Unit XII (C)

COURSE TITLE Building Design for Homeland Security for Continuity of Operations (COOP) Train-the-Trainer

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 highest risks identified by the assessment groups, the vulnerabilities identified for these risks, and recommended mitigation measures to reduce vulnerability and risk.
   a. Prioritize the top three risks as well as the top three recommended mitigation measures with rationale and justification. This includes any consideration for changes to the Risk Matrix from knowledge gained in Units IX, X, and XI.
   b. Identify all requirement gaps that need to be provided for Cooperville Information / Business Center to be a fully functional COOP facility supporting the U.S. Department of Artificial Intelligence.

REFERENCES

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings:*
   a. Pages 2-50 to 2-58
   b. Pages 3-50 to 3-52
   c. Chapter 5
   d. Appendix D
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 C: COOP, Cooperville Information / Business Center

4. Student Manual, Unit XII (C) (info only – do not list in SM)
5. Unit XII (C) visuals (info only – do not list in SM)

REQUIREMENTS

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings* (one per student)
2. FEMA 452, *Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings* (one per student)
3. Instructor Guide, Unit XII (C)
4. Student Manual, COOP Case Study (C) (one per student)
5. Overhead projector or computer display unit
6. Unit XII (C) visuals
7. Risk Matrix poster and box of dry-erase markers (one per team)
8. Chart, paper, easel, and markers (one per team)

UNIT XII (C) OUTLINE

PREPARING TO TEACH THIS UNIT

- **Tailoring Content to the Local Area:** There is no specific content that can be linked to the local area. All actions of this instruction focus on the Case Study, Appendix C, Cooperville Information / Business Center.

  The Instructor will review the Case Study, Appendix C, Cooperville Information / Business Center, DoD Antiterrorism Standards, DHS Interagency Security Criteria, and understand the parameters for the Design Basis Threat and Levels of Protection and their impact upon the assessment. Additionally, review of the school solution mitigation measures, blast analysis, CBR analysis, and costs will ensure a smooth presentation in a time-constrained environment.

The first part of this instruction unit is not so much to repeat the Case Study contents of Unit 1, but to provide an opportunity for review and allow questions before students prepare their presentations within their assessment groups.

- **Optional Activity:** There are no optional activities in this unit.
- **Activity:** The students will prepare and present the top three risks identified by the assessment group, the vulnerabilities identified for these risks, and the top three recommended mitigation measures to reduce vulnerability and risk. The group will prioritize the top three risks as well as the top three recommended mitigation measures with rationale and justification. Includes any consideration for changes from the knowledge obtained in Units IX, X, and XI. The students will also present any COOP requirements gaps identified in the CI/BC building that are needed to support US Department of Artificial Intelligence Requirements.
- Refer students to their Student Manuals for worksheets and activities.
- Direct students to the appropriate page (Unit #) in the Student Manual.
- Instruct the students to read the activity instructions found in the Student Manual.
- Tell students how long they have to work on the requirements.
- While students are working, <u>all</u> 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. Also, monitor each group for full participation of all members. For example, ask any student who is not fully engaged a question that requires his/her viewpoint to be presented to the group.
- At the end of the working period, reconvene the class. Ask for volunteer groups to determine the order of presentation. Capture the answers provided by the students for future update of the course.
- After the students have completed their presentations, **as time permits**, present the "school solution" mitigation measures, blast analysis, CBR analysis, and associated costs and decision process. Be prepared to answer any student questions.
- Ask for and answer questions.

<u>Editor Note</u>: Two methods have been used in Instructor Guides to ensure the slide designation and slide thumbnail in the left column aligns with the Content/Activity in the right column.

(1) Highlight row by placing cursor in left column until arrow shifts to right, Tab <Insert>, <Break>, <select Page Break>, <OK>

(2) Highlight row as in (1), right click on highlighted row for menu, <Table Properties>, Tab <Row>, remove check in box <Allow row to break across pages>

(3) Alternate for (2), highlight row, click on <Table> at top of screen, <Table Properties> and continue like (2)

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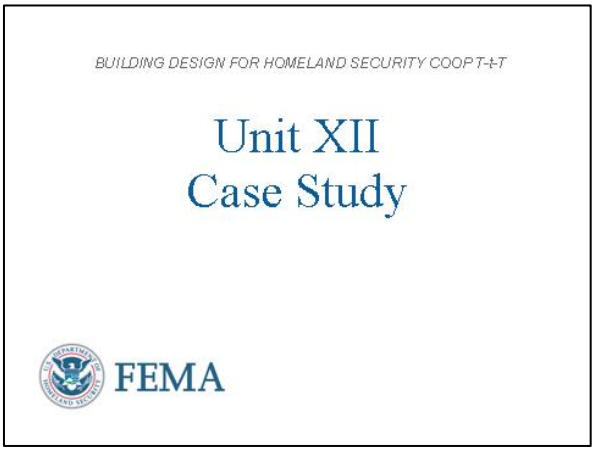
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-C-1	**Introduction and Unit Overview**
	This is the Unit XII Case Study activity. This unit will review the Cooperville Information / Business Center site and building portfolio, DoD Antiterrorism Standards, DHS Interagency Security Criteria, and the parameters for the Design Basis Threat and Levels of Protection. Students will prepare and present the top three risks identified by the assessment group, the vulnerabilities identified for these risks, and the top three recommended mitigation measures to reduce vulnerability and risk. The groups will prioritize the top three risks as well as the top three recommended mitigation measures with rationale and justification. Consider any changes to the Risk Matrix due to knowledge gained in Units IX, X, and XI..
VISUAL XII-C-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-C-3

Cooperville Information / Business Center

The Case Study will be a comprehensive review and practical application of **FEMA 426 / FEMA 452**.

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)

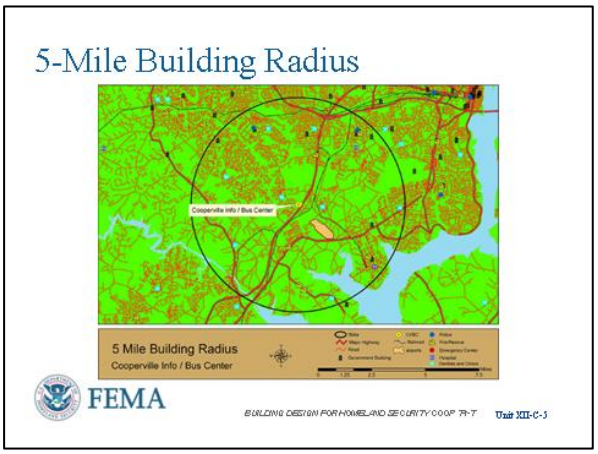
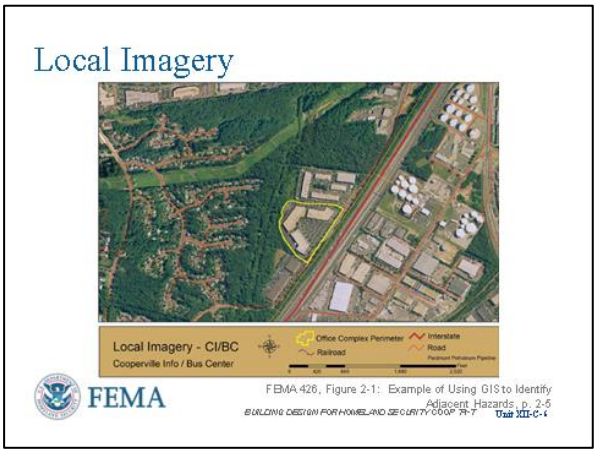
VISUAL XII-C-4

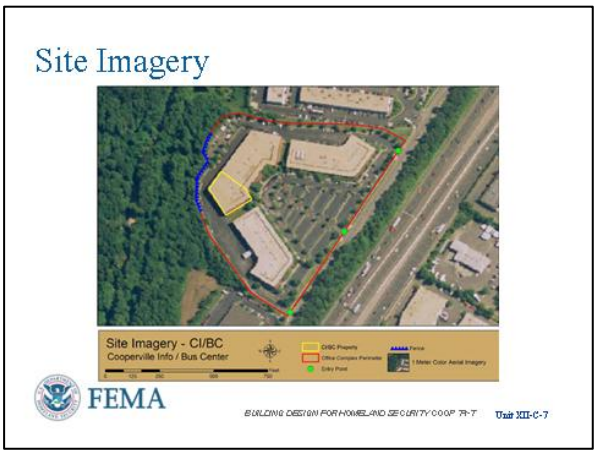
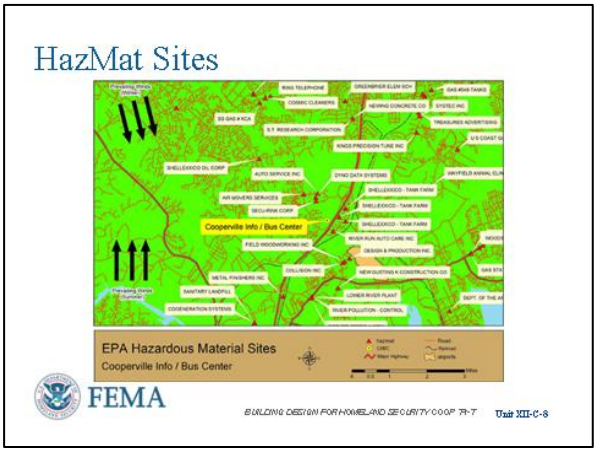
Cooperville Information / Business Center

The Cooperville Information / Business Center supports approximately 1,000 users and 100 applications as a primary data center and as a disaster recovery backup site. It also provides temporary office space as required by regular and traveling clients.

