Unit XII

COURSE TITLE Building Design for Homeland Security

TIME 135 minutes

UNIT TITLE Case Study

OBJECTIVES

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 of interest
3. Justify the recommended mitigation measures, explaining the benefits in reducing the risk for the high risk situations of interest

SCOPE

The following topics will be covered in this unit:

1. Activity: Preparation and presentation of the top three risks identified by the groups, 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. This includes any consideration for changes to electronic security systems per Unit XI.

REFERENCES

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*
2. FEMA 452, *Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings*, pages 5-1 to 5-18
3. Case Study – Appendix A: Suburban, Hazardville Information Company
4. Student Manual, Unit XII-A
5. Unit XII-A visuals

REQUIREMENTS

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*
2. Instructor Guide, Unit XII-A
3. Student Manual, Unit XII-A (one per student)
4. Overhead projector or computer display unit

5. Unit XII-A visuals
6. Threat Matrices poster and dry-erase markers (one per team)
7. Chart, paper, easel, and markers

UNIT XI OUTLINE

PREPARING TO TEACH THIS UNIT

- **Tailoring Content to the Local Area:** Review the Instructor Notes to identify topics that should focus on the local area. Plan how you will use the generic content, and prepare for a locally oriented discussion.

  The Instructor will review the Hazardville Information Company site and building portfolio, DoD Antiterrorism Standards, and GSA Interagency Security Criteria, and provide the parameters for the Design Basis Threat and Levels of Protection.

- **Optional Activity:** There are no optional activities in this unit.

- **Activity:** The students will prepare and present the top three risks identified by the group, the vulnerabilities identified for these risks, and the 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 electronic security systems per Unit X.

- Refer students to their Student Manuals for worksheets and activities.

- Direct students to the appropriate page in the Student Manual.

- Read the activity instructions found in the Student Manual.

- Describe how the Student Manual requirements are used to obtain the data needed for that aspect of the HIC building assessment and walk through the information provided.

- "Walk through" the pages of the activity with the students, describing the steps followed to obtain the answers in the completed examples, and what is expected of the groups for this activity.

- If applicable to this activity, explain what information is to be transferred to the Risk Matrix poster.

- Tell students how long they have to work on the requirements.

- While students are working, all instructors should closely observe the groups' process and progress. If any groups are struggling, immediately assist them by clarifying the assignment and providing as much help as is necessary for the groups to complete the requirement in the allotted time.

- At the end of the working period, reconvene the class.

- Ask a representative from one group to provide the answer to the first requirement. Then simply ask if anyone disagrees. If the answer is correct and no one disagrees, state that the answer is correct and move on to the next requirement. If there is disagreement, provide the "school solution" and move on.

- If time is short, simply provide the "school solution" and ask for questions. Do not end the activity without ensuring that students know if their answers are correct or at least on the right track.

- Ask for and answer questions.

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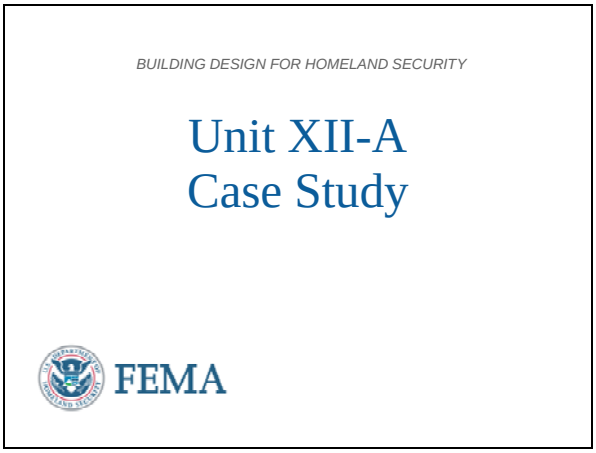
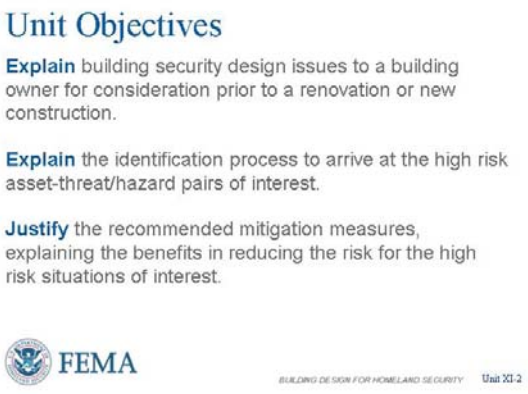
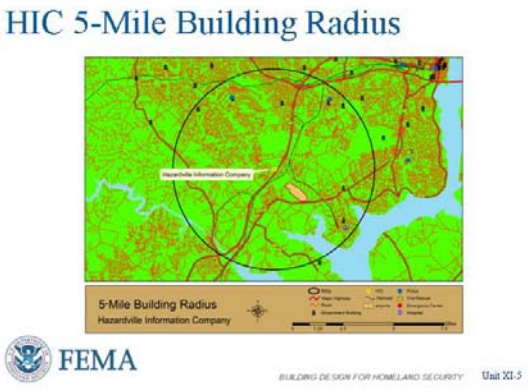
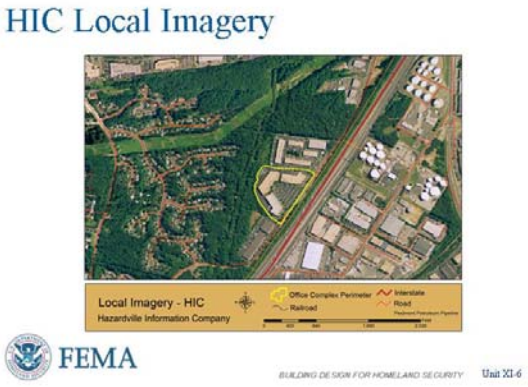
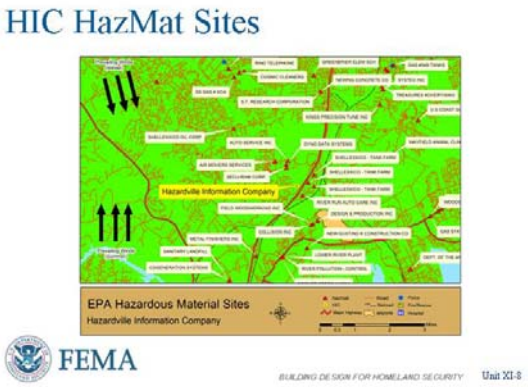
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-1 (XI-1)	**Introduction and Unit Overview**
	This is Unit XII Case Study activity. This unit will review the Hazardville Information Company site and building portfolio, DoD Antiterrorism Standards, and GSA Interagency Security Criteria, and provide the parameters for the Design Basis Threat and Levels of Protection. Students will prepare and present the top three risks identified by the group, the vulnerabilities identified for these risks, and the 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 electronic security systems per Unit X.
VISUAL XII-A-2 (XI-2)	**Unit Objectives**
	At the end of this unit, the students should 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 of interest. 3. Justify the recommended mitigation measures, explaining the benefits in reducing the risk for the high risk situations of interest.

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-3 (XI-3)	**Hazardville Information Company** The Case Study will be a comprehensive review and practical application of **FEMA 426**. In this unit, the following topics will be presented: • Company Functions • Company Infrastructure • Threats/Hazards (including Design Basis Threat and Levels of Protection) • Vulnerabilities (including Impact and Mitigation)
VISUAL XII-A-4 (XI-4)	**Hazardville Information Company** The Hazardville Information Company supports approximately 1,000 users and 100 applications as a primary data center and as a disaster recovery backup site. HIC has over 130 employees and approximately 80 to 100 employees are in the building at any given time. • Regional computer center • Suburban business park • Customers and neighbors

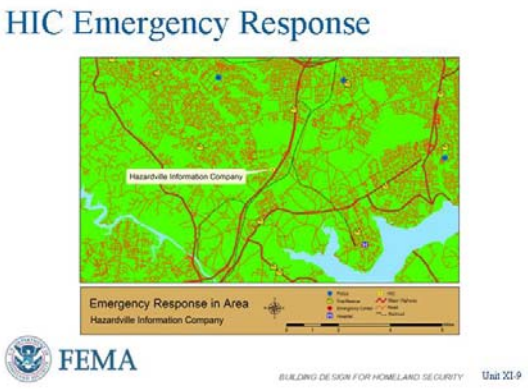
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-5 (XI-5)	**HIC 5-Mile Building Radius** The Hazardville Information Company is located approximately 15 miles outside of a major urban city in the suburbs, and adjacent to a major interstate highway. There are several commercial iconic properties, one military installation, and several government offices within a 5-mile radius of the HIC building.
VISUAL XII-A-6 (XI-6)	**HIC Local Imagery** The office building is part of a corporate business park. HIC does not control the front parking area, signage, or other general site conditions such as stormwater drainage, lighting, or vehicle and pedestrian traffic flow and movement. The business park is responsible for grounds maintenance to include cutting the grass, planting flowers, trimming trees, sweeping the parking lot, and towing unauthorized vehicles. Trash service is the responsibility of tenants. HIC has a large dumpster located at the rear of the loading dock area approximately 50 feet from the building. HIC receives the mail and packages at the front office lobby desk. Large packages and equipment are delivered to the rear loading dock. HIC does not have a separate mail room, but does have an internal administrative space with copiers, printers, supplies, and staff mailboxes. The front desk receptionist is responsible for sorting and screening all mail. The business park is adjacent to a major

