosed, conditioned walkways.
3. Provide fire rated exterior walls or fire walls between buildings in accordance with IBC Chapter 6, Types of Construction, requirements.

4. Provide buildings of an area or height to require fixed fire protection systems in accordance with IBC Chapter 5, General Building Heights and Areas requirements, and provide these fixed protection systems.

#### **4-4.3 Assembly Occupancy**

Assembly occupancy is an occupancy used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation or similar uses; or used as a special amusement building, regardless of occupant load. Assembly occupancies include but are not limited to: dining facilities, clubs, chapels, conference rooms, and morale welfare, and fitness centers for general personnel use.

##### **4-4.3.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings must be limited to one story high.
  - i. Buildings constructed of combustible construction must be limited to 6,000 sq. ft. (557 sq. m.) in area.
  - ii. Buildings constructed of non-combustible or fire-resistive construction must be limited to 9,500 sq. ft. (883 sq. m.) in area.
- b. Buildings must be provided with a sprinkler system designed in accordance with the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with IBC Chapter 5, General Building Heights and Areas, limits on building areas. Building height must be limited to 2 stories.

##### **4-4.3.2 Building Separation.**

Buildings must be separated from other buildings by one of the following options (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. The clear space may be used for vehicle roadways or pedestrian walkways, but not for parking, storage or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided due to site constraints, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.



- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Adjacent buildings must be separated by at least twice the height of the taller building.

#### **4-4.3.3 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 12, New Assembly Occupancies, for egress, except as follows:

- a. For buildings without sprinkler protection in accordance with this document, provide exits 100% above the number required by NFPA 101, Chapters 7, Means of Egress, and 12, New Assembly Occupancies. Exits must be evenly distributed along at least three sides of the building.
- b. Provide local fire alarm notification throughout the space for evacuation in the event of an emergency. The fire alarm notification system must be activated by manual stations at each exit. The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with NFPA 72 requirements.

#### **4-4.3.4 Kitchen Requirements.**

Provide an exhaust hood with a listed kitchen hood fire protection system for any commercial-type cooking operation.

Provide one-hour rated fire barrier separation between any cooking/serving operations and the seating area(s).

#### **4-4.4 Business Occupancy.**

Business occupancy is an occupancy used for the transaction of business other than mercantile. Business occupancies include the following: general offices and administrative facilities, outpatient clinics, doctors' offices, detention facilities, and fitness centers that are located within an office, solely for office personnel use (no public or common use).

##### **4-4.4.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings constructed of combustible construction must be limited to 9,000 sq. ft. (836 sq. m.) per floor, and 3 stories above grade.

- i. Buildings constructed of non-combustible or fire-resistive construction must be limited to 23,000 sq. ft. (2,137 sq. m.) per floor, and 3 stories above grade.
- b. Buildings must be provided with a sprinkler system designed in accordance with the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with 2009 IBC Chapter 5, General Building Heights and Areas, limits on floor areas. Building height must be limited to 3 stories.

#### **4-4.4.2 Building Separation.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings within the same contingency compound. A clear space of 100 ft. (30.5 m) must be provided between the building and other buildings not associated with the contingency compound. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.
  - ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Buildings must be separated by at least twice the height of the taller building.

Comply with NFPA 101, Chapters 7 and 38, for egress except that all exits, including grade level exit doors, exit stairs, and fire-rated exit passageways must discharge directly to the exterior to public ways.

#### **4-4.4.3 Fire Alarm System.**

Provide local fire alarm notification throughout the space where any of the following conditions occur:

- a. Levels of the building located on other than grade level exceed 5,000 sq. ft. (465 sq. m.) per floor.
- b. The total area of all floors exceeds 30,000 sq. ft. (2,787 sq. m.).

The notification system must be activated at each exit by either:

- a. Manual pull stations

OR

- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.

OR

- c. Combined standalone sounder and strobe battery powered push button stations.

The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with the installation requirements of NFPA 72.

#### **4-4.4.4 Detention Facilities.**

Detention Facilities are classified as Business Occupancy with special population requirements. Detention facilities are those buildings and structures where persons are under restraint or where security is closely supervised and are not capable of self-preservation because the conditions of confinement are not under their control (i.e. they require assistance by the facility's staff to reach safety in an emergency situation). For occupancy classification purposes the population refers only to the number of persons being secured or restrained. The number of guests or staff is not counted.

##### **4-4.4.4.1 Detention Facilities Allowable Population.**

The allowable population of a detention facility, building or structure is no more than five (5) persons who are under restraint or security.

##### **4-4.4.4.2 Detention Facilities Fire Separation Distance.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings within the same contingency compound. A clear space of 100 ft. (30.5 m) must be provided between the building and other buildings not associated with the contingency compound. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC

Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.

- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Buildings must be separated by at least twice the height of the taller building.

#### **4-4.5 Industrial Occupancy.**

A factory-industrial occupancy is an occupancy in which products are manufactured or in which processing, assembling, mixing, packaging, finishing, decorating, or repair operations are conducted. This occupancy includes factories, laundries, power plants, maintenance shops, and pumping stations.

##### **4-4.5.1 Building Construction.**

Buildings must be constructed in accordance with one of the following options (a or b):

- a. Buildings constructed of combustible construction must be limited to 8,500 sq. ft (790 sq. m.) and one story above grade.
  - i. Buildings constructed of non-combustible or fire-resistive construction must be limited to 15,500 sq. ft. (1,440 sq. m.) per floor and two stories above grade.
- b. Buildings must be provided with a sprinkler system designed in accordance with NFPA 13. Buildings provided with this protection must be constructed in accordance with IBC Chapter 5, General Building Heights and Areas, requirements for floor areas and heights.

##### **4-4.5.2 Building Separation.**

Buildings must be provided fire separation from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distance as noted in Option (a) cannot be provided, one of the following must be provided:
  - i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC requirements.

- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other approved type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Fire separation distance between these buildings must be at least twice the height of the taller building.

#### **4-4.5.3 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 40, Industrial Occupancies, for egress.

#### **4-4.5.4 Mezzanines.**

Mezzanines within industrial buildings cannot be used for normally occupied spaces (such as offices). Mezzanines must be limited to storage rooms and/or mechanical/electrical rooms only.

#### **4-4.5.5 Fire Alarm and Mass Notification Systems.**

Provide local fire alarm notification throughout the space where \1\ any of the following conditions occur:

- a. Levels of the building located on other than grade level exceed 5,000 sq. ft. (465 sq. m.) per floor.
- b. The total area of all floors exceeds 30,000 sq. ft. (2,787 sq. m.).

