Unit IX-B

COURSE TITLE Building Design for Homeland Security **TIME** 150 minutes

UNIT TITLE Site and Layout Design Guidance

OBJECTIVES

1. Identify site planning concerns that can create, reduce, or eliminate vulnerabilities and understand the concept of "Layers of Defense".
2. Recognize protective issues for suburban site planning.
3. Compare the pros and cons of barrier mitigation measures that increase stand-off or promote the need for hardening of buildings at risks.
4. Understand the need for keeping up with the growing demand for security design.
5. Understand the benefits that can be derived from appropriate security design.
6. Understand the benefits of adopting a creative process to face current design challenges.
7. Understand the benefits of including aesthetic elements compatible with security and architecture characteristics of building and surrounding environment.
8. Apply these concepts to an existing site or building and identify mitigation measures needed to reduce vulnerabilities

SCOPE

The following topics will be covered in this unit:

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

REFERENCES

1. FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, Chapter 2; Checklist at end of Chapter 1
2. FEMA 430, *Primer for Incorporating Building Security Components in Architectural Design* (when available)
3. FEMA 452, *Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings*, pages 5-1 to 5-16

4. Case Study – Appendix B: Urban, HazardCorp Building
5. Student Manual, Unit IX-B (info only – do not list in SM)
6. Unit IX-B 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 430, *Primer for Incorporating Building Security Components in Architectural Design* (one per student when available)
3. FEMA 452, *Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings* (one per student)
3. Instructor Guide, Unit IX-B
4. Student Manual, Urban Case Study (one per student)
5. Overhead projector or computer display unit
6. Unit IX-B visuals
7. Risk Matrix poster and one box of dry-erase markers (one per team)
8. Chart paper, easel, and markers

UNIT IX-B OUTLINE

PREPARING TO TEACH THIS UNIT

- **Tailoring Content to the Local Area:** This is a generic instruction unit, but it has great capability for linking to the Local Area. Local Area discussion may be generated as students have specific situations for which they would like to determine vulnerabilities or vulnerability rating prompted by points brought up in the presentation.

- **Optional Activity:** There are no optional activities in this unit, except Student Activity questions that are applicable to the selected Case Study (Suburban or Urban) – Urban in this case.

  Group Roundtable / Plenary / Discussion session can occur after Unit IX with regular student activity for Unit IX being combined with Unit X at end of Unit X. In certain course offerings the experience of well-qualified students can enhance learning through cross pollination of lessons learned, impediments, successes, etc. Students may consider doing some parts of Unit IX student activity for homework. [Hidden slide at end of Visuals IX-B cover this and replaces existing last slide.]

  This Group Roundtable is an excellent approach to generating Local Area discussion when the class expertise warrants it.

- **Activity:** The students will continue familiarizing themselves with the Case Study materials. The Case Study is a risk assessment and analysis of mitigation options and strategies for a high-rise commercial office building located in an urban environment. The assessment uses the DoD Antiterrorism Standards and the GSA Interagency Security Criteria to determine Levels of Protection and identify specific vulnerabilities. Mitigation options and strategies will use the concepts provided in **FEMA 426** and other reference materials.

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

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

- Instruct the students to read the activity instructions found in the Student Manual. Note that this Student Activity is extensive with 41 questions and the only way the students can

accomplish it is as a team is with each member taking a block of questions to answer in the first 2/3 rd of available time (30 minutes for 5 to 8 questions/student) and then bringing all team members up to speed in the last 1/3rd of student activity time (15 minutes).

- Since this activity expands upon Unit IV and takes the vulnerability assessment of the building to a greater depth with expanded understanding of problems and mitigation options, the team may consider adjusting the Risk Matrix poster scores for vulnerability rating, with resultant changes to risk rating.

- 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. 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.

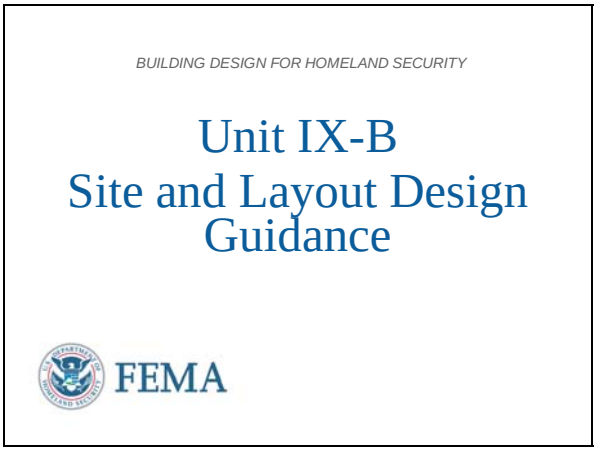
- After the students have completed the assignment, "walk through" the activity with the students during the plenary session. Call on different teams to provide the answer(s) for each checklist section of questions, in summary fashion or select representative questions in each section as the starting points of discussion. 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, allow some discussion of rationale, 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. Note, there are no right or wrong answers, but all answers must be justified with rationale.