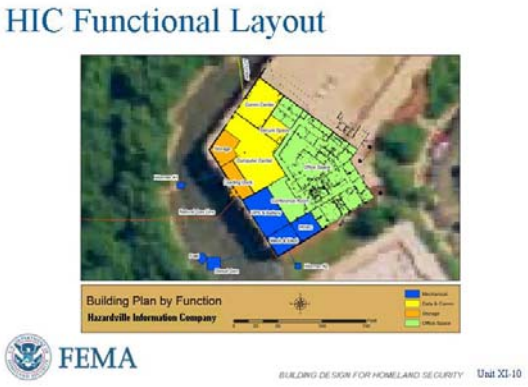




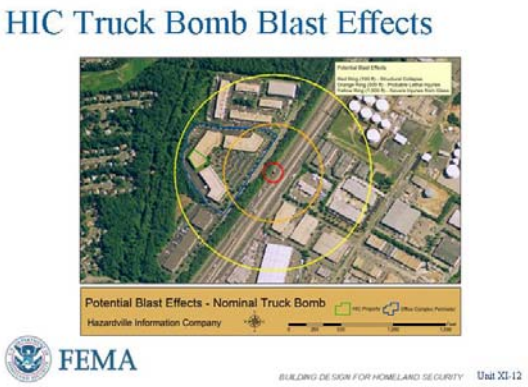
INSTRUCTOR NOTES	CONTENT/ACTIVITY
	interstate highway and there are a number of storage tanks, manufacturing and production facilities, and other commercial properties across the interstate.
VISUAL XII-A-7 (XI-7)	**HIC Office Building (Site Imagery)**
	The HIC office space has client and staff parking in the front and a rear parking and loading dock area for supply trucks, vendors, and trash. The front parking are is unrestricted, but the back parking area is fully enclosed with chain link fencing on the perimeter of the property. There is no gate or means to prevent vehicles from transiting around the rear of the business park.
VISUAL XII-A-8 (XI-8)	**HIC HazMat Sites**
	There are a significant number of hazardous waste sites in near proximity to the HIC building. The vast majority are small generators such as gas stations, dry cleaning, and other commercial businesses. Large generators include the petroleum storage and production facility located across the interstate.

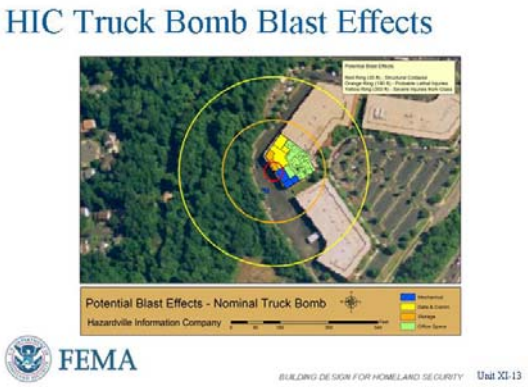
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-9 (XI-9)	**HIC Emergency Response** The local emergency response capabilities include primary police, fire, and medical facilities approximately 8 to 10 miles away. There are multiple means of ingress and egress to the HIC building complex and the site is served by fire mains with a hydrant located approximately 200 feet from the HIC office.
VISUAL XII-A-10 (XI-10)	**HIC Functional Layout** • Downstairs: Computer Center, Communications, Staff • Upstairs: Executive offices • Highbay loading dock, mechanical and electrical (M&E) room
VISUAL XII-A-11 (XI-11)	**HIC Car Bomb Blast Effects** The nominal range-to-effects chart radius of influence of a small car bomb detonation at the front entrance indicates that the building would experience significant damage, but would likely not suffer progressive collapse. The front façade of the building is approximately 75 percent annealed glass and has an 8-foot overhang. The terrain slopes upward from the parking lot to the main entrance, and is landscaped with flower beds and trees. Key staff would



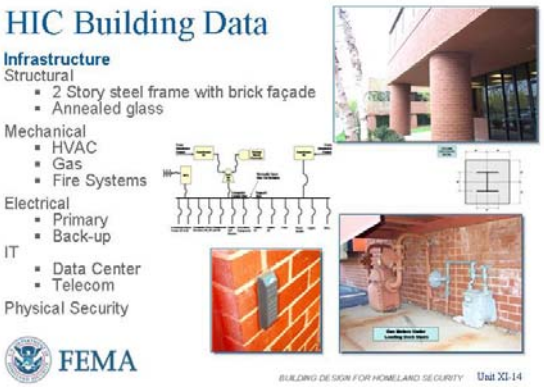


INSTRUCTOR NOTES	CONTENT/ACTIVITY
	probably be killed and administrative functions destroyed, but the Computer Center and Communications functions would likely survive relatively intact.
VISUAL XII-A-12 (XI-12)	**HIC Truck Bomb Blast Effects** A truck bomb detonation occurring on the interstate would also significantly damage the HIC building, primarily glass breakage and potentially some structural damage. If the truck bomb were to detonate near the tank farm, the ensuing explosion, fire, and plume would have significant impact on the HIC building.
VISUAL XII-A-13 (XI-13)	**HIC Truck Bomb Blast Effects** A truck bomb detonation at the rear of the HIC building at the loading dock would result in significant structural damage and potentially progressive collapse. The Computer Center, Communications, and other critical functions would be destroyed. Critical infrastructure that would be destroyed includes the mechanical/electrical room.





INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-14 (XI-14)	**HIC Building Data (Infrastructure)**

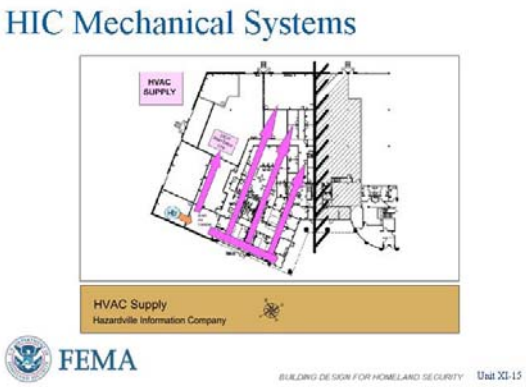


- Structural
- Mechanical
- Electrical
- IT
- Physical Security

VISUAL XII-A-15 (XI-15)

HIC Structural System

The HIC building is a two-story steel frame structure with a brick facade and annealed glass.



HIC Mechanical Systems

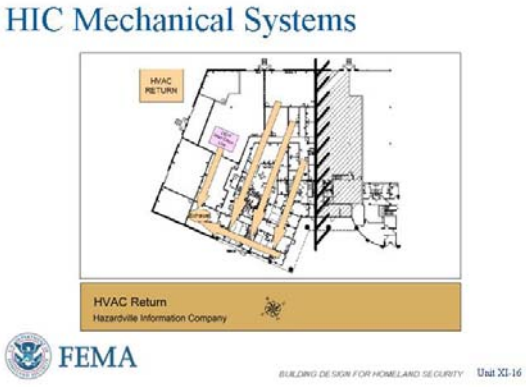
The air used to heat or cool the HIC Headquarters building is filtered in the HVAC room using standard industrial grade MERV 8 filters. Outside make-up air is brought in through a vent in the wall located approximately 3 feet above ground level.

The Computer Data Center has two additional air cooling units located in the data center and uses the main chill water supply. The data center maintains a slight net positive pressure compared to the main office areas.

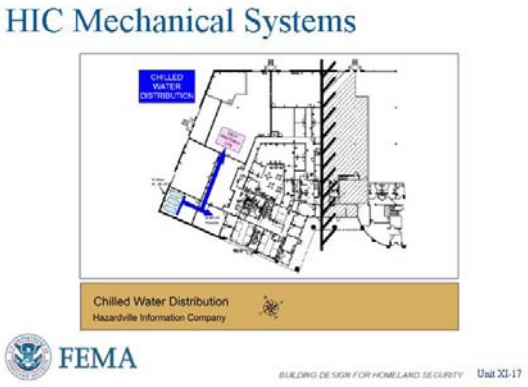
VISUAL XII-A-16 (XI-16)

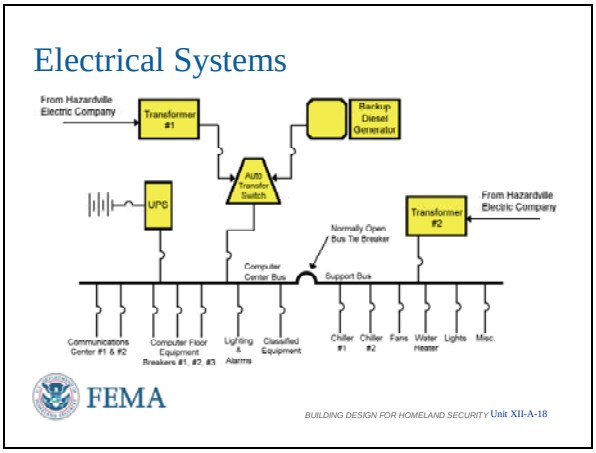
HIC Mechanical Systems

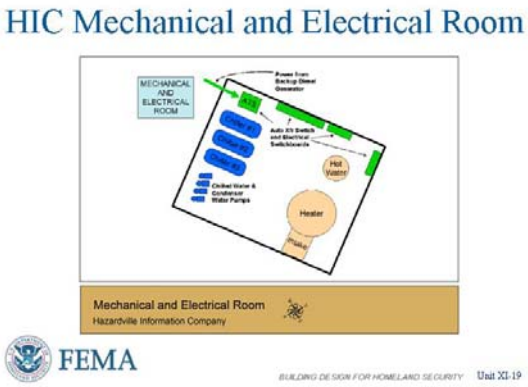
The return air for the main office space has sufficient room inside the ductwork and mechanical room area to incorporate additional filters and equipment.



INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-17 (XI-17)	**HIC Mechanical Systems** Chiller operation along with chilled water and condenser water flow are managed from a single control unit in the M&E room. A single chilled water pump provides adequate flow for all cooling situations; a backup pump is available at the push of a button. The same is true for the condenser water pumps.
VISUAL XII-A-18 (XI-18)	**HIC Electrical System** HIC's electrical loads are divided between two main electrical buses, the Computer Center Bus (CCB) and the Support Bus (SB). They are located in separate "closets" of the building. A tie breaker allows the buses to be connected, so they can be powered by a single main transformer, or to allow SB loads to be carried by the backup diesel generator. The system is monitored by a digital energy management system, which provides indications, alarms, and instructions.





INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-19 (XI-19)  	**HIC Mechanical and Electrical Room** Typical of many commercial office buildings, the mechanical and electrical systems share common utility penetetrations and floor space. There are no redundant utility feeds to the building from different directions.
VISUAL XII-A-20 (XI-20)  	**IT** The Computer Center is the heart of the Hazardville Information Company's (HIC) operation. The Computer Center is composed of several interconnected systems and one independent system for classified data processing. The systems run either VMS, Unix, or Windows. <u>Data:</u> HIC has two T1 lines and one T3 line connected at the demark to ATT's high performance backbone network. The ATT fiber connectivity provides more than enough bandwidth for HIC's current needs and planned future expansion. <u>Telecom and Network Connections:</u> • Two T1 lines (1.544 Mbps) • One T3 (45 Mbps) • Frame Relay • Narrowband ISDN (64/128 Kbps) <u>Voice</u>

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

NEC DS2000 telephone systems that come with an 8-slot cabinet that can handle 32 lines from 48 stations.

VISUAL XII-A-21 (XI-21)

Physical Security

HIC uses a layered approach to physical security:

The outermost physical security layer is provided by a contract security firm and the Defense Protective Service (DPS).

- The parking lot behind the HIC office is well lit and monitored by older generation analog CCTV cameras.
- The front parking lot is lit, but not monitored.

HIC's middle layer of security is the building envelope.

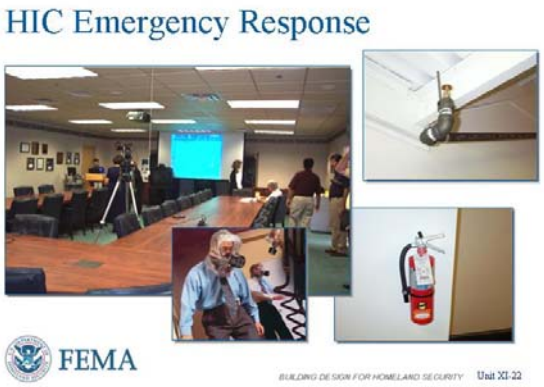
- The building is monitored by door and window alarms, which connect to ADT, the nationwide alarm company.

The innermost layer of physical security involves the Computer Center and the Communications Center.

- Equipped with locked doors, rooms meet the government's requirements for handling classified material.
- Only authorized employees possess the necessary proximity cards and PINs to gain access.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-22 (XI-22)



Emergency Response

In the event of an emergency, HIC senior management use the large conference room as an emergency operations center. The room is equipped with network and telephone connections and cell phones are able to receive a signal.

The nearest fire station is approximately 2½ miles north of the HIC Headquarters. Seven others are within 5 miles of the site. Firefighters are trained as Emergency Medical Technicians (EMTs) and Hazardous Material Technicians. Many are also skilled in technical rescue (high places, confined spaces, etc.). Ambulances are also dispatched from these stations. Emergency response time for emergencies is estimated to be 8-10 minutes. Fire hydrants are available in the office park.

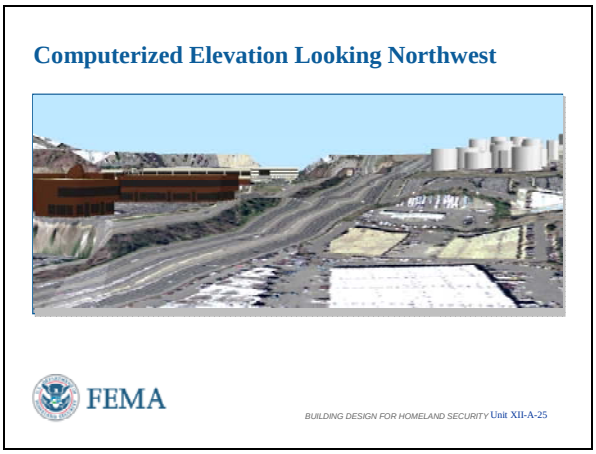
The nearest hospital with an emergency room is 5 miles away.

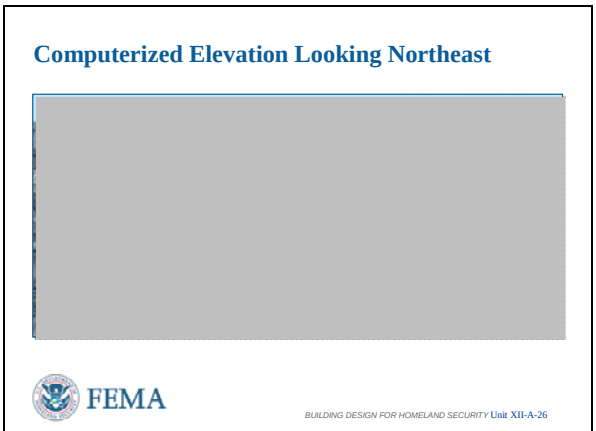
VISUAL XII-A-23

Threats/Hazards – Terrorism, Intelligence, and Crime

- Terrorism – no direct threat, but collateral damage possible
- Intelligence – due to work done by CI/BC this is always a concern
- Crime – relatively low for the type of work being done

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-24 (XI-23)	**Threats/Hazards – HazMat, Technological, and Natural** Many forms of HazMat in the local area, but especially the Tank Farm and the Interstate Highway are potential locations for Technological Hazards (accidents). Natural Hazards consist of various windstorms and lightning, with other hazards occurring less frequently.
VISUAL XII-A-25	**Elevation Looking Northwest** The lay of the land indicates that a fuel spill from the Tank Farm will not get to the HIC building, as well as any liquid spill on the Interstate Highway.
VISUAL XII-A-26	**Elevation Looking Northeast** Similarly, along the back of the office park the terrain makes vehicle approach very difficult and liquid HazMat spills from the railroad line will not flow to the HIC building. The slope will also tend to direct any gases blown toward HIC from the southwest to be propelled up and over the HIC portion of the building.





INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-27 (XI-24)	**Design Basis Threat**

Explosive Blast: Car Bomb – approximately 250 lb TNT equivalent. Truck Bomb – approximately 5,000 lb TNT equivalent (Murrah Federal Building class weapon)

Chemical: Large quantity gasoline spill and toxic plume from the adjacent tank farm, small quantity (tanker truck and rail car size) spills of HazMat materials (chlorine)

Biological: Anthrax delivered by mail or in packages, smallpox distributed by spray mechanism mounted on truck or aircraft around metropolitan area.

Radiological: Small "dirty" bomb detonation within the 10-mile radius of the HIC building.

VISUAL XII-A-28 (XI-25)

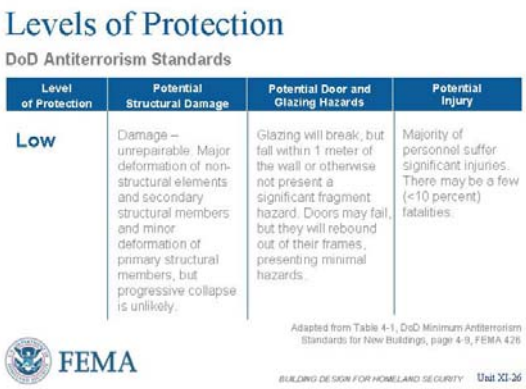
Levels of Protection

GSA Level II Interagency Security Criteria

- Perimeter Security
- Entry Security
- Interior Security
- Administrative Procedures
- Blast/Setback Standards

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-29 (XI-26)

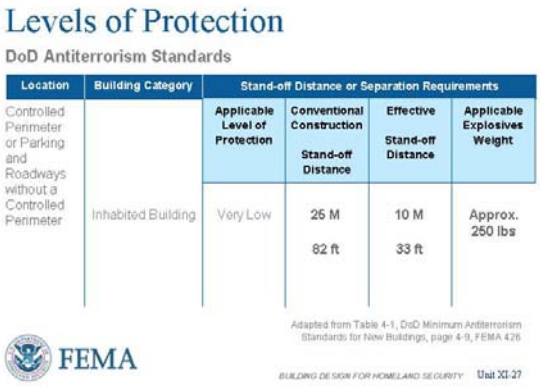


Levels of Protection

DoD Low, Inhabited Building

- Potential Structural Damage
- Potential Door and Glazing Hazards
- Potential Injury

VISUAL XII-A-30 (XI-27)



Levels of Protection

DoD Low, Inhabited Building Stand-off Distance or Separation Requirements

VISUAL XII-A-31 (XI-28)

Levels of Protection

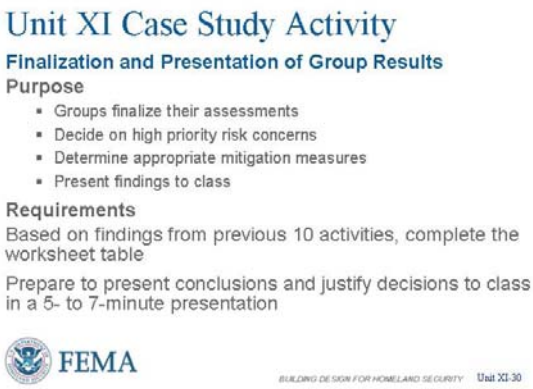
UFC 4-010-01 Appendix B
DoD Minimum Antiterrorism Standards for New and Existing Buildings Standards 1-12

What standards are applicable to the Case Study?

