Practical Application of Physical Security Criteria

AIA Course Number IEICES082615

Presented By:

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with
INNOVATIVE ENGINEERING

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Learning Objectives

- Learn and Understand

  - Core principles of physical security design
  - The effects of blast loading on the building envelope
  - Department of Defense Physical Security Criteria UFC 4-010-01
  - Approaches to mitigate the hazards associated with Physical Security

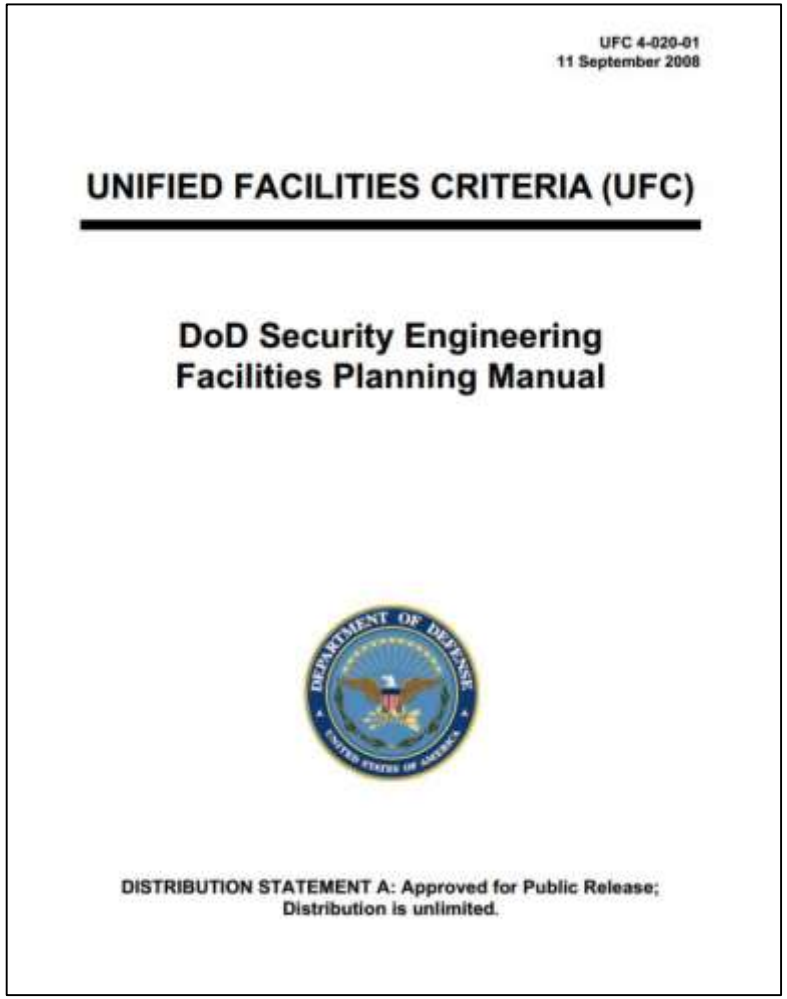
Today's Presenters

- **Scott L Weiland PE**
  - Education
    - BSCE **University of Michigan**
    - Graduate Studies:
      - San Jose State University
      - Georgia Institute of Technology
    - Anti-Terrorism/Force Protection Security Engineering: Applied Research Associates
    - Design of Blast Resistant Structures: Baker Risk
    - Blast Resistance for Anti-Terrorism: Protective Engineering Consultants
    - Updated UFC 4-010-01: SAME Architectural Practice
    - **Security Engineering: USACE Protective Design Center**
  - Registration: PE in 15 States + PR
  - Experience
    - 35 Years in Design and Construction
    - **21 Years in ATFP Security Engineering**

Today's Presenters

- **Stephen L Morgan EI**
  - Education
    - BSCET, **Southern Polytechnic State University**
    - Blast Resistance for Anti-Terrorism: Protective Engineering Consultants
    - Blast Resistance by Design: Stone Security Engineering
  - Experience: 11 Years Security Engineering
  - Expertise
    - ATFP Peer Reviews
    - Blast Design
    - Progressive Collapse

DoD Criteria Starting Point


UFC 4-020-01
11 September 2008

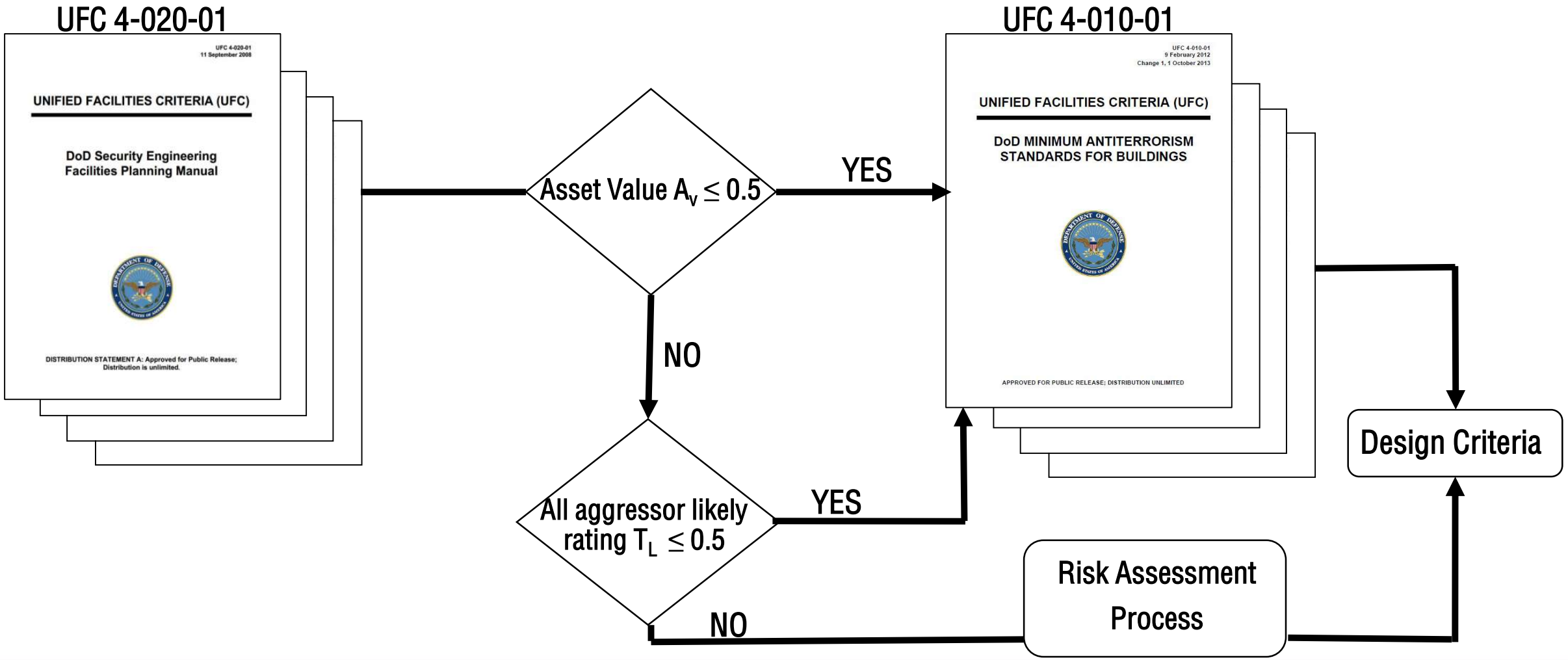
UNIFIED FACILITIES CRITERIA (UFC)