CI/BC has over 75 employees and approximately 40 employees are in the building during shift change.

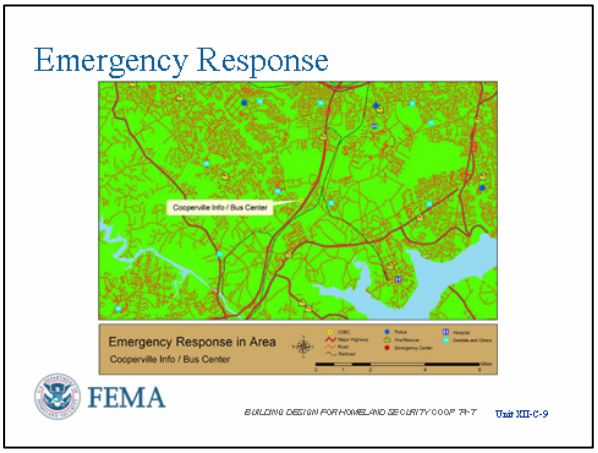
- Regional computer center
- Suburban business park
- Customers and neighbors

INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-C-5	**5-Mile Building Radius**
	The Cooperville Information / Business Center 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 CI/BC building.
VISUAL XII-C-6	**Local Imagery**
	The office building is part of a corporate business park. CI/BC 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. CI/BC has a large dumpster located at the rear of the loading dock area approximately 50 feet from the building. CI/BC receives the mail and packages at the front office lobby desk. Large packages and equipment are delivered to the rear loading dock. CI/BC 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 interstate highway and there are a number

INSTRUCTOR NOTES	CONTENT/ACTIVITY
	of storage tanks, manufacturing and production facilities, and other commercial properties across the interstate.
VISUAL XII-C-7	**Office Building (Site Imagery)**
	The CI/BC 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 partially 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-C-8	**HazMat Sites**
	There are a significant number of hazardous waste sites in near proximity to the CI/BC 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**

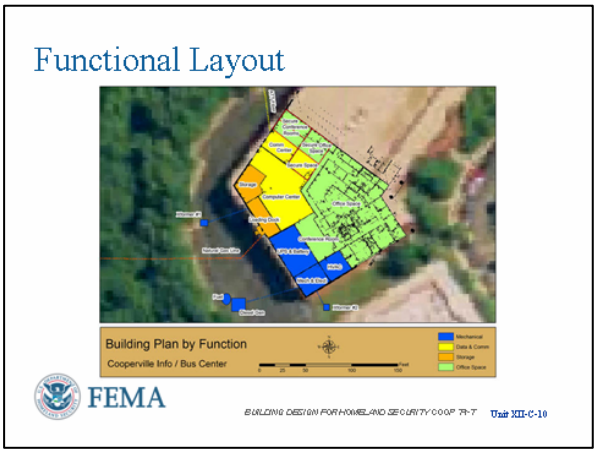
VISUAL XII-C-9



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 CI/BC building complex and the site is served by fire mains with a hydrant located approximately 200 feet from the CI/BC office.

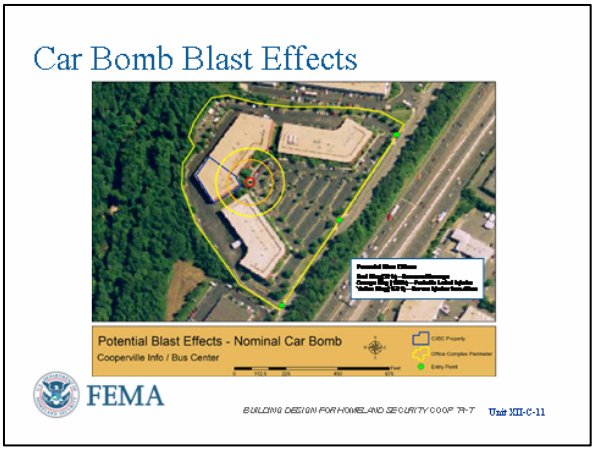
VISUAL XII-C-10



Functional Layout

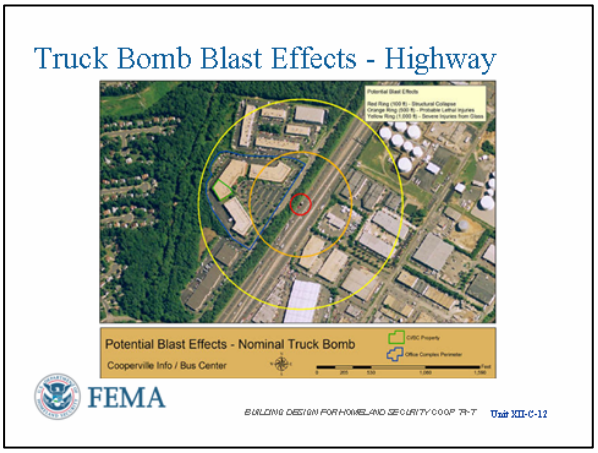
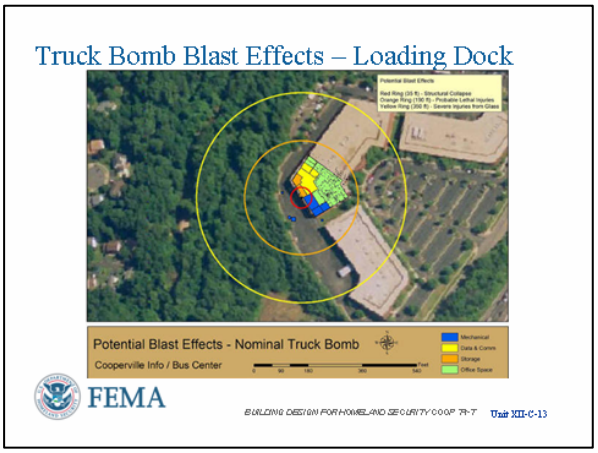
- Downstairs: Computer Center, Communications, Storage, Secure Space, Conference Rooms (Secure and Unclassified) and Business Center (Office Space)
- Downstairs: Highbay, loading dock, mechanical and electrical (M&E) room, HVAC room
- Upstairs: Executive Offices and Staff

VISUAL XII-C-11

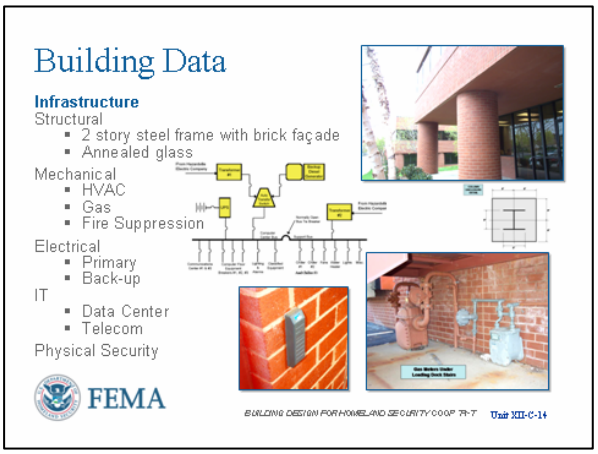


Car Bomb Blast Effects

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 over 50 percent glass and has an 8-foot overhang. The terrain slopes upward from the parking lot to the main entrance, and landscaped with flowerbeds and trees. Key staff and Business Center clients would probably receive severe

INSTRUCTOR NOTES	CONTENT/ACTIVITY
	injuries and administrative functions destroyed, but the Computer Center and Communications functions would likely survive relatively intact.
VISUAL XII-C-12	**Truck Bomb Blast Effects - Highway**
	A truck bomb detonation occurring on the interstate would also significantly damage the CI/BC building, primarily glass breakage and potentially some structural damage. If the truck bomb were to detonate near the tank farm, the ensuing plume would impact the CI/BC building.
VISUAL XII-C-13	**Truck Bomb Blast Effects – Loading Dock**
	A truck bomb detonation at the rear of the CI/BC building at the loading dock would result in significant structural damage and potential localized collapse. The blast would greatly affect the Computer Center, Communications, and other critical functions. Critical infrastructure would also be seriously affected, including the mechanical/electrical room.