INSTRUCTOR NOTES

VISUAL XII-A-32 (XI-29)

VISUAL XII-A-33 (XI-30)



Members of the instructor staff should be available to answer questions and assist groups as needed.

At the end of 45 minutes, reconvene the class and facilitate group reporting.

CONTENT/ACTIVITY

Levels of Protection

UFC 4-010-01 Appendix B
DoD Minimum Antiterrorism Standards for New and Existing Buildings Standards 13-22

What standards are applicable to the Case Study?

In addition to the standards, review the DoD Recommendations for New and Existing Buildings, Appendix C.

Case Study Activity

In this unit, the students will finalize the assessment, determine high priority risk concerns, recommend appropriate mitigation options, and present findings to the class.

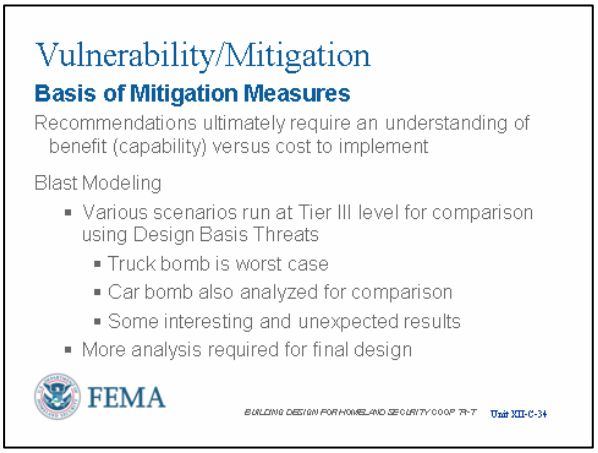
Activity Requirements

- Working in small groups, refer to the HIC Case Study and the GIS portfolio to determine answers to the worksheet questions.

- Then review results to identify vulnerabilities and possible mitigation measures, and rank and prioritize the findings.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-34 (C-34)



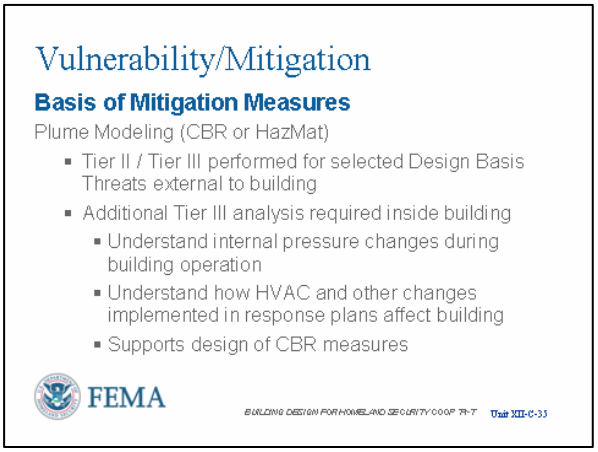
Vulnerability Mitigation – Basis of Measures - Blast

Need to understand benefit versus cost.

Blast modeling concentrates upon worst case, but must work all scenarios. Since both positive and negative blast wave phases are used in retrofitting existing buildings, results were interesting and, in some cases unexpected.

The higher tier assessment indicates the first cut of possible approaches, but more analysis is needed to work with the architects and engineers in achieving a final design.

VISUAL XII-A-35 (C-35)

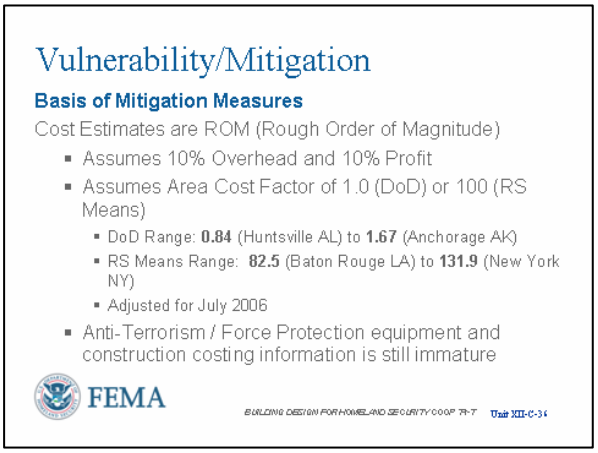


Vulnerability Mitigation – Basis of Measures - Plume

Plume modeling for CBR or HazMat follows similar approaches to indicate actions to consider, then followed by more detailed analysis to achieve the final design.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-36 (C-36)



Vulnerability Mitigation – Basis of Measures – Cost

When comparing benefit versus cost, the cost is equally difficult to determine due to the still immature nature of anti-terrorism / force protection costing information.

The costing used in this presentation assumes 10% overhead, 10% profit, an Area Cost Factor of 1.0, and adjusted for July 2006.

For your actual situation you can then adjust the dollar values given for your conditions.

VISUAL XII-A-37 (C-37)

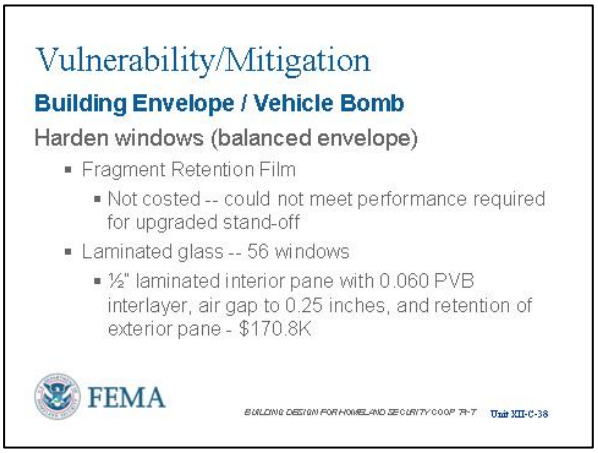
Vulnerability/Mitigation – Site / Vehicle Bomb

The front side and rear of the building have access roads that allow straightaway approaches to the building, especially the front. The achievable speed requires K12 stopping power.

For the front of the building, there are three options to hinder this approach and provide some stand-off to the situation. Landscaping using large boulders is the cheapest and has aesthetic qualities.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-38 (C-38)



Building Envelope / Vehicle Bomb

The windows are those found in standard commercial construction. They are relatively weak and require significant increase in tensile strength.

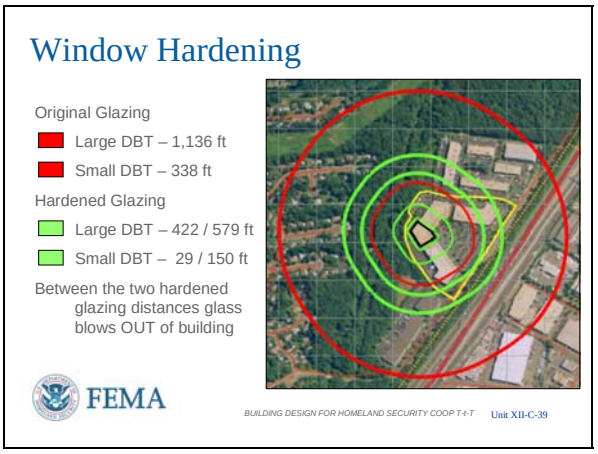
The goal is to achieve a balanced envelope between windows and walls.

While fragment retention film (FRF) comes to mind as the first glazing mitigation measure, it is not always successful in achieving protection for the existing stand-off available or the upgraded stand-off achieved through other measures. In this case 15 mil FRF requires 92 feet of stand-off for the Small DBT and is greater than 500 feet for the Large DBT. Thus putting a controlled perimeter on the main road outside the office park would not achieve protection from the Large DBT. And achieving 92 feet of stand-off from HIC will greatly impact parking at the office park, especially if the mitigation measure is extended to the other buildings in the office park.