The notification system must be activated at each exit by either:

- a. Manual pull stations

OR

- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.

OR

- c. Combined standalone sounder and strobe battery powered push button stations.

The fire alarm notification system may be integrated with the mass notification system for the building. Fire alarm systems must comply with the installation requirements of NFPA 72. /1/

#### **4-4.5.6 Hazardous Areas.**

Hazardous areas such as flammable painting operations, combustible dust producing operations, areas with combustible hydraulic fluid systems over 100 gallons (379 liters), or other industrial operations with significant flammable liquid or gas storage and/or use must be protected by one of the following (a or b):

- a. Provided protection in accordance with NFPA 13, 30, and 101 requirements.
- b. These areas must be located in buildings with a minimum 100 ft (30.5 m) fire separation distance from adjacent buildings.

#### **4-4.6 Residential Occupancy.**

The residential occupancy is defined as an occupancy that provides sleeping accommodations for purposes other than health care or detention and correctional. Residential occupancies include one- and two-family dwellings, dormitories, barracks, billeting, Bachelor Enlisted Quarters and Bachelor Officer's Quarters, apartment buildings, relocatable buildings and converted shipping containers.

##### **4-4.6.1 Building Construction.**

Buildings must be constructed in accordance with one of the following requirements (a or b):

- a. Buildings constructed of combustible construction must be limited to 7,000 sq. ft. (650 sq. m.) per floor, and 2 stories in height.
  - i. Buildings constructed of non-combustible construction must be limited to 15,000 sq. ft. (1,394 sq. m.) per floor, and 4 stories in height.
- b. Buildings must be provided with a sprinkler system designed in accordance with NFPA 13R and the fire sprinkler requirements of this document. Buildings provided with this protection must be constructed in accordance with IBC Chapter 5, General Building Heights and Areas, requirements for floor areas. Building heights must be limited to 4 stories.

##### **4-4.6.2 Building Separation.**

Buildings must be separated from other buildings by one of the following (a or b):

- a. A fire separation distance of 30 ft. (9.1 m) must be provided between the building and other buildings. Clear space must not be used for vehicle parking, storage, or vegetation other than lawns.
- b. If fire separation distances as noted in Option (a) cannot be provided due to site constraints, one of the following must be provided (i, ii or iii):

- i. Each exterior wall of the building that faces an exposing building must be rated at one hour with opening protectives in accordance with IBC Chapters 6, Types of Construction, and 7, Fire and Smoke Protection Features, requirements.
- ii. Each exterior wall of the building that faces an exposing building must be provided with a full height barrier (earth-filled bastions, pre-cast concrete barrier, sandbag revetment, or other similar type) without openings. The barrier must be at least as high as the eave level of the tallest structure involved. Fire separation distance must be at least twice the height of the taller building.
- iii. The residential building must be provided with sprinkler protection by a system designed in accordance with NFPA 13R and the fire sprinkler requirements of this document.

#### **4-4.6.3 Fire/Smoke Alarms.**

Multiple station type smoke alarms must be provided throughout each room of the living unit in accordance with NFPA 72 residential fire alarm system requirements. Actuation of any smoke alarm must cause all smoke alarms within the living unit to generate an audible signal.

A manual alarm system must be provided throughout each building, with notification appliances provided in each living unit in accordance with NFPA 72 for residential type occupancies.

The notification system must be activated at each exit by either:

- a. Manual pull stations  
OR
- b. Push-button stations with tamper resistant covers with battery powered alarm controlling a separate strobe.  
OR
- c. Combined standalone sounder and strobe battery powered push button stations

#### **4-4.6.4 Range-Top Extinguishing Systems.**

For all living units with residential range-top cooking units, an approved residential range-top extinguishing system must be provided. Actuation of the residential range-top extinguishing system must cause a general building alarm, and automatically shut off all sources of fuel and electrical power to the cooking unit.

#### **4-4.6.5 Egress Requirements.**

Comply with NFPA 101, Chapters 7, Means of Egress, and 28, New Hotels and Dormitories, for egress, except as modified below:

Means of egress from sleeping rooms must be provided in accordance with one of the following (a or b):

- a. A secondary means of escape must be provided, consisting of a door or window readily operable from inside with no special tools or knowledge. The window must be sized at a minimum of 5.7 sq. ft. (0.53 sq. m.) with a width of at least 20 inches (508 mm) and an open height of at least 24 inches (610 mm). The secondary means of escape must be located on a different exterior wall than the main entrance door to the sleeping room.
- b. For sleeping rooms where it is not practical to provide a secondary means of escape as noted in (a), the following must be provided (i and ii):
  - i. Walls between sleeping rooms must be rated at a minimum of 30 minutes.
  - ii. Sprinkler protection must be provided throughout the building installed in accordance with NFPA 13R or NFPA 13D requirements.

#### **4-4.7 Aircraft Hangars.**

The requirements of UFC 4-211-01 do not apply, unless specifically required by the facility owning entity.

Aircraft hangars must be protected as follows:

- a. Single hangars over 15,000 sq. ft. (1,394 sq. m.) must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".
- b. Multiple hangars less than 15,000 sq. ft. (1,394 sq. m.) per hangar, that are separated by less than 50 ft. (15.2 m.) from each other, must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".
- c. Any hangar within 100 ft. (30.5 m.) of a normally occupied structure (office, shop, lodging building, etc) must be provided with fire protection as called for by UFC 3-600-01 Section 6-16, "Aircraft Facilities".

#### **4-4.8 Fuel Depots (Petroleum, Oil and Lubricants (POL) and Hazardous Material Storage Areas).**

##### **4-4.8.1 Fixed POL Storage.**

Fixed POL installations, including cut and cover type tanks, must comply with UFC 3-460-01.



#### **4-4.8.2 Hazardous Materials and Hazardous Waste Storage.**

Hazardous materials and hazardous waste must be protected in accordance with UFC 3-600-01.