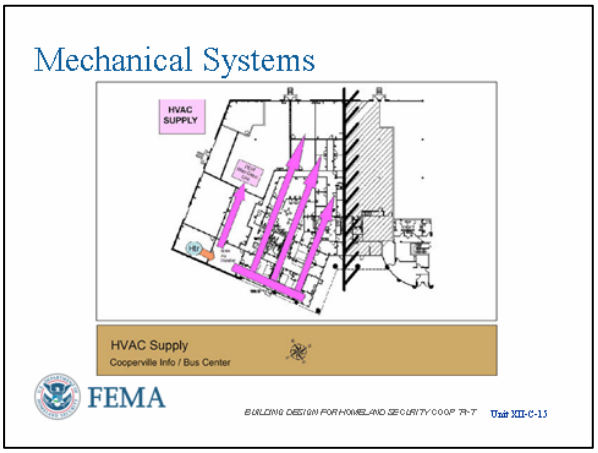
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-C-14	**Building Data (Infrastructure)**



- Structural -- two-story steel frame structure with a brick facade and annealed glass.
- Mechanical – HVAC cooling towers, natural gas, and water sprinkler system
- Electrical – backup generator
- IT – computer center and communications
- Physical Security – access control

VISUAL XII-C-15

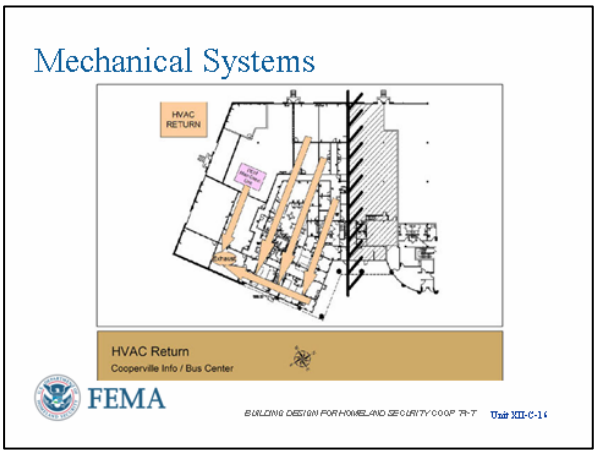
Mechanical Systems – HVAC Supply

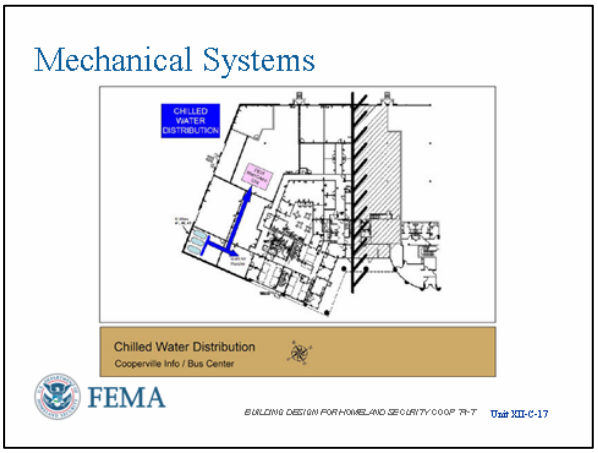


The air used to heat or cool the CI/BC building is filtered in the HVAC room using standard industrial grade MERV 8 filters. Outside make-up air is brought in through a vent in the wall located at ground level.

The Computer Data Center has two additional air cooling units located in the Data Center and uses the main chilled water supply. The Data Center maintains a slight net positive pressure compared to the rest of the building.

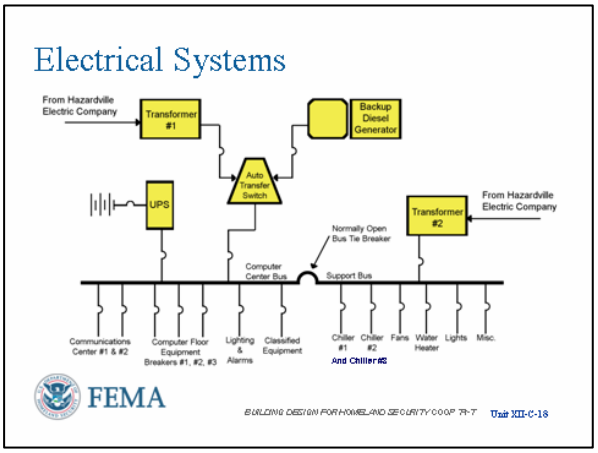
INSTRUCTOR NOTES	CONTENT/ACTIVITY
VISUAL XII-C-16	**Mechanical Systems – HVAC Return** The return air for the main office space has sufficient room inside the ductwork and mechanical room area to incorporate additional filters and equipment.
VISUAL XII-C-17	**Mechanical Systems – Chilled Water** Chiller 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. There is one supply and return line between the chiller and the Data Center.





INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

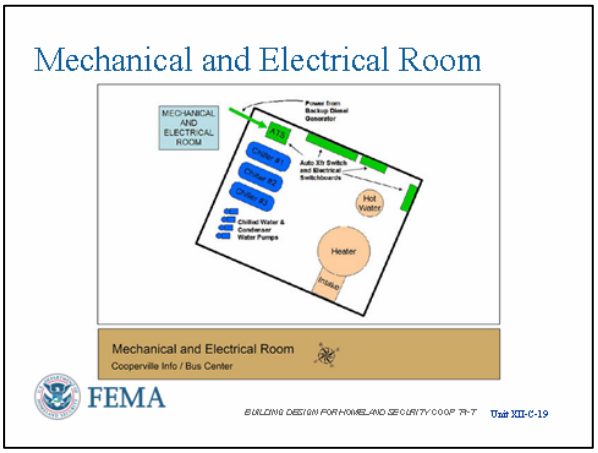
VISUAL XII-C-18



Electrical System

CI-BC'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. A digital energy management system monitors the electrical system and provides indications, alarms, and instructions.

VISUAL XII-C-19



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, but utilities loop around the buildings in the office park, although they connect to the same radial feeder outside the office park.

VISUAL XII-C-20

IT (Information Technology)

The Computer Center is the heart of the Cooperville Information / Business Center (CI/BC) 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>
CI/BC has two T1 lines and one T3 line connected at the demark to ATT's high

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

performance backbone network. The ATT fiber connectivity provides more than enough bandwidth for CI/BC's current needs and planned future expansion.

Telecom and Network Connections:

- Two T1 lines (1.544 Mbps)
- One T3 (45 Mbps)
- Frame Relay
- Narrowband ISDN (64/128 Kbps)

Voice

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

VISUAL XII-C-21

Physical Security

CI/BC 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 CI/BC office is well lit and monitored by older generation analog CCTV cameras.
- The front parking lot is lit, but not monitored.

CI/BC's middle layer of security is the building envelope.

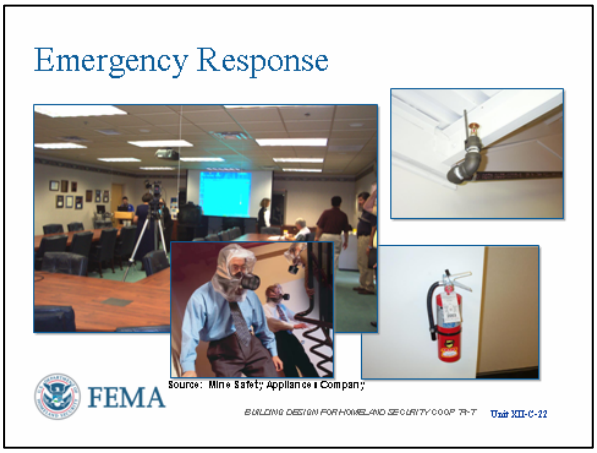
- The building is monitored by door and window alarms, which connect to ADT, the nationwide alarm company.

The innermost layer of physical security involves the Computer Center, Communications Center, and Secure Spaces (offices and conference rooms).

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

- 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.
- The receptionist handles badging of visitors and Business Center clients and works with security to provide appropriate access.
- Access to Computer Center and Communications is through the secure area of the Information Division on the mezzanine.

VISUAL XII-C-22



Emergency Response

In the event of an emergency, CI/BC senior management uses the large conference room as an emergency operations center and shelter-in-place area. 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 CI/BC building. 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.). These stations also dispatch ambulances. Estimates for emergency response time is 8-10 minutes. Fire hydrants are available in the office park.