DoD Security Engineering
Facilities Planning Manual

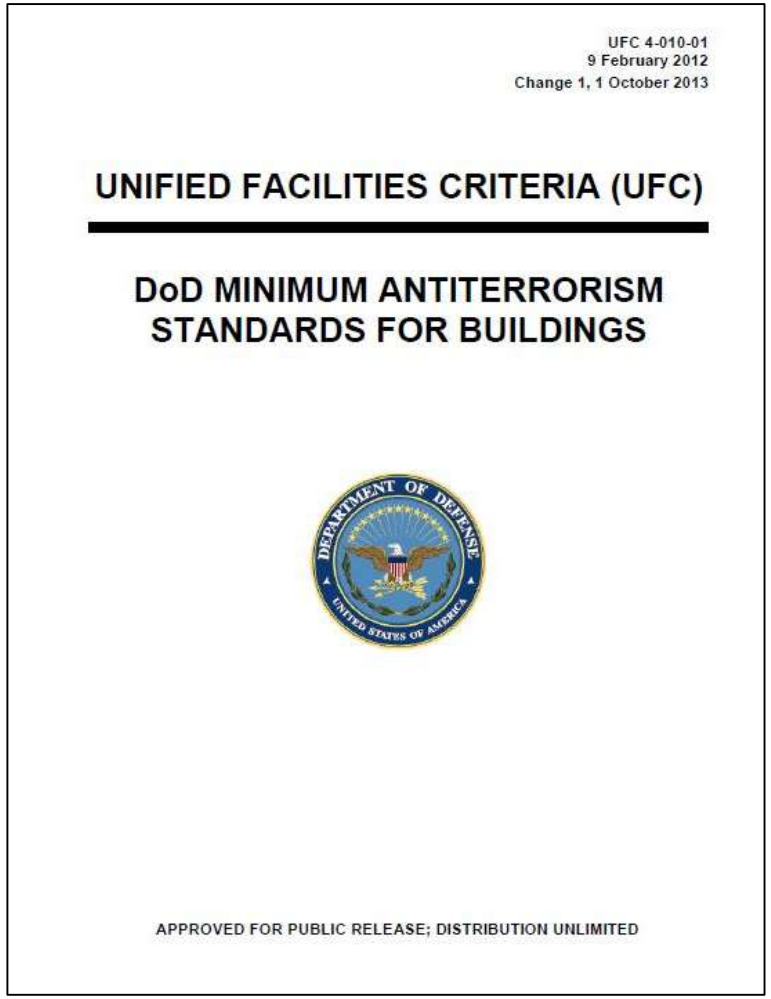
DISTRIBUTION STATEMENT A: Approved for Public Release;
Distribution is unlimited.

- 18 Asset Categories
- 10 Aggressor Types
- 13 Tactics
- 5 Levels of Protection

Design Criteria Development



DoD Minimum Standard Criteria


UFC 4-010-01
9 February 2012
Change 1, 1 October 2013

UNIFIED FACILITIES CRITERIA (UFC)

DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS

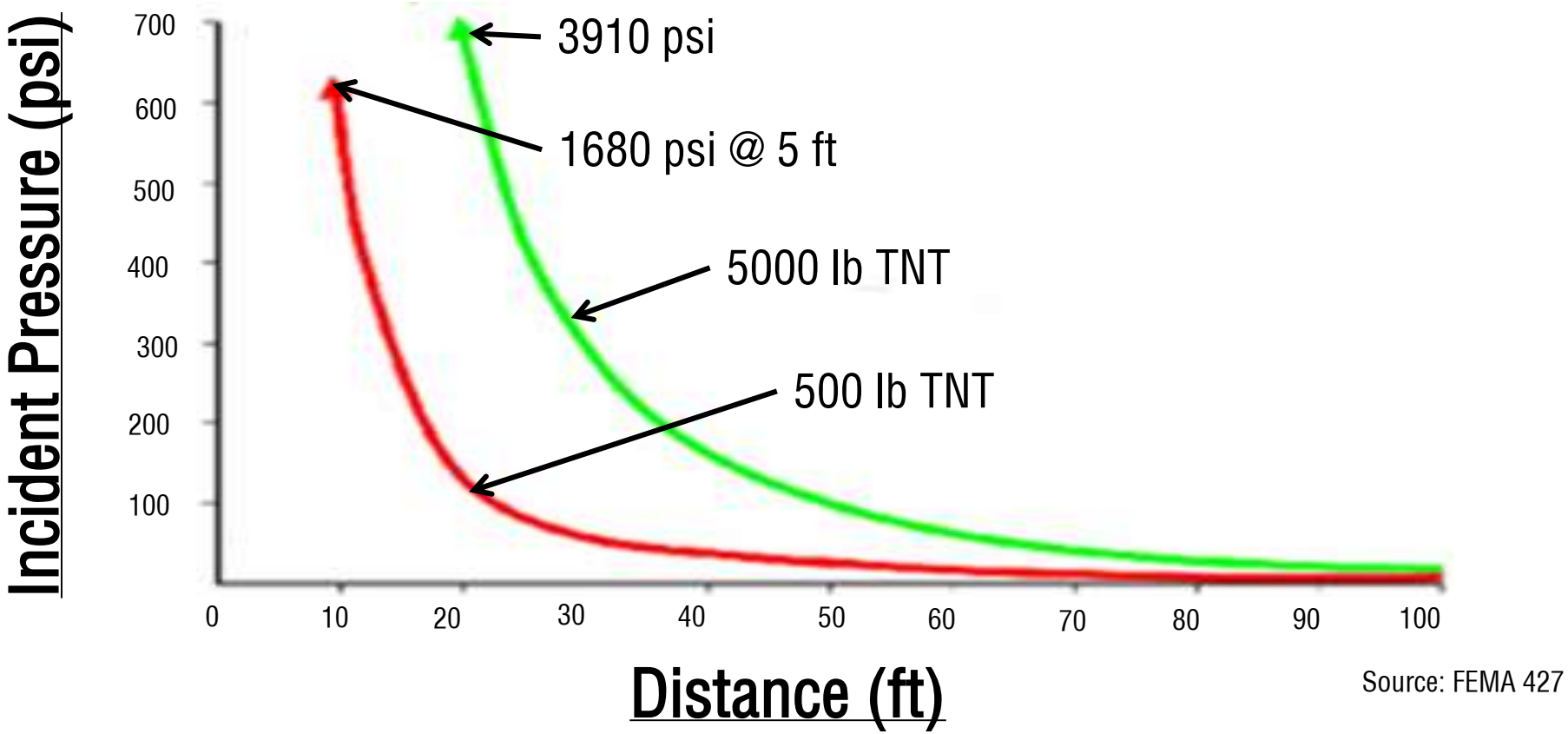
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