#### **4-4.8.3 Flammable Liquid Storage.**

Flammable liquid storage tanks must be located as follows:

- a. Above-ground tanks containing liquids with flash points less than 100 degrees F (38 degrees C) (gasoline, most solvents) must be separated from adjacent tanks or important buildings by 100 ft. (30.5 m.) or one tank diameter, whichever is greater.
- b. Above-ground tanks containing liquids with flash points over 100 degrees F (38 degrees C) (typical diesel fuel and fuel oil) and more than 50,000 gallons (189,270 liters) must be separated from important buildings by 100 ft. (30.5 m.).
- c. Above-ground tanks containing liquids with flash points over 100 degrees F (38 degrees C) and less than 50,000 gallons (189,270 liters) must be separated from important buildings by a minimum of 60 ft. (18.3 m.).
- d. Underground storage tanks and bladders must be separated from adjacent underground tanks or important buildings by a minimum of 25 ft. (7.6 m.). Each underground bladder or tank must be provided an independent berm sized for containment of the largest tank's volume.
- e. All flammable liquid tanks must be provided with fire response vehicle access within one tank diameter of the tank on at least one side.

#### **4-4.9 Mixed-use Occupancies and Co-locating of Occupancies.**

Residential occupancies with accommodations for more than 10 persons must be located in separate buildings from dining, offices, and recreational occupancies. Dining, offices, and recreational occupancies may be co-located in a single building.

Conference rooms, lunch rooms, gymnasiums, or other assembly spaces located within a business or other occupancy may have an occupant load of up to 49 persons in a single space without the facility being considered a mixed-use occupancy. Occupant loads shall be calculated using NFPA 101 Chapter 7, Means of Egress.

Comply with NFPA 101 Chapter 6, Classification of Occupancy and Hazard of Contents, requirements for occupancy classifications and egress related to mixed-use occupancies and with IBC Chapter 5, General building Heights and Areas, for all other requirements related to mixed-use occupancies.

#### **4-4.10 Medical Facilities.**

Medical facilities are those that house inpatients. Refer to the applicable Service Medical Group for guidance in constructing medical facilities.

#### **4-4.11 Sprinkler System Design Criteria.**

##### **4-4.11.1 Non-Residential Buildings.**

For the purposes of non-residential military facilities in the temporary or semi-permanent construction level, NFPA 13 serves as the sprinkler standard for sprinkler systems. In situations where it may not be possible to construct systems meeting the requirements of NFPA 13 related to water storage volume, the number of design sprinklers from NFPA 13R and an amended water supply duration may be used in lieu of the NFPA 13 requirements for non-storage buildings or non-hazardous occupancies.

NFPA 13R requires that all (or 4 at most if more than 4 exist in compartment) sprinklers in the hydraulically most remote compartment must be able to operate at the required density for 30 minutes. For the purposes of this document, the water supply must be required to supply sprinklers for 20 minutes, with a maximum supply volume of 2,000 gallons (7,571 liters) of water (based on 4 sprinklers operating at 25 gpm for 20 minutes).

For non-residential buildings, all other aspects of sprinkler installation, including scope of sprinkler system coverage and installation standard must be per NFPA 13.

##### **4-4.11.2 Storage Buildings, Factory-Industrial and Hazardous Areas.**

Storage buildings, factory-industrial, and hazardous areas, if sprinklered, must be protected by systems designed per NFPA 13, including supply duration and flow volume requirements.

##### **4-4.11.3 Residential Buildings.**

For residential buildings requiring sprinkler protection, sprinkler systems must be designed per NFPA 13R and this section, or NFPA 13D as applicable.

#### **4-4.12 Design Documentation.**

- Drawing / Narrative Basis of Design (can be combined)
- A fire protection summary is required for all designs. Provide a summary discussing the following minimum fire protection provisions, based on UFC 1-200-01, UFC 1-201-01 and UFC 3- 600-01:
- Building code analysis summary drawing (i.e., type of construction, height and area limitations, and building separation or exposure protection),

- Classification of occupancy, mixed use requirements, any hazardous areas,
- Requirements for fire and smoke barriers, fire rated walls,
- Life safety plan showing locations of fire rated walls, egress paths, travel distances, and emergency response vehicle access,
- Fire protection plan ( include type of system and location of equipment), and water supply information (if system is required),
- Fire alarm system (and mass notification system if integrated into the fire alarm) plan showing type of system and location of equipment, indicating reporting method to a central station/base location (if system is required),
- Interior finish ratings required and provided
- Coordination with security and antiterrorism requirements.

#### **4-5 PLUMBING AND MECHANICAL SYSTEMS.**

Provide interior spaces intended for occupancy with ventilation by natural or mechanical means in accordance with the International Mechanical Code (IMC), Chapter 4, "Ventilation".

Recommend interior spaces intended for occupancy be provided with active or passive air-conditioning systems capable of maintaining the spaces at an ASHRAE effective maximum temperature of 93 degrees Fahrenheit (33.9 deg. C), and effective minimum temperature of 60 degrees Fahrenheit (15.5 deg. C).

##### **4-5.1 Requirements for Specific Systems.**

The requirements listed below in the remainder of this section are additional life safety and habitability requirements that must be incorporated if these features are included in order to meet the functional requirements as defined by the COCOM.

##### **4-5.2 Engineering Weather Data.**

Follow UFC 3-400-02, Design: Engineering Weather Data.

##### **4-5.3 HVAC Systems and Controls.**

Follow IMC Chapter titled "General Regulations".

##### **4-5.4 Exhaust Systems.**

Follow IMC Chapter 5, Exhaust Systems.

#### **4-5.5 Noise.**

Noise levels shall not exceed the permissible exposures of 29 CFR 1910.95, Table G-16.

#### **4-5.6 Plumbing - Introduction and Administration.**

Follow UFC 3-420-01, *Plumbing Systems*, Section titled "Purpose and Scope," through Section titled "Primary Voluntary Consensus Standard Reference," and Section titled "Conflicts in Criteria."

Requirements in UFC 3-420-01, Section titled "Energy Efficiency in Water Conservation" and Section titled "Reliability" do not apply; however, consideration must be given to resource conservation where and when practical. See paragraph 1-11 of this UFC, "Resource Conservation." Follow UFC 3-420-01, Section titled "Piping Arrangement." Piping is not required to be concealed or painted.

Follow UFC 3-420-01, Appendix A: IPC Chapter 1 "Administration" Supplements, Item A, Delete Chapter 1 in its entirety.

Follow UFC 3-420-01, Appendix A: IPC Chapter 2 "Definitions" Supplements.