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

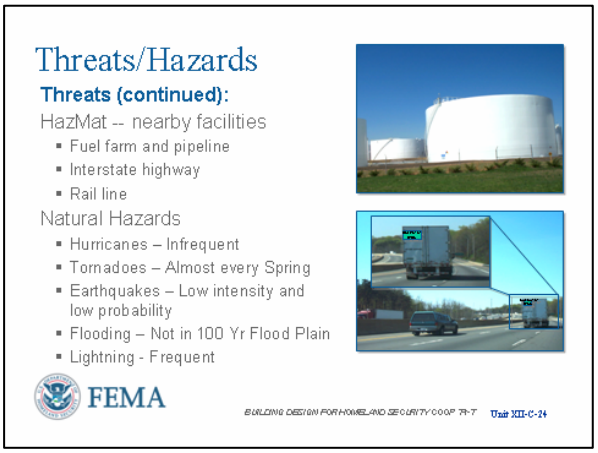
INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-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

VISUAL XII-C-24



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 have also been researched, indicating that this COOP Alternate Facility is in a lower risk area than the DAI Primary Facility.

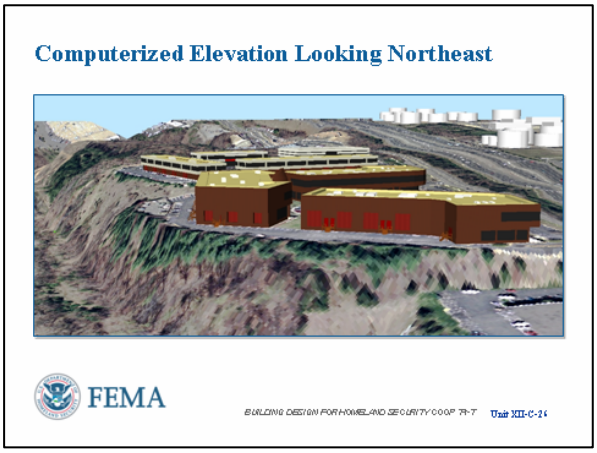
VISUAL XII-C-25

Elevation Looking Northwest

The lay of the land indicates that a fuel spill from the Tank Farm will not get to the CI/BC building, as well as any liquid spill on the Interstate Highway.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

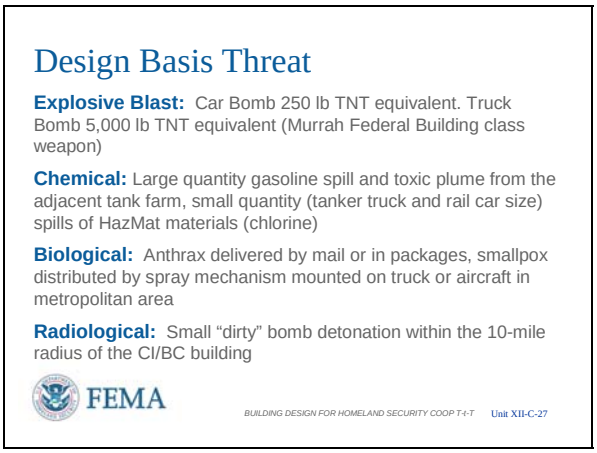
VISUAL XII-C-26



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 CI/BC building. The slope will also tend to direct any gases blown toward CI/BC from the southwest to be propelled up and over the CI/BC portion of the building.

VISUAL XII-C-27



Design Basis Threat

Explosive Blast: Car Bomb – approximately 250 lb TNT equivalent. Truck Bomb – approximately 5,000 lb TNT equivalent (Delivery Truck)

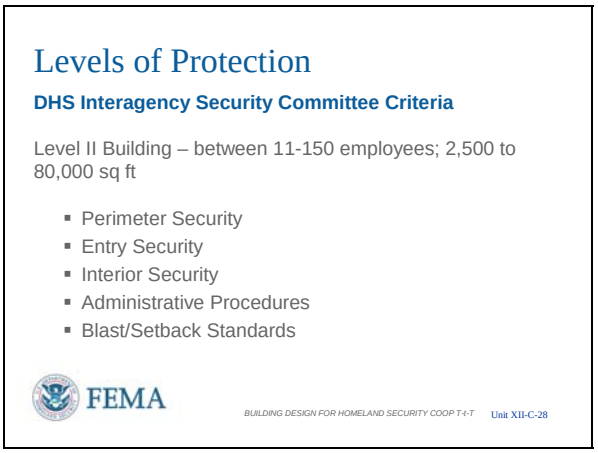
Chemical: Large quantity gasoline spill and toxic plume from the adjacent tank farm, small quantity (tanker truck and rail car size) spills of HazMat materials (chlorine)

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 CI/BC building.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-28

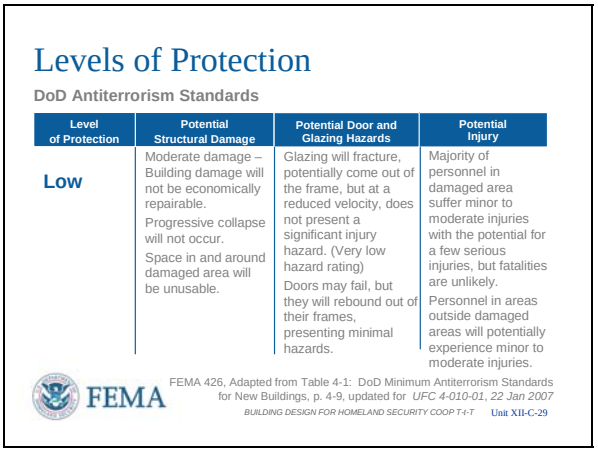


Levels of Protection -- DHS

DHS Level II Interagency Security Committee Criteria

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

VISUAL XII-C-29



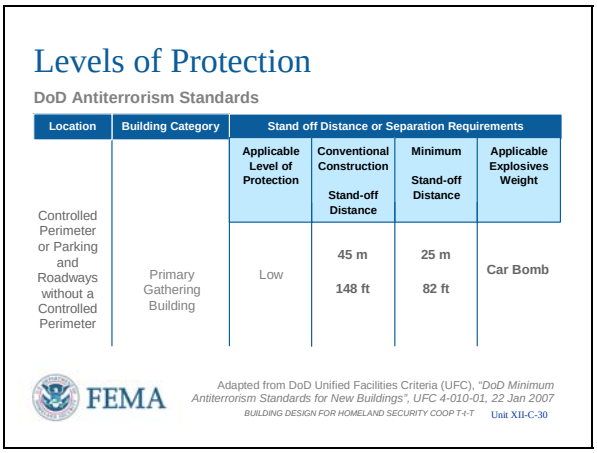
Levels of Protection -- DoD

DoD Low, Primary Gathering Building (more than 50 people regularly in structure)

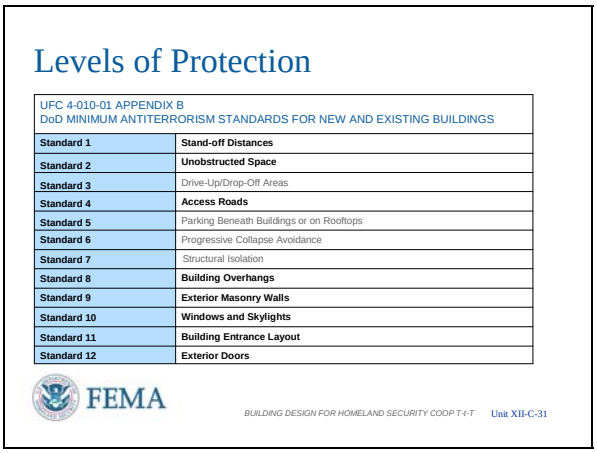
- Potential Structural Damage
- Potential Door and Glazing Hazards
- Potential Injury

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-30



VISUAL XII-C-31



Levels of Protection – DoD (cont.)

DoD Low, Primary Gathering Building Stand-off Distance or Separation Requirements

This is WITHOUT a Controlled Perimeter where VBIEDs (Vehicle Borne Improvised Explosive Devices) would be detected.

NOTE to instructor: While this is one goal, having a Controlled Perimeter at the outer reaches of the parking lot reduces the stand-off distance for vehicles to 25m (82 feet) and 10m (33 feet) in the two respective columns.