- 1 Asset Category - **People**
- 2 Aggressor Types
  - Domestic & International **Terrorists**
- 4 Tactics
  - Stationary **Bomb** - Primary
  - Hand Delivered Bomb*
  - Indirect Fire Weapon*
  - Direct Fire Weapon*
  - Airborne Contamination*
- 2 Levels of Protection

Blast Theory - Explosion

- Shock Wave
- Reflected Pressure
- Side-On Pressure
- Rebound

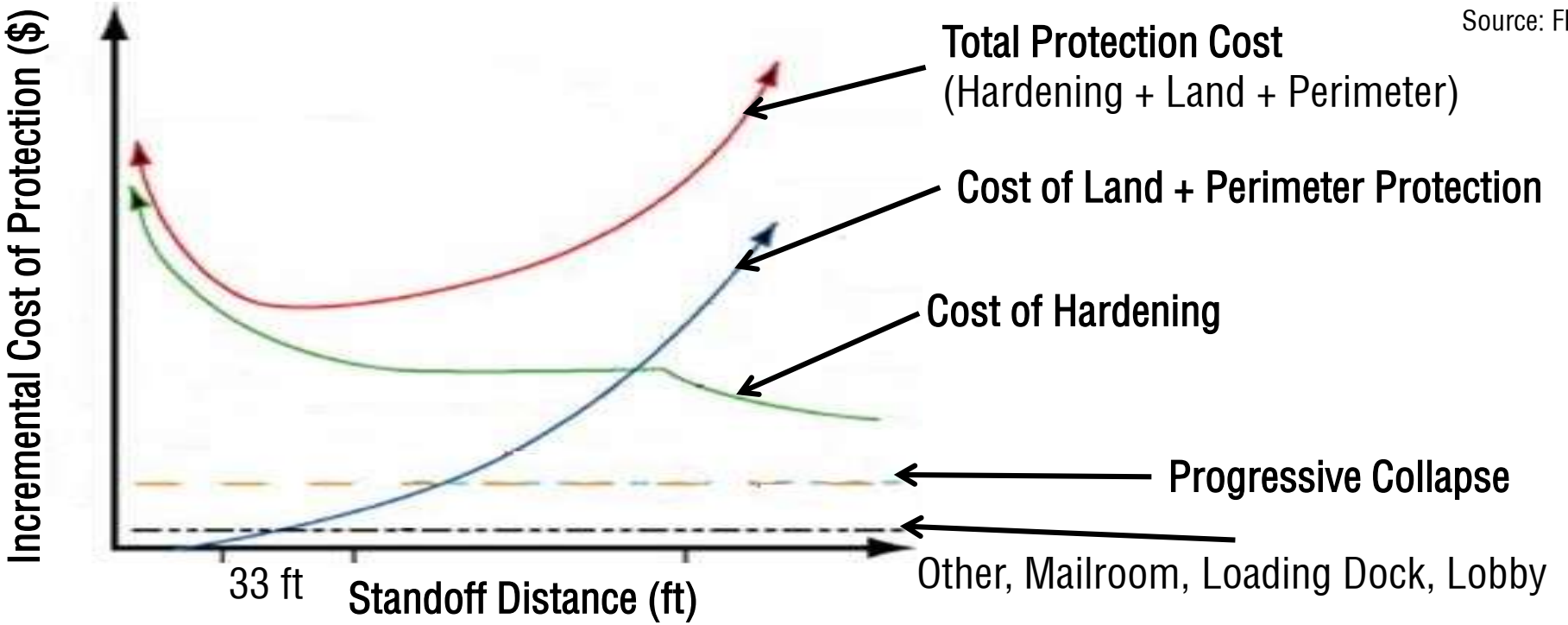
Blast Theory - Distance



Source: FEMA 427

- Pressures decay with the cube root of the distance from the explosion.

Blast Theory - Optimum Standoff



Source: FEMA 427

- **Optimize total cost of Hardening + Land + Perimeter**
  - Less stand-off requires more hardening.
  - More stand-off requires more land and perimeter
  - Note Progressive Collapse is threat independent.

Questions

Questions?

Next: DoD Minimum Antiterrorism Standards for Buildings

Stephen L Morgan EI

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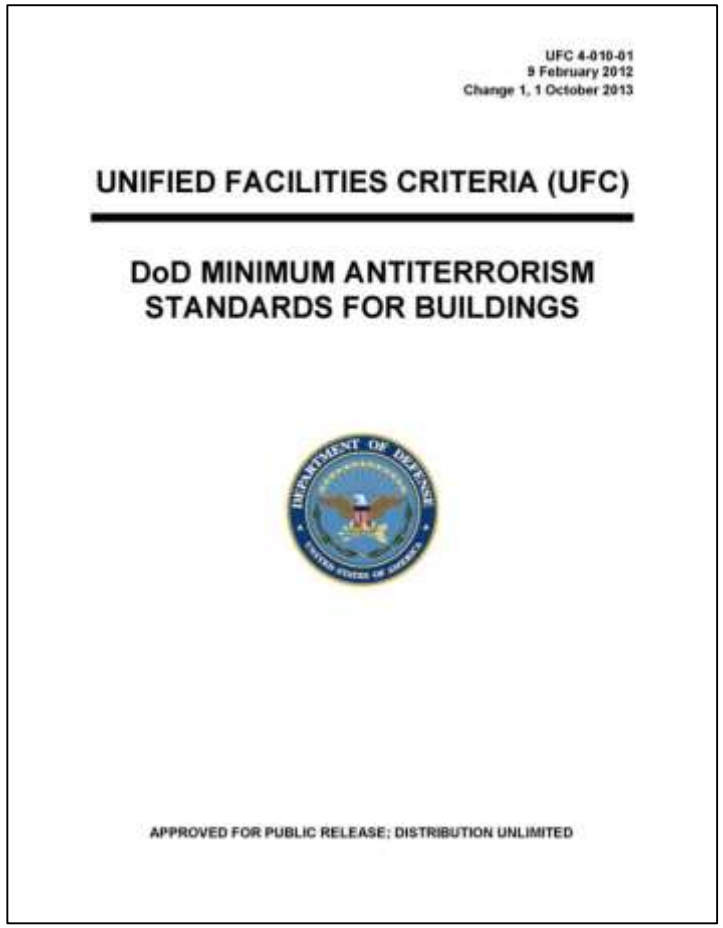
Content Overview

- Intent of UFC 4-010-01
- Basic Concepts
  - Levels of Protection
  - Building Categories
  - Standoff Distance
- Applicability and Exemptions
- Examples