- Ask for and answer questions.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

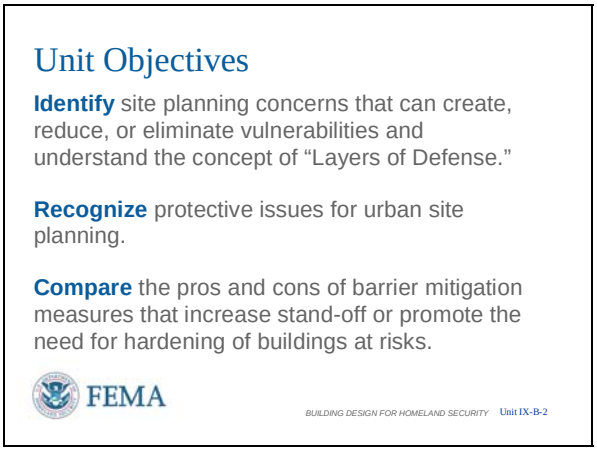
Unit IX-B-1



Introduction and Unit Overview

This is Unit IX, Site and Layout Design Guidance. This lecture will examine site level considerations and concepts for integrating land use planning, landscape, architecture, site planning, and other strategies to mitigate the design basis threats. The students will gain an understanding of the myriad options available to enhance site design taking into account many environmental challenges.

Unit IX-B-2



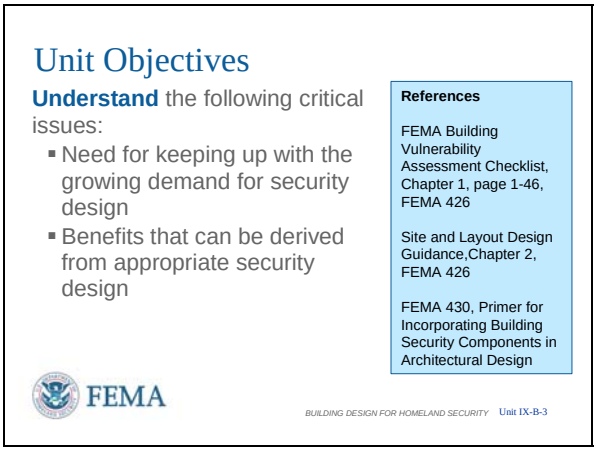
Unit Objectives

At the end of this unit, the students should be able to:

1. Explain the concerns of basic land use planning that affect vulnerabilities to threats and hazards due to terrorism and technological accidents.
2. Understand the concept of "Layers of Defense" which will be applied throughout this instruction unit and the next.
3. Recognize protective issues for suburban site planning so as to aid in selecting appropriate mitigation measures.
4. Compare the pros and cons of barrier mitigation measures that increase stand-off and the need for hardening buildings at risk.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-3

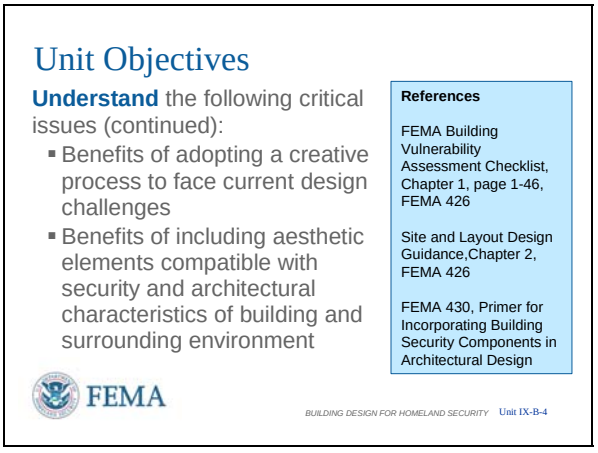


Unit Objectives (cont.)

5. Understand the benefits in keeping up with the growing demand for security design issues. The technology and manufacturing continues to improve.
6. Understand the benefits that can be derived from appropriate security design. Meeting security design can satisfy other requirements at the same time.

FEMA 426 and FEMA 430 contain architectural and site planning considerations for new design or renovation of existing.

Unit IX-B-4

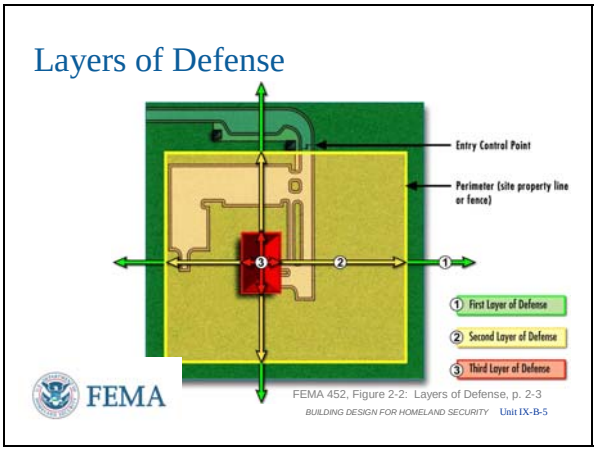


Unit Objectives (cont.)

7. Understand that there are benefits to adopting a creative process to face current design challenges. While many criteria are prescriptive, there are many techniques to meet the spirit, intent, purpose, and performance sought.
8. Understand that design can include aesthetic elements that are compatible with security and architectural characteristics of the building and surrounding environment. Blending security so that it does not look like security so that buildings feel open and friendly should be a goal.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-5



From FEMA 452

The layers of defense is a traditional approach in security engineering and use concentric circles extending out from an area or site to the building or asset that requires protection. They can be seen as demarcation points for different security strategies. Identifying the layers of defense early in the assessment process will help you to understand better the assets that require protection and determine your mitigation options. Figure 2-2 shows the layers of defense described below.

