PLAN OF INSTRUCTION

FOR

BUILDING DESIGN
FOR HOMELAND SECURITY
FEMA 426
Course Number E155

March 2004

Department of Homeland Security
Federal Emergency Management Agency
National Emergency Training Center
Emergency Management Institute
Emmitsburg, MD

TABLE OF CONTENTS

RATIONALE

The increasing occurrence and threat of terrorist activity in the United States, especially the events of September 11, 2001, resulted in the creation of the Department of Homeland Security (DHS). This was one of the most significant transformations in the Federal Government in decades. DHS's first priority is to protect the Nation against further terrorist attacks.

As part of the DHS, the Directorate of Emergency Preparedness and Response (EP&R) will ensure that our Nation is prepared for catastrophes – whether natural disasters or terrorist assaults. The Building Sciences and Technology Branch of the Federal Insurance and Mitigation Administration, part of EP&R, carries its former mandate as part of the Federal Emergency Management Agency (FEMA) to protect lives and prevent the loss of property from natural hazards by promoting building design and technology to mitigate the effects of natural disasters. This increased damage resistance is achieved through improvements in construction codes and standards, designs, methods, and materials used for both new construction and post-disaster repair and recovery. Under DHS, this mandate now extends to manmade hazards, including terrorism and technological hazards (accidents).

Understanding the assessment process for manmade hazards and identifying associated mitigation measures is the focus of this course, with the emphasis upon specific tactics: explosive blast and agent release (chemical, biological, and radiological). Nearby industrial accidents can have characteristics equivalent to these tactics. Post-incident continuity of operations perspectives are included as part of the protection of people and property immediately following an incident and resumption of business operations once life-safety activities are completed. The course will cover the content of FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, as the initial document combining best design practices among Federal agency publications for the full-spectrum FEMA target audience.

PURPOSE AND COURSE GOAL

The "Building Design for Homeland Security" training course familiarizes students with assessment methodologies available to identify the relative level of risk for various threats. Then the students can comprehend the applicability of various mitigation measures for inclusion in a site, layout, and building design or renovation to increase protection and reduce risk. The students will be introduced to FEMA 426 as an initial reference for designing sites and buildings to protect people and property against terrorist attacks.

The goal of the course is to enhance student understanding of the measures and technology available to reduce risk from terrorist attack. Included in this understanding is the process for assessing risk to focus upon which mitigation measures have the greatest applicability and benefit. The students will understand the design approaches to mitigate

manmade hazards and comprehend the trade-offs needed to optimize various design requirements.

COURSE OBJECTIVES

After attending the Building Design for Homeland Security course, students should be able to:

1. Explain the basic components of the assessment methodology – threat/hazard, asset value, vulnerability, and risk, as applied to site, layout, and building.

2. Understand the different assessment methodology approaches being used by Federal agencies and comprehend which approach to use for a given organizational structure.

3. Perform a pre-assessment for a given building by identifying the assessment components and prioritizing the asset – threat/hazard pairs by their relative risk to focus resources upon mitigation measures that reduce risk.

4. Identify available mitigation measures either in-place or for new design and comprehend their applicability to a given situation.

5. Understand the technology limitations and application details of mitigation measures for terrorist tactics and technological accidents involving explosive blast and agent release (chemical, biological, and radiological) to achieve a desired level of protection.

6. Perform a final assessment for a given building by identifying vulnerabilities using the **Building Vulnerability Assessment Checklist** in **FEMA 426** and adjusting the pre-assessment relative risk based upon the identified vulnerabilities.

7. Select applicable mitigation measures and prioritize them based upon the final assessment relative risk values and associated estimated risk reduction provided so as to focus limited resources, all for a given situation.

8. Demonstrate that designing to mitigate building vulnerabilities against terrorist attacks has conflicts with other design requirements, resulting in trade-offs to achieve acceptable compliance and Levels of Performance among the differing regulations, codes, programs, operational requirements, and owner desires within the resources available.

TARGET AUDIENCE

The primary target audience for this course will be engineers, architects, and state and local government and building officials with engineering and architectural backgrounds involved in mitigation planning and design to protect people and property against manmade hazards. Secondary audiences may be drawn from local officials who are

responsible for planning land use requirements, hazard mitigation specialists, and other professionals who may support state and local planning and design efforts, such as consultants and academic staff.

COURSE STRUCTURE/STRATEGY

This course will be delivered using a wide range of training methods, including lecture, demonstration, interactive question-and-answer, and Case Study. Media, including limited video and other visuals, will be used to complement the training methods and support the learning. The course will include a written examination. Each instruction block has an associated student activity using a Case Study to emphasize the concepts taught and apply what was just learned. The student activity – Case Study interaction builds throughout the course resulting in a short report justifying the top three prioritized mitigation measures selected to reduce the high risk – threat/hazard pairs and explaining the thought process behind determination of the high risk pairs.

COURSE DURATION

This course is 3 days in length.

INSTRUCTOR QUALIFICATIONS

Instructors should be engineers or architects with expertise in performing assessments (antiterrorism vulnerability, facility condition, security) or program management/publishing (construction, hazard mitigation, criteria) along with expertise in building or system design, operations, or maintenance in order to understand the associated terminology. An engineering or architectural background is needed to be able to answer student questions in the applicable technologies and design concepts. Instructors should also have experience in training methodologies and in working with adult learners.