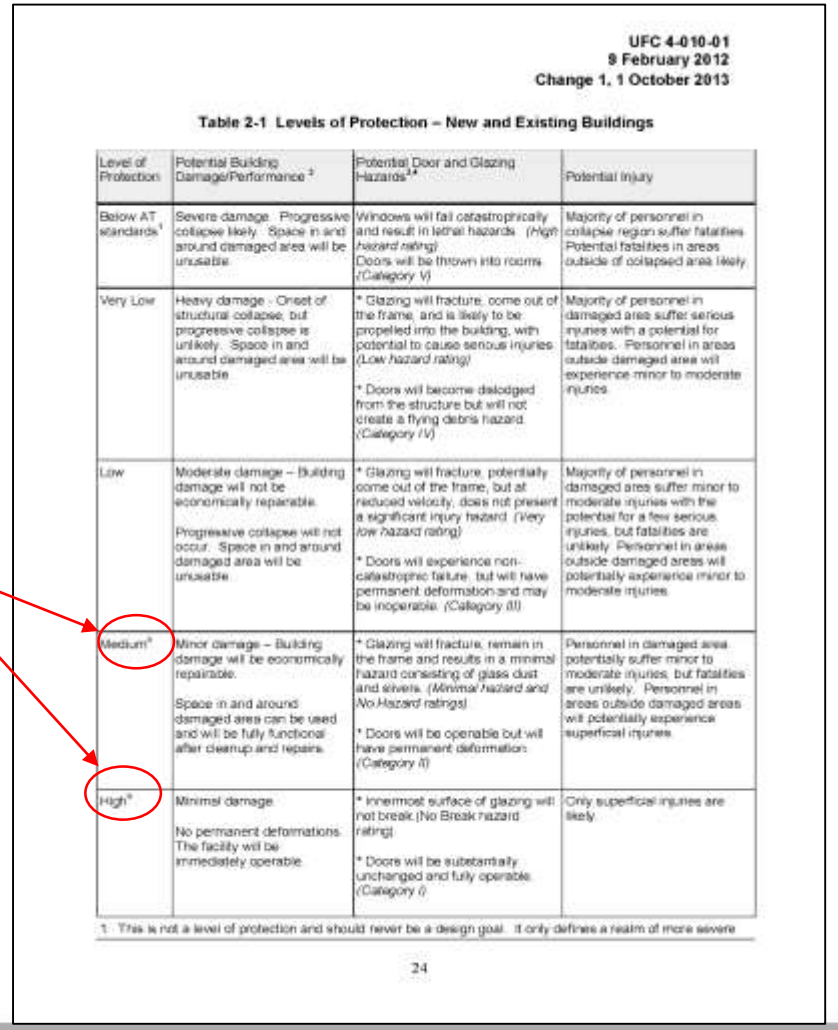


Intent of UFC 4-010-01

- **Minimize mass casualties** in buildings or portions of buildings owned, leased, privatized or otherwise occupied, managed, or controlled by or for the DoD in the event of a terrorist attacks
- **Provides baseline – minimum standards** to address anti-terrorism force protection for DoD buildings
- **Cost effective means** of protecting DoD personnel from a wide range of threats posed by terrorist
- **Allows implementation of the standard to vast quantity of assets** controlled by DoD over time in a more cost effective way

Levels of Protection

- **Below Anti-Terrorism Standards –NOT** a level of protection and never a design goal
- **Very Low** – heavy damage, onset of collapse
- **Low** – moderate damage, progressive collapse will not occur
- **Medium and High**
  - Outside the scope of the UFC
  - Refer to UFC 4-020-01 DoD Security Engineering Facilities Planning Manual



UFC 4-010-01
9 February 2012
Change 1, 1 October 2013

Table 2-1 Levels of Protection – New and Existing Buildings

Level of Protection	Potential Building Damage/Performance [2]	Potential Door and Glazing Hazards [2,4]	Potential Injury
Below AT standards [1]	Severe damage. Progressive collapse likely. Space in and around damaged area will be unusable.	Windows will fail catastrophically and result in lethal hazards. *(High hazard rating)* Doors will be thrown into rooms. *(Category V)*	Majority of personnel in collapse region suffer fatalities. Potential fatalities in areas outside of collapsed area likely.
Very Low	Heavy damage - Onset of structural collapse, but progressive collapse is unlikely. Space in and around damaged area will be unusable.	* Glazing will fracture, come out of the frame, and is likely to be propelled into the building, with potential to cause serious injuries *(Low hazard rating)* * Doors will become dislodged from the structure but will not create a flying debris hazard. *(Category IV)*	Majority of personnel in damaged area suffer serious injuries with a potential for fatalities. Personnel in areas outside damaged area will experience minor to moderate injuries.
Low	Moderate damage – Building damage will not be economically repairable. Progressive collapse will not occur. Space in and around damaged area will be unusable.	* Glazing will fracture, potentially come out of the frame, but at reduced velocity, does not present a significant injury hazard. *(Very low hazard rating)* * Doors will experience non-catastrophic failure, but will have permanent deformation and may be inoperable. *(Category III)*	Majority of personnel in damaged area suffer minor to moderate injuries with the potential for a few serious injuries, but fatalities are unlikely. Personnel in areas outside damaged areas will potentially experience minor to moderate injuries.
Medium [5]	Minor damage – Building damage will be economically repairable. Space in and around damaged area can be used and will be fully functional after cleanup and repairs.	* Glazing will fracture, remain in the frame and results in a minimal hazard consisting of glass dust and slivers. *(Minimal hazard and No Hazard ratings)* * Doors will be operable but will have permanent deformation. *(Category II)*	Personnel in damaged area potentially suffer minor to moderate injuries, but fatalities are unlikely. Personnel in areas outside damaged areas will potentially experience superficial injuries.
High [5]	Minimal damage. No permanent deformations. The facility will be immediately operable.	* Innermost surface of glazing will not break (No Break hazard rating) * Doors will be substantially unchanged and fully operable. *(Category I)*	Only superficial injuries are likely.

1. This is not a level of protection and should never be a design goal. It only defines a realm of more severe

24

Building Categories

- **Billeting -** Any building or portion of building in which 11 or more DoD personnel are routinely housed regardless of population density
- **High Occupancy Family Housing –** DoD buildings used as quarters for DoD personnel and their departments with 13 or more units per building.
- **Primary Gathering -** Buildings sheltering DoD personnel routinely occupied by 50 or more and a populations density of more than 1 person/430 SF
- **Inhabited –** Buildings sheltering DoD personnel routinely occupied by 11 or more and a populations density of more than 1 person/430 SF
- **Low Occupancy –** Buildings sheltering DoD personnel routinely occupied by fewer than 11 or population density less than 1 person/430 SF
- **Historic Buildings**
  - Determine adverse affects caused by standard implementation
  - Historic status does not negate the implementation of the standard

Threat Definition

- Types of Threats
  - **Vehicle Bombs – Charge Weight I or II**
  - Waterborne Vessel Bombs – Charge Weight I or II at perimeter
  - Placed Bombs – Charge Weight II
  - Mail Bombs (No size defined in this standard)
  - Indirect Fire Weapons Charge Weight III
  - Direct Fire Weapons – small arms or shoulder fired rockets
  - Chemical, Biological and Radiological Weapons
  - Explosive Weights for each charge weight can be found in UFC 4-010-02 (FOUO)
  - **Charge Weight I is MUCH higher than Charge Weight II**