#### **4-5.7 Plumbing - General Regulations.**

Follow the International Plumbing Code (IPC), Chapter 3, General Regulations, with the following exceptions:

- Section 310.5, "Urinal Partitions": does not apply
- Section 313, "Equipment Efficiencies": does not apply
- Section 314.2.1, "Condensate Disposal": does not apply with the exception of the last sentence that does apply (i.e., "Condensate cannot discharge into a street, alley, or other areas so as to cause a nuisance").
- Section 314.2.2, "Drain Pipe Materials and Sizes": does not apply; instead refer to IPC Table 314.2.2, Condensate Drain Sizing, for condensate drain sizing.
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item F, Section 305.6 Freezing, with the exception of the third, fourth, and fifth sentences regarding piping freeze protection that do not apply.
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item G, Section 305.6.1 Sewer Depth, with the following revision: Revise to state: "Replace with the following: 'Building sewers must be installed not less than 6 inches (150 mm) below the frost line.'"

- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 3 "General Regulations" Supplements, Item H, Section 312.4 Drainage and Vent Final Test, with the following revision: Revise to state "Add after the last sentence: 'A peppermint test may be accepted as a final test for the drainage and vent systems, provided the contractor submits a testing procedure for approval.'"

#### **4-5.8 Plumbing Fixtures.**

Follow the International Plumbing Code, Chapter 4, Fixtures, Faucets, and Fixture Fittings, with the following exceptions:

- Section 402, "Minimum Plumbing Facilities": does not apply. Instead provide a minimum of one water closet and one showerhead for every 20 occupants and a maximum of one water closet and one showerhead for every 10 occupants.
- Section 404, "Accessible Plumbing Facilities": does not apply except for special use facilities, such as medical, where more stringent standards may apply.
- Section 405.3, "Setting": does not apply
- Section 405.4.1, "Floor Flanges": does not apply
- Section 405.4.3, "Securing Wall-hung Water Closet Bowls": does not apply
- Section 405.5, "Water-tight Joints": does not apply
- Section 405.6, "Plumbing in Mental Health Centers": does not apply
- Section 405.7.1, "Connection of Overflows": does not apply
- Section 405.8, "Slip Joint Connections": does not apply
- Section 405.9, "Design and Installation of Plumbing Fixtures": does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 4 "Fixtures, Faucets, and Fixture Fittings" Supplements, Item A, Section 401.2 Prohibited fixtures and connections, Item J, Add "Section 411.3 Design guidance for emergency shower and eyewash stations", Item K, Add "Section 412.5 Required locations and construction", and Item L, Add "Section 412.6 Floor drains for emergency shower and eyewash stations".
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 4, "Fixtures, Faucets, and Fixture Fittings" Supplements, Items D or E, and F.

#### **4-5.9 Water Heaters.**

Follow the International Plumbing Code, Chapter 5, Water Heaters, with the following exceptions:

- Section 501.2, “Water Heater as a Space Heater”: does not apply
- Section 502.3, “Water Heaters Installed in Attics”: does not apply
- Section 503, “Connections”: does not apply
- Section 505, “Insulation”: does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 5 “Water Heaters” Supplements, Item H, Add “Section 506 Sizing Hot Water Systems, 506.1 Sizing Calculations” with the following revision: Revise to state: “Design in accordance with American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook – *HVAC Applications*, Chapter 49 ‘Service Water Heating’; and in accordance with ASHRAE Standard 90.1, *Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings*. Size hot water system and set service water heater (SWH) storage temperature set point for not less than 140°F (60°C) to limit the potential for growth of Legionella pneumophila. Provide a hot water and cold water blending, tempering valve immediately downstream of the SWH storage tank to provide anti-scalding protection. Provide a balanced-pressure-type tempering valve. Set the blending valve to deliver 110°F (43°C) water to the fixtures except where higher temperatures are required by specialized equipment”.

#### **4-5.10 Water Supply and Distribution.**

Follow the International Plumbing Code Chapter 6, Water Supply and Distribution, with the following exceptions:

- Section 604.10, “Gridded and Parallel Water Distribution Systems”: does not apply
- Section 604.11, “Individual Pressure Balancing In-line Valves for Individual Fixture Fittings”: does not apply
- Section 608.8.3, “Size”: does not apply
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 6 “Water Supply and Distribution” Supplements, Item B, Add “Section 602.2.1 Non-potable water exception”, Item J, Add “Section 607.1.1 Legionella Pneumophila (Legionnaire’s Disease)”, Item M, Section 608.1 “General”, and Item N, Section 611.2 “Reverse osmosis systems”.

#### **4-5.11 Sanitary Drainage.**

Follow International Plumbing Code, Chapter 7, “Sanitary Drainage”.

Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 7, “Sanitary Drainage Supplements”, Item B, Section 712.3.2 “Sump Pit”, and Item D, Section 712.3.6 “Controls”.

**4-5.12 Indirect/ Special Waste.**

Follow International Plumbing Code, Chapter 8, "Indirect/Special Waste".

**4-5.13 Vents.**

Follow International Plumbing Code, Chapter 9, "Vents".

**4-5.14 Traps, Interceptors, and Separators.**

Follow International Plumbing Code, Chapter 10, "Traps, Interceptors, and Separators", with the following exceptions:

- Section 1002.4, "Trap Seals": applies with the exception of the second sentence that does not apply (i.e. "Where a trap seal is subject to loss by evaporation, a trap seal primer valve must be installed").
- Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 10, "Interceptors and Separators Supplements"; Item A, Section 1002.4, "Trap Seals".

**4-5.15 Storm Drainage.**

Follow International Plumbing Code, Chapter 11, "Storm Drainage".

Follow UFC 3-420-01, *Plumbing Systems*, Appendix A: IPC Chapter 11 "Storm Drainage" Supplements, Item B, Section 1104.2, "Combining Storm with Sanitary Drainage", and Item C, Add "Section 1104.4 Insulation of rainwater conductors".

**4-5.16 Special Piping and Storage Systems.**

Follow UFC 4-510-01, *Design: Medical Military Facilities*, Section titled "Medical Gas Systems" for medical gas and vacuum systems.

**4-5.17 Gray Water Recycling Systems.**

Follow International Plumbing Code, Appendix C, "Gray Water Recycling Systems", Sections C101 and C102.

**4-5.18 Emergency Shower and Eyewash Stations.**

Follow UFC 3-420-01, Appendix D, "Design Guidance for Emergency Shower and Eyewash Stations".

**4-5.19 Structural Safety.**

Follow International Plumbing Code, Appendix F, "Structural Safety".

**4-5.20 Compressed Air Systems.**

Follow Compressed Air and Gas Institute's *Compressed Air and Gas Handbook* and ASME Boiler and Pressure Vessel Codes.