COURSE SCHEDULE

Topic	Duration	Schedule
Day 1		
Unit I – Introduction and Course Overview	90 minutes	8:30 a.m. to 10:00 a.m.
Break		
Unit II – Asset Value Assessment	75 minutes	10:15 a.m. to 11:30 a.m.
Lunch		
Unit III – Threat/Hazard Assessment	75 minutes	12:30 p.m. to 1:45 p.m.
Break		
Unit IV – Vulnerability Assessment	105 minutes	2:00 p.m. to 3:45 p.m.

Topic	Duration	Schedule
Break		
Unit V – Risk Assessment/Risk Management	45 minutes	4:00 p.m. to 4:45 p.m.
Day 1 Wrap-up and Day 2 Forecast	15 minutes	4:45 p.m. to 5:00 p.m.
Day 2		
Day 1 Review and Day 2 Overview	15 minutes	8:30 a.m. to 8:45 a.m.
Unit V – Risk Assessment/Risk Management (continued)	30 minutes	8:45 a.m. to 9:15 a.m.
Unit VI – Explosive Blast	60 minutes	9:15 a.m. to 10:15 a.m.
Break		
Unit VII – Chemical, Biological, and Radiological (CBR)	60 minutes	10:30 a.m. to 11:30 a.m.
Lunch		
Written Exam	30 minutes	12:30 p.m. to 1:00 p.m.
Exam Review	30 minutes	1:00 p.m. to 1:30 p.m.
Break		
Unit VIII – Site and Layout Design Guidance	105 minutes	1:45 p.m. to 3:30 p.m.
Break		
Unit VIII – Site and Layout Design Guidance (continued)	45 minutes	3:45 p.m. to 4:30 p.m.
Day 2 Wrap-up and Day 3 Forecast	30 minutes	4:45 p.m. to 5:00 p.m.
Day 3		
Day 2 Review and Day 3 Overview	15 minutes	8:30 a.m. to 8:45 a.m.
Unit IX – Building Design Guidance	90 minutes	8:45 a.m. to 10:15 a.m.
Break		
Unit IX – Building Design Guidance (continued)	60 minutes	10:30 a.m. to 11:30 a.m.
Lunch		
Unit X – Electronic Security Systems	45 minutes	12:30 p.m. to 1:15 p.m.
Break		
Unit XI – Finalization of Case Study Results [Goal is to brief building owner on prioritized recommendations and justifications for security work.]	45 minutes	1:30 p.m. to 2:15 p.m.
Break		
Unit XI – Presentation of Group Case Study Results and Discussion (continued) [Assumes 6 teams and 10 minutes per team to present and 5 minutes per team to discuss.]	90 minutes	2:30 p.m. to 4:00 p.m.

Topic	Duration	Schedule
Unit XII – Course Wrap-up	60 minutes	4:00 p.m. to 5:00 p.m.

VIII. SUGGESTED COURSE SCHEDULE (Alternate Layout)

DAY ONE	DAY TWO	DAY THREE
Unit I • Introduction and Course Overview (90 minutes) **Unit II** • Asset Value Assessment (75 minutes)	**Unit V (continued)** • Risk Assessment/Risk Management (30 minutes) **Unit VI** • Explosive Blast (60 minutes) **Unit VII** • Chemical, Biological, and Radiological Measures (60 minutes)	**Unit IX** • Building Design Guidance (150 minutes)
LUNCH		
Unit III • Threat/Hazard Assessment (75 minutes) **Unit IV** • Vulnerability Assessment (105 minutes) **Unit V** • Risk Assessment/Risk Management (45 minutes)	• Written Exam (60 minutes) **Unit VIII** • Site and Layout Design Guidance (150 minutes)	**Unit X** • Electronic Security Systems (45 minutes) **Unit XI** • Finalization of Case Study Results and Presentation by Groups (135 minutes) **Unit XII** • Course Wrap-up (60 minutes)

COURSE MATERIALS, SUPPLIES, AND EQUIPMENT

The following materials, supplies, and equipment are needed to conduct this course:

Materials

- Building Design for Homeland Security Plan of Instruction (one per instructor)
- Building Design for Homeland Security Instructor Guide (one per instructor)
- Building Design for Homeland Security Student Manual (includes all requirements for Case Study) (one per student)
- Building Design for Homeland Security PowerPoint Slides and handouts (CD-ROM containing open source Reference Publications and FEMA Terrorism Planning Course Toolkit)
- FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings* (one per instructor and student)
- Hardcopy publications for display and quick reference
    - **Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (CDC/NIOSH)**
        - Publication 2002-139, *Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Hazards*
        - Publication 2003-136, *Guidance for Filtration and Air Cleaning Systems to Protect Building Environments from Airborne Chemical, Biological, or Radiological Attacks*, April 2003
    - **Federal Emergency Management Agency (FEMA)**
        - FEMA 154, *Rapid Visual Screening of Buildings for Seismic Hazards: A Handbook*, 1988 (also, Applied Technology Council (ATC-21) by same name)
        - FEMA 386-7, *Integrating Human-Caused Hazards Into Mitigation Planning*, September 2002
        - SLG 101, *Guide for All-Hazard Emergency Operations Planning, Chapter 6, Attachment G, Terrorism*, April 2001
    - **General Services Administration (GSA)**
        - PBS – P100, *Facilities Standards for Public Buildings Service*, November 2002
    - **Lawrence Berkeley National Laboratory (LBNL)**
        - LBNL PUB-51959, *Protecting Buildings from a Biological or Chemical Attack: Actions to Take Before or During a Release*, January 10, 2003
    - **National Capital Planning Commission**
        - *Designing for Security in the Nation's Capital*, October 2001
        - *The National Capital Planning Urban Design and Security Plan*, October 2002
    - **Military Handbooks (MIL-HDBK) (U.S. Navy Executive Agent)**
        - MIL-HDBK-1013/1A, *Design Guidelines for Physical Security of Fixed Land-Based Facilities*, December 15, 1993