Standoff Distance – Standard 1

- **What is Standoff Distance?**
  - **Minimum Standoff Distance** – The smallest permissible standoff distance for new construction regardless of analysis. For existing buildings standoff distances less than the minimum used for new construction may be used if analysis shows the level of protection can be met
  - **Conventional Construction Standoff Distance** –Standoff distance at which conventional construction may be used for building components without specific analysis. However windows and doors must always be analyzed for blast effects
  - **Standoff distances are measured to Controlled perimeters, parking, roadways and trash containers**

Standoff Distance – Standard 1

- **What is Conventional Construction?**
  - Parts of a building not specifically designed to resist weapons or explosive effects. Windows, doors and their respective support system always require analysis at their respective standoff distance and associated charge weight
  - This construction is not exempt from building code requirements for gravity, wind, seismic loading

Conventional Construction Assumptions

Table 2-3 Conventional Construction Parameters

Wall or Roof Type[1]	Analysis Assumptions[2, 9]						
	Sections	Span	Spacing	Support Condition	Supported Weight[5]	Reinforcement Ratio	Min. Static Material Strength
Wood Studs – Brick Veneer	2x4 & 2x6 in (50x100 & 50x150 mm)	8 – 10 ft (2.4 - 3 m)	16 - 24 in (400 – 600 mm)	S-S	44 psf (215 kg/m^2)	N/A	875 psi (6 MPa)
Wood Studs – EIFS	2x4 & 2x6 in (50x100 & 50x150 mm)	8 – 10 ft (2.4 – 3 m)	16 -24 in (400 -600 mm)	S-S	10 psf (49 kg/m^2)	N/A	875 psi (6 MPa)
Steel Studs – Brick Veneer[3]	600S162-43 600S162-54 600S162-68	8 – 12 ft (2.4 – 3.7 m)	16 - 24 in (400 – 600 mm)	S-S	44 psf (215 kg/m^2)	N/A	50,000 psi (345 MPa)
Steel Studs – EIFS[3]	600S162-43 600S162-54 600S162-68	8 – 12 ft (2.4 – 3.7 m)	16 - 24 in (400 – 600 mm)	S-S	10 psf (49 kg/m^2)	N/A	50,000 psi (345 MPa)
Metal Panels[6] (in wall or roof construction)	1.5 – 3 in (38 - 76 mm) 22, 20, & 18 ga	4 – 8 ft (1.2 - 2.4 m)	N/A	S-S	10 psf (49 kg/m^2)	N/A	33,000 psi (228 MPa)
Girts[6] (in wall or roof construction)	8Z3 &10Z3 16, 14, & 12 ga	20 – 25 ft (6 – 7.6 m)	6 – 8 ft (1.8 – 2.4 m)	S-S	5 psf (24 kg/m^2)	N/A	50,000 psi (345 MPa)
Reinforced Concrete[7]	≥ 6 in (≥ 150 mm)	12 – 20 ft (3.7- 6 m)	N/A	S-S, One way flexure	10 psf (49 kg/m^2)	≥ 0.0015	3,000 psi (21 MPa)
Unreinforced Masonry[4, 8]	6 – 12 in (150 – 300 mm)	8 – 12 ft (2.4 – 3.7 m)	N/A	S-S, One way flexure	10 psf (49 kg/m^2)	0	1,500 psi (10 MPa)

Table 2-3 Conventional Construction Parameters

Wall or Roof Type[1]	Analysis Assumptions[2, 9]						
	Sections	Span	Spacing	Support Condition	Supported Weight[5]	Reinforcement Ratio	Min. Static Material Strength
Reinforced Masonry[7, 8]	8 – 12 in (200 - 300 mm)	10 – 14 ft (3 – 4.3 m) 12 ft (3.7m) 14 ft (4.3m)	N/A	S-S, One way flexure	10 psf (49 kg/m^2)	0.0005 - 0.0030	1,500 psi (10 MPa)
European Block[3, 4]	6 – 8 in (150 – 200 mm)	10 – 12 ft (3 – 3.7 m)	N/A	S-S, Brittle Flexure	10 psf (49 kg/m^2)	0	1,800 psi (12 MPa)
Concrete Roofs[7]	4 – 12 in (100 - 300 mm)	6 ft (1.8 m)	N/A	F-S	15 psf (73 kg/m^2)	0.0015 - 0.005	3,000 psi (21 Mpa)
Metal Roofs	K and LH joists with Metal Deck and/or 3.5 - 5.5 in (90 - 140 mm) Concrete Topping	30 ft (9.1m)	4 – 8 ft (1.2 – 2.4 m)	S-S	15 – 90 psf (73 – 439 kg/m^2)	N/A	50,000 psi (345 MPa)

1. Other types of construction other than that shown in this table may be permissible subject to validation by the designer of record.
2. See PDC Technical Report 10-01 for details on the analysis assumptions and material properties.
3. \1\ Steel studs are assumed to be connected top and bottom for load bearing walls. For non-load bearing walls steel studs are assumed to have a slip-track connection at the top /1/.
4. Unreinforced masonry must have adequate lateral support at the top and bottom.
5. Weight supported by the wall that moves through the same deflection as the wall, not including self-weight of the component.
6. \1\ For walls or roofs built using metal panels and girts; use the greater of the standoffs for the metal panel and the girt /1/.
7. \1\ Reinforcing steel is 60,000 psi (414 MPa) tensile strength./1/
8. \1\ Concrete Masonry Units (excluding European block) are medium weight (120 pcf / 1922 kg/m^3) /1/
9. \1\ Shear will need to be checked when using higher than minimum material strengths. /1/

S-S = Simple - Simple Supports F-S = Fixed - Simple Supports

Standoff Distance – Standard 1

- **Important Site Features**
  - **Controlled perimeter** – a physical boundary at which vehicle access is controlled, generally at the perimeter of on installation or high water mark, where threats of charge weight I can be searched and detected.
  - **Unobstructed Space**
    - Space that extends from the building walls out to the conventional construction standoff distance.

