"Using AT/FP Requirements and UFC 4-020-01 Design Process to Increase Climate and Natural Hazard Resilience of Military Installation Infrastructure and Mission-critical Assets!"

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Climate and Severe Weather Hazards in Action

Agenda

- Key Terms and Definitions
- Perspectives on Resilience
- Typical Climate/Natural Hazards
- Mission-Critical Design Standards
- Adapting UFC 04-010-01 Process for Installation Climate Impact Analysis
- Using UFC 4-020-01 Spreadsheets

True Story: The Marshall Fire

Urban Wild-Fire 8 Miles North of My Home in Arvada, Colorado
30 December 2021

On our way to lunch…

NPR.org

After lunch…

Boulder County Colorado Urban Wildfire - 30 December 2021

- The wildfire was **fueled by 55 mile an hour winds gusting to 70/80/105 mph**
- **Created a “blowtorch” effect**
- **Grew quickly to**122 acres (49 hectares) **with no containment**
- **35,000 people evacuated… some with less than 30 seconds to leave!**
- **2 people died…**
- **> 1000 pets perished…**

6,200 acres burned

Over 1000 homes and other buildings destroyed

Over 2 Billion $$ in damages

It snowed the next day…

The Denver Post

Lessons Learned and Effective Design

See: firewise-construction2012.pdf
"Site Design & Building Materials Based on the 2009 International Wildland-Urban Interface Code"

Chapter 4: Building Design

- **Vents, eaves, soffits, gutters, downspouts and decks**
- **Ignition-resistant construction class**

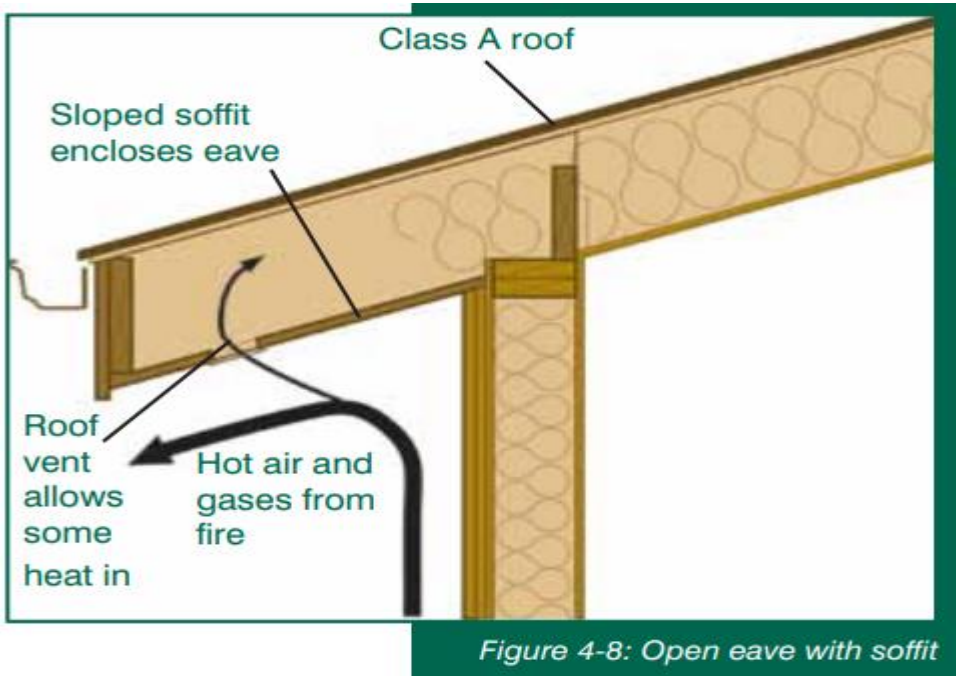


Figure 4-8: Open eave with soffit

"The eave should be covered with a soffit. If the soffit is applied directly to the rafter eave, it forms a sloping soffit, which creates a pocket that can trap fire."