    - MIL-HDBK-1013/10, *Design Guidelines for Security Fencing, Gates, Barriers, and Guard Facilities*, May 14, 1993
    - MIL-HDBK-1013/12, *Evaluation of Security Glazing for Ballistic, Bomb, and Forced Entry Tactics*, March 10, 1997
    - MIL-HDBK-1013/14, *Selection and Application of Vehicle Barriers*, February 1, 1999
- **U.S. Air Force (USAF)**
    - *Entry Control Facilities Design Guide*, February 18, 2003, Air Force Center for Environmental Excellence
    - *Installation Entry Control Facilities Design Guide*, October 2002, Air Force Center for Environmental Excellence
    - *Installation Force Protection Guide*, 1997, Air Force Center for Environmental Excellence
- **U.S. Army (USA)**
    - Field Manual (FM) 5-114, *Engineer Operations Short of War*, July 13, 1992
    - Technical Manual (TM) 5-853-4, *Security Engineering, Electronic Security Systems*, May 12, 1994
- **U.S. Army Corps of Engineers (USACE)**
    - Engineer Technical Letter (ETL) 1110-3-498, Design of Collective Protection Shelters to Resist Chemical, Biological, and Radiological (CBR) Agents, February 24, 1999
- **U.S. Department of Commerce, Critical Infrastructure Assurance Office (DOC CIAO)**
    - *Vulnerability Assessment Framework 1.1*, October 1998
- **U.S. Department of Defense (DoD)**
    - Unified Facilities Criteria (UFC), UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, July 31, 2002
- **U.S. Department of Veterans Affairs (VA)**
    - *Physical Security Assessment for the Department of Veterans Affairs Facilities, Recommendations of the National Institute of Building Sciences Task Group to the Department of Veterans Affairs*, 6 September 2002

Supplies

- Name plate (one per instructor and student)
- Tablet (one per student)
- Pen or Pencil (one per student)
- Highlighter (one per student)
- Easel with paper pad refill (one per student activity team)
- Markers for use with Flipchart (one package of various colors)
- White board markers for use with slide acetates as required if Elmo projector not available (one package of various colors)

Equipment

- Computer with display unit and Microsoft PowerPoint software
- Overhead projector or Elmo projector (if overhead projector need slide acetates for use with copier)
- Flipchart stand (for use with flipchart paper and markers)
- Calculator (one per student and brought by student)

PRE-COURSE ACTIVITIES

- There are no pre-course activities required for this course.
- Pre-Course Reading(s): FEMA 426, FEMA 386-7 – Recommended, if available to students from FEMA website. [Revisit one month prior to course offering to ensure available on web site.]

COURSE REFERENCES

- Building Design for Homeland Security Plan of Instruction
- Building Design for Homeland Security Instructor Guide
- Building Design for Homeland Security Student Manual (including Case Study)
- FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*

PRE-REQUISITES

- There are no pre-requisites for this course. However, the EMI Homeland Security Planning for Local Governments Course (E408) is recommended for increased understanding of terrorist threats.

UNITS OF INSTRUCTION

See the following pages.

UNIT I

Introduction and Course Overview

TIME 90 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Describe the goal, objectives, and agenda for the course
2. Describe and find material in the course reference manual and student activity handout

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SCOPE: This unit will cover the following topics:

1. Welcome and Opening Remarks
2. Instructor Introductions
3. Administrative Information
4. Student Introductions
5. Course Overview
6. Course Materials
7. Activity: Become familiar with Case Study materials

METHODOLOGY:

The Instructor will introduce himself and ask the other Instructor(s) to introduce themselves with each instructor providing a brief statement of their backgrounds and experience. Then, the Instructor or Course Manager will provide the students with important administrative information required for the course.

Next, each student will introduce him- or herself, providing:

1. A brief background and experience statement, including work in the course topic area if applicable
2. One reason why they are attending this course
3. What they plan to do with what they learn

The Instructor will follow the student introductions by providing an overview of the course, including the agenda and course requirements.

The Instructor will go over the EMI Evaluation Forms (standard EMI scan sheet and detailed validation offering form for each instruction block). The emphasis will be the completion of these forms soon after the instruction block and not to wait to accomplish it all during Unit XII, Course Wrap-up.

Then the Instructor will introduce the course materials, ensuring that each student has a copy of everything required for the course. The introduction of FEMA 426 will be a short summary of the content in each section of each chapter of the book, along with the

appendices. Small Post-It Notes may be used to mark specific pages that will be used later. Included with the introduction is a similar review of the Case Study, again with a short summary of each section's content.

Finally, the Instructor will transition to Unit II by relating the course content to the introductory seismic design training in the 1970s. However, the manmade hazards of terrorism and technological accidents do not have all the historical and actuarial information developed for natural hazards that formed the basis for wind, flood, seismic, and wildfire design standards. Thus, Unit II will familiarize the students with the terrorism threats and hazards to consider during building design.