Standoff Distance – Standard 1

- **Parking**
  - New buildings parking never permitted within minimum standoff
  - Existing Buildings parking only permitted within minimum standoff if LOP can be achieved through hardening
  - Controlled parking for existing buildings can be within CCSD without hardening provided controlled parking with ID check is provided at or beyond the CCSD. Pedestrian access control must also be provided to these parking areas (IE Fencing)
  - Parking of government and emergency vehicles that never leave restricted access areas are allowed within the minimum standoff
  - Driving lanes within Parking Areas of existing buildings may be closer than parking spaces located at the required standoff, but vehicles may not be left unattended. Standoff for this condition is the nearest parking space. This is not allowed for new buildings

Standoff Distance – Standard 1

- **Roadways**
  - New and existing buildings roadways never within minimum standoff distance
- **Trash Containers**
  - Never within minimum standoff distance
  - If more that two sides or within the unobstructed space, container must be 5 sided and prevent concealment of an object 6 inches or greater in height or width
- **Adjacent Existing Buildings**
  - Where new or existing buildings designed in accordance with this standard including parking, roadways and trash containers are adjacent to an existing inhabited building, the standoff distance from the new or existing building project to the adjacent existing building shall be in accordance with Standard 1. If these distances can not be met, the adjacent existing building must be analyzed for the new standoff distance

Standoff Distance Tables B-1 and B-2

Table B-1 Standoff Distances for New and Existing Buildings

Distance to:	Building Category	Standoff Distances				
		Applicable Level of Protection	Conventional Construction Standoff Distance		Minimum Standoff Distance [2]	Applicable Explosive Weight [3]
			Load Bearing Walls [1]	Non-Load Bearing Walls [1]		
Controlled Perimeter or Parking and Roadways without a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	A	C	20 ft (6 m)	I
	Primary Gathering Building	Low	A	C	20 ft (6 m)	I
	Inhabited Building	Very Low	B	D	20 ft (6 m)	I
Parking and Roadways within a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	E	G	13 ft (4 m)	II
	Primary Gathering Building	Low	E	G	13 ft (4 m)	II
	Inhabited Building	Very Low	F	H	13 ft \1\ (4 m) /1/	II
Trash Containers	Billeting and High Occupancy Family Housing	Low	E	G	13 ft (4 m)	II
	Primary Gathering Building	Low	E	G	13 ft (4 m)	II
	Inhabited Building	Very Low	F	H	13 ft \1\ (4 m) /1/	II

1. See Table B-2 for standoff distances.
2. For new construction, standoff distances less than those in this column are not allowed for new buildings regardless of analysis or hardening. For existing buildings that are constructed / retrofitted to provide the required level of protection, standoffs less than those in this column are allowed, but discouraged.
3. See UFC 4-010-02, for the specific explosive weights (pounds / kg of TNT) associated with explosive weights I and II. UFC 4-010-02 is For Official Use Only (FOUO).

Table B-2 Conventional Construction Standoff Distances

Wall Type \1\ (1, 6) /1/	Column Letter							
	Without Controlled Perimeter Applicable Explosive Weight I [5]				Within Controlled Perimeter Applicable Explosive Weight II \1\ (5) /1/			
	Load Bearing Walls		Non-Load Bearing Walls		Load Bearing Walls		Non-Load Bearing Walls	
	A PG & BIL LLOP	B INHAB VLLOP	C PG & BIL LLOP	D INHAB VLLOP	E PG & BIL LLOP	F INHAB VLLOP	G PG & BIL LLOP	H INHAB VLLOP
Wood Studs – Brick Veneer	105 ft (32 m)	105 ft (32 m)	79 ft (24 m)	66 ft (20 m)	36 ft (11 m)	36 ft (11 m)	23 ft (7 m)	16 ft (5 m)
Wood Studs – EIFS	207 ft (63 m)	207 ft (63 m)	164 ft (50 m)	141 ft (43 m)	86 ft (26 m)	86 ft (26 m)	66 ft (20 m)	56 ft (17 m)
Metal Studs – Brick Veneer	187 ft (57 m)	187 ft (57 m)	207 ft [3] (63 m)	187 ft [3] (57 m)	75 ft (23 m)	75 ft (23 m)	82 ft [3] (25 m)	75 ft [3] (23 m)
Metal Studs – EIFS	361 ft (110 m)	361 ft (110 m)	420 ft [3] (128 m)	361 ft [3] (110 m)	151 ft (46 m)	151 ft (46 m)	167 ft [3] (51 m)	151 ft [3] (46 m)
Metal Panels	n/a [2]	n/a [2]	151 ft (46 m)	108 ft (33 m)	n/a [2]	n/a [2]	56 ft (17 m)	39 ft (12 m)
Girts	n/a [2]	n/a [2]	115 ft (35 m)	59 ft (18 m)	n/a [2]	n/a [2]	23 ft (7 m)	16 ft (5 m)
Reinforced Concrete	66 ft (20 m)	66 ft (20 m)	26 ft (8 m)	20 ft (6 m)	16 ft (5 m)	16 ft (5 m)	13 ft (4 m)	13 ft (4 m)
Unreinforced Masonry [4]	262 ft (80 m)	262 ft (80 m)	125 ft (38 m)	33 ft (10 m)	80 ft (24 m)	80 ft (24 m)	26 ft (8 m)	16 ft (5 m)
Reinforced Masonry	86 ft (26 m)	86 ft (26 m)	30 ft (9 m)	20 ft (6 m)	30 ft (9 m)	30 ft (9 m)	13 ft (4 m)	13 ft (4 m)
European Block	164 ft (50 m)	164 ft (50 m)	59 ft (18 m)	30 ft (9 m)	39 ft (12 m)	39 ft (12 m)	23 ft (7 m)	16 ft (5 m)
\1\ Roof Construction in Table 2-3 /1/	20 ft (6 m)				13 ft (4 m)			

Applicability of UFC 04-010-01

- **All new non-exempt buildings shall comply with the UFC including**
  - DoD Occupied Buildings
  - Non DoD Tenant Buildings on DoD property
  - National Guard Buildings
  - Visitor Centers and Museums
  - Visitor Control Centers at entry control Facilities/Access control points
  - Expeditionary

Applicability of UFC 04-010-01

- **Existing Buildings shall comply with the UFC when Triggered by the following**
  - **Major Investment** – When renovation exceeds 50% of the total plant replacement value ,excluding costs to meet this standard I.E. using blast windows vs non-blast windows
  - **Change of Occupancy** – I.E From Inhabited to Primary Gathering
  - **Window, Skylight and Glazed Door Replacement and Installation**
  - **Roadway Improvement Projects** that change standoff distances from the original building design

Applicability of UFC 04-010-01

- **Building Additions**
  - Includes the addition **AND** entire building if addition area is greater than 50% of the existing building
- **Leased Buildings**
  - All new and renewing leases where DoD occupies at least 25% of the building area.
  - If off installation building shall conform with Interagency Security Committee standards
- **DoD Purchase of Existing Buildings**
- **Projects under previous versions of the standard do not need to be reprogrammed to meet the current standard if they are beyond 35% complete or passed the RFP stage for Design/Build projects**

Exemptions of UFC 04-010-01

- **Buildings exempted from all provisions in the UFC**
  - Low occupancy family housing
  - Low occupancy buildings
  - Fisher houses with 24 units or less
  - Town Centers
  - Enhanced Use leases
  - Transitional Structures and spaces
  - Temporary relocatable buildings
  - Construction administration structures

Exemptions of UFC 04-010-01

- **Exempt from Roadway and Standoff Provisions**
  - Gas stations and car care centers
  - Military protective construction
  - Stand-alone franchised fast food operations
  - Stand-alone shopettes, minimarts and similarly sized commissaries
  - Small stand-alone commercial, bank and pharmacy facilities
  - Parking structures