**4-5.21 Fuel Oil Piping and Storage.**

Follow requirements in IMC Chapter 13 for fuel storage and piping supporting building systems.

**4-5.22 Boilers, Water Heaters, and Pressure Vessels.**

Follow requirements in IMC Chapter 10 for facilities that are provided with boilers or water heaters, and pressure vessels.

**4-5.23 Refrigeration.**

Follow requirements in IMC Chapter 11 for facilities that are provided with refrigerant systems.

**4-5.24 Duct Systems.**

Follow IMC Chapter 6, Duct Systems.

**4-5.25 Hydronic Systems.**

Follow IMC Chapter 12, Hydronic Piping.

**4-5.26 Design Documentation**

Provide as a minimum:

1. Drawings:
  - a. Natural ventilation - Floor plans showing the layout of the ventilation system, dimensions of openings and associated equipment, and the means of controlling the system.
  - b. Mechanical ventilation - Floor plans showing the layout of the ventilation system, equipment schedules and details, schematic diagrams, and control sequences and diagrams.
  - c. Calculations based on facility function and local climatic conditions:
  - d. Natural ventilation – Calculations showing ventilation opening areas.
  - e. Mechanical ventilation – Calculations showing required ventilation air quantities based on facility occupancy.



- f. For any specific systems as defined in Section 3-4.1.1, Requirements for Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-4, “Calculations”, and Chapter 3-5, “Drawings”, and Plumbing System documentation per UFC 3-420-01, Chapter 1-10.2, “Calculations”, and Chapter 1-11, “Drawings”.

## **4-6 ELECTRICAL SYSTEMS.**

### **4-6.1 Hazardous Material and Waste.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 2-1.1, “Hazardous Materials and Waste, and Controlled Materials”.

### **4-6.2 Arc Flash Analysis.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, “Electrical Calculations Overview”, with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.6, “Arc Flash Analysis”.

Comply with the requirements of UFC 3-501-01, Section 2-1.12, “Arc Flash Warning Labels”.

### **4-6.3 Short Circuit Analysis.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, “Electrical Calculations Overview”, with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.4, “Short Circuit Analysis”.

### **4-6.4 Lightning Protection.**

Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, Section 3-2.2, “Electrical Calculations Overview”, with the exception of the list of required calculations as outlined at the end of the referenced section. The only required calculations are short circuit, arc flash and lightning protection analyses.

Comply with the requirements of UFC 3-501-01, Section 3-2.15, “Lightning Protection Calculations”.

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-14, “Lightning Protection Systems”.

#### **4-6.5 Service Entrance and Distribution Equipment.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-2, "Service Entrance and Distribution Equipment", third paragraph. First, second and fourth paragraphs are not applicable.

#### **4-6.6 Circuit Lockout Requirements.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-2.9, "Circuit Lockout Requirements".

#### **4-6.7 Raceway and Wiring.**

Comply with the latest edition of NFPA 70, *National Electrical Code*, Chapter 2, "Wiring and Protection"; Chapter 3, "Wiring Methods and Materials"; and Chapter 4, "Equipment for General Use".

#### **4-6.8 Emergency and Exit Lighting.**

Comply with the requirements of UFC 3-530-01, *Design: Interior and Exterior Lighting and Controls*, Section 5-6, "Emergency and Exit Lighting".

#### **4-6.9 General Electrical Requirements.**

Comply with the requirements of UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-2, "General Electrical Requirements".

#### **4-6.10 Configuration for Pad-mounted Distribution Transformers, Switchgears, and Sectionalizing Termination Cabinets.**

Use dead-front construction for pad-mounted distribution transformers, switchgears, and sectionalizing termination cabinets unless not available within system parameters.

In rare cases when "live-front construction" is required due to equipment ratings (available system fault current values), obtain approval from the authority having jurisdiction.

#### **4-6.11 Distribution System Grounding.**

Comply with the requirements of UFC 3-520-01, *Interior Electrical Systems*, Section 3-12, "Grounding, Bonding, and Static Protection".

Comply with UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-14, "Distribution System Grounding".

#### **4-6.12 Fire Protection System for Oil-filled Equipment.**

Comply with the requirements of UFC 3-550-01, *Exterior Electrical Power Distribution*, Section 3-19, "Fire Protection Considerations".

#### **4-6.13      Underground Structures (Manholes and Handholes).**

Where required, power and communication systems must be in separate manholes.

#### **4-6.14      Emergency and Standby Power Systems.**

Comply with the requirements of International Building Code (IBC) latest edition, Chapter 27, Electrical, Section 2702, with the exception of the following subsections: 2702.2.8, Semiconductor Fabrication Facilities; 2702.2.9, Membrane Structures; 2702.2.14, Covered Mall Buildings; and 2402.2.18, Airport Traffic Control Towers.

Comply with the requirements of UFC 3-520-01 *Interior Electrical Systems*, Section 3-8, "Emergency Generators".

#### **4-6.15      Underground Distribution General Criteria – Cable Identification in Manholes.**

Tag all underground cables in all accessible locations such as in manholes, transformers, switches and switchgear. Install a detectable locator tape above all buried underground circuits.

#### **4-6.16      Design Documentation**

As a Minimum Provide:

- Drawings:
  - Comply with the requirements of UFC 3-501-01, *Electrical Engineering*,
  - Section 3-3, "Drawing Requirements", and the following subsections:
    - Section 3-3.1, "Legends and Abbreviations"
    - Section 3-3.2.2, "Transformer Details"
    - Section 3-3.2.3, "Underground Distribution"
    - Section 3-3.4, "Lighting Plans and Details"
    - Section 3-3.5, "Power Plans"
    - Section 3-3.12, "Telecommunications Riser Diagram"
    - Section 3-3.13, "Intercommunication/Paging Riser Diagram"
    - Section 3-3.14, "Fire Alarm Riser Diagram"
    - Section 3-3.16, "Schedules and Elevations"

Calculations:

- Comply with the requirements of UFC 3-501-01, *Electrical Engineering*, for the following calculations:
  - Section 3-2.4, “Short Circuit Analysis”
  - Section 3-2.6, “Arc Flash Analyses”
  - Section 3-2.15, “Lightning Protection Calculations”

#### **4-7 TELECOMMUNICATIONS SYSTEMS.**

##### **4-7.1 Grounding and Bonding.**

Follow UFC 3-580-01, Telecommunications Interior Infrastructure Planning and Design, Section 2-9, “Grounding, Bonding and Static Protection”.