REFERENCE MATERIALS: The following references are required for this unit:

1. Course Agenda
2. Course Goal and Objectives
3. EMI Evaluation Forms
4. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*
5. Student Manual, Unit I
6. Case Study, Hazardville Information Company (HIC), for student activities
7. Unit I visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Welcome and Opening Remarks……	5
Instructor Introductions…….	5
Administrative Information……	5
Student Introductions…….	30
Course Overview……	15
Course Materials……	20
Summary and Transition……	10
Total Time……..…	**90**

REMARKS:

The time allocated for student introductions was based upon 30 students with 1 minute each to talk. The course overview is a run-through of the agenda and a heads-up of the student activities. The course materials are run through slowly to ensure the students know where everything is in FEMA 426 and the HIC Case Study in the Student Manual.

UNIT II

Asset Value Assessment

TIME 75 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Identify the assets of a building or site that can be affected by a threat or hazard
2. Explain the components used to determine the value of an asset
3. Determine the critical assets of a building or site
4. Provide a numerical rating for the asset and justify the basis for the rating

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SCOPE: The following topics will be covered in this unit:

1. The core functions and critical infrastructure listed on the threat-vulnerability matrix.
2. Various approaches to determine asset value – Federal Emergency Management Agency, Department of Defense, Department of Justice, and Veterans Affairs
3. A rating scale and how to use it to determine an asset value.
4. Activity: Identify the assets to consider in the Case Study. Determine the asset value for each asset of interest.

METHODOLOGY:

The Instructor will discuss the generic core functions and critical infrastructure associated with a building as listed on the threat-vulnerability matrix. Similar to the threat rating presented in Unit III, various approaches to determine asset value will be presented. As with Unit III, an asset value rating approach suitable for use during a design charette will be presented. One or more specific examples will be used to focus students on the associated student activity. The Instructor will walk through the examples, describing the asset in relation to the Case Study and applying the asset value rating approach.

The students will then apply these techniques (asset identification and asset value rating) to the Case Study to identify and rate the assets found in the Case Study. The student will have to quickly review/scan the mission statement, building data, physical security, building structure, electrical systems, mechanical systems, information systems, and communications to have a sense of the value of the asset to the Hazardville Information Company.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, pages 1-10 to 1-14
2. Student Manual, Unit II
3. Case Study – Hazardville Information Company
4. Unit II visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Identification of Core Functions and Critical Infrastructure..……..……	10
Asset Value Rating Approaches..……	10
Asset Value Rating Approach for Student Activity……..	10
Application of Selected Asset Value Rating Approach Examples……...	10
Activity: Asset Value Rating…..……..	35
Total Time……..… 75	

REMARKS:

The Instructors must have a good understanding of the content of the Case Study and the rating methodology applicable to the first four student activities. Three to four instructors are being planned for the course. With six groups of five students, each instructor will have to be available to cover three groups (15 students) each.

The various methodologies for assessing asset value, threat/hazard, vulnerability, and risk presented in FEMA 426, Chapter 1, are actually hybrids whereby two or more of the assessment categories are encompassed in the selection matrix. The FEMA 426 methodology to be used in the Case Study attempts to ensure the actions and terminology remain consistent to the individual assessments. Thus, one approach to relate this point to the students would be to comment on the applicability of an entry within a vulnerability matrix (GSA and ODP, for example) as it is more an asset value item or a threat/hazard item. Then emphasize the FEMA 426 methodology during the application of the asset value rating approach prior to the student activity.

UNIT III

Threat/Hazard Assessment

TIME 75 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Identify the threats and hazards that may impact a building or site
2. Define each threat and hazard using the Department of Defense methodology
3. Provide a numerical rating for the threat or hazard and justify the basis for the rating.
4. Define the Design Basis Threat and Levels of Protection

SCOPE: The following topics will be covered in this unit:

1. From what offices is threat and hazard information available.
2. The spectrum of event profiles for terrorism and technological hazards from FEMA 386-7.
3. The five components used by DoD to define a threat and how it can be applied to the Homeland Security Advisory System.
4. Various approaches to determine threat/hazard rating – Federal Emergency Management Agency, Department of Defense, Department of Justice, and Veterans Affairs.
5. A rating scale and how to use it to determine a threat rating.
6. Activity: Identify the threats and hazards to consider in the Case Study. As an absolute minimum, consider explosive blast and agents (chemical, biological, and radiological). Determine the threat rating for the minimum threat/hazards.

METHODOLOGY:

The Instructor will begin this unit with a brief discussion of terrorism and technological hazards worldwide and within the United States. The probability of natural hazards and how they are considered during design will be compared to the probability of manmade hazards, both terrorism and technological accidents. This sets the stage for identifying where to get information about threats and hazards.

Next, the Instructor will use FEMA 386-7 to describe the spectrum of tactics or events that can occur. This leads into the five components used to define a threat (or hazard) and one interpretation of the Homeland Security Advisory System.

Various threat and vulnerability rating systems will be discussed to understand the different methodologies and their applicability to different situations. A simplified threat rating approach will be presented that can be used during a design charette for new construction or major renovation. This FEMA 426 approach forms the basis of the Unit II student activity.

The Instructor will use one threat/hazard example from the Case Study to focus students on the student activity. The Instructor will walk through the example, describing the threat and the threat rating approach.