Levels of Protection

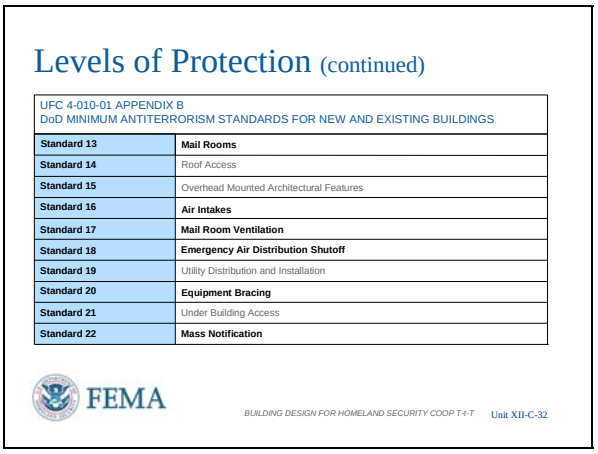
UFC 4-010-01 Appendix B
(22 January 2007)
DoD Minimum Antiterrorism Standards for New and Existing Buildings Standards 1-12

What standards are applicable to the Case Study?

- Std 1 – Stand-Off Distances
- Std 2 – Unobstructed Space
- Std 4 – Access Roads
- Std 8 – Building Overhangs
- Std 9 – Exterior Masonry Walls
- Std 10 – Windows and Skylights
- Std 11 – Building Entrance Layout
- Std 12 – Exterior Doors

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-32



Levels of Protection

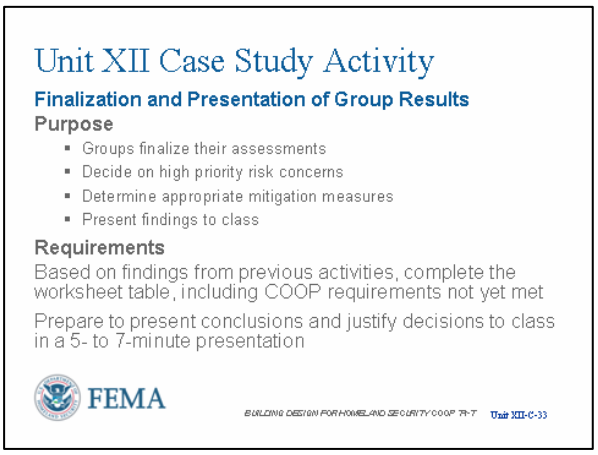
UFC 4-010-01 Appendix B
(22 January 2007)
DoD Minimum Antiterrorism Standards for New and Existing Buildings Standards 13-22

What standards are applicable to the Case Study?

- Std 13 – Mail Rooms
- Std 16 – Air Intakes
- Std 17 – Mail Room Ventilation
- Std 18 – Emergency Air Distribution Shutoff
- Std 20 – Equipment Bracing
- Std 22 – Mass Notification

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

VISUAL XII-C-33



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

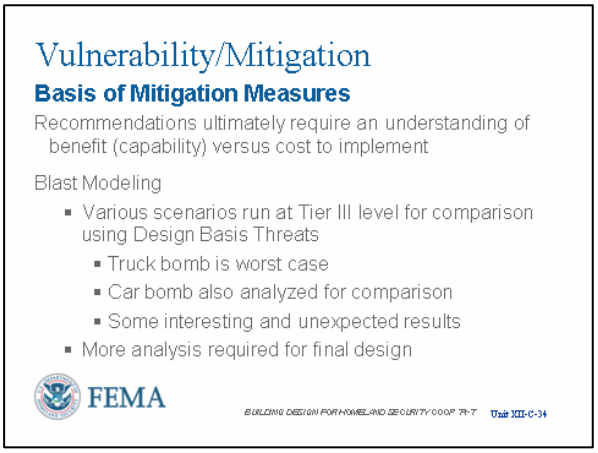
- Working in assessment groups, refer to the Case Study and imbedded GIS portfolio to determine answers to the worksheet questions.
- Then review results to identify vulnerabilities and possible mitigation measures, and rank and prioritize the findings.
- Additionally, refer back to the student activity for Unit I and identify all requirements gaps in the CI/BC building needed to meet COOP Alternate Facility FPC-65 criteria.

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.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-34



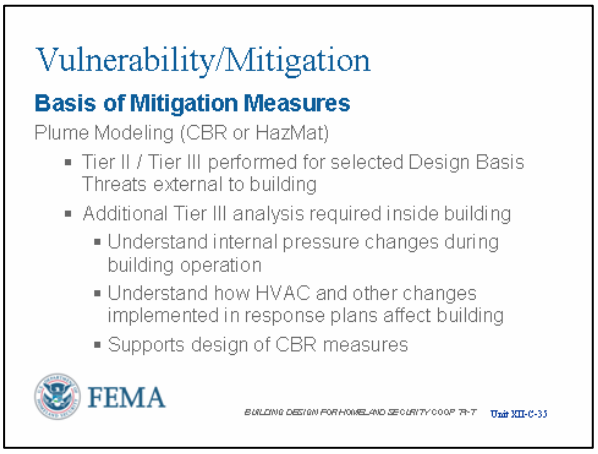
Vulnerability Mitigation – Basis of Measures - Blast

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-C-35

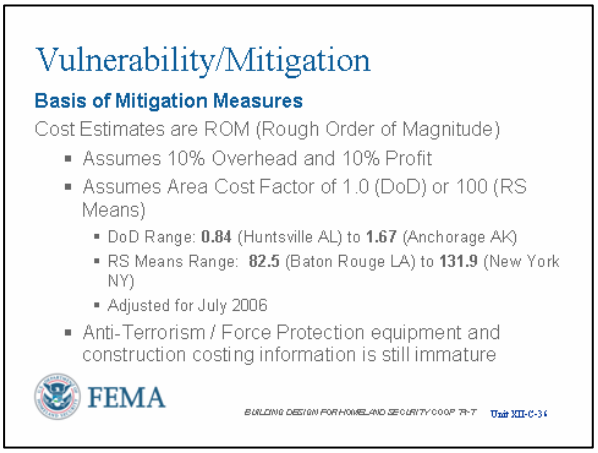


Vulnerability Mitigation – Basis of Measures - Plume

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-C-36



VISUAL XII-C-37

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.

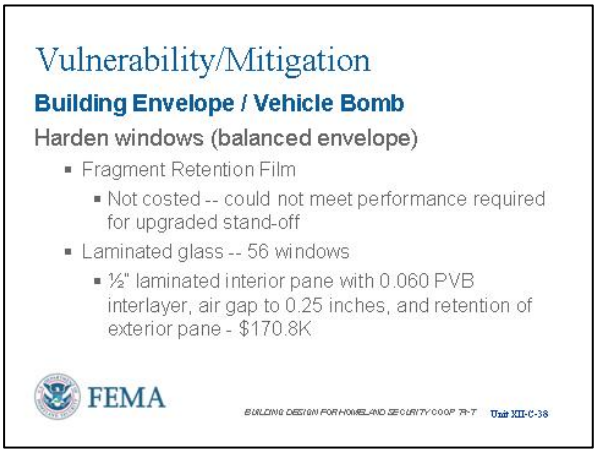
Vulnerability/Mitigation – Site / Vehicle Bomb

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-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.

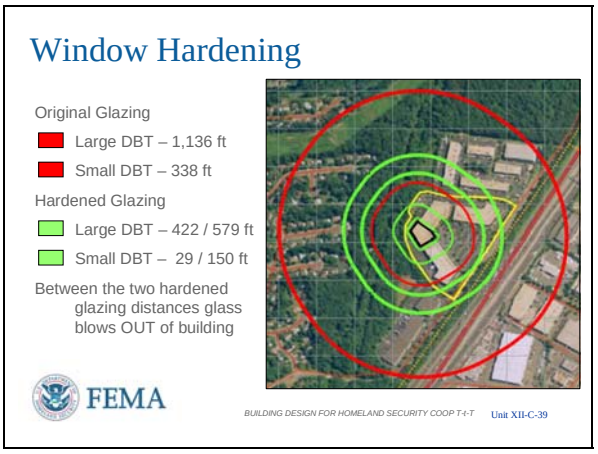
The goal is to achieve a balanced envelope between windows and walls.