First Layer of Defense. This involves understanding the characteristics of the surrounding area, including construction type, occupancies, and the nature and intensity of adjacent activities. It is specifically concerned with buildings, installations, and infrastructure outside the site perimeter. For urban areas, it also includes the curb lane and surrounding streets. **The building owner has little or no control outside of working with the city or municipality. The first layer of defense should be designed to prevent large bombs or weapons into the site and control access**

Layers of Defense

There should always be multiple layers of defense in order to deter and detect potential threat elements that attempt to access critical assets to their benefit and everyone else's detriment. There may be an additional layer applied around a building when a site is large or one or more additional layers inside a building when a building has functions at various levels of security. The intent is to deter first, then detect sufficiently quickly to have a response force engage the potential threat elements prior to reaching the next layer.

The first layer is the demarcation between control and no control. Outside the first layer the local, regional, and national police and intelligence forces work to track, detain, and arrest the potential threat elements before they can initiate an incident. This should be a controlled perimeter whose intent is to keep large threats outside by deterrence or detect them at this point and prevent entry. If the weapon activates at this layer the effectiveness is reduced if sufficient stand-off exists.

The second layer keeps any smaller weapons that may slip past the first layer from getting close enough to the critical asset to cause damage. This layer should mitigate the effectiveness of tactics, reduce the impact due to insider action, and controls the stand-off from the building for the smaller weapons that may get through.

The first and second layers are primarily the venue for site and layout design, the basis for this unit.

The third layer (usually 3 layers are the minimum found) is the building envelope which also deters and detects, but if an incident occurs this layer is the only one that provides

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

of personnel.

Second Layer of Defense. This refers to the space that exists between the site perimeter and the assets requiring protection. It involves the placement of buildings and forms in a particular site and understanding which natural or physical resources can provide protection. It entails the design of access points, parking, roadways, pedestrian walkways, natural barriers, security lighting, and signage. For urban areas, it refers specifically to the building yard. **The building owner has control of this layer. The second layer controls stand-off from the building which provides protection from weapons that may slip through the first layer of defense.**

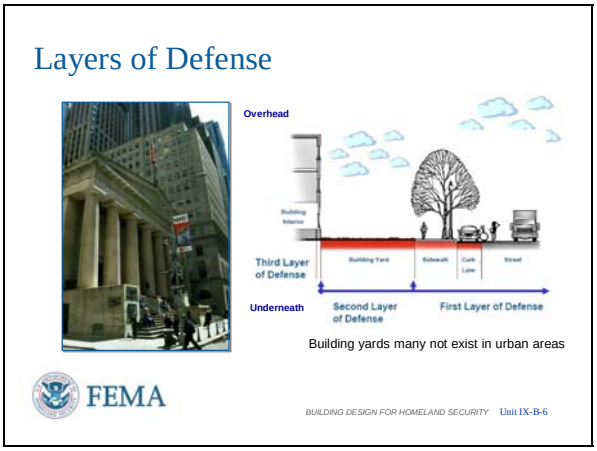
Third Layer of Defense. This deals with the protection of the asset itself. It proposes to harden the structures and systems, incorporate effective HVAC systems and surveillance equipment, and wisely design and locate utilities and mechanical systems. Note that, of all blast mitigation measures, distance is the most effective measure because other measures vary in effectiveness and can be more costly. However, often it is not possible to provide adequate standoff distance. For example, sidewalks in many urban areas may be less than 10 meters (33 feet), while appropriate stand-off may require a minimum of 25 meters (82 feet). **The building owner has control of this layer and its main mitigation measures are hardening against blast and security sensors/CCTV as final access control.**

any level of protection during the tactic and weapon release. The third layer is the venue for building design which will be found in the next instruction unit.

It is important to remember that the nature of any threat is always changing. Consideration should be given to accommodating enhanced protection measures in response to future threats that may emerge. Asset protection must be balanced with other design objectives, such as the efficient use of land and resources, and must also take into account existing physical, programmatic, and fiscal constraints.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-6



The layers of defense are not predetermined and they may vary from site to site and from building to building. If a particular building requiring protection is part of a campus or located in a rural, semi-rural, or urban area, a similar analysis may be applicable for all cases when determining the importance of the asset. However, the security elements necessary to protect the building can be entirely different, depending on its location. The approach suggests establishing different demarcation points in order to identify sound security strategies. The layers of defense concept proposes that each designer study a particular site and determine critical assets that need to be protected and how protection should take place.

Note: Layers of Defense will be during this and the next two instruction units to illustrate the elements:

- Deter
- Detect
- Deny
- Devalue

Layers of Defense

The layers of defense convey the idea of using concentric circles extending out from an area or site to the building that requires protection. They are used as demarcation points for different security strategies. The objective of layers of defense is to create succeeding more difficult layers to security to penetrate, provide additional warning and response time, and allow building occupants to more into defensive positions or designated Safe Haven protection.