The students will then apply these techniques (threat identification, threat description, and threat rating) to the Case Study to identify and rate the threat from explosive blast and agents (chemical, biological, and radiological). Note that these event profiles can result from terrorism or technological hazards.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, pages 1-1 to 1-18
2. Student Manual, Unit III
3. Case Study – Hazardville Information Company
4. Unit III visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Threats and Hazards..……	10
Components of a Threat Description……..…….....	5
Threat Rating Approaches……	10
FEMA 426 Threat Rating Approach for Student Activity……..	10
Application of Selected Threat Rating Approach Example..……....	10
Activity: Threat/Hazard Rating……..	30
**Total Time……..… **	**75**

REMARKS:

The students were exposed to the Case Study during the Unit I Introduction and Course Overview. They will have to read the Threat Analysis and Hazard Analysis portions and then concentrate upon explosive blast and agents, versus looking at all potential threats/hazards within the timeframe available. A review of the GIS portfolio will also be recommended for gaining threat and hazard information.

UNIT IV

Vulnerability Assessment

TIME 105 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain what constitutes a vulnerability
2. Identify vulnerabilities using the Building Vulnerability Assessment Checklist
3. Understand that an identified vulnerability may indicate that an asset is vulnerable to more than one threat or hazard and that mitigation measures may reduce vulnerability to one or more threats or hazards
4. Provide a numerical rating for the vulnerability and justify the basis for the rating

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SCOPE: The following topics will be covered in this unit:

1. Review types of vulnerabilities, especially single-point vulnerabilities and tactics possible under threats/hazards for which there are no mitigation measures.
2. Various approaches and considerations to determine vulnerabilities – Federal Emergency Management Agency, Department of Defense, Department of Justice, and Veterans Affairs.
3. A rating scale and how to use it to determine a vulnerability rating. One or more specific examples will be used to focus students on the following activity.
4. Activity: Identify the vulnerabilities present in the Case Study. As an absolute minimum, consider threats/hazards associated with explosive blast and agents (chemical, biological, and radiological). Determine the vulnerability rating for each asset – threat/hazard pairs of interest.

METHODOLOGY:

The Instructor will discuss generic vulnerabilities found in a building and how tactics possible under threats/hazards can be used against a building. In essence, the student will see the terrorist's thought process used to select a tactic against a target. Conversely, the student will also be presented with vulnerabilities that exist for many tactics. Similar to the ratings presented in Units II and III, various approaches to determine vulnerability will be presented. Also, a vulnerability rating approach suitable for use during a design charette will be presented.

One or more specific examples will be used to focus students on the associated student activity. The Instructor will walk through the examples, describing the vulnerability in relation to the Case Study and applying the vulnerability rating approach. The students will be introduced to use of the Building Vulnerability Assessment Checklist at the end of Chapter 1 during this Unit. Use of the checklist will be re-emphasized in Units VIII and IX covering Chapters 2 and 3, respectively, in FEMA 426. Note that the vulnerability rating at this point in the assessment process is a rapid screening approach used during a charette. It provides an initial vulnerability rating based upon mitigation measures

already in place against the threat/hazard tactic. It is derived from the interview process with the building management and staff to focus the actual vulnerability assessment to be performed later.

The students will then apply the vulnerability identification, or lack of mitigation measures, and vulnerability rating to the Case Study to identify and rate the vulnerabilities found in the Case Study for each asset – threat/hazard pair. The students will quickly review/scan the building data, physical security, building structure, electrical systems, mechanical systems information systems, communications, emergency response, and geographic information system (GIS) portfolio to have a sense of the vulnerabilities at the Hazardville Information Company. The Building Vulnerability Assessment Checklist should also be used to capture the sense of potential vulnerabilities and mitigation measures.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, Chapter 1
2. Student Manual, Unit IV
3. Case Study – Hazardville Information Company
4. Unit IV visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Identification of Vulnerabilities	10
Vulnerability Rating Approaches	15
Vulnerability Rating Approach for Student Activity	10
Application of Selected Vulnerability Rating Approach Examples	25
Activity: Vulnerability Identification and Vulnerability Rating	45
Total Time	**105**

REMARKS: More time is allotted to this student activity to allow the students to do a deeper review of the Case Study and to catch up the prior student activities as necessary.

UNIT V

Risk Assessment/Risk Management

TIME 75 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain what constitutes risk
2. Evaluate risk using the Threat-Vulnerability Matrix to capture assessment information
3. Provide a numerical rating for risk and justify the basis for the rating
4. Identify top risks for asset – threat/hazard pairs that should receive measures to mitigate vulnerabilities and reduce risk

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SCOPE: The following topics will be covered in this unit:

1. Definition of risk and the various components to determine a risk rating
2. The FEMA 426 approach to defining risk
3. A rating scale and how to use it to determine a risk rating. One or more specific examples will be used to focus students on the following activity.
4. The relationships between high risk, the need for mitigation measures, and the need to identify a Design Basis Threat and Level of Protection.
5. Activity: Determine the risk rating for the asset – threat/hazard pairs of interest. Identify the top three risk ratings for the Case Study.

METHODOLOGY:

The Instructor will begin this unit with a brief discussion of terrorism and technological hazards worldwide and within the United States. The probability of natural hazards and how they are considered during design will be compared to the probability of manmade hazards, both terrorism and technological accidents. This sets the stage for identifying where to get information about threats and hazards.

Next, the Instructor will use FEMA 386-7 to describe the spectrum of tactics or events that can occur. This leads into the five components used to define a threat (or hazard) and one interpretation of the Homeland Security Advisory System.

Various threat and vulnerability rating systems will be discussed to understand the different methodologies and their applicability to different situations. A simplified threat rating approach will be presented that can be used for new construction or major renovation. This FEMA 426 approach forms the basis of the Unit V student activity.