Laminated glass with a 60 mil interlayer was selected for the interior pane so that the existing 1-inch IGU (insulated glass unit) frame could be reused to save money. This resulted in reducing the 1/2" air gap to 1/4" and retaining the exterior pane. This turned out to be the minimum upgrade for the projected controlled perimeter stand-off distance.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-39 (C-39)



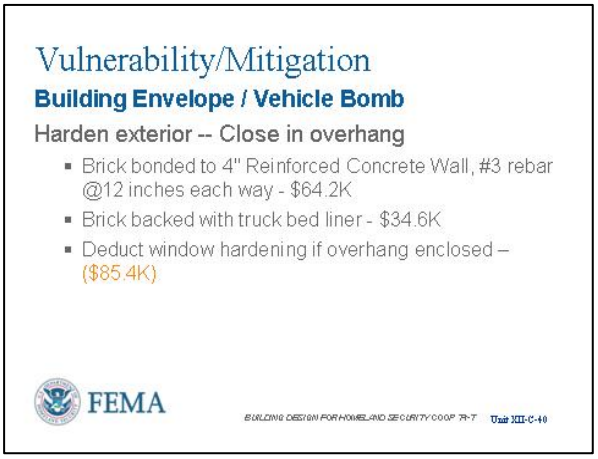
Window Hardening

As can be seen the Large DBT for the original glazing (thicker red contour) encompasses much of the interstate highway. The Small DBT (thinner red contours) covers a good portion of the parking lot.

The upgraded window with the 1/2" laminated glass inserted as the interior pane (and confirmation that the window frame connections to the building can survive the blast loading) reduces the stand-off to a controlled perimeter at the entrances to the office park for the Large DBT.

For the Small DBT, building occupants are protected down to a 29-foot stand-off. Although from 29 feet to 150 feet the glazing blows OUT of the building during the negative phase of the blast.

VISUAL XII-A-40 (C-40)



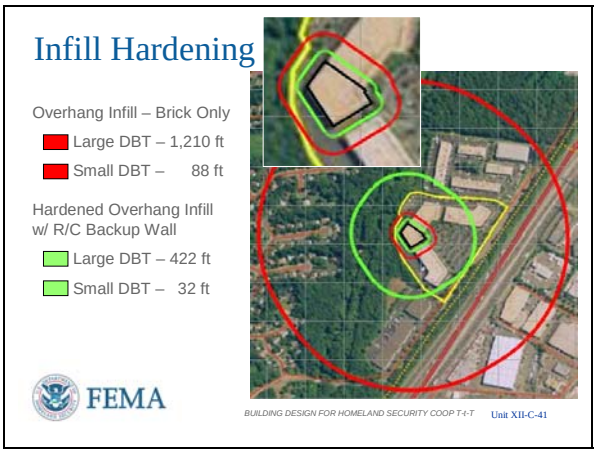
Building Envelope / Vehicle Bomb

Next, the goal is to enclose the overhang as this architectural feature greatly increases blast damage. Two mitigation options were analyzed. A benefit of enclosing the overhang results the savings indicated as half the windows in the HIC building would then not require hardening.

Note that brick is retained for architectural compatibility and the Spray-On Polymer (truck bed liner) is significantly cheaper than the reinforced concrete backing wall.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-41 (C-41)

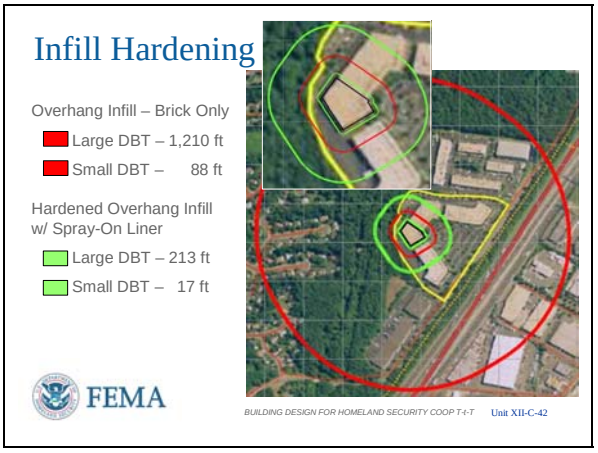


Infill Hardening – R/C Backing Wall

Comparing to a Brick Only wall (which is also an indication of the blast resistance of the outer wythe of the double wythe wall) shows that Brick is even weaker than the windows.

The reinforced concrete backing wall helps by keeping the Large DBT contour inside the main road serving the office park. The standoff for the Small DBT also has limited impact on changing parking in front of the HIC building.

VISUAL XII-A-42 (C-42)



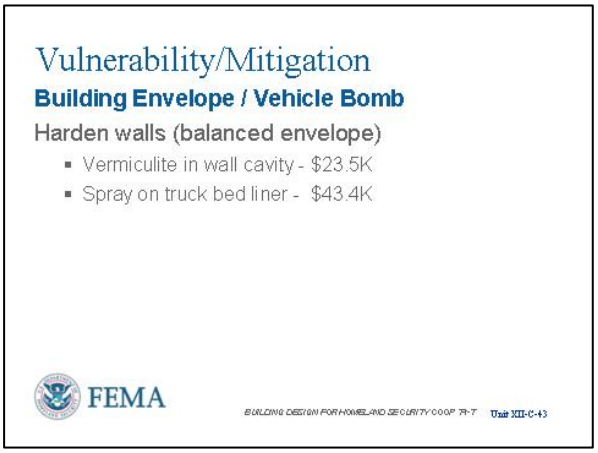
Infill Hardening – Spray-On Polymer Liner

The performance of the truck bed liner is remarkable considering it is only 1/4” thick with a 1 foot overlap onto the concreter overhang ceiling and the concrete overhang floor.

The Spray-On Polymer Liner shows about half the stand-off distance compared to the R/C Backing Wall, and, since it is cheaper, then it is the preferred mitigation measure. Be aware that the Spray-On Liner has some environmental concerns during installation and fire concerns due to its fuel capacity.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-43 (C-43)



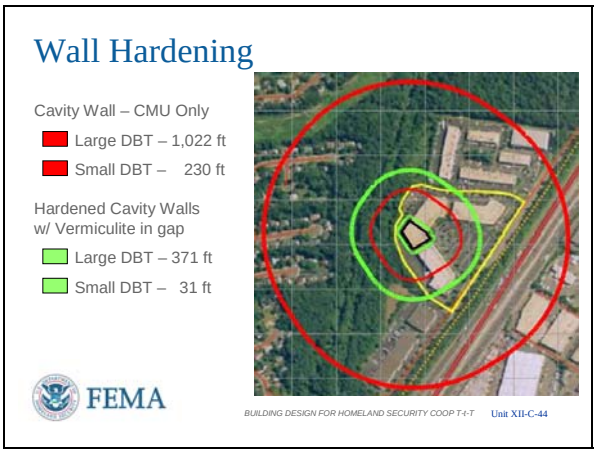
Wall Hardening

The cavity wall (Brick / Cavity / CMU) gains strength if both walls act together to resist the blast pressure vice working independently like tearing individual pages of a phone book to tear a phone book in half.

The Vermiculite in the wall cavity has mechanical properties that supports the need to tie the two walls together so that they act as one.

The Spray-On Polymer Liner (truck bed liner) is expected to have good performance per the Infill Hardening just presented, but at almost twice the cost of the Vermiculite. The exterior walls must be stripped to the CMU surface for applying the Liner, and then wallboard has to be replaced.

VISUAL XII-A-44 (C-44)

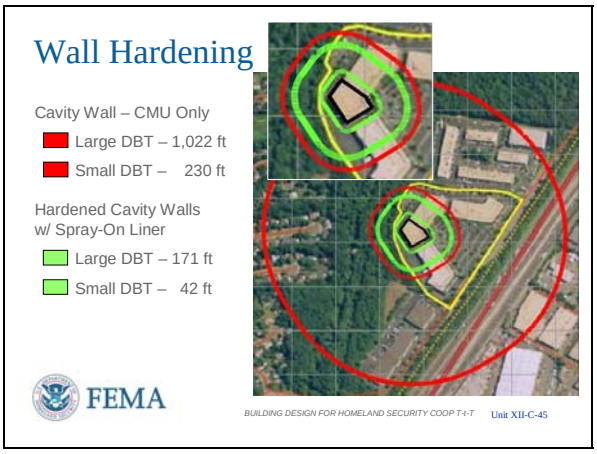


Wall Hardening – Vermiculite

The Vermiculite provides comparable stand-off to that needed for retention of parking and using the entrances to the office park as the controlled perimeter access control points.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

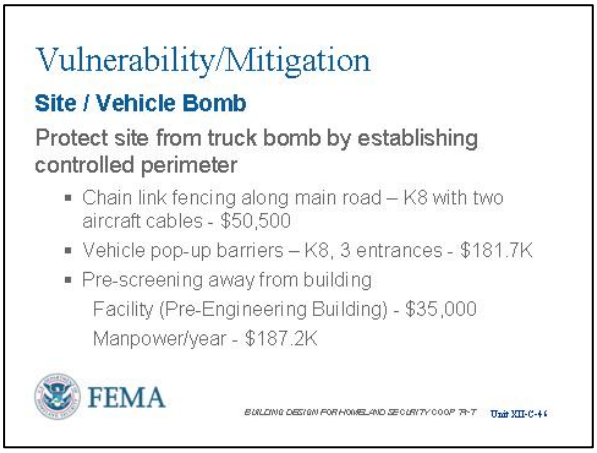
VISUAL XII-A-45 (C-45)



Wall Hardening – Spray-On Liner

As expected, the Spray-On Polymer Liner has very good performance, especially for the Large DBT. However, the controlled perimeter location and the additional cost of the Liner, justifies going with the Vermiculite to achieve a balanced envelope.