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 CI/BC 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-C-39



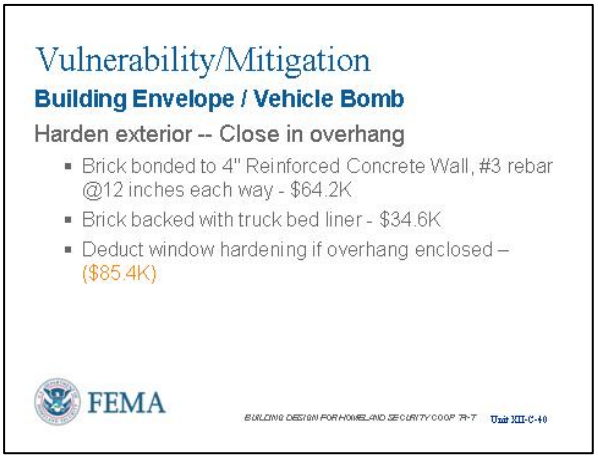
Window Hardening

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-C-40



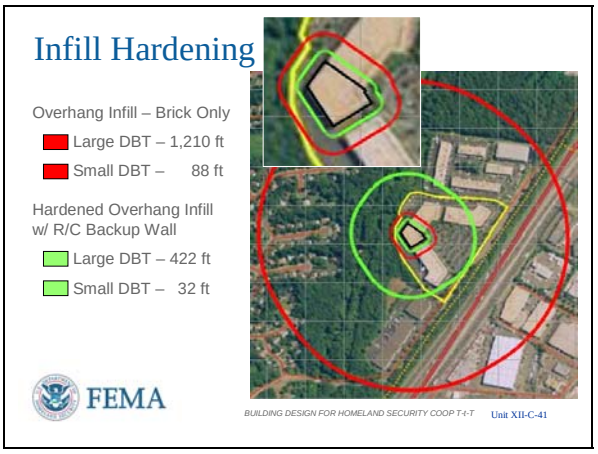
Building Envelope / Vehicle Bomb

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 CI/BC 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-C-41

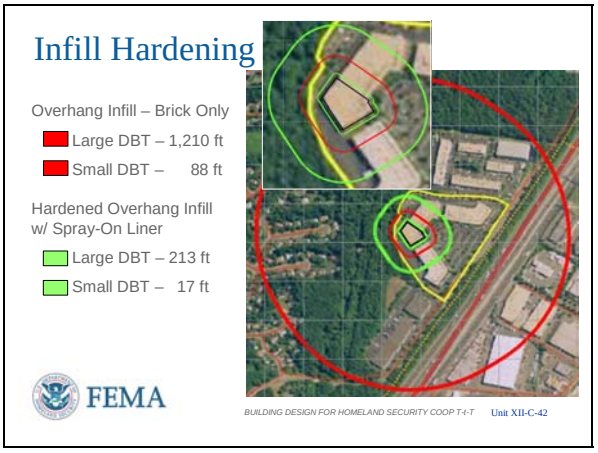


Infill Hardening – R/C Backing Wall

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 CI/BC building.

VISUAL XII-C-42



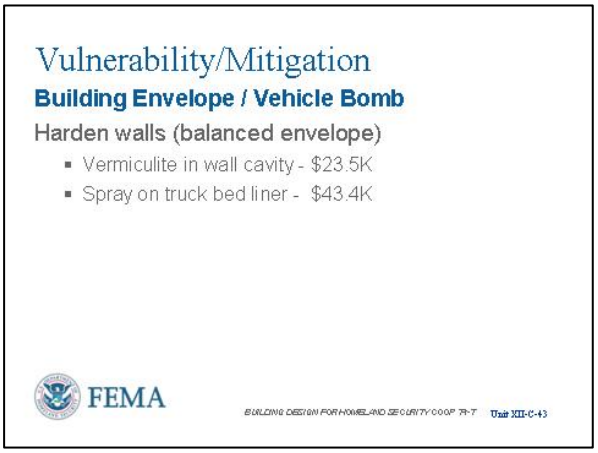
Infill Hardening – Spray-On Polymer Liner

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-C-43



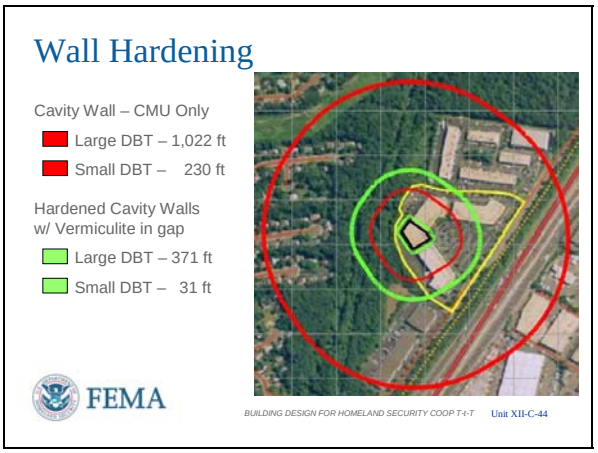
Wall Hardening

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-C-44

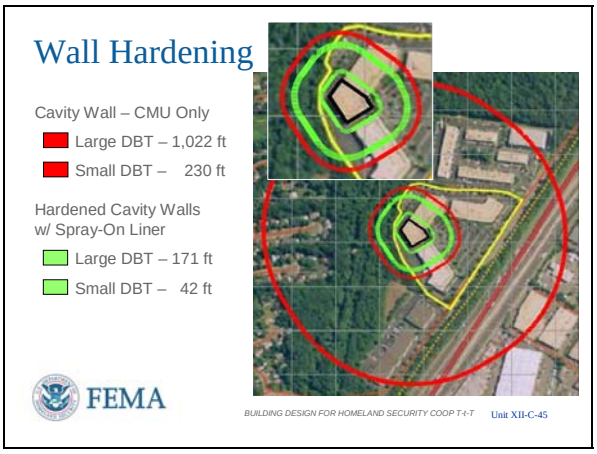


Wall Hardening – Vermiculite

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**

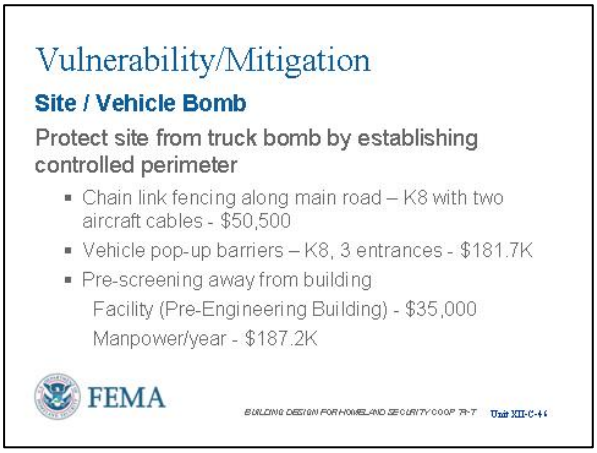
VISUAL XII-C-45



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-C-46



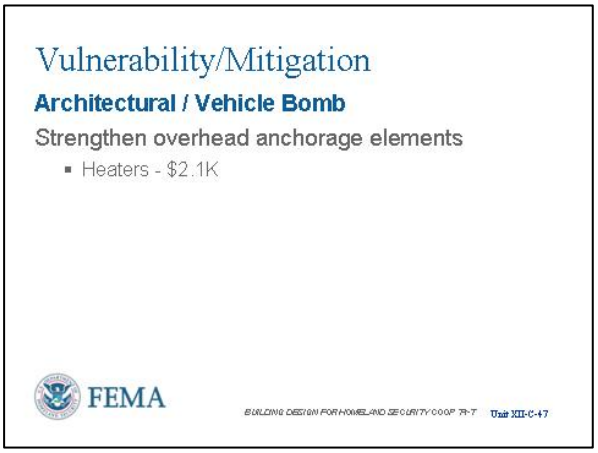
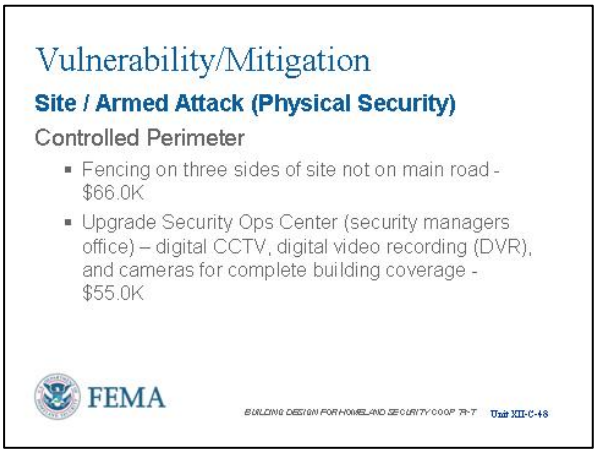
Site / Vehicle Bomb

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-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-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**