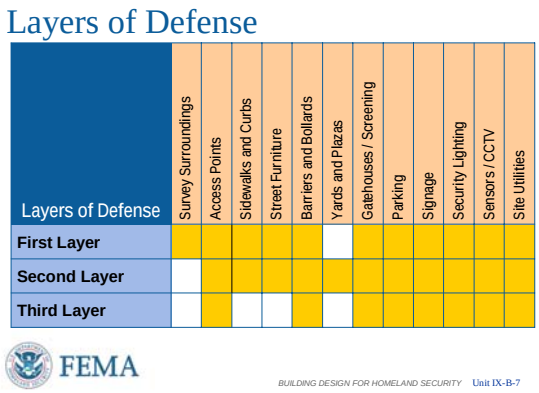
The layers of defense defines sites and projects as follows: *(While the previous slide is a generic explanation, this slide shows the urban situation where there are fewer options to the layers of defense and inherently less stand-off to provide protection)*:

- The first layer addresses the characteristics of the surrounding area and the public realm. It starts at the site perimeter and outward. The building owner has very limited or no control to implement mitigation measures. In the urban environment the first layer consists mainly of the sidewalk, the curb lane, and the street.
  - Protection in this area will require coordination with local municipal police, public works, and urban planning organizations.
- The second layer is concerned with the space and physical barriers at the perimeter of the site to keep explosives at a distance to protect buildings. It comprises the space between the site perimeter and building. The building owner has the authority and control to implement mitigation measures.
  - This layer consists of the building yard or plaza, or may be non-existent with the building directly on the property line.
- The third deals with the protection integral to the building itself. The building owner

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Instructors may want to relate to a castle – First layer of defense is clearing all trees and vegetation out to the effective range of arrows and crossbows. Second layer of defense is moat and initial castle wall. Third layer of defense is the castle keep where the last defensive position exists with its additional walls.

Unit IX-B-7



has certain level of control to implement mitigation measures. Incorporating the protection in initial design, whether blast hardening or security, is the least expensive approach. Retrofitting after the building has been constructed can cost up to 30% of the original construction, if the retrofitting can be done.

- Due to limited stand-off in the urban environment, building hardening, barriers, additional security (sensors, CCTV, and personnel) and street closure are considerations based upon threats and the timing of these threats.

Layers of Defense

There are many mitigation techniques available that can be used at one or more layers of defense. This instruction unit concentrates on site and layout design, thus it looks primarily at the first and second layers of defense and emphasizes the predominant layer of defense considered.

Here are general mitigation considerations for the urban environment and this presentation will follow the flow of these measures from left to right – starting with Survey Surroundings on the left and ending with Site Utilities on the right.

The flow also follows the general assessment approach of looking from outside to inside and going from general information to specific information.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-8

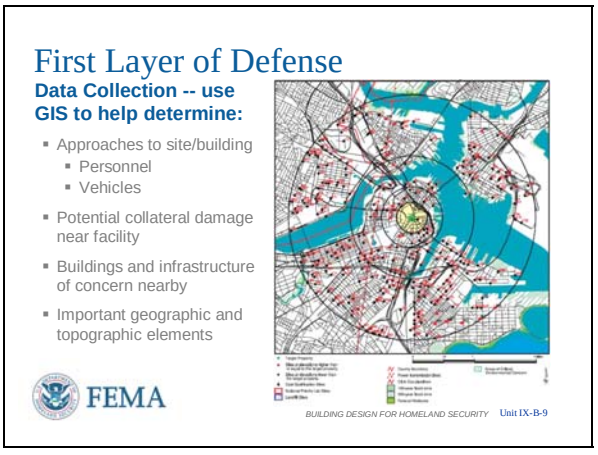
Survey Surroundings – Data Collection

In an urban environment, this action literally considers what may be a threat or vulnerability in all directions.

Understanding the surroundings includes any structures above and under the building and site of interest as to their impact on design or assessment.

- What can fall on the building?
- Where are vantage points for looking into the building?
- Where are different approaches for getting access to the building?
- Problems in installing mitigation measures because of location, temporal changes, or conflicting existing structures?

Unit IX-B-9



Survey Surroundings – Data Collection

A 5-mile perspective around the urban building or site of interest is also needed to understand interaction of the building's critical functions and critical infrastructure against utilities, response capability, and other support provided in the local community. Included should be potential targets in the area to determine the potential for collateral damage and choke points that may restrict response or evacuation capability.

GIS applications are excellent resources that enable designers and building owners to analyze various demographic, hazardous areas, transportation networks, access control points, etc., in order to identify potential threats, hazards, and vulnerabilities. These applications may depict a truer picture of the surrounding situation, allowing decision-makers to take proactive measures to mitigate potential vulnerabilities.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-10

Access Points

The "Ring of Steel" is being installed in a core area of London, England. This is a first layer of defense similar to a military installation where access control and inspection of vehicles occurs at the installation perimeter, which hopefully is very far from occupied buildings. This approach is also being considered for lower Manhattan in New York City.

- Roads entering the city are narrowed and have small chicanes to force drivers to slow down and be recorded by CCTV cameras.
- These roads typically have a paved strip down the middle with a sentry box where police can stand guard and monitor traffic.
- Some roads have been closed to traffic entirely.
- Despite the term "ring of steel", the roadblocks and chicanes are actually created with concrete blocks, sometimes plastic coated, that are wedged together.

The congestion charge zone in London also uses CCTV -- 180 cameras on the edge of the zone, and 50 further cameras placed within it.