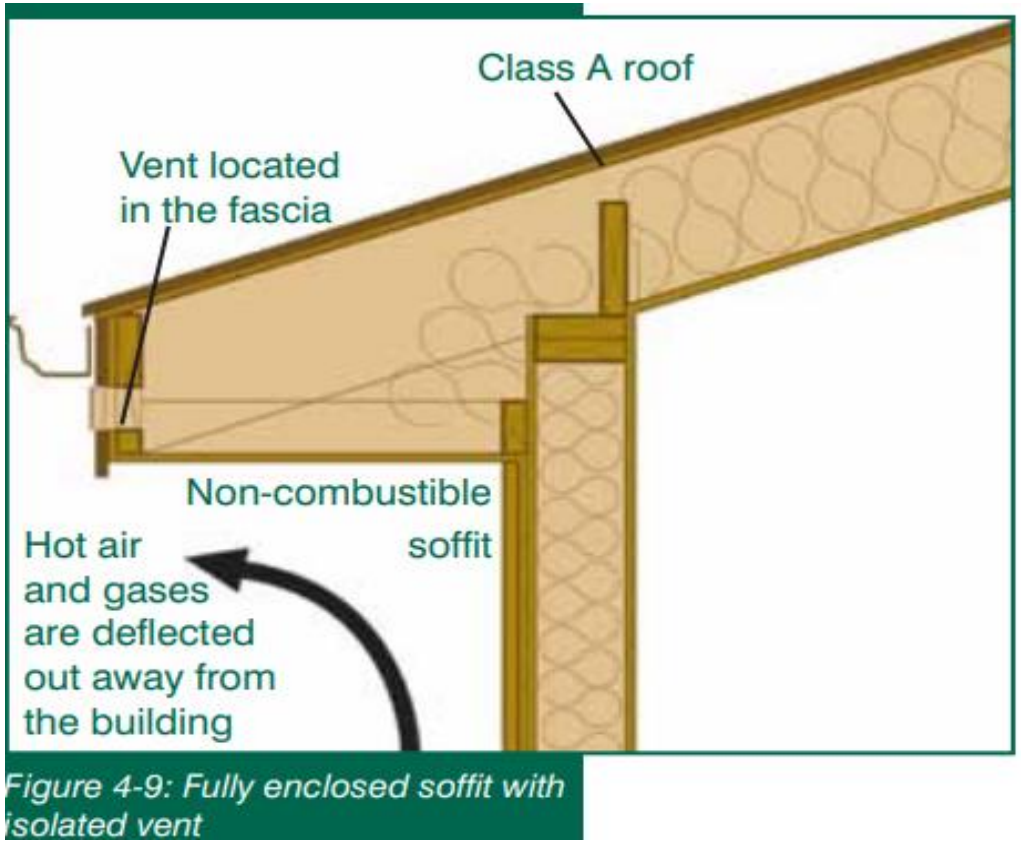


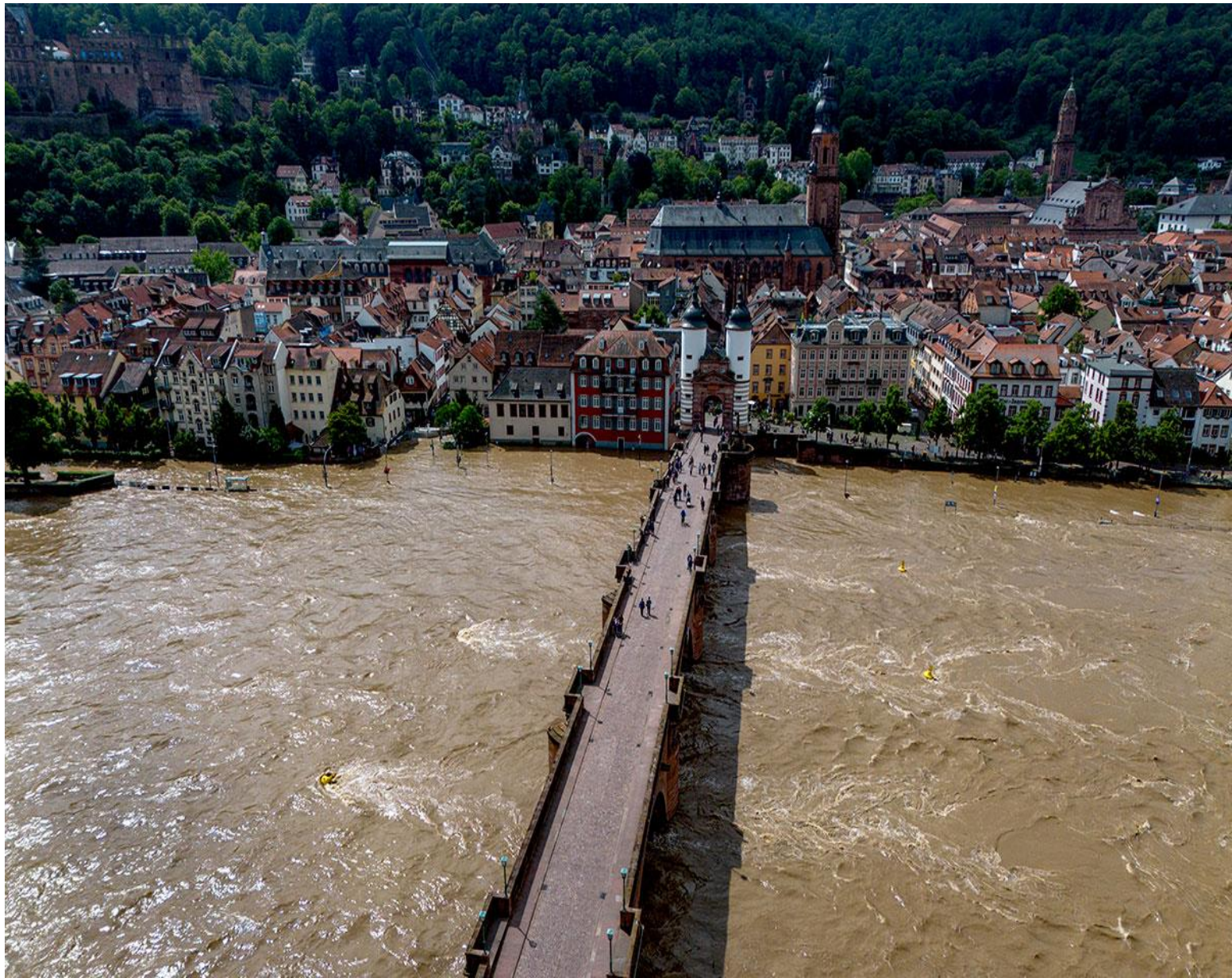
Figure 4-9: Fully enclosed soffit with isolated vent