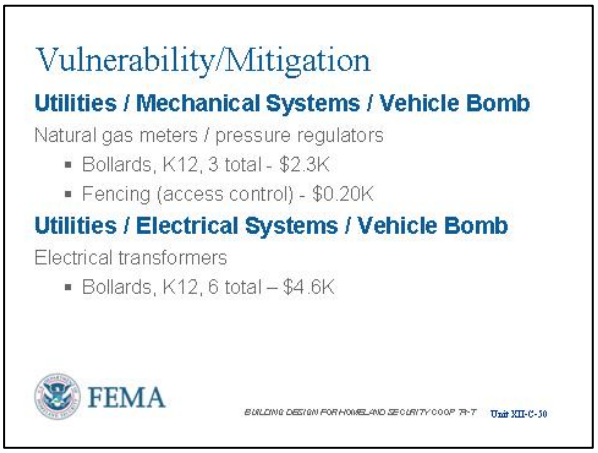
VISUAL XII-C-49

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-C-50

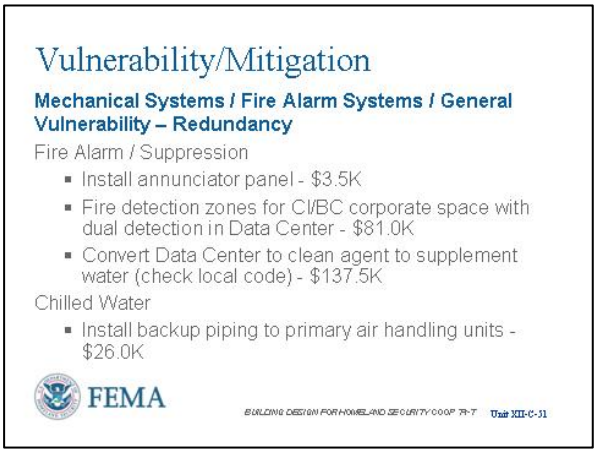


Utilities / Vehicle Bomb

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 CI/BC building. K12 fixed bollards and fencing to prevent approach to these systems needs consideration.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-51



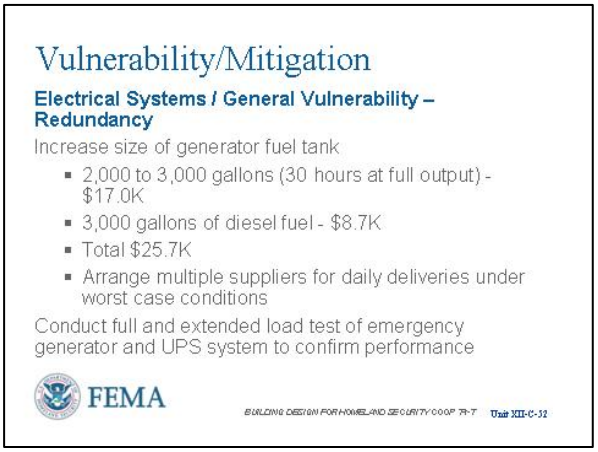
Mechanical / Fire / General Vulnerability - Redundancy

For better control of the Fire Alarm and Fire Suppression Systems, install a fire annunciator panel in CI/BC 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-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.

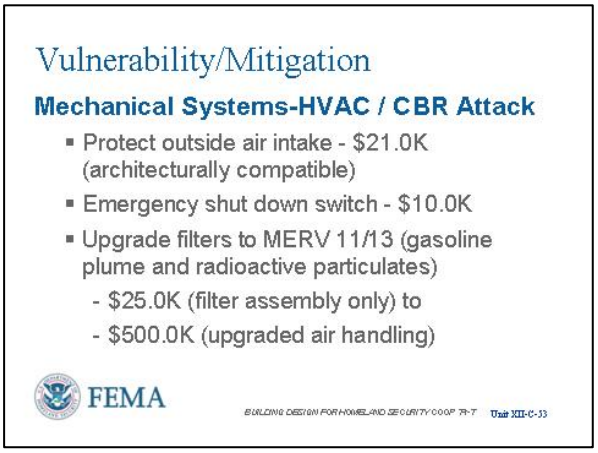
Multiple fuel suppliers should be arranged to prevent a single occurrence (like a utility power outage) from preventing deliveries or fuel supplies should be canvassed to determine if they have backup generators to overcome utility power outages.

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-C-53



HVAC / CBR Attack

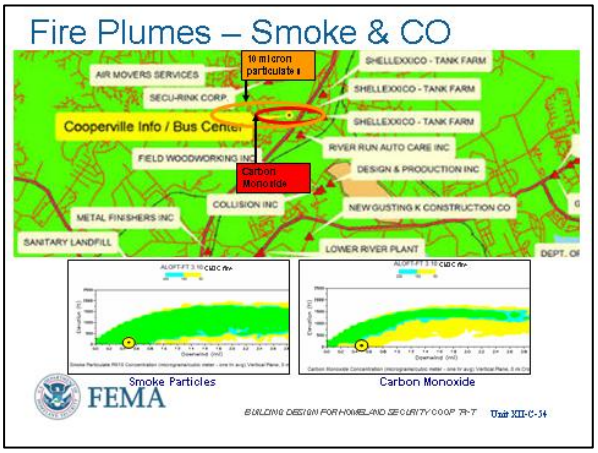
Raising the outside air intake is probable the first action to take to make it less vulnerable to attack and reduce the risk of heavier-than-air agents. This measure is more expensive because it will have to be architecturally compatibility (brick).

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-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.

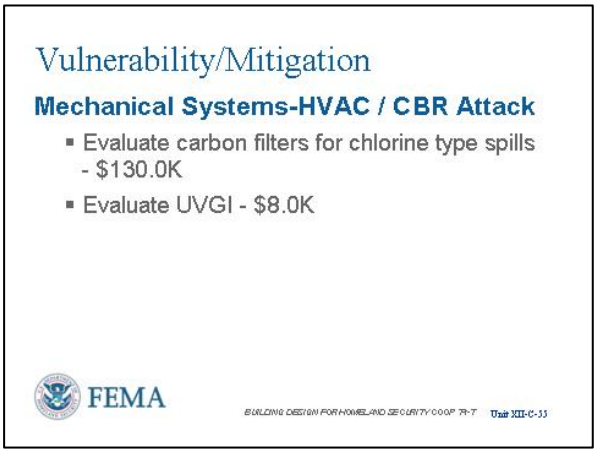
Circles on the lower graphs indicate the approximate location of the CI/BC building.

The smoke particles will be in high concentration as they reach the CI/BC 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.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

VISUAL XII-C-55

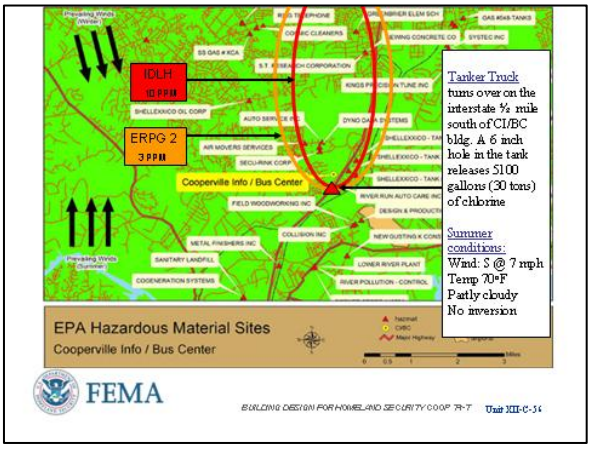


HVAC / CBR Attack

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-C-56



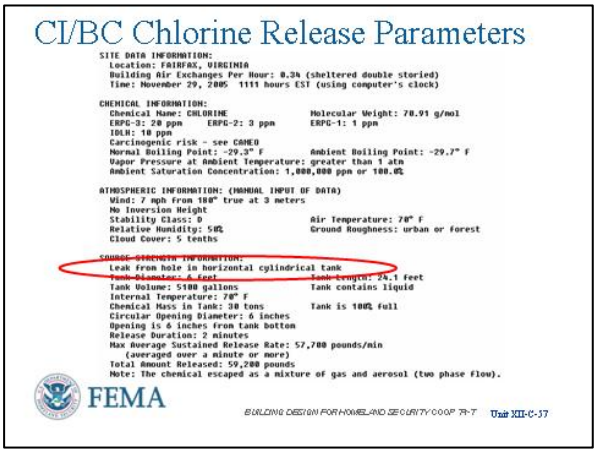
Chlorine Spill – Tanker Truck on Interstate Highway

In this case the prevailing winds are from the south, sending the chlorine plume over the CI/BC 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-C-57



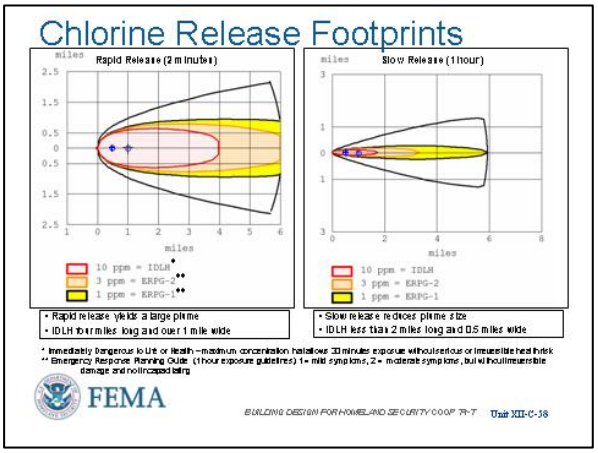
CI/BC Chlorine Release Parameters

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 | **CONTENT/ACTIVITY**

VISUAL XII-C-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.