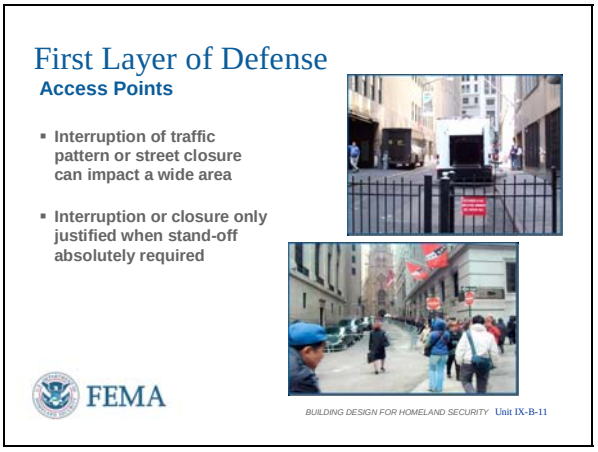
- These cameras are intended to pick up cars that are missed on entry and/or exit and those that are solely moving within the zone.

To create temporary stand-off when a credible threat has been identified:

- Temporary street closures
- Temporary barriers or vetted vehicles along the curb lane (one situation had an armored car company parking around a building to provide a barrier system.
- In all cases work with neighbors, local authorities (police, public works, and community planners) to plan and exercise the options available

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-11



The upper photo is closure of a service alley.

The lower photo shows crowd fencing directing pedestrian traffic to one side of the street.

Access Points

Anytime a traffic pattern is interrupted by accidents, by maintenance and repair crews, or by deliberate street closure, there will always be complaints.

In alleys and typical urban streets adequate stand-off distance is an impossibility without street closure. Service roads are probably the easiest to close as access is only required by the buildings served by the road.

Improvised closures tend to destroy the attractiveness of the street with a combination of security personnel and ugly temporary barriers.

Unit IX-B-12

Upper photo was taken from roof of high-risk building showing a potential high speed approach route to the building, especially after all traffic has passed.

Lower photo shows that the building in the background has a wall and parked cars protecting from a high speed approach, but the entrance to the building on the left is only

Access Points

Controlling the angle of approach and the length of straight-aways is important to provide protection to high-risk buildings.

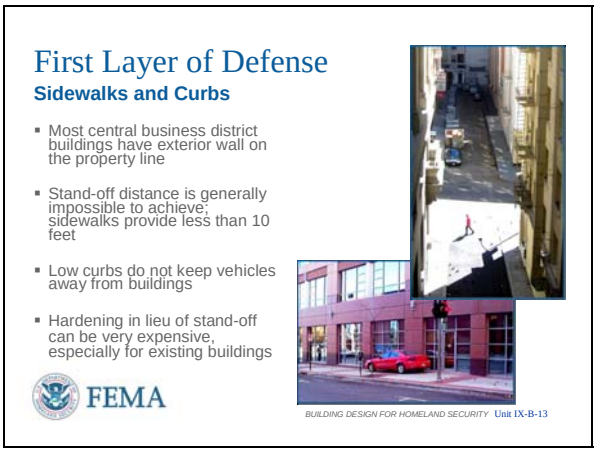
Traffic calming strategies seek to use design measures to cue drivers as to the acceptable speed for an area. These include raised crosswalks, speed humps and speed tables, pavement treatments, build outs, and traffic circles. Additionally, by controlling the angle of approach, requiring turns or providing curves, vehicles must slow down.

In conjunction with traffic calming considerations, appropriate barriers to block moving vehicle attacks should be considered at high-risk buildings.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

protected by the turn required at the bottom of the ramp or not protected at all if traveling the taxi route from behind the building on the right.

Unit IX-B-13



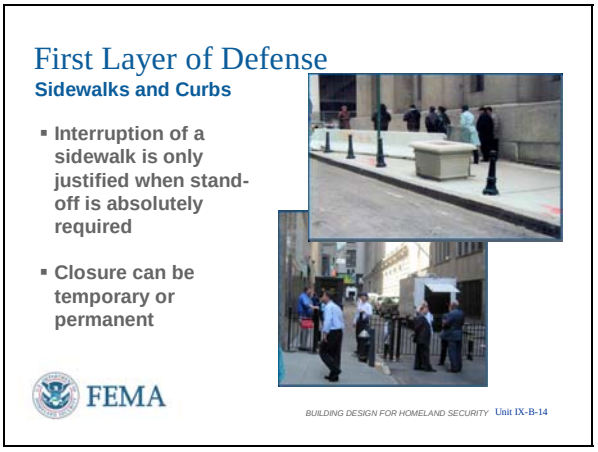
Sidewalks and Curbs

With exterior walls on the property line, the stand-off distance is the width of the sidewalk in many cases.

Low curbs are not a deterrent in keeping vehicles away from buildings as shown in the lower photo.

With little stand-off, increased building security and hardening are the expensive options available.

Unit IX-B-14



Sidewalks and Curbs

Additional examples of interruptions in sidewalks and closure of streets.