Indicators for Prioritization of Climate and Natural Hazard Impacts

- **Location specific Asset Data**
  - Geographic location
  - Proximity to hazard
  - Past events
  - Site-specific knowledge
  - Physical condition
  - Age
  - Mission/Purpose/Criticality
  - Exposure, Sensitivity, Adaptive Capacity
  - Vulnerability
  - Security
  - Design and Construction Standards

Typical Climate Severe Weather and Natural Hazards

- **Severe Wind: Hurricane, Tornado**
- **Flooding: Riverine, Coastal, Pluvial**
- **Severe Temperature: Heat and Cold**
- **Lightning**
- **Drought/Water Scarcity**
- **Wild-Fire**



The River Neckar, Heidelberg, June 3, 2024; 3 m above regular level; reached 5.1 m above that day. AP

Have a Shared Understanding of Terms and Definitions!

- **Hazard - A condition with the potential to cause injury, illness, or death of personnel; damage to or loss of equipment or property; or mission degradation.**
- **(DoD Dictionary, 2021)**

- **Resilience - The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.**
- **(DoDD 4715.21)**

- **Risk – Probability and severity of loss linked to threats or hazards and vulnerabilities.**
- **(DoDD 3020.40)**

Increasing Military Installation Resilience

https://www.specialwarfaretw.af.mil/News/Video/?videoid=899620&dvpTag=NDR&dvpcc=false#DVIDSVideoPlayer43860

3 Key Perspectives on Resilience

- **Scientific: Sustainability, Environmental – Species, Carbon, Air, Land, Water, Data**

- **Engineering: Standards, Design, Construction - Built and Natural Infrastructure, Nature Based-Solutions (NBS)**

- **Organizational: Managerial, Operational - Leadership, Managers, Operators, Staff, Assets, Risks, Opportunities, Objectives**

- **Organizations need to learn and understand:**
  - **Mission-Critical Infrastructure and Asset Design and Construction Needs**
  - **Perspective interfaces, interdependencies and linkages**
  - **Data, Goals, Outcomes**
  - **Technological, human, and asset capability and capacity**
  - **How and When to "Take Action to Achieve Objectives and Outcomes!"**

How Building Design and (Going Above) Construction Standards Reduce Asset and Human Risk and Increase Resilience