VISUAL XII-A-46 (C-46)



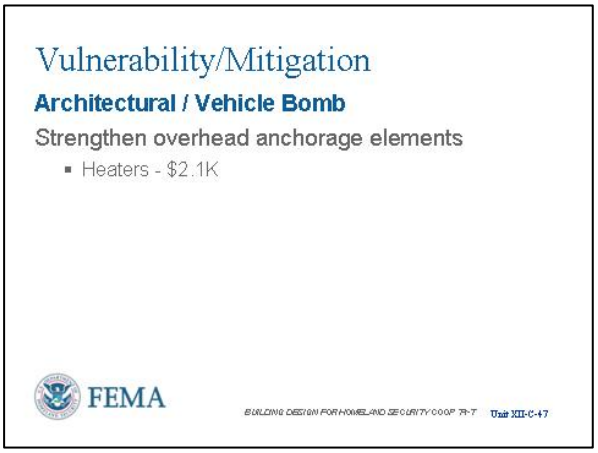
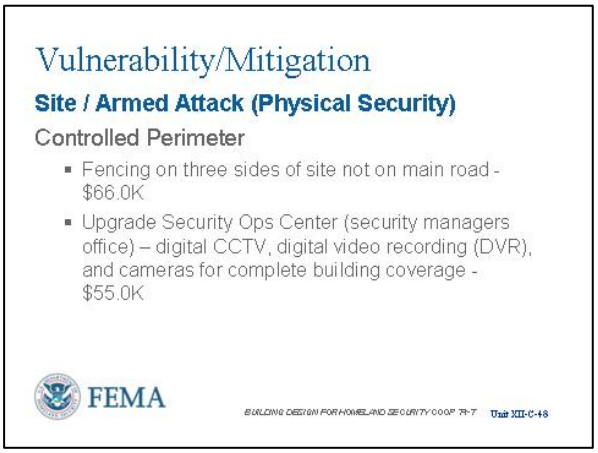
Site / Vehicle Bomb

Establishing a controlled perimeter is the next step (but should be started first as it affects all the other office park tenants).

K8 ratings along the main road will provide the level of protection needed with three entrances as follows:

- Truck entrance
- Car entrance
- Truck exit (one-way traffic flow with trucks only allowed on the back side of the office park buildings.

If screening is not done at the vehicle entrance, then pre-screening off-site will be very expensive comparatively with a facility and annual labor. Access control can be by tenant with scheduled deliveries and remote control barrier operation linked with CCTV.

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-47 (C-47)	**Architectural / Vehicle Bomb**
	A low cost mitigation measure is to upgrade the supports for the overhead heaters the areas near the loading dock per DoD guidelines.
VISUAL XII-A-48 (C-48)	**Site / Armed Attack (Physical Security)**
	In addition to the controlled perimeter along the main road, upgrading the fencing around the back of the office park is also in order to control foot access Upgrading the Security Operations Center with updated digital CCTV, digital recording, and cameras for complete building coverage would also be in order, in addition to vehicle access points.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

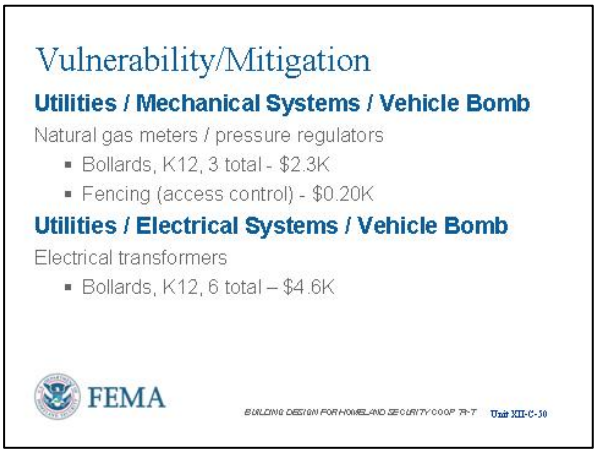
VISUAL XII-A-49 (C-49)

Architectural / Mailroom

Two approaches for the mailroom were considered:

- The first is to convert the receptionist lobby into a mailroom operation area (to continue using the receptionist as the mail clerk).
- The second is to build a separate mailroom, which will probably require someone else to perform mail duties.
- In either case, sealing, hardening, and separate HVAC are in order.

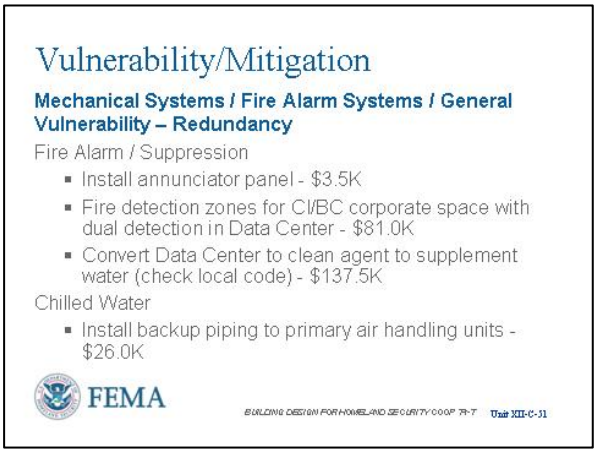
VISUAL XII-A-50 (C-50)



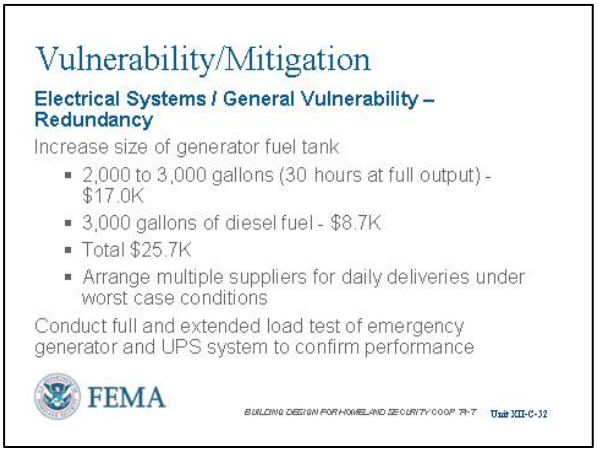
Utilities / Vehicle Bomb

Protection of utilities on the backside of the building also comes under the low cost umbrella. As stated previously the straightaway allows high-speed approach to the back of the HIC building. K12 fixed bollards and fencing to prevent approach to these systems needs consideration.

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-51 (C-51)	**Mechanical / Fire / General Vulnerability - Redundancy**



	For better control of the Fire Alarm and Fire Suppression Systems, install a fire annunciator panel in HIC area of the building. Rezone the fire alarms throughout the building and install dual zones in the Data Center to support adding the Clean Agent system in the Data Center (and probably the Communications Center). Note that depending upon local codes the Clean Agent system will NOT REPLACE the water sprinkler system. The Chilled Water supply and return lines are vital to the proper operation of the Data Center. Adding redundant lines should be considered to maintain 24/7 operations.
VISUAL XII-A-52 (C-52)	**Electrical / General Vulnerability – Redundancy**



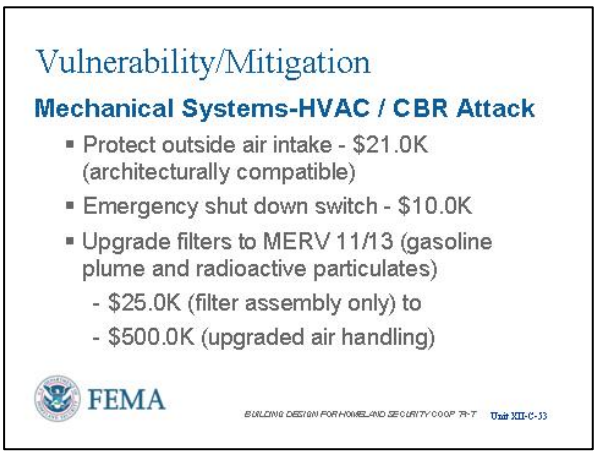
	Since electricity is vital to 24/7 operations the existing 2,000 gallon fuel tank (and 250 gallon day tank) will not last long enough to maintain a once-per-day delivery schedule at full load (which may occur only during the heat of the summer). The generator consumes 100 gallons per hour. Replacing the fuel tank is one approach, or renting a fuel truck during the peak summer season when the 2,000 gallon fuel tank re has insufficient fuel capacity is another. Multiple fuel suppliers should be arranged to prevent a single occurrence (like a utility power outage) from preventing deliveries or fuel supplies should be canvassed to determine if they have backup generators to overcome utility power outages.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Finally, upgrading the generator and UPS testing program is in order.

- Test the generator and outage sensor system once per month for 2 hours at the peak electrical consumption of the week.
- Test the battery capacity of the UPS once per year to ensure it can carry the load for the time required for orderly shutdown.