- Top photo shows bollards that are spaced so far apart that they cannot keep most vehicles out, so a single planter was placed to fill a gap. Also in the top photo, note the restriction to pedestrian traffic caused by the jersey barrier which would have been equally effective if placed directly behind the bollards or angled with the planter to open up the sidewalk.
- The bottom photo shows pedestrian traffic being controlled into a closed service street.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-15

Sidewalks and Curbs

Sidewalks serve as the common space for pedestrian interaction, movements, and activity. Sidewalks should be open and accessible to pedestrians to the greatest extent possible and security elements should not interfere with circulation particularly in crowded locations

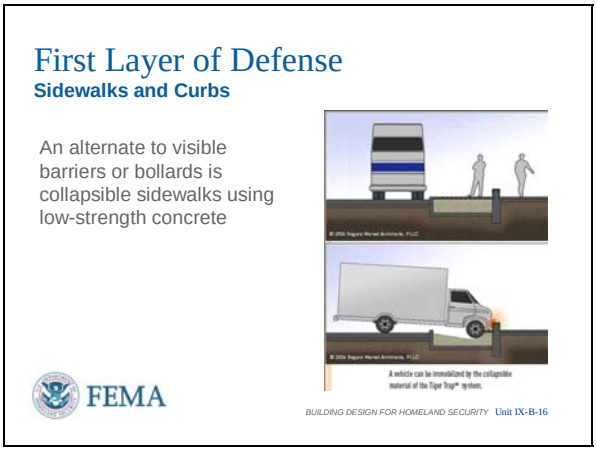
Curbside parking should not be removed unless additional stand-off distance is absolutely necessary for high-risk buildings. Prohibiting on street parking or closing lanes should only be used as a temporary measure during times of increased alert.

High curbs and other measures may be installed to keep vehicles from departing the roadway in an effort to avoid other security counter measures.

- However, jacked up trucks with oversized tires might find the upper photo to be a nuisance, but smaller vehicles with smaller tires, like in Europe, would find it formidable (especially if curb height is at the axle height).
- Watch out for Americans with Disabilities Act requirements at crosswalks when considering high curbs.
- The lower photo shows two rows of jersey barriers that increase stand-off into the street, but drastically reduces the throughput on that street.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-16



Sidewalks and Curbs

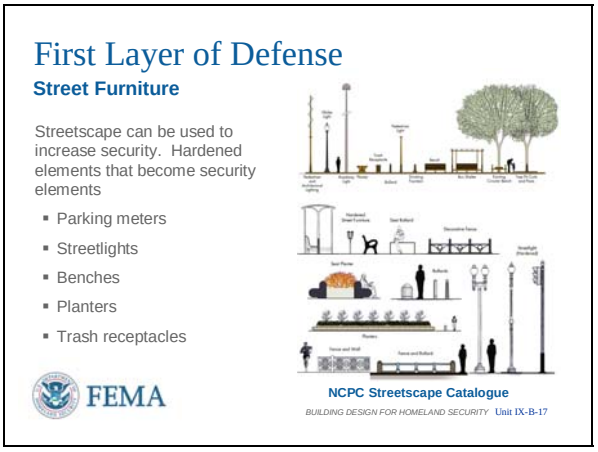
Another unobtrusive approach for providing a vehicle barrier is combining collapsible sidewalk with a small wall that will catch a vehicle bumper. The sidewalk is made of low-strength concrete that takes pedestrian weight but not vehicle weight.

These graphics are of the Rock Twelve Security Architecture Tiger Trap ™ and their product literature information:

- Designed to reduce the impact of security on public space, this innovative vehicle arrest system utilizes a subgrade compressible material that lowers the elevation of an attacking vehicle and a low wall that then halts the lowered vehicle.
- The subgrade compressible material allows the rear wall to be as low as a bench or even completely below grade.
- The compressible material combined with a decorative covering surface supports pedestrian loads, but fails under the weight of a vehicle.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-17



Street Furniture

Planters, bollards or decorative boulders can be designed to resist the impact of a weapon-laden vehicle in a much more aesthetically pleasing manner than a hardened (strengthened) wall or fence. The wall or fence may be more appropriate in a suburban setting, but the hardened street furniture may be the only options in the urban setting.

The streetscape can included hardened versions of parking meters, street lights, benches, planters and trash receptacles that act as barriers to moving vehicles.

The National Capital Planning Commission (NCPC) provides a catalog that shows several examples of hardened streetscape furniture.

Unit IX-B-18

Street Furniture

The scale of the streetscape should be appropriate to its primary users and it can be manipulated to increase the comfort level of desired users while creating a less inviting atmosphere for users with malicious intent.

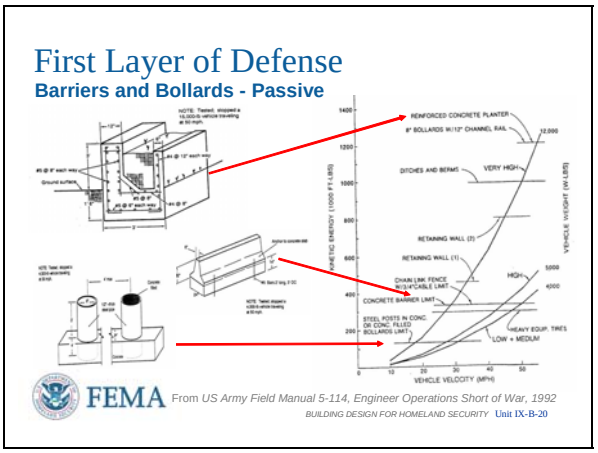
It is critical to maintain important functions such as adequate space for pedestrian circulation and appropriate distances between vehicles and security barriers. The recommended distance to place streetscape security components is at least 24 inches from the edge of the curb to allow for the opening of car doors and pedestrian movement from car to sidewalk.