Examples – New Buildings

- **Increase Standoff Distance Wherever Possible to minimize hardening for blast loading**
  - Roadway realignment to increase standoff distance to conventional construction distance

Examples – New Buildings

- **Envelope Design**
  - Mass is your friend (12 Ft; 600S162 16 GA Stud at 16” OC with 30 FT Standoff, CWII)

Results Summary

θ_{max} =	5.99	deg.	Design Criteria:	VLLOP/Secondary-NS	
μ =	4.95		Response DOES NOT MEET input design criteria		
X_{max} Inbound =	7.56	in	at time =	23.50	msec
X_{min} Rebound =	0.00	in	at time =	0.00	msec
R_{max} =	1.86	psi	at time =	23.50	msec
R_{min} =	-1.86	psi	at time =	58.50	msec
Shortest Yield Line Distance to Determine θ:				72.0	in

With EIFS

Results Summary

θ_{max} =	1.95	deg.	Design Criteria:	VLLOP/Secondary-NS	
μ =	1.61		Response meets input design criteria		
X_{max} Inbound =	2.45	in	at time =	25.00	msec
X_{min} Rebound =	-1.13	in	at time =	82.60	msec
R_{max} =	1.86	psi	at time =	25.00	msec
R_{min} =	-1.86	psi	at time =	82.60	msec
Shortest Yield Line Distance to Determine θ:				72.0	in

With Brick

Results Summary

θ_{max} =	3.34	deg.	Design Criteria:	VLLOP/Secondary-NS	
μ =	2.55		Response meets input design criteria		
X_{max} Inbound =	4.20	in	at time =	16.80	msec
X_{min} Rebound =	-1.46	in	at time =	45.00	msec
R_{max} =	4.62	psi	at time =	16.80	msec
R_{min} =	-4.62	psi	at time =	31.40	msec
Shortest Yield Line Distance to Determine θ:				72.0	in

To meet the blast requirements using EIFS the Studs will need to be increased to 600S162 12GA at 12” O.C. This is a significant increase in cost over the entire building.

Examples – New Buildings

- **Stronger members are not always better**
  - Using the same example (12 Ft; 600S162 16 GA Stud at 16” OC with 30 FT Standoff, CWII; With Brick)

Equivalent Static Reactions*		
Peak Reactions Based on Ultimate Flexural Resistance of Metal Studs: Vu		
Vu at Support A =	2,143	lb
Vu at Support B =	2,143	lb

16GA Stud

Equivalent Static Reactions*		
Peak Reactions Based on Ultimate Flexural Resistance of Metal Studs: Vu		
Vu at Support A =	3,993	lb
Vu at Support B =	3,993	lb

12GA Stud

The increase in stud size lead to an increase of 87% in the Equivalent Static Reaction. This leads to higher connection costs for the studs.

Examples – New Buildings

- **Balanced Design Approach**
  - Used to control the mode of failure
  - Glazed Opening Example
    - Window Resistance
    - Window anchorage to the supporting structural element resistance
    - Supporting structural element resistance
    - Supporting structural element anchorage to main structure resistance

Governs the design of the system

- This concept is important because when specifying window requirements, the requirements should not be in excess of what is really required as this will lead to a more expensive and unbalanced system.
- Always review glazing submittals to ensure the window system resistance does not exceed the project requirements and if testing is submitted always review the anchorage used during testing. Often the anchorage used does not reflect project conditions.

Examples – New Buildings

- **Clearly Identify the Blast Criteria in Specifications and Documents**
  - Drawing Notes: Be mindful of FOUO information

1. BUILDING CATEGORY: PRIMARY GATHERING
2. GLAZING, GLAZING FRAMES AND ANCHORAGE:
   a. EQUIVALENT 3-SECOND DURATION DESIGN PRESSURE DETERMINED IN ACCORDANCE WITH ASTM E1300 IN CONJUNCTION WITH ASTM F2248 BASED ON THE APPLICABLE EXPLOSIVE WEIGHT (EXPLOSIVE WEIGHT II) AND ACTUAL STAND OFF DISTANCE TO GLAZING. AS AN ALTERNATIVE THESE ITEMS CAN BE DESIGNED DYNAMICALLY OR TESTED IN ACCORDANCE WITH UFC 4-010-01 REQUIREMENTS. THE ALTERNATE DESIGNS SHALL BE BASED ON APPLICABLE EXPLOSIVE WEIGHT (EXPLOSIVE WEIGHT II) AND ACTUAL STANDOFF DISTANCE.
3. STRUCTURAL ELEMENTS SUPPORTING GLAZING IN WINDOWS AND DOORS:
   a. DESIGN LOAD DETERMINED IN ACCORDANCE WITH UFC 4-010-01 BASED ON APPLICABLE EXPLOSIVE WEIGHT (EXPLOSIVE WEIGHT II) AND ACTUAL STAND OFF DISTANCE.
4. FACADE: WALL PANELS AND ROOF PANELS
   a. DESIGN LOAD DETERMINED IN ACCORDANCE WITH UFC 4-010-01 BASED ON APPLICABLE EXPLOSIVE WEIGHT (EXPLOSIVE WEIGHT II) AND ACTUAL STAND OFF DISTANCE.

  - Generally window, door and façade elements are specified by the architect and must be coordinated with the blast requirements by the blast consultant to avoid confusion by the vendor and costly change orders and or incorrectly designed products for the project.

Examples – Existing Buildings

- **Low Cost Standoff Distance Increase**
  - Existing building has parking within conventional construction standoff distance up to the minimum standoff distance.
  - Provide controlled parking at conventional construction standoff distance.