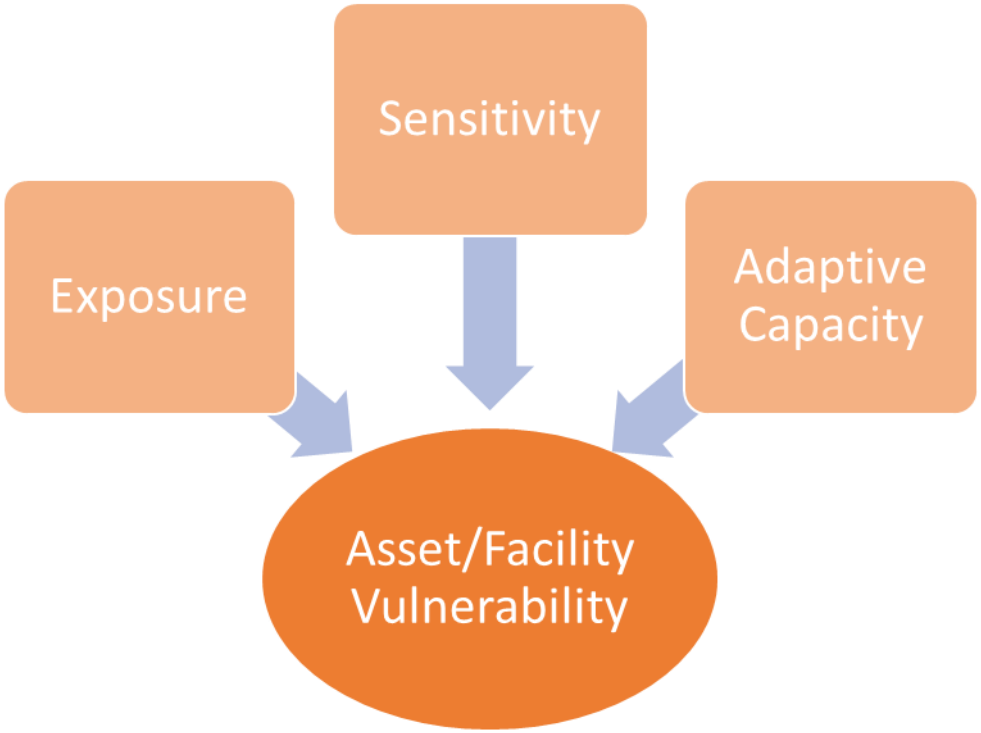
Source: CNN

House on Mexico Beach in Florida, USA that survived Hurricane Michael

Cardno®

Key Lessons Learned and Areas of Focus

- **Existing/Available Data vs Proprietary Data (Beware of Black Boxes!)**
- **Local, Region, Country, International Exposures, Conditions, Characteristics, Vulnerability**
- **Prioritization/Characteristics: Infrastructure/Asset Sensitivity, Vulnerability**
- **Conditions Inside and Outside the Fence**
- **Supply Chains**

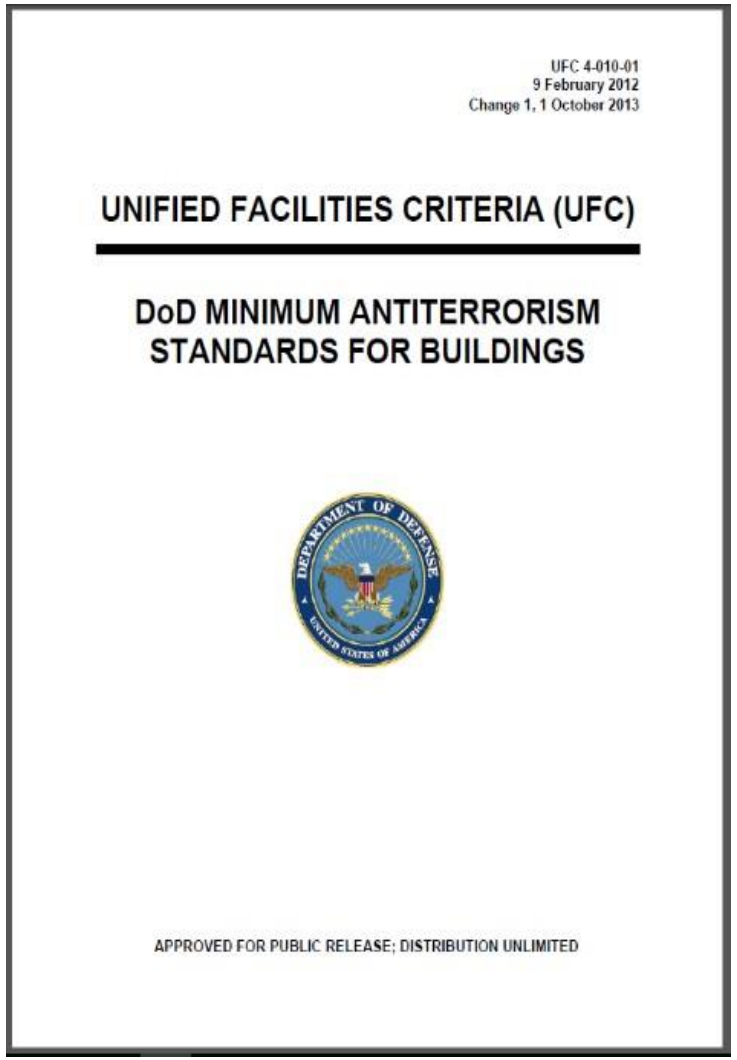


Refining UFC 4-010-01 and 4-020-01 to Accommodate Severe Weather and Other Natural Hazards

AT Requirement Sources, History

- **Intent**
  - **Minimize mass casualties**
  - Standardization across DoD to reduce **subjectivity** for reasonable and **justifiable** levels of threat and protection

- **Evolution of DoD AT Requirements**
  - 1999: **Interim** after Khobar findings
  - 2002: First version of UFC 4-010-01
  - 2003: Standoff per **25 m & 45 m**
  - 2007: Minor changes
  - 2012: Standoff **per bldg. materials**
  - 2013: Minor changes
  - 2018: **VBIED threat tactic eliminated as minimum standard (But not in EUCOM)**