The Instructor will use one threat/hazard example from the Case Study to focus students on the student activity. The Instructor will walk through the example, describing the threat and the threat rating approach.

The students will then apply these techniques (threat identification, threat description, and threat rating) to the Case Study to identify and rate the threat from explosive blast and agents (chemical, biological, and radiological). Note that these event profiles can result from terrorism or technological hazards.

The Instructor will define risk by its components and the different approaches used to determine risk. One or more examples will be used to show the students how to determine and evaluate the risk rating for each asset – threat/hazard pair in the threat-vulnerability matrix. The Instructor will also discuss the relationship between an identified high risk asset – threat/hazard pair and the need for mitigation measures to reduce that risk by reducing the vulnerability rating. Finally, the value of providing a Design Basis Threat and Desired Level of Protection will be presented. The Design Basis Threat and Desired Level of Protection are needed to allow designers to build the building to withstand the threats. Without the Design Basis Threat or Level of Protection, the building owner would have to provide specific building material specifications to the designer to achieve the Level of Protection for the perceived threat or the designer must provide an educated guess to the building owner for his/her acceptance or rejection.

The student activity is primarily a math exercise in multiplying threat, asset value, and vulnerability ratings to determine the risk rating and then compare it against the risk rating scale. The top three risks should receive additional emphasis during an actual vulnerability assessment to validate the risk by identifying vulnerabilities and as an input to select mitigation measures.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, Chapter 1
2. Student Manual, Unit V
3. Case Study – Hazardville Information Company
4. Unit V visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Introduction and Unit Overview…….	5
Risk Rating Approaches..……	5
Risk Rating Approach for Student Activity……	15
Application of Selected Risk Rating Approach Examples…….....	15
Design Basis Threat and Level of Protection…….	15
Activity: Risk Rating and Determination of High Risk Situations……..	20
Total Time…….. 75	

REMARKS: As in Unit IV, additional time is provided here for students to review their previous work as necessary.

UNIT VI

Explosive Blast

TIME 60 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain the basic physics involved during an explosive blast event, whether by terrorism or technological accident
2. Explain building damage and personnel injury resulting from the blast effects upon a building
3. Perform an initial prediction of blast loading and effects based upon incident pressure

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SCOPE: The following topics will be covered in this unit:

1. Time-pressure regions of a blast event and how these change with distance from the blast
2. Difference between incident pressure and reflected pressure
3. Differences between peak pressure and peak impulse and how these differences affect building components
4. Building damage and personal injuries generated by blast wave effects
5. Levels of protection used by the Department of Defense and the General Services Administration
6. The generic range-to-effect chart [minimum standoff in feet versus weapon yield in pounds of TNT-equivalent] for an identified level of damage or injury
7. The benefits of stand-off distance
8. Approaches to predicting blast loads and effects, including one using incident pressure

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METHODOLOGY:

The Instructor will present the characteristics of the blast wave associated with detonating explosives and how these characteristics impact building components and people. Associated with these effects are Levels of Protection that may be desired when designing a building and how they are determined during tests. The use of a generic range-to-effect chart will be presented as a screening tool and as a lead-in to the benefits of stand-off. Finally various approaches for predicting blast loads and effects will be presented, such as software available to government agencies and a paper-based approach using incident pressure.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings, pages 4-1 to 4-20
2. Student Manual, Unit VI
3. Case Study, Hazardville Information Company (HIC), for student activities
4. Unit VI Visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Introduction and Unit Overview…….	5
Blast Characteristics and Their Interaction with Buildings……	15
Types of Building Damage and Personal Injuries Caused by Blast Effects	10
Levels of Protection Used by Federal Agencies..……..…….....	5
The Nominal Range-to-Effect Chart and Benefits of Stand-off ……	5
Predicting Blast Loads and Effects……..……..	5
Activity: Stand-off Distance and the Effects of Blast……..……....	15
**Total Time…….. **	**60**

REMARKS: After the student's exposure to the assessment process, an understanding of the nature of explosive blast and how it affects people and buildings solidifies the understanding of this threat tactic. By having this understanding prior to covering the design issues of FEMA 426, Chapters 2 and 3, makes the design issues associated with the explosive blast tactic easier to understand.

UNIT VII

Chemical, Biological, and Radiological (CBR) Measures

TIME 60 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain the five possible protective actions for a building and its occupants
2. Compare filtration and collection mechanisms and applicability to the particles present in chemical, biological, and radiological agents
3. Explain the key issues with CBR detection
4. Identify the indications of CBR contamination

SCOPE: The following topics will be covered in this unit:

1. Five protective actions for a building and its occupants: evacuation; sheltering in place; personal protective equipment; air filtration and pressurization; and exhausting and purging
2. Air filtration and cleaning principles and its application
3. CBR detection technology currently available
4. Indications of CBR contamination that do not use technology

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METHODOLOGY:

As with Unit VI, the Instructor for this unit will present the characteristics of CBR agents and how a building can be operated or built to reduce the effects of these agents. The principles of air filtration and cleaning and how to apply this equipment are issues to cover in building design. Similarly, the current technology for detecting CBR agents is another building design and operation issue. Finally, the Instructor covers non-technology indications of CBR contamination.

There is no student activity associated with this unit. However, information in this unit will be used during the student activities associated with Chapters 2 and 3.