VISUAL XII-A-53 (C-53)



HVAC / CBR Attack

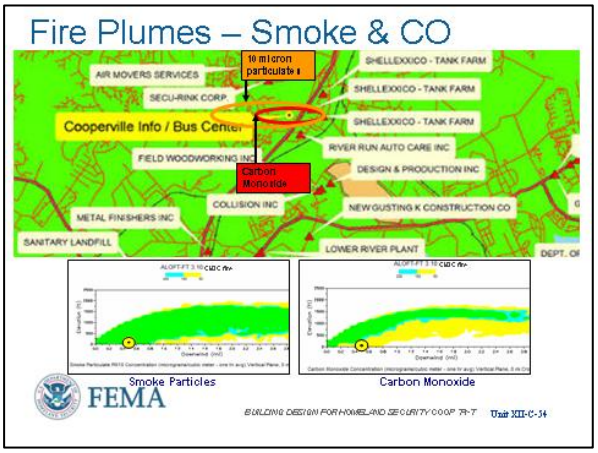
Raising the outside air intake is probable the first action to take to make it less vulnerable to attack and reduce the risk of heavier-than-air agents. This measure is more expensive because it will have to be architecturally compatibility (brick).

The second action is the emergency shutdown switch to shut down all air handling equipment in the building. If funds are tight, this should be the first action as it is less expensive than raising the air intake.

Upgrading the filters of the HVAC systems from MERV 8 to MERV 11/13 has a potential range of cost that requires further investigation. It is beneficial whenever there are particulates involved. It can be as simple as adding the filters or as expensive as upgrading the complete air handling system to accommodate the pressure drop of the higher MERV filters.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-54 (C-54)



Fire Plumes – Smoke and Carbon Monoxide

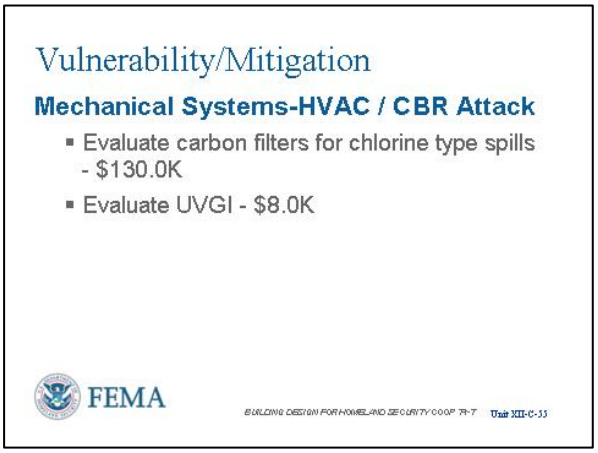
Two points to consider are smoke particles that MERV 11.13 filters will capture and carbon monoxide, a lighter-than-air gas that kills by overcoming the oxygen in a room. The wind direction for this scenario does not follow the predominant wind patterns shown in earlier HazMat slides.

Circles on the lower graphs indicate the approximate location of the HIC building.

The smoke particles will be in high concentration as they reach the HIC building as shown in the lower left graphic. Filtering of these smoke particles is not only a concern from a human health standpoint, but also for sensitive electronic equipment, such as computer and communications.

Alternately, the carbon monoxide will be at a lesser concentration, but still high, although not high enough to be instantly fatal. This allows for evacuation from the site if a plume heads for the building. Sheltering-in-place is not recommended in this case.

VISUAL XII-A-55 (C-55)



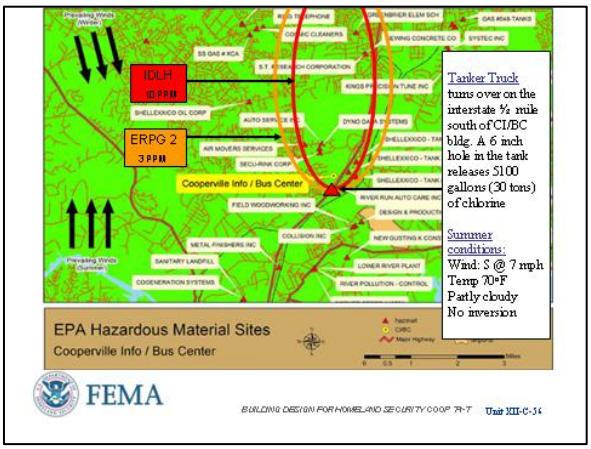
HVAC / CBR Attack

Carbon filters for removal of chlorine gas and similar gaseous spills is expensive and the filters should be on a sensor to switch them into the system when needed, rather than always being in operation – pressure drop and eventual consumption of capacity.

Ultraviolet Germicidal Irradiation (UVGI) in contrast is very reasonable and has the added benefit of killing biological agents in addition to standard infections. Thus, building air recirculation through the UVGI will not only protect from (C**B**R) attack, but has the

capability of reducing employee downtime due to spreading normal diseases (flu, colds, etc.) through the air handling system.

VISUAL XII-A-56 (C-56)



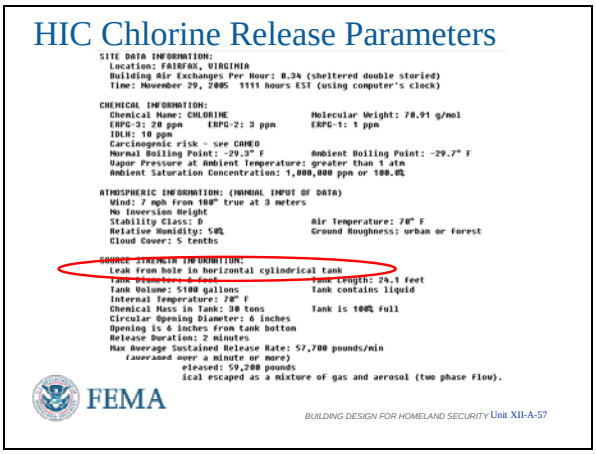
Chlorine Spill – Tanker Truck on Interstate Highway

In this case the prevailing winds are from the south, sending the chlorine plume over the HIC building.

- Immediately Dangerous to Life or Health (**IDLH**) refers to a concentration, formally defined as the maximum exposure concentration of a given chemical from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. The IDLH for chlorine is 10 ppm.
- The **ERPG-2** is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-57



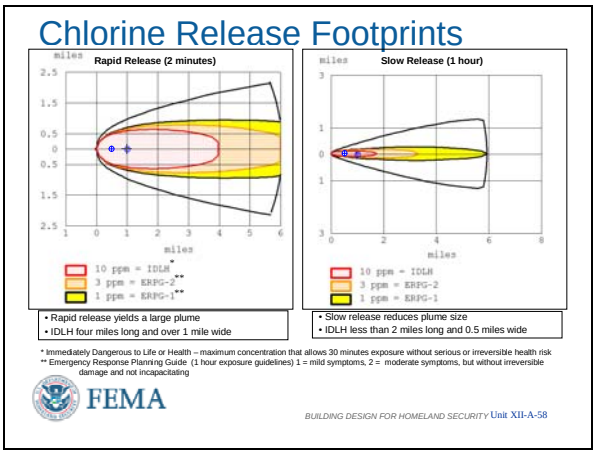
HIC Chlorine Release Parameters

This slide shows the information available from the CAMEO toxic industrial chemical (TIC) modeling program of EPA and NOAA and can be downloaded at http://archive.orr.noaa.gov/cameo/aloha.html.

- It is important to note that chlorine is approximately 2.5 times heavier than air so it will not readily disperse into the atmosphere. Instead it will hug the ground as it disperses and will settle in the lowest elevations.
- Notice this release is a rapid release of 5100 gallons (30 tons) of chlorine through a 6-inch hole in the tanker truck. The entire release occurs in approximately two minutes.
- A much smaller leak was also modeled (such as might occur in a ruptured hose) in order to demonstrate how changing just one variable makes a tremendous difference in the release and potentially in the response.

INSTRUCTOR NOTES

VISUAL XII-A-58



The **ERPG-3 (not shown)** is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

CONTENT/ACTIVITY

Chlorine Release Footprints

On the left is a basic plume footprint for the rapid release of chlorine [5100 gallons (30 tons) at 225 psi over 2 minutes].

On the right is the footprint for a slower release, occurring over the course of one hour.

The blue circle with plus sign indicates the range of building location versus spill site (from 0.5 miles to one mile).

Note how a rapid release covers a much wider area, but reduces the DOSE (concentration x time) that can be received. Whereas the slow release is a bigger problem as a high concentration is present for a much longer time.

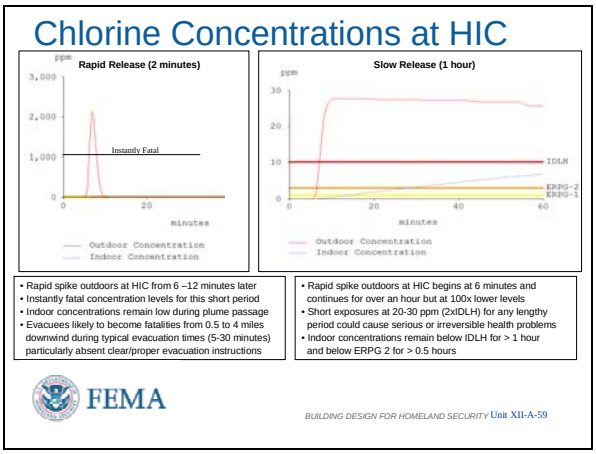
Immediately Dangerous to Life or Health (IDLH) [30 minutes] was defined earlier.