Follow UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

Follow UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications- Electronics Facilities and Equipments.

Follow UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities.

##### **4-7.2 CYBERSECURITY.**

All control systems (including systems separate from an energy management control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.

**APPENDIX A CONSTRUCTION LEVEL CHECKLISTS**

**A-1 INITIAL CONSTRUCTION LEVEL CHECKLIST.**

CIVIL				
	Are facilities and equipment located away from areas subject to stormwater runoff and flooding?	YES	NO	Comment
	Are low lying, tidal, and tributary areas avoided?			
	Were adjacent facilities or functional areas considered for stormwater runoff control?			
	Is water flow controlled with surface drainage and trenches?			
	Were available surface laid / shallow buried culverts utilized?			
STRUCTURAL				
	Were manufacturers' instructions for Government-approved systems for assembly of pre-packaged shelters in theater followed?	YES	NO	Comment
ELECTRICAL				
	Were manufacturers' instructions for installation of Government-approved pre-packaged electrical equipment in theater followed?	YES	NO	Comment
Complete the following only if pre-packaged systems are not available:				
	In compliance with the requirements of UFC 3-550-01, <i>Exterior Electrical Power Distribution</i> , Section 3-2, "General Electrical Requirements".	YES	NO	Comment
	In compliance with the requirements of UFC 3-520-01, <i>Interior Electrical Systems</i> , Section 3-12, "Grounding, Bonding, and Static Protection".			
	In compliance with UFC 3-550-01, <i>Exterior Electrical Power</i>			

	Distribution, Section 3-14, "Distribution System Grounding".			
Grounding.	Are all electrical systems grounded in accordance with manufacturer recommendations?			
Power Cable Installation.	Were cables surface laid or protected from vehicular and foot traffic?			
Circuit Lockout Requirements.	Were manufacturers' instructions for installation of Government-approved pre-packaged electrical equipment in theater followed?			
	Are non-government pre-packaged circuit breakers, disconnect switches, and other devices that are electrical energy isolating lockable or protected from unauthorized access?			
<b>PLUMBING AND MECHANICAL</b>				
Water Treatment, Storage, and Distribution.	Does design and operation of all potable water (drinking water) facilities and systems to ensure protection of health and safety meet requirements in COCOM or coalition guidance or international agreements?	YES	NO	Comment
	Are Army, Navy, Marine Corps systems in compliance with the respective chapters from ATP 4-44/MCRP 3-17.7Q Water Support Operations and NTRP 4-04.2.13/FM 3-34.469/AFMAN 32-1072, Water-Well Drilling Operations?			
Water Treatment	Are Air Force systems in compliance with the respective chapters from AF TTP 3-32.33 V1?			
Waste Water.	Are waste water facilities and systems designed and operated to ensure protection of health and safety in compliance with requirements in international			

	agreements, COCOM or coalition guidance?			
Heating, Ventilating and Air-Conditioning (HVAC).	Were ventilation and environmental control systems installed in accordance with manufacturers' instructions and service technical manuals for pre-packaged heating, ventilating, and air-conditioning (HVAC) systems?			
<b>FIRE PROTECTION</b>				
	Is Spray Plastic Foam Insulation (SPFI) used?	YES	NO	Comment
	Is exposed Urethane foam or other exposed plastic insulations on walls or ceilings used?			
Allowable Area / Population.	Are more than 200 persons shall be located within a billeting structure group?			
Structure Separation.	<p>Where this document uses the term structure group, this is defined as a cluster of independent structures, including tents, trailers, containerized housing units, or similar construction.</p> <p>Separation of structures within structure groups consisting of fabric structures, containers, trailers, or similar structures must comply with the following:</p>			
	Are UFC 4-010-01 requirements for antiterrorism/force protection requirements related to space separation met?			
	Is the minimum separation between individual structures within a row of a billeting structure group consisting of fabric structures of 12 ft (3.7 m) met?			
	Is the minimum separation between rows of structures within a billeting			

	structure group of 30 ft (9.1 m) met?			
	Is the minimum separation between billeting structure groups and other structures of 100 ft (30.5 m) met?			
	Is the minimum separation between billeting structure groups of 59 ft (18 m) met?			
	Use of Revetments.			
	Are the requirements of UFC 4-010-01 met for the use of revetments?			
Fire Safety Analysis for Constrained Sites	If site constraints do not permit compliance with the above space separation requirements, has a fire-safety analysis been done performed or reviewed by the Unit Safety Officer and approved by the first O-6 level officer in the chain of command.			
Interior Finishes / Fabric Coverings	Are fabric coverings for tents or membrane structures in accordance with NFPA 701 requirements?			
	Do other structures comply with NFPA 101 requirements? (Compliance with NFPA 101 can be achieved using painted or unpainted finishes of concrete masonry units, gypsum wallboard, sheet metal, or 3/8-inch (9.5 mm) plywood. Fabric covering or textile coverings must be fire retardant as established by the manufacturer through testing in accordance with NFPA requirements.)			
Fire Extinguishers.	Are all facilities provided with listed portable fire extinguishers consistent with the occupancy of the facility?  (If traditional listed/approved extinguishers are not available, the			



	use of extinguishers with equivalent rating from EU, Asian, or other countries is permitted.)			
<b>TELECOMMUNICATIONS</b>				
	Are Army requirements in FM 4-20.07, paragraphs 2-79 and 4-25 met?	YES	NO	Comment
	Are Air Force requirements in AFH 10-222, Volume 1, Table 2.8, and Attachment 6 met?			
	Were Navy/Marine Corps assembly instructions for installation of pre-packaged equipment in theater followed?			
	If pre-packaged systems are not available and when fabricating a grounding system from components:			
	Was UFC 3-580-01, <i>Telecommunications Interior Infrastructure Planning and Design</i> , Section 2-7, "Grounding" followed?			
	Was UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises followed?.			
	Was UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, <i>Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments</i> followed?			
	Was UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, <i>Grounding, Bonding, and Shielding For Electronic Equipments and Facilities</i> followed?			