REFERENCE MATERIALS:

The following sources will provide information used in this Unit:

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, pages 5-1 to 5-36
2. Appendix C, Chemical, Biological, and Radiological Glossary
3. Student Manual, Unit VII
4. Case Study – Hazardville Information Company
5. Unit VII visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Protective Actions for Buildings and Occupants……	15
CBR Detection and Technology……..……..…….	15
Air Filtration and Cleaning Principles and Technology…….	20
Activity: CBR Considerations..…….....	10
Total Time……..	**60**

REMARKS: After the student's exposure to the assessment process, an understanding of the nature of chemical, biological, and radiological (CBR) agents and the technology for detecting and removing them from buildings solidifies the understanding of this threat tactic. By having this understanding prior to covering the design issues of FEMA 426, Chapters 2 and 3, makes the design issues associated with the CBR tactic easier to understand.

The mid-course written examination will be administered after this unit and lunch. The time allotted is 45 minutes for the exam and 30 minutes for the review. The exam will cover information presented to this point and take 15 to 30 minutes to complete (about 25 multiple choice, fill-in-the-blank, short answer, and read-the graph questions).

UNIT VIII

Site and Layout Design Guidance

TIME 150 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain the concerns of land use as applied to threats and hazards due to terrorism and technological accidents
2. Identify site planning concerns that can create, reduce, or eliminate vulnerabilities and understand the concept of "Layers of Defense"
3. Compare the pros and cons of barrier mitigation measures that increase stand-off or create controlled access zones
4. Identify the positive and negative aspects of mitigation approaches for entry control and vehicle access, signage, parking, loading docks, lighting, and site utilities
5. Explain the basic concepts of Crime Prevention Through Environmental Design (CPTED) and its applicability to building security against terrorism
6. Apply these concepts to an existing site or building and identify mitigation measures needed to reduce vulnerabilities

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SCOPE: The following topics will be covered in this unit:

1. Land use considerations both outside and inside the property line
2. Site planning issues to include site design, layout and form, vehicular and pedestrian circulation, and landscape and urban design
3. Creating stand-off distance using perimeter controls, non-exclusive zones, and exclusive zones along with the design concepts and technology to consider
4. Design considerations and mitigation measures for building security

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METHODOLOGY:

The Instructor will present the information from FEMA 426, Chapter 2, in sequential order, covering the major points of each and emphasizing the interrelationships between concepts. The main point to follow is that antiterrorism design must be balanced against many other requirements and that architectural considerations can provide protection without resulting in a fortress mentality due to the construction techniques used. CPTED will complete the presentation as a design approach that benefits preventing terrorist attacks as it prevents criminal attacks.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, Chapter 2
2. Student Manual, Unit VIII
3. Case Study – Hazardville Information Company
4. Unit VIII visuals

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Introduction and Unit Overview…….	5
Layout Design and Land Use Considerations…….……	15
Site Planning Issues……..…….....	15
Entry Control and Vehicle Access …….……	15
Design Considerations and Mitigation Measures..……	.20
Walk-through of Building Vulnerability Assessment Checklist ……..…	20
Activity: Site and Layout Design Guidance ……..	60
Total Time…….. 150	

REMARKS: Units VIII and IX reemphasize the use of the Building Vulnerability Assessment Checklist.

UNIT IX

Building Design Guidance

TIME 150 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain architectural considerations to mitigate impacts from blast effects and transmission of chemical, biological, and radiological agents from exterior and interior incidents
2. Identify key elements of building structural and nonstructural systems for mitigation of blast effects
3. Compare and contrast the benefit of building envelope, mechanical system, electrical system, fire protection system, and communications system mitigation measures, including synergies and conflicts
4. Apply these concepts to an existing building or building conceptual design and identify mitigation measures needed to reduce vulnerabilities

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SCOPE: The following topics will be covered in this unit:

1. Architectural considerations, including building configuration, space design, and special situations
2. Building structural and nonstructural considerations with emphasis on progressive collapse, loads and stresses, and good engineering practices
3. Design issues for the building envelope, including wall design, window design, door design, and roof system design with approaches to define levels of protection
4. Mechanical system design issues, including interfacing with operational procedures, emergency plans, and training
5. Other building systems design consideration for electrical, fire protection, communications, electronic security, entry control, and physical security that mitigate the effects of a threat or hazard
6. Do an Activity that encompasses identified high risk pairs (asset – threat/hazard) in the threat-vulnerability matrix developed for the Case Study and select mitigation measures that reduce vulnerability and associated risk from the building perspective

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METHODOLOGY:

The Instructor will present the information from FEMA 426, Chapter 3, in sequential order covering the major points of each and emphasizing the interrelationships between concepts. Many of the concepts for building systems are repetitive, so these will be covered as general considerations and specific concerns within a system will be covered by exception. The emphasis will be upon providing a balanced building envelope that is a defensive layer against the terrorist tactic of interest and avoiding situations where one incident affects more than one building system.

The Building Vulnerability Assessment Checklist will again provide a process for review of the building to identify vulnerabilities and mitigation measures. The building systems sections of the Case Study will be the most beneficial for the student activity. The Building Vulnerability Assessment Checklist sections covering building systems and interior security systems are appropriate for this Unit.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, Instructor Guide, and Student Manual.
2. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, pages 3-1 to 3-46 and 3-48 to 3-52; Checklist at end of Chapter 1.
3. FEMA 427, *Primer for Design of Commercial Buildings to Mitigate Terrorist Attacks*
4. FEMA 430, *Primer for Incorporating Building Security Components in Architectural Design*
5. Case Study – Hazardville Information Company

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Introduction and Unit Overview	10
Architectural Considerations	15
Structural and Nonstructural Considerations	15
Building Envelope Considerations	15
Other Building Systems	15
Walk-through of Building Vulnerability Assessment Checklist	40
Activity: Building Mitigation Measures	40
Total Time	**150**

REMARKS: Units VIII and IX re-emphasize the use of the Building Vulnerability Assessment Checklist.