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.

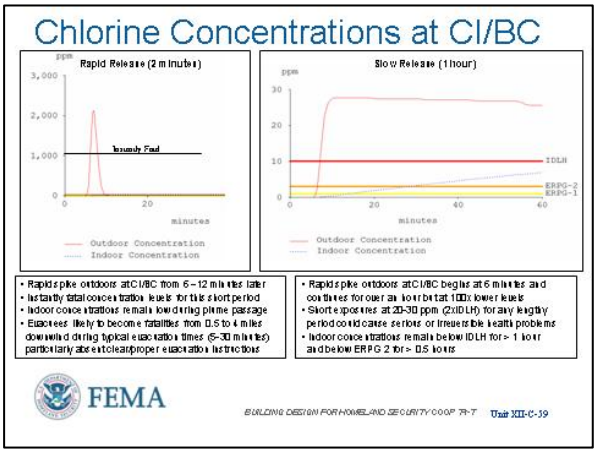
Immediately Dangerous to Life or Health (IDLH) [30 minutes] was defined earlier.

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-C-59

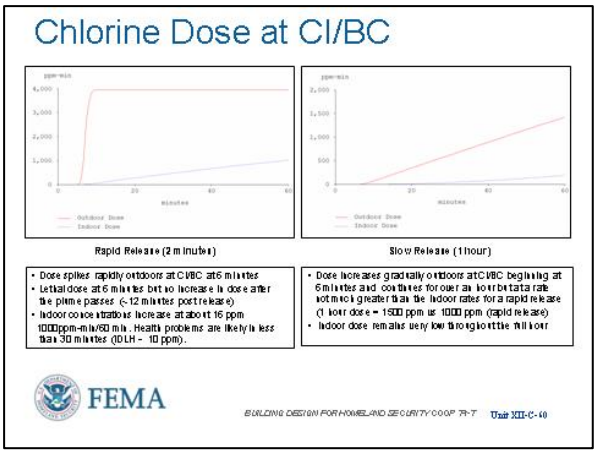


Chlorine Concentrations at CI/BC

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-C-60



Chlorine Dose at CI/BC

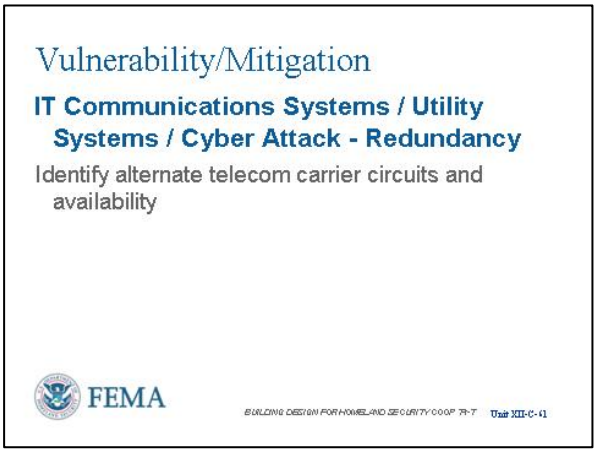
Bottomline: Once again it is clear that remaining indoors is the best option until or unless it is clear evacuation can be accomplished safely. It should be noted that the while the total indoor dose for the slow release is approximately **100 ppm-min** this only equals about 1.6 ppm (concentration) – 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-C-61



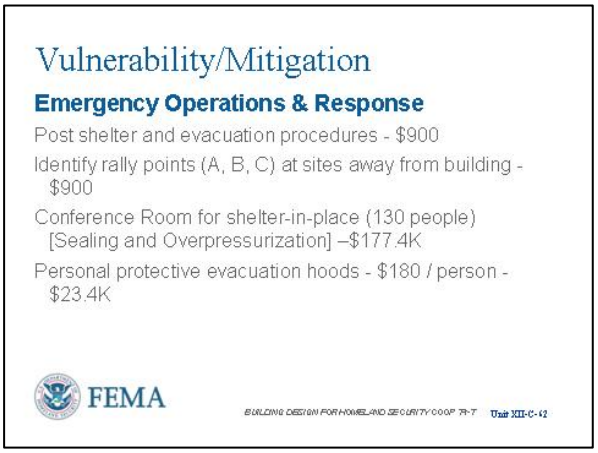
IT Communication Systems – Redundancy

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

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

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

VISUAL XII-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.

UNIT XII (C) CASE STUDY ACTIVITY: PREPARATION AND PRESENTATION OF GROUP RESULTS (COOP Version)

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

The student presenter(s) will decide on the number of asset-threat/hazard pairs to present and the mitigation measures to apply. Of great importance is the rationale for the selection of these high risk asset-threat/hazard pairs and the rationale for the recommended mitigation measures. No Cost / Low Cost recommended mitigation measures are always welcome as procedural changes can derive significant benefit.

In light of limited resources that building owners / decision makers have to work with, the presenter(s) will identify the top three asset-threat/hazard pairs that their assessment identified and the top three mitigation measures that they would recommend to have funded using those limited resources.

Since this facility is also being assessed for COOP capability to support the Federal Agency, identify any requirements that are not currently present in the CI/BC building.

Requirements

Activity #1: Based on findings from the previous activities and understanding of course content, complete the Assessment Team Briefing Summary table on the next page. One entry is provided as an example. Add at least three additional entries. Identify the top three risks and the top three mitigation measures.

Activity #2: Complete the COOP Requirements Gaps table for all COOP requirements gaps identified and recommendations to satisfy / correct them. This table is at the end of this Student Manual Unit.

Activity #3: Select one or two presenters from the assessment team to brief the team's conclusions and recommendations with rationale and justifications. The presentation should be 5-7 minutes in length. Ensure points in activities above are covered.

Assessment Team Briefing Summary

Prioritized Asset-Threat/Hazard Pair	Requirements to Mitigate	Rationale
Priority #: _____ *Envelope Systems / Vehicle Bomb*	*Protect building and internal functions and infrastructure from explosive blast.* *Priority #: _____* *1. Use planters, plinth walls, landscaping and / or reconfiguration of parking to increase standoff.* *Priority #: _____* *2. Harden glazing with Fragment Retention Film on windows or replace with laminated glass as this is the weakest exterior component.* *Priority #: _____* *3. Harden walls by installing vermiculite between wythes so they function as a single system.* *Priority #: _____* *4. Reduce reflective blast pressure by approaching property manager about closing in overhang area.*	Design basis threats include car bomb and truck bomb, with truck bomb more difficult to mitigate • Apply known standards, such as ISC Level II Blast/Setback Standards or DoD Standards 1,8, 9 and 10 / Recommendation 17 • Note that known standards are based upon a design basis threat that may or may not equate to design basis threat selected for the assessment • Increasing stand-off will reduce blast pressure and hardening will reduce blast pressure damage. Enclosing the overhang will significantly reduce reflective blast pressure on the first floor front side. • Fragment retention film can be selected to reduce summer heat gain to reduce air conditioning load. • Vermiculite can add to insulation factor of walls to reduce heating and cooling load on the building.

Prioritized Asset-Threat/Hazard Pair	Requirements to Mitigate	Rationale

***NOTE** to instructor: Due to the variations possible in student responses, there is no benefit in trying to prioritize the mitigation measures identified on pages IG XII-C-21 to IG XII-C-37.*

Referring back to Unit 5, Risk Assessment / Risk Management the following school solution high risks were identified.

***Risk #1**: Cyber Attack upon IT/Communications (630 / 576)*
***Risk #2**: Vehicle Bomb upon Data Center and Communications (480 / 432), but all Functions and Infrastructure is High Risk*
***Risk #3**: CBR Attack upon Data Center, Communications, Engineering/IT Technicians, and Mechanical Systems (320 / 288 / 256)*

Risk #1, Cyber Attack upon Communications, requires specialty personnel that are not specifically building oriented in their needed approach. However, building officials need to understand how this risk interfaces with the building.

Risk #2 and Risk #3 cover most of the mitigation measures identified on the pages mentioned (C-21 to C-37) above as these are the measures that apply to the building and site as designed and constructed.

COOP Requirements Gaps

COOP Requirement Gap	Action to Correct