CYBERSECURITY				
	Are all control systems (including systems separate from an energy management control system) planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.	YES	NO	Comment

**A-2 TEMPORARY CONSTRUCTION LEVEL CHECKLIST.**

CIVIL				
Drawings	Site plan showing location of water source supply, sanitary sewer facilities, solid waste disposal areas, and all other facilities critical to life safety and health.	YES	NO	Comment
Calculations	Showing compliance with potable water testing requirements contained in referenced standards.			
STRUCTURAL				
Drawings		YES	NO	Comment
	General Notes			
	Inspection Requirements			
	Foundation Plans			
	Framing Plans, all levels			
	Roof Framing Plans			
	Details			
	Schedules as required (footings, columns, beams, shear walls)			
Calculations				
	Basis of Design; summary of applicable codes, live loading, snow loading, wind and seismic loads, and dead load assumptions Gravity design; design of floor and roof			

	framing members - beams, slabs, joists, decks, composite slabs, etc.			
	Column and bearing wall design			
	Foundation design			
	Lateral design; design of diaphragms and collectors, distribution of loads to lateral forces resisting elements (frames, walls), design of shear walls, moment frames, and braced frames, design of foundations at lateral force resisting elements, design of hold downs, straps, etc.			
	Design for AT/FP; confirm setbacks, wall construction types, and progressive collapse mitigation design requirements, check window designs, jambs and sills for AT/FP window loading requirements			
	Load combinations used			
	Materials used with properties and section properties.			
	Connection design and details – bolted and welded			
	Wind load analysis applied to structure			
	Seismic load analysis			
	Serviceability check (deflections and overturning)			
	Wall panel design (building envelope) and connection to superstructure			
	Stated structure life-span			
	Erection plan(s)			
<b>ELECTRICAL</b>				
Drawings		YES	NO	Comment
	Comply with the requirements of UFC 3-501-01, <i>Electrical Engineering</i> , Section 3-3, "Drawing Requirements", and the following subsections:			

	Section 3-3.2, "Site Plans"			
	Section 3-3.9, "Lightning Protection Plans"			
	Section 3-3.11, "Power One-line/Riser Diagrams"			
	Section 3-3.18, "Grounding Diagram"			
<b>Calculations</b>		<b>YES</b>	<b>NO</b>	<b>Comment</b>
	Comply with the requirements of UFC 3-501-01, <i>Electrical Engineering</i> , for the following calculations:			
	Section 3-2.4, "Short Circuit Analysis"			
	Section 3-2.6, "Arc Flash Analyses"			
	Section 3-2.15, "Lightning Protection Calculations"			
<b>PLUMBING AND MECHANICAL</b>				
<b>Drawings</b>		<b>YES</b>	<b>NO</b>	<b>Comment</b>
	Natural ventilation - Floor plans showing the layout of the ventilation system, dimensions of openings and associated equipment, and the means of controlling the system.			
	Mechanical ventilation - Floor plans showing the layout of the ventilation system, equipment schedules and details, schematic diagrams, and control sequences and diagrams.			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-5, "Drawings"			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 1-11, "Drawings".			
<b>Calculations based on facility function and local climatic conditions</b>				
	Natural ventilation – Calculations showing ventilation opening areas.			

	Mechanical ventilation – Calculations showing required ventilation air quantities based on facility occupancy.			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-4, “Calculations”			
	Specific Systems, provide Plumbing System documentation per UFC 3-420-01, Chapter 1-10.2, “Calculations”			
<b>FIRE PROTECTION</b>				
<b>Drawing / Narrative Basis of Design (can be combined)</b>		<b>YES</b>	<b>NO</b>	<b>Comment</b>
	A fire protection summary is required for all designs. Provide a summary discussing the following minimum fire protection provisions, based on UFC 1-200-01, UFC 1-201-01 and UFC 3-600-01:			
	Building code analysis summary drawing (i.e., type of construction, height and area limitations, and building separation or exposure protection).			
	Classification of occupancy, mixed use requirements, any hazardous areas.			
	Requirements for fire and smoke barriers, fire rated walls.			
	Life safety plan showing locations of fire rated walls, egress paths, travel distances, and emergency response vehicle access.			
	Fire protection plan (include type of system and location of equipment), and water supply information (if system is required).			
	Fire alarm system (and mass notification system if integrated into			

	the fire alarm) plan showing type of system and location of equipment, indicating reporting method to a central station/base location (if system is required),			
	Interior finish ratings required and provided.			
	Coordination with security and antiterrorism requirements.			
<b>TELECOMMUNICATIONS</b>				
	Follow UFC 3-580-01, Telecommunications Interior Infrastructure Planning and Design, Section 2-9, "Grounding, Bonding and Static Protection".	YES	NO	Comment
	Follow UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.			
	Follow UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments.			
	Follow UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities.			
<b>CYBERSECURITY</b>				
	All control systems (including systems separate from an energy management control system) planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.	YES	NO	Comment

**A-3 SEMI-PERMANENT CONSTRUCTION LEVEL CHECKLIST.**

CIVIL				
Drawings	Site plan showing location of water source supply, sanitary sewer facilities, solid waste disposal areas, and all other facilities critical to life safety and health.	YES	NO	Comment
Calculations	Showing compliance with potable water testing requirements contained in referenced standards.			
STRUCTURAL				
Drawings		YES	NO	Comment
	General Notes			
	Inspection Requirements			
	Foundation Plans			
	Framing Plans, all levels			
	Roof Framing Plans			
	Details			
	Schedules as required (footings, columns, beams, shear walls)			
Calculations				
	Basis of Design; summary of applicable codes, live loading, snow loading, wind and seismic loads, and dead load assumptions Gravity design; design of floor and roof framing members - beams, slabs, joists, decks, composite slabs, etc.			
	Column and bearing wall design			
	Foundation design			
	Lateral design; design of diaphragms and collectors, distribution of loads to lateral forces resisting elements (frames, walls), design of shear walls, moment frames, and braced frames, design of foundations at lateral force			

	resisting elements, design of hold downs, straps, etc.			
	Design for AT/FP; confirm setbacks, wall construction types, and progressive collapse mitigation design requirements, check window designs, jambs and sills for AT/FP window loading requirements			
	Load combinations used			
	Materials used with properties and section properties.			
	Connection design and details – bolted and welded			
	Wind load analysis applied to structure			
	Seismic load analysis			
	Serviceability check (deflections and overturning)			
	Wall panel design (building envelope) and connection to superstructure			
	Stated structure life-span			
	Erection plan(s)			
ELECTRICAL				
Drawings		YES	NO	Comment
	Comply with the requirements of UFC 3-501-01, <i>Electrical Engineering</i> , Section 3-3, “Drawing Requirements”, and the following subsections:			
	Section 3-3.1, “Legends and Abbreviations.			
	Section 3-3.2.2, “Transformer Details.			
	Section 3-3.2.3, “Underground Distribution”.			
	Section 3-3.4, “Lighting Plans and Details”.			
	Section 3-3.5, “Power Plans”.			
	Section 3-3.12, “Telecommunications Riser Diagram”.			