Well planned barriers can also assist in clearly defining areas of public and private space and in protecting pedestrians from traffic.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-19

Unit IX-B-20



Street Furniture

Numerous urban design elements present opportunities to provide security. Even at the pedestrian scale, certain operational requirements must be accommodated. For example, although efficient pedestrian and vehicle circulation systems are important for day-to-day living, they are also critical for emergency response, evacuation, and egress. Furthermore, despite an emphasis on downsizing the scale of the streetscape, it is critical to maintain the maximum stand-off distance possible between vehicles and structures.

Barriers and Bollards – Passive Barriers

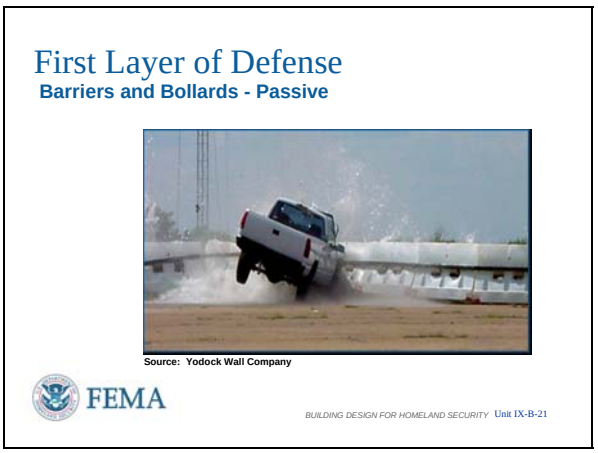
It is one thing to provide a passive barrier; it is another to ensure the barrier will provide the level of protection sought. We have talked about controlling vehicle speed approaching access points and buildings. Essentially, any barrier will stop a given level of kinetic energy which is ½ mass * velocity squared. Thus, the bigger the vehicle and the higher its speed the stronger the barrier must be as shown by this chart.

The greater the barrier mass and reinforcement and the deeper it is connected to the earth, the higher its rating.

Notice the jersey barrier has the rating listed only if there are four rebar pinning the barrier at least 18 inches into pavement. Alternately, a 1-inch steel cable linking the jersey barriers would be an alternate technique, but with some penetration.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-21

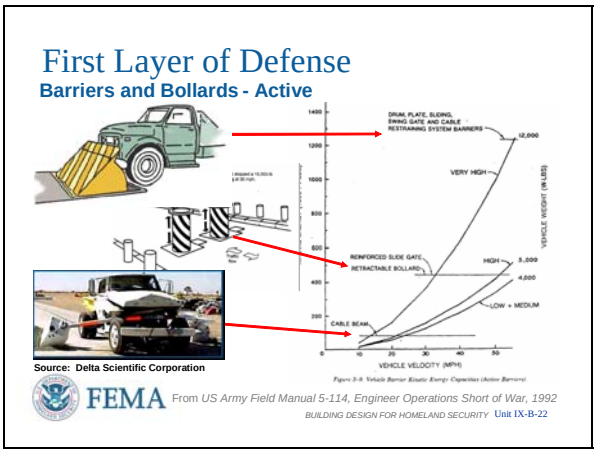


Barriers and Bollards – Water Barriers

Water-filled barriers are another approach as they are lightweight and easy to deploy. The photo shows the stopping power of this barrier when properly installed. Filling the barriers with sand make them less portable.

As with jersey barriers, linking the barriers with 1-inch steel cable improves their performance, but with additional penetration (less mass). Also, these barriers must be checked periodically for leaks, especially if allowed to freeze when filled with water. Without water or sand these would lack critical needed mass.

Unit IX-B-22



Barriers and Bollards – Active Barriers

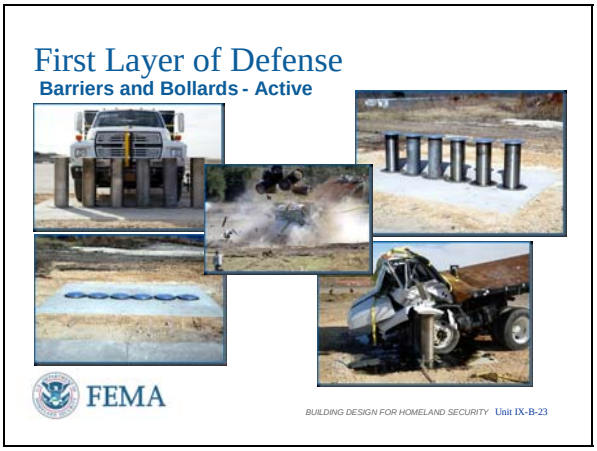
As with passive barriers, active barriers also have different levels of kinetic energy stopping power, based upon mass and connection to the earth.

The advantage of active barriers is that access points and building access to loading docks or for maintenance can allow vehicles to pass or not based upon authorization.