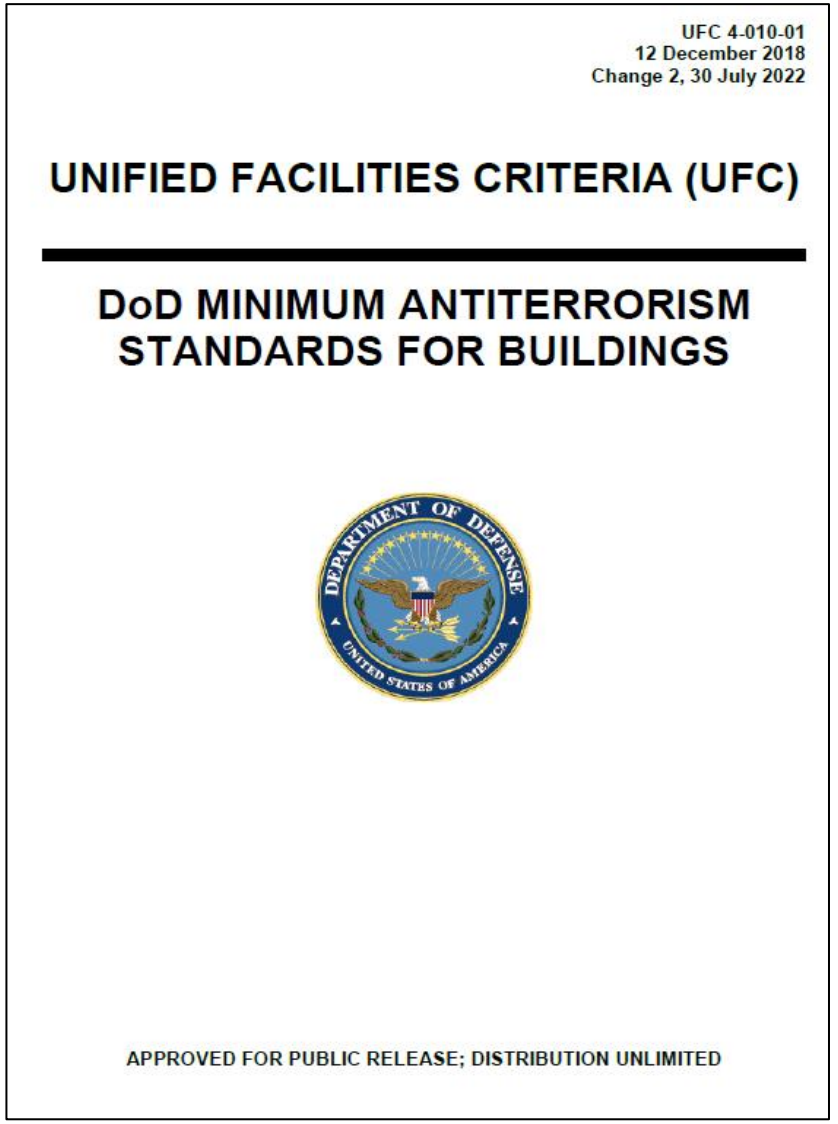


AT Requirement Sources for DoD Facilities

- **Unified Facilities Criteria (UFC)**
  - **UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings**
  - UFC 4-010-03 Security Measures for High-Risk Personnel
  - **UFC 4-020-01 DoD Security Engineering Facilities Planning Manual**
  - UFC 4-020-02 DoD Security Engineering Facilities Design Manual
  - UFC 4-021-01 Mass Notification Systems
  - UFC 4-022-01 Access Control Points
  - **UFC 4-022-02 Selection of Vehicle Barriers**
- Theater and Agency Supplements
  - **U.S. European Command AT Operations Order 23-01**
  - **Army Europe Regulation 525-13 Antiterrorism**
  - IMCOM-Europe Guidelines for Offices
  - DoDEA Protection Criteria 4-010-01
  - Army Standard for Access Control Points, 2020
  - NATO ACO Directive 80-25 Force Protection

Minimum AT Standards for Buildings UFC 4-010-01, Introduction

- **Applicability:**
  - New Construction
  - Changes to Existing Buildings
  - Change of Occupancy
  - Window Replacement Projects
  - HVAC Replacement Projects
  - Leased Buildings
  - See UFC for more…
- **Exemptions:**
  - “Low Occupancy” Buildings (<11 people)
  - “Temporary” and Relocatable Buildings, Transitional Spaces
  - Not Routinely Occupied
  - See UFC for more…


UFC 4-010-01
12 December 2018
Change 2, 30 July 2022

UNIFIED FACILITIES CRITERIA (UFC)

DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

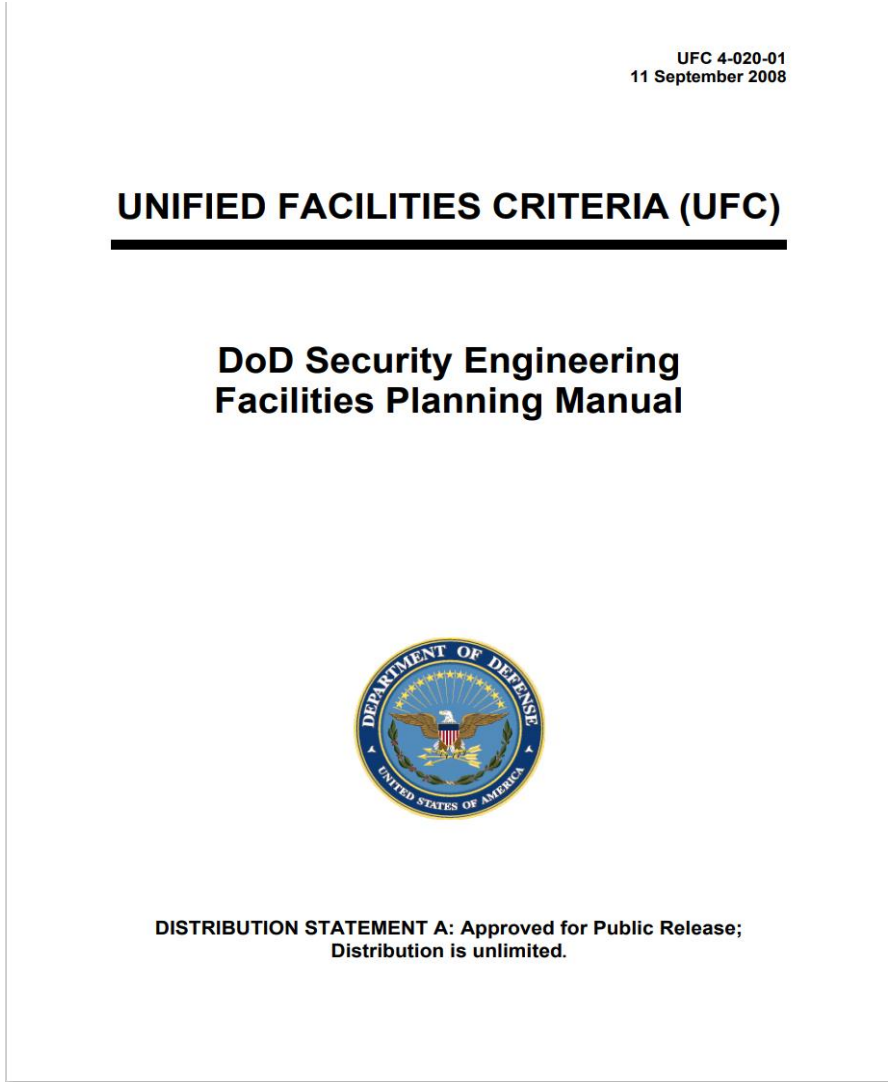
Minimum AT Standards, Introduction

- **UFC 4-020-01 must be used to determine the Design Basis Threat (DBT) and Level Of Protection (LOP) for each project**

- **Use minimum standards of UFC 4-010-01 only when UFC 4-020-01 calculations result in no identified threat or level of protection**

Facility DBT

- UFC 4-020-01 Chapter 3, Design Criteria Development
  - **Risk** is function of **criticality, threat, and vulnerability**
  - Step 1: Convene the planning team
  - Step 2: Identify assets
  - Step 3: Determine **asset value**
  - Step 4: Identify **aggressor likelihoods**
  - Step 5: Identify **tactics** and threat **severity** levels
  - Step 6: Consolidate into initial **design basis threat (DBT)**
  - Step 7: Determine initial **level of protection (LOP)**
  - Step 8: Determine planning risk levels
  - Step 9: Assess acceptability of risk levels
  - Step 10: Identify user constraints


UFC 4-020-01
11 September 2008

UNIFIED FACILITIES CRITERIA (UFC)

DoD Security Engineering
Facilities Planning Manual

DISTRIBUTION STATEMENT A: Approved for Public Release;
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Facility DBT, Protection Parameters (Climate DBT Mock-up)

- UFC 4-020-01 **Chapter 4, Protection Design Strategies**
  - **Vehicle bomb tactics (stationary & moving)**
  - Hand delivered devices
  - Indirect fire weapons
  - **Direct fire weapons**
    - **Low LOP: block sightlines**
    - **High LOP: harden building elements (e.g. 4” RC for 7.62mm)**
  - Airborne contamination tactic
  - Waterborne contamination tactic
  - Waterfront attack tactic
  - **Forced entry tactic**
    - **Low LOP: 1 min. delay**
    - **High LOP: 15 min. delay**
  - Covert entry tactic
  - Visual surveillance tactic

DBT Design Criteria Summary Worksheet

Project or Building =>	Coastal admin building	Analyst =>	Climate Hawk	Date =>	2/27/2030

Assets	Asset Category	Asset Value Rating	Damaging winds		Rain flooding		Wildfire		Tropical event		Tornado		Lightning		Extreme temperature		Coastal flooding		Rising water		1000 year flood		Flash flood		Hail		Snow	
			DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP	DBT	LOP
General population	A	0.67	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Mission critical population	A	0.50	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Arms and ammunition	B	0.63	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Critical infrastructure and industrial equipment	O	0.65	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Data centers	D	0.70	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Activities and operations	R	0.52	L	L	L	L	L	L	M	L	M	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
		0.00																										