Existing Construction Example

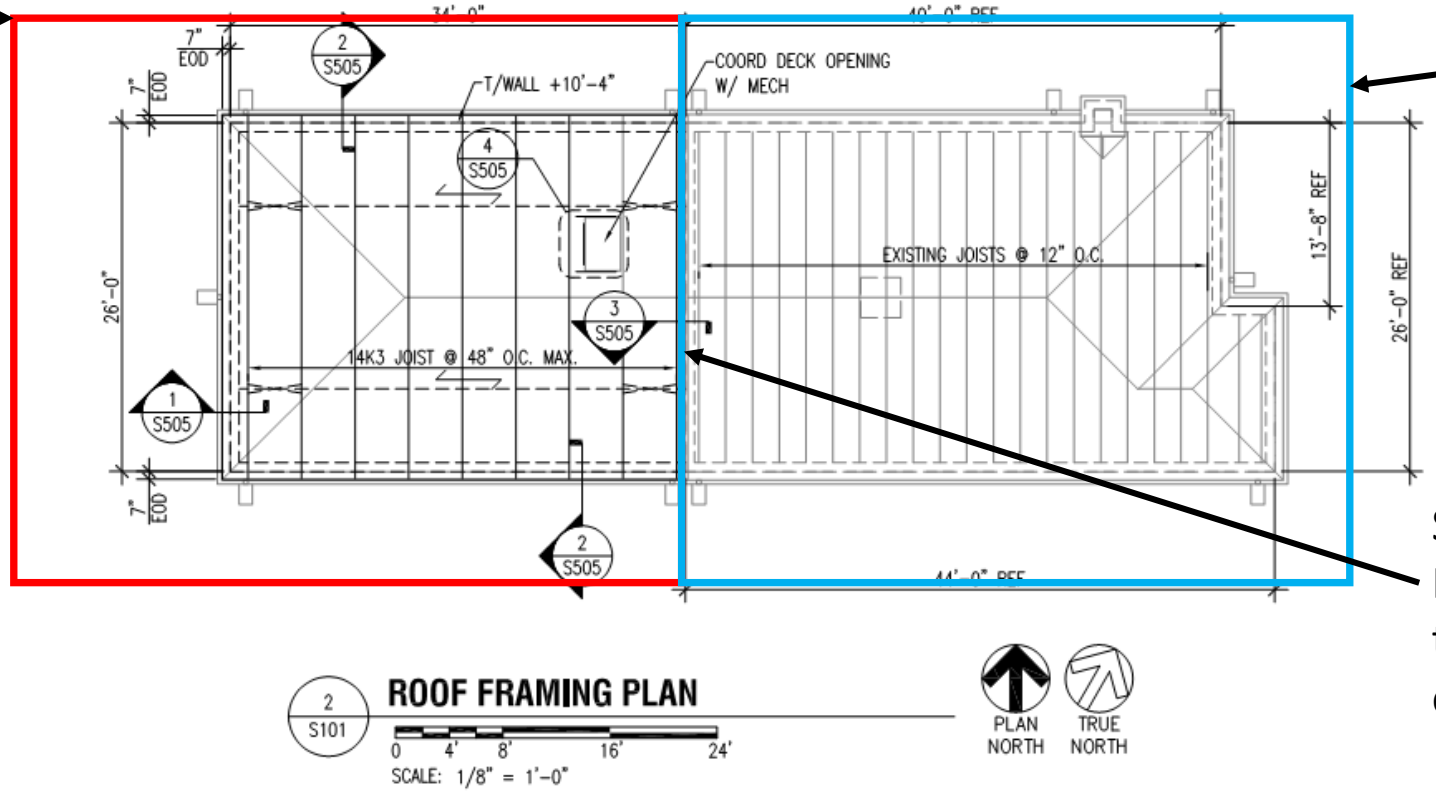
Examples – Existing Buildings

- **Be Aware of Major Renovation Costs**
  - Renovation projects can tend to grow in price over the course of a project. Ensure that the estimate cost does not invoke the Major Renovation Trigger
  - Always verify the Plant Replacement Value (PRV) determined via UFC 3-701-01 with the installation. Installations my have a lower or higher PRV for the particular building under consideration.
  - Remember window replacement costs are not part of the major renovation cost trigger.

Examples – Existing Buildings

- Understand the Building Occupancy

New Inhabited Occupancy. All UFC requirements to be met.



2 S101 ROOF FRAMING PLAN

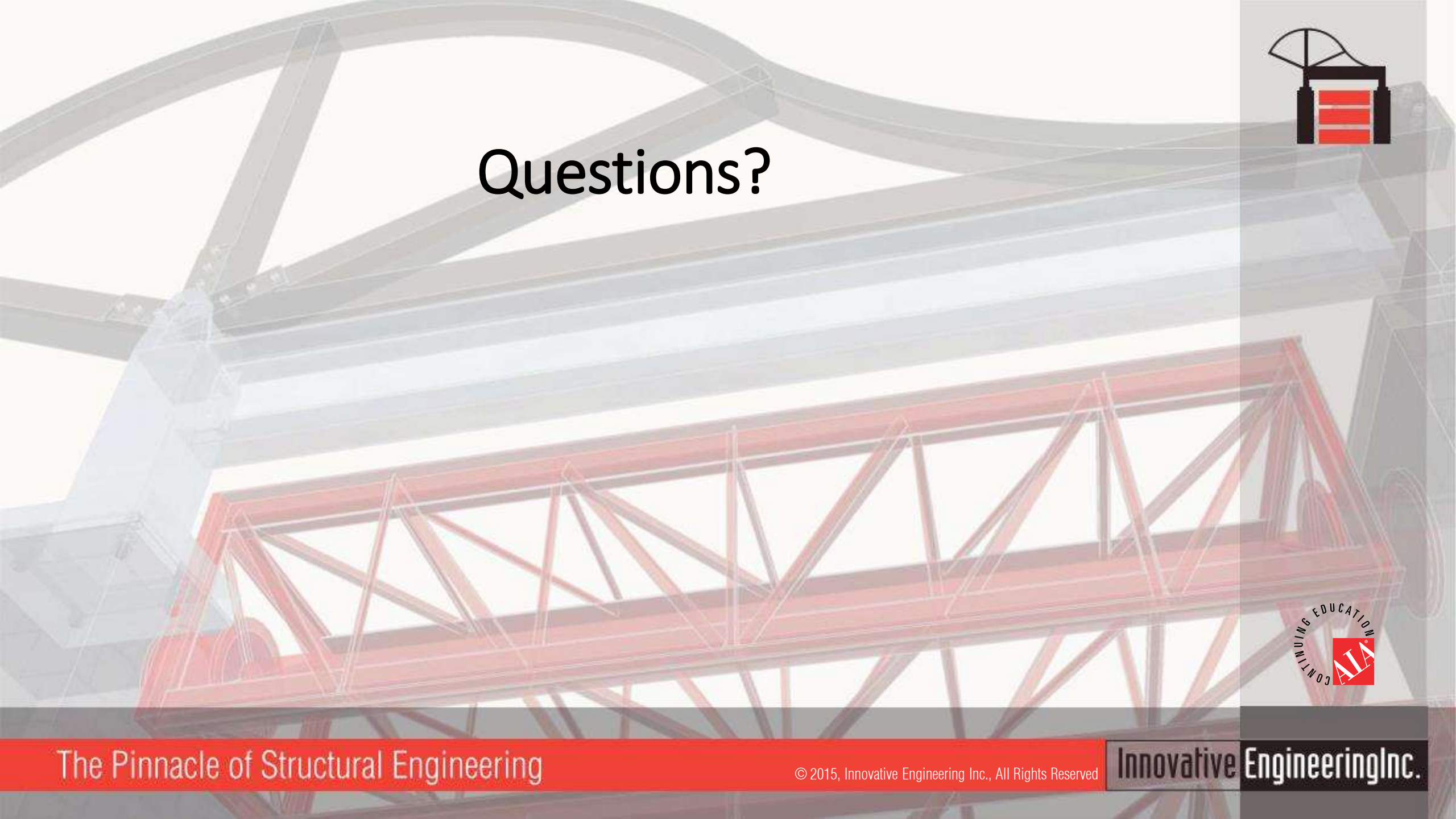
0 4' 8' 16' 24'

SCALE: 1/8" = 1'-0"

PLAN NORTH TRUE NORTH

Existing Low Occupancy. Exempt from UFC

Structural Isolation between the new and existing structure



Questions?