One company is marketing a turntable that allows the fixed bollards to be turned 90 degrees to the vehicle path, then rotated back to block vehicle traffic.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-23



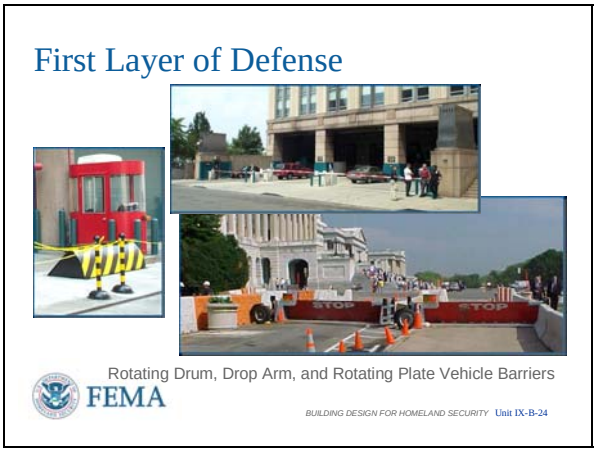
Barriers and Bollards – Active Barriers

These photos show retractable bollards stopping a substantial truck with very little penetration.

An active barrier can be activated in seconds (1 to 3) and should be either always up (sally port concept) or deployed upon identification that the gate is being crashed (taking into consideration response time, maximum vehicle speed and activation speed.

Pop-up barriers can create serious damage to vehicles, especially if deployed when a vehicle is above the barrier. Consider manual activation to avoid unnecessary damage (avoid magnetic vehicle loops to redeploy a barrier that will catch a tailgating vehicle).

Unit IX-B-24



Barriers and Street Closure

Here are various examples to control vehicle access to a building or a street.

- The drop arm barriers in the upper photo have low stopping power and are suitable where snow is a concern.
- The rotating drum in the left photo is a very capable barrier with great stopping power, but has problems with water, snow, ice, and foreign matter entering the drum mechanism.
- The portable rotating plate barriers in the lower right photo are very good for effective street closure against large, fast moving vehicles.

Improvised closures tend to destroy the attractiveness of the street with a combination of security personnel and ugly temporary barriers. However, they provide strong deterrence, which is equally important during a high-threat situation.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-25

First Layer of Defense
Barriers and Bollards

Department of State periodically issues list of manufacturers and model numbers certified in meeting prescribed testing criteria (March 2003)

Rating	Vehicle Weight (lbs.)	Vehicle Speed (mph)	Distance Past Barrier (ft)
K4	15,000	30	<= 3.3
K8	15,000	40	<= 3.3
K12	15,000	50	<= 3.3

Check site utilities, water runoff, and other subterranean Conditions when installing bollards and barriers

FEMA

BUILDING DESIGN FOR HOMELAND SECURITY Unit IX-B-25

Department of State Barrier Ratings

Department of State barrier ratings are more suitable to an urban environment where stand-off is limited -- the 3.3 feet distance allowed past the barrier is for the leading edge of the cargo area of the truck (where the bomb is most likely being carried).

Also, Department of State has found that diesel trucks have greater penetration capability, so their tests now require the use of diesel trucks vice gasoline powered trucks.

Unit IX-B-26

First Layer of Defense
Barriers and Bollards

Department of Defense periodically issues list of manufacturers and model numbers certified in meeting prescribed testing criteria (August 2003)

Vehicle Weight (lbs.)	Vehicle Speed (mph)	Distance Past Barrier (ft)
15,000	30	<=3(L3)/20(L2)/50(L1)
15,000	40	<=3(L3)/20(L2)/50(L1)
15,000	50	<=3(L3)/20(L2)/50(L1)
10,000	50	0 to 50
10,000	15	50 to 100

FEMA

BUILDING DESIGN FOR HOMELAND SECURITY Unit IX-B-26

Department of Defense Barrier Ratings

Department of Defense barrier ratings use the old Department of State criterion that allows the front of the vehicle to penetrate a given distance past the barrier. This would be more suitable in a suburban environment where there is greater distance between the barrier and the nearest building than in the urban environment.

Unit IX-B-27

First Layer of Defense
Barriers and Bollards

- Fixed bollards
- Retractable bollards
- Planters

Fixed bollards

FEMA

BUILDING DESIGN FOR HOMELAND SECURITY Unit IX-B-27

Barriers and Bollards

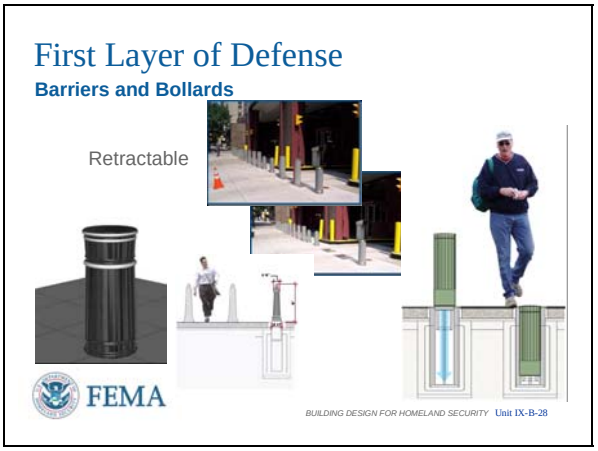
Sidewalks serve as the common space for pedestrian interaction, movements, and activity.

Extending barriers into sidewalks, streets or parking lanes may provide additional stand off distance. While this is technically possible, this approach often creates negative impacts within the public realm, which may make this an unfeasible solution