	Section 3-3.13, "Intercommunication/Paging Riser Diagram".			
	Section 3-3.14, "Fire Alarm Riser Diagram".			
	Section 3-3.16, "Schedules and Elevations".			
Calculations		YES	NO	Comment
	Comply with the requirements of UFC 3-501-01, <i>Electrical Engineering</i> , for the following calculations:			
	Section 3-2.4, "Short Circuit Analysis"			
	Section 3-2.6, "Arc Flash Analyses"			
	Section 3-2.15, "Lightning Protection Calculations"			
<b>PLUMBING AND MECHANICAL</b>				
Drawings		YES	NO	Comment
	Natural ventilation - Floor plans showing the layout of the ventilation system, dimensions of openings and associated equipment, and the means of controlling the system.			
	Mechanical ventilation - Floor plans showing the layout of the ventilation system, equipment schedules and details, schematic diagrams, and control sequences and diagrams.			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-5, "Drawings"			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 1-11, "Drawings".			
Calculations based on facility function and local climatic conditions				
	Natural ventilation – Calculations showing ventilation opening areas.			

	Mechanical ventilation – Calculations showing required ventilation air quantities based on facility occupancy.			
	Specific Systems, provide Mechanical System documentation in accordance with UFC-3-400-10N, Chapter 3-4, “Calculations”			
	Specific Systems, provide Plumbing System documentation per UFC 3-420-01, Chapter 1-10.2, “Calculations”			
<b>FIRE PROTECTION</b>				
Drawing / Narrative Basis of Design (can be combined)		YES	NO	Comment
	A fire protection summary is required for all designs. Provide a summary discussing the following minimum fire protection provisions, based on UFC 1-200-01, UFC 1-201-01 and UFC 3-600-01:			
	Building code analysis summary drawing (i.e., type of construction, height and area limitations, and building separation or exposure protection).			
	Classification of occupancy, mixed use requirements, any hazardous areas.			
	Requirements for fire and smoke barriers, fire rated walls.			
	Life safety plan showing locations of fire rated walls, egress paths, travel distances, and emergency response vehicle access.			
	Fire protection plan (include type of system and location of equipment), and water supply information (if system is required).			
	Fire alarm system (and mass notification system if integrated into the fire alarm) plan showing type of system and location of equipment, indicating reporting method to a central			

	station/base location (if system is required),			
	Interior finish ratings required and provided.			
	Coordination with security and antiterrorism requirements.			
<b>TELECOMMUNICATIONS</b>				
	Follow UFC 3-580-01, Telecommunications Interior Infrastructure Planning and Design, Section 2-9, "Grounding, Bonding and Static Protection".	YES	NO	Comment
	Follow UFC 3-580-01, Appendix A, Item 19: TIA-J-STD-607-B, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.			
	Follow UFC 3-580-01, Appendix A, Item 23: MIL-STD-188-124B, Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications-Electronics Facilities and Equipments.			
	Follow UFC 3-580-01, Appendix A, Item 24: MIL-HDBK-419A, Grounding, Bonding, and Shielding For Electronic Equipments and Facilities.			
<b>CYBERSECURITY</b>				
	All control systems (including systems separate from an energy management control system) planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06, and as required by individual Service Implementation Policy.	YES	NO	Comment

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**APPENDIX B GLOSSARY**

**B-1                    ACRONYMS.**

AFCEE	Air Force Center for Engineering and the Environment
BIA	Bilateral Infrastructure Agreement
DoD	Department of Defense
HQUSACE	Headquarters, U.S. Army Corps of Engineers
HNFA	Host Nation Funded Construction Agreements
NAVFAC	Naval Facilities Engineering Command
SOFA	Status of Forces Agreements
UFC	Unified Facilities Criteria
U.S.	United States

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## APPENDIX C REFERENCES

### ARMY PUBLISHING DIRECTORATE

#### Army Techniques Publications

ATP 4-44, *WATER SUPPORT OPERATIONS*

#### Field Manuals

FM 4-20.07

#### Technical Manuals

TM 3-34.56, *WASTE MANAGEMENT FOR DEPLOYED FORCES*

TM 3-34.70, *PLUMBING, PIPE FITTING, AND SEWERAGE*

#### Engineer Manuals

EM 385-1-1, *Safety and Health Requirements*

### NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 10, *Standard for Portable Fire Extinguishers*

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*

NFPA 101, *Life Safety Code*

NFPA 701, *Standard Methods of Fire Tests for Flame Propagation of Textiles and Films*

### UNIFIED FACILITIES CRITERIA

<https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc>

UFC 1-200-01, *DoD Building Code*

UFC 1-201-02, *Assessment of Existing Facilities for Use in Military Operations*

UFC 3-301-01, *Structural Engineering*

UFC 3-310-04, *Seismic Design of Buildings*

UFC 3-420-01, *Plumbing Systems*

UFC 3-550-01 *Exterior Electrical Power Distribution*

UFC 3-580-01, *Telecommunications Interior Infrastructure Planning and Design*

UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*

UFC 4-010-06, *Cybersecurity of Facility-Related Control Systems*

**JOINT PUBLICATIONS**

*Department of Defense Dictionary of Military and Associated Terms*

JP 1, *Doctrine for the Armed Forces of the United States*

JP 3-0, *Joint Operations*

JP 3-34, *Joint Engineer Operations*

JP 4-0, *Joint Logistics*

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**APPENDIX D DATA PLATE EXAMPLE**

<b>DATE MANUFACTURED</b>	<b>FACILITY CONSTRUCTION LEVEL</b>
<b>OCCUPANCY TYPE</b>	<b>BUILDING/SERIAL NUMBER</b>
<b>DEPARTMENT OF DEFENSE</b>	
THIS FACILITY COMPLIES TO UNIFIED FACILITY CRITERIA (UFC) 1-201-01 FOR NON-PERMANENT DOD FACILITIES IN SUPPORT OF MILITARY OPERATIONS. THIS DATA PLATE IS REQUIRED TO BE POSTED AT THE MAIN ENTRY DOOR OF FACILITY UNTIL THE END OF USE. IF FACILITY IS UPGRADED AFFIX NEW DATA PLATE NEXT TO ORIGINAL.	

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APPENDIX E MISSION CRITICAL FACILITIES DECISION TREE