DBT = Design Basis Threat severity level LOP = Level of Protection

Asset Ratings

- **Severity Levels**
- **Levels of Protection**
- **Asset Categories**
- **Asset Value Rating**

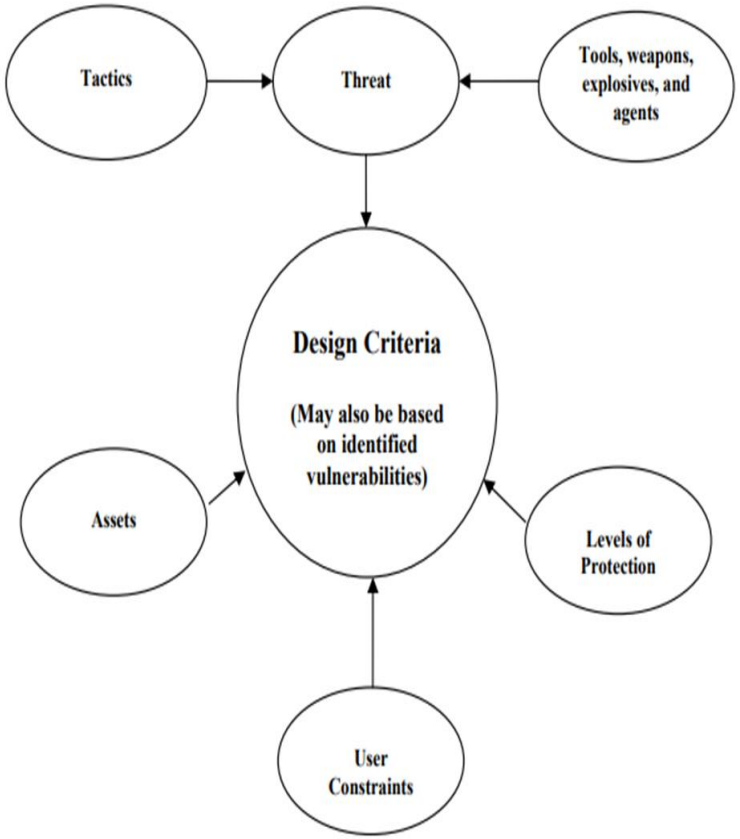
Table 3-5. Impact on the National Defense

Impact of Asset's Loss on the National Defense	Value Rating Factor
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could have insignificant impact on the United States or a region.	0
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could have significant mission impact on a regional level.	1
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could compromise the defense infrastructure of the United States.	2
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could impact the tactical capability of the United States.	3
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could be expected to harm the operational capability of the United States.	4
The loss, theft, destruction, or misuse of the asset or operation's /activity's compromise could result in great harm to the strategic capability of the United States.	5

Key Criteria

- Adaptation of Ratings to Key Assets
- Criticality
- Key Climate Hazards
- Likelihood Ratings
- Ranking
- Prioritization

Figure 3-1. Design Criteria



3-1

Asset Value and Climate/Severe Weather Hazard (Climate DBT Mock-up)

UFC ASSET VALUE / AGGRESSOR LIKELIHOOD WORKSHEET

Project or Building =>	Coastal admin building	Asset =>	General population	Analyst =>	Climate Hawk
		Asset Category =>	A	Asset Value	0.67
				Date =>	2/27/2030

Criticality to User / Population Type[1]	Impact on National Defense	Replaceability	Political Sensitivity	Relative Value to User	Sum of Value Factors	Value Rating[2]
General Population						
5			3	2	10	0.67
Critical Infrastructure and Operations and Activities						
					0	0.00
Data centers						0.00
All Other Assets						
					0	0.00
Proceed to Aggressor Likelihood						0.67

Potential Aggressors	Aggressor Goal[3]	Hazards	Installation Location[4] (Table_3_10)	Current features	Proximity	Availability[4] (Table_3_13)	[4] (Table_3_14)	(Table_3_15)	(Table_3_16)	emergency services	(Table_3_18)	(Table_3_19)	History[5] / Intentions[5] (Table_3_20)	[6] (Table_3_21)	[6] (Table_3_22)	[6] (Table_3_23)	Sum of Likelihood Factors	Likelihood Ratings[7]
		damaging winds	2	4	4	3				0			24				37	0.21
		rain flooding	2	4	4	3				0			8				21	0.12
		wildfire	2	4	4	3				0			24				37	0.21
		tropical event	2	4	4	3				0			30				43	0.24
		tornado	2	4	4	3				0			24				37	0.21
		lightning	2	4	4	3				0			24				37	0.21
		extreme temperature	2	4	4	3				0			24				37	0.21
		coastal flooding	2	4	4	3				0			30				43	0.24
		snow	2	4	4	3				0			24				37	0.21
		Flash flood	2	4	4	3				0			30				43	0.24

Proceed to Tactics, DBT and LOP Worksheet for GREEN Aggressors [Likelihood > .50]

1. Population type applies to general population only.

4. Factors that should be the same for all aggressors for given asset.

Summarized Example of Rating and UFC Design Criteria

- Likelihood Determinations
- Asset Value Ratings
- Climate/Natural Hazards
- Rating Scores
- What the scores indicate!
- How the UFC design criteria come into play.