UNIT X

Electronic Security Systems

TIME 45 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Use the assessment process to identify electronic security system requirements that are needed to mitigate vulnerabilities
2. Describe the electronic security system concepts and practices that warrant special attention to enhance public safety
3. Explain the basis concepts of electronic security system components, their capabilities, and their interaction with other systems
4. Justify selection of electronic security systems to mitigate vulnerabilities

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SCOPE: The following topics will be covered in this unit:

1. Control centers and building management systems
2. Perimeter layout and zoning of sensors
3. Intrusion detection systems and sensor technologies
4. Entry-control systems and electronic entry control technologies
5. Closed circuit television and data-transmission media
6. Definitions of the degree of security and control

METHODOLOGY:

The Instructor will walk the students through the various components and technology currently available for use in electronic security systems, such as exterior and interior intrusion detection systems; access control, including biometrics; closed circuit television; and terminology to describe levels of security. These are the mitigation measures available to reduce risks due to vulnerabilities in physical security systems.

There is no student activity associated with this unit. However, any mitigation measures identified as a priority to reduce high risks will be covered in Unit XI as part of the group presentation.

REFERENCE MATERIALS: The following references are required for this unit:

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, pages 3-47 to 3-50; Appendix D; and Security Systems and Security Master Plan sections of Checklist at end of Chapter (pages 1-81 – 1-92)
2. Unit X visuals
3. Case Study

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Introduction and Unit Overview…….	5
Perimeter Layout and Zoning Sensors ……..…	5
Intrusion Detection Systems and Technology…….....	10
Entry Control Systems and Technology……..……..…….....	5
CCTV Systems and Data Transmission Media….…….	5
Terminology for the Degree of Security……	5
Activity: Vulnerability Checklist - Security Systems…….	10
Total Time……..	**45**

REMARKS:

UNIT XI

Finalization and Presentation of Case Study Results

TIME 135 minutes

OBJECTIVES: At the conclusion of this unit, the students will be able to:

1. Explain building security design issues to a building owner for consideration prior to a renovation or new construction
2. Explain the identification process to arrive at the high risk asset – threat/hazard pairs
3. Justify the recommended mitigation measures, explaining the benefits in reducing the risk for the high risk situations of interest

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SCOPE: The following topics will be covered in this unit:

- Activity: Preparation and presentation of the top three risks identified by the group, the vulnerabilities identified for these risks, and top three recommended mitigation measures to reduce vulnerability and risk. The top three risks will be prioritized as well as the top three recommended mitigation measures with rationale and justification. Includes any consideration for changes to security systems per Unit X.

METHODOLOGY:

The Instructor will review the rules of engagement for preparation of the individual student summary sheet and the briefing content which are included in the Student Manual.

REFERENCE MATERIALS:

1. FEMA 426
2. Student Manual, Unit XI (handouts will be a 1-page summary of analysis results and briefing format for presentation of information)
3. Unit XI visuals
4. Case Study – Hazardville Information Company

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
Activity: Preparation of Presentation by Groups	45
Presentation by Groups	90
Total Time	**135**

REMARKS: The group presentations provide the second grade for the course.

UNIT XII

Course Wrap-up

TIME 60 minutes

SCOPE: The following topics will be covered in this unit:

1. Discussion of general issues and concerns
2. Course evaluation
3. Distribution of course certificates

METHODOLOGY:

The Instructor will summarize the key points from the course and answer any final questions the students may have.

Next, the Instructor will ask the students to complete the course evaluation. For the validation offering there will be, in addition to the standard EMI scan sheet, an evaluation form going into detail on each block of instruction. Because the evaluations were covered in the course overview, the allotted time should be sufficient.

When all students have finished the evaluations and handed them in, the Instructor will distribute the course certificates and release the class.

REFERENCE MATERIALS: No references are required for this unit.

SUGGESTED TIME PLAN: The following time plan is suggested for this unit:

Topic	*Time (minutes)*
General Discussion ……	15
Course Evaluations…..……..	15
Distribution of Course Certificates……	30
Total Time……..	**60**

REMARKS:

XIII. COURSE EVALUATION

- **Level I**: The EMI Course Evaluation Form (FEMA 95-41, Aug 96) will be used to document student's overall impression of the facilities, instructors, and course content using a 1-5 rating system (a 5 being the highest).

- **Level II**: Each attendee will complete a written exam to assess their understanding of the assessment process, design concepts, and mitigation measures to design buildings against potential terrorist attack. In addition, the students will provide a short report culminating the student activity Case Study by providing the top three prioritized mitigation measures they selected and the rationale behind the selection.

XIV. COURSE DEPLOYMENT AND DELIVERY

This course will be delivered as a resident course at the FEMA Emergency Management Institute (EMI), Emmitsburg, Maryland. After completion of the pilot course, recommendations based upon course feedback will be developed for future deliveries at EMI, with the potential for field course deliveries in FEMA regions and at schools of higher education in engineering and architecture.