Emergency Response Planning Guides (ERPG) are defined in thin three categories

- The **ERPG-1** is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.
- The **ERPG-2** is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hr without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-A-59

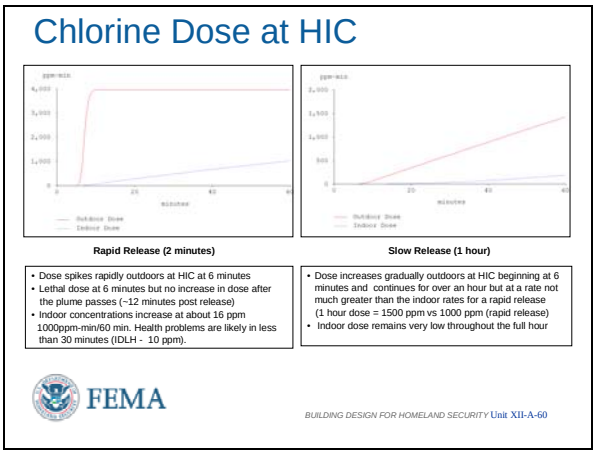


Chlorine Concentrations at HIC

Bottomline: In all circumstances it is best to remain indoors unless or until the facts related to the release are clear and it can determined safe evacuation is possible. For even more protection move to upper floors and if intakes are roof-mounted - turn the HVAC on high (pressurize) until the odor of chlorine is noticed.

If configured, HVAC carbon filters can be put into operation or go to shelter-in-place configuration and turn on roof-mounted pressurization units.

VISUAL XII-A-60



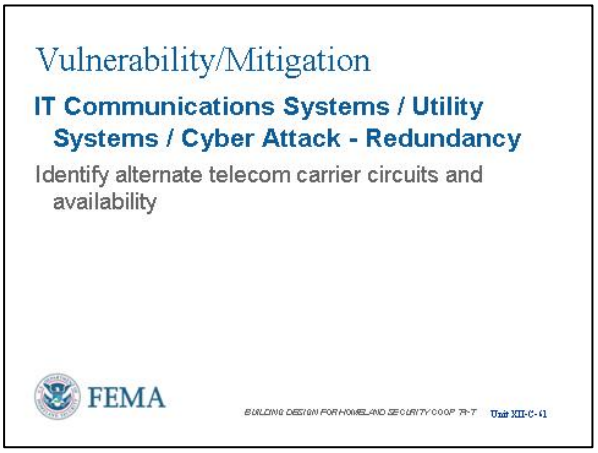
Chlorine Dose at HIC

Bottomline: Once again it is clear that remaining indoors is the best option until or unless it is clear evacuation can be accomplished safely. It should be noted that the while the total indoor dose for the slow release is approximately **100 ppm-min** this only equals about 1.6 ppm (concentration) – well below IDLH and ERPG 2.

Any efforts to maintain a positive pressure in the building and seal exterior openings (particularly at the lowest levels) could further reduce the infiltration and therefore dosage for occupants.

After the plume passes, this would be the time to purge the building to reduce the indoor concentration and, thus reduce the dose to people inside the building. While high concentrations are a concern for immediate effects, high dosage is a concern for long-term effects.

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-A-61 (C-61)	**IT Communication Systems – Redundancy**



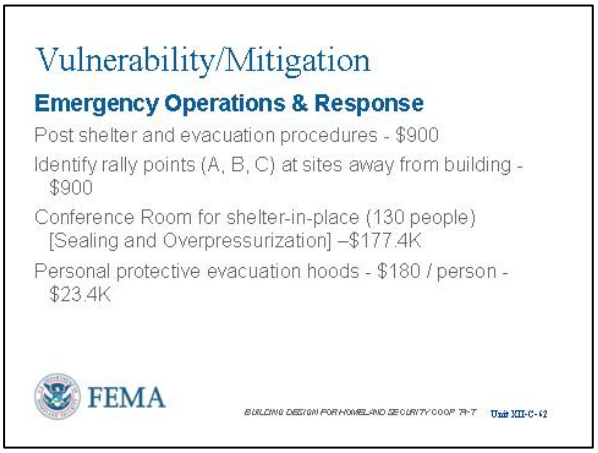
Currently there is only one telecom carrier provider. Identifying an alternate telecom carrier and the availability of circuits that can be run to the HIC building provides similar backup as the generator and UPS provide to the electrical utility.

Since communications (data and voice) is so important to the HIC 24/7 operations, backup in this area should receive equivalent consideration.

NOTE: Since the HIC building needs a satellite communications link to satisfy DAI COOP requirements, this satellite link can provide the redundancy sought here.

VISUAL XII-A-62 (C-62)

Emergency Operations and Response



Low cost, no cost actions, especially shelter, evacuation, and rally point procedures should be the first step. And these should be updated as the building is reconfigured for updated operations.

For sheltering-in-place the conference room will require 3 filter/pressurization units on the roof to overpressurize the Conference Room. This will allow a longer shelter-in-place strategy, but NOT at a low cost.

Protective evacuation hoods are cheaper than overpressurization systems, but may not work with all agents with which personnel may contend. Recommend labeling the evacuation hoods for their design contaminants (or label them for the NON-DESIGN contaminants, whichever list is smaller).

INSTRUCTOR NOTES	CONTENT/ACTIVITY
	Transition This completes the Building Design for Homeland Security instruction. In this course, you have learned how to perform a multihazard risk assessment of a building and have become familiar with the key concepts of how to protect buildings from manmade threats and hazards: • Asset Value • Design Basis Threat • Levels of Protection • Layers of Defense • Vulnerability Assessment • Risk Assessment • Mitigation Options Using the approach and guidance provided in **FEMA 426 / FEMA 452**, the majority of building owners should be able to complete a risk assessment of their building in a few days and identify the primary vulnerabilities, mitigation options, and make informed decisions on the ability of their building to survive, recover, and operate should an attack or event occur. The next instruction unit will cover how to teach this course by covering basic Train-the-Trainer concepts and the support requirements for this course.

INSTRUCTOR NOTES	CONTENT/ACTIVITY
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UNIT XII-A CASE STUDY ACTIVITY: PREPARATION AND PRESENTATION OF GROUP RESULTS

In this activity, students work with their groups to finalize their assessments, decide on high priority risk concerns, determine appropriate mitigation measures and present findings to the class.

Requirements

1. Based on findings from the previous activities completed in the previous instruction units, complete the following table.

2. Be prepared to present conclusions and to justify decisions to the class in a 5-7 minute presentation.

Prioritized Asset-Threat/Hazard Pair of Interest	Requirements to Mitigate	Rationale
Car Bomb Blast/Site and Building	Protect front entrance from car bomb blast – 82-foot stand-off Use planters, plinth walls, landscaping FRF film on windows or replace with laminated glass Consider closing in overhang area	*DoD Standard 1, 8, and 10 apply in that there are stand-off concerns, window strength concerns, and architectural feature / building envelope concerns.*
Truck Bomb/Site	Protect rear parking area from truck bomb Use chain link gate, vehicle pop barriers, pre-screening away from building Consider closing in overhang area	DoD Standard 1 DoD Standard 6 DoD Standard 8

Chemical/Mechanical-HVAC	Install emergency shut down switch, protect outside air intake Evaluate carbon filters for chlorine type spills Upgrade filters to MERV 11 to remove gasoline plume and other particulates	DoD Standard 17 DoD Standard 18 DoD Recommendation 6
Biological/Mechanical-HVAC	Evaluate UVGI Evaluate a standalone mailroom on separate HVAC zone	DoD Standard 13 DoD Standard 17 DoD Standard 18
Radiological/Site	Install emergency shut down switch on HVAC Upgrade filters to MERV 11 to remove radioactive particulates	DoD Standard 17 DoD Standard 18
Blast Site	Separate front lobby from interior office space with security door if primary mail entry point is the lobby area Distribute internal functions for redundancy Evaluate other utility connections/distribution capability for redundant feed to the building	DoD Standard 11 DoD Standard 19 DoD Recommendation 2 DoD Recommendation 3 DoD Recommendation 12 DoD Recommendation 13 DoD Recommendation 15
Blast/Structural and Building	Strengthen overhead anchorage elements - Heaters	DoD Standard 15 DoD Standard 20

Blast or Armed Attack/Mechanical	Fire sprinklers - Install annunciator panel and go to zones, dual stage in data center, clean agents versus water Chill water - Install backup piping to primary air handling units Install exhaust fan in UPS room (lead acid batteries) Place bollards around or relocate natural gas meters	DoD Standard 16 DoD Standard 17 DoD Standard 18 DoD Standard 19
Blast or Armed Attack/Electrical	Primary Bus - Separate Computer Center Bus from Support Bus Place bollards or fencing around transformers Increase size of generator fuel tank	DoD Standard 18 DoD Standard 19
Cyber Attack and Blast/IT Systems	Store backup tapes/data at least 10 miles away Identify alternate telecom carrier circuits and availability Conduct full extended load test of emergency power/UPS system	DoD Standard 18 DoD Standard 19 DoD Standard 20
Blast or Armed Attack/Physical Security	Raise height of rear perimeter fencing Evaluate installing a small Security Operations Center and increase monitoring/awareness of exterior Upgrade CCTV system to digital and DVR and install	DoD Standard 1 DoD Standard 2

	additional cameras to view front parking, lobby, and loading dock	
Blast and CBR/Emergency Operations/Disaster Recovery	Post shelter and evacuation procedures Identify rally point at site away from building Use Computer Center for shelter-in-place Acquire personal protective evacuation hoods	DoD Standard 22 DoD Recommendation 14