Table 3-10. Asset Location

Installation or facility Location	Likelihood Rating Factor
Located away from any known climate hazards	1
Located in an area with less than two climate hazards classifed as minor (lighting, high wind)	2
Located in an area with 2-4 climate hazards and at least one major threat	4
Located located in an area with more than 4 climate hazards and at least two major hazards	5

Table 3-11. Installation current features

current features	Likelihood Rating Factor
Installation or facility lacks any climate hardening	5
Installation or facility has very minor climate hardening	4
Installation or facility has moderate climate hardening	3
Installation or facility has robust climate hardening	2
Installation or facility has significant hardening	1

Summarized Example of Rating and UFC Design Criteria

Table 3.12 proximity to hazards

Asset Location and Access Controls	Likelihood Rating Factor
The facility in which or at which the asset is located is in an area not in any proximity to climactic hazards	0
The facility in which or at which the asset is located is in an area that is within in minor proximity to climactic hazards	2
The facility in which or at which the asset is located is in moderate proximity to climactic hazards	4
The facility in which or at which the asset is located is in major proximity to climactic hazards	6
The facility in which or at which the asset is located is in significant proximity to climactic hazards	8
The facility in which or at which the asset is located is directly on or within a climactic hazard	10

Table 3-13. Asset Availability

Asset Availability Likelihood Rating Factor	
Similar assets are widely available both on and in the immediate vicinity off the installation or site	0
Similar assets have limited availability in the immediate vicinity off the installation, but are widely available on the installation or site	1
Similar assets are not available in the immediate vicinity off the installation, but are widely available on the installation or site	2
Similar assets have limited availability on the installation and are not available in the immediate vicinity off the installation or site	3
Similar assets are available at fewer than 3 other locations on the installation and are not available in the immediate vicinity off the installation or site	4
There are no similar assets on or off the installation except at this location or site	5

Summarized Example of Rating and UFC Design Criteria

Table 3-17. emergency services locations

Emergency services available but more than 20 miles or 10 km from installation
10
Emergency services avalialbe but more than 10 miles or 5 km from installation
8
Emergency services available but more than 5 miles or 2.5 km from installation
6
Emergency services available nearby but off installation
4
Emergency services available on installation but limited
2
Emergency services availalbe on installation and fully capable
0

Local data center, with redundancy	2
Local data center without redundancy	4
Regional data center with redundancy	6
Regional data center without redundancy	8
Strategic data center with redundancy	10
Strategic data center without redundancy	12

Table 3-20. History of Acts Against Like Assets / Terrorist Intention

Aggressor / Factor History or Intention _Likelihood Rating Factor

Aggressor: All except fire or flood-Factor: History__There is no history of hazard
_6
Aggressor: All except fire or flood-Factor: History__There is little or no history hazard.
_12
Aggressor: All except fire or flood-Factor: History__There is history of hazard however it has not happend in the last 10 years.
_18
Aggressor: All except fire or flood-Factor: History__There history of hazard however it has not happened in the last 5 years.
_24
Aggressor: All except fire or flood-Factor: History__There is a history of hazard and it has happened with in the last two years
_30

Aggressor: fire or flood__No history of fire or flood
_2
Aggressor: fire or flood__There is a history of fire or floods however not in the last 10 years _4
Aggressor: fire or flood__there is a history of fire or flood within the last 5 years _6
Aggressor: fire or flood__fire or floods happen locally yearly but not near installation _8
Aggressor: fire or flood__fire or floods threaten the installation yearly

Benefits of Adapting 4-010-01 and 4-020-01 for Severe Weather and Natural Hazards

- Refining UFC 4-020-01 with climate/severe weather/natural hazard elements can provide validated process to identify climate and natural hazard risks
- Refining 4-010-01 to accommodate climate and other natural hazards can benefit installations with increased resilience
- Like the AT DBT, a climate/severe weather/natural hazard DBT can help justify costs of climate hardening
- Refinements can clearly show related design basis threat level of protection for assets

Presentation Summary and Questions

- Key Terms and Definitions
- Perspectives on Resilience
- Typical Climate/Severe Weather and Natural Hazards
- Mission-Critical Design Standards
- Adapting UFC 04-010-01 Process for Climate/Severe Weather/Natural Hazard Impact Analysis
- Using UFC 4-020-01 Spreadsheets

The River Neckar, Heidelberg, June 3, 2024; 3m above regular level; reached 5.1m above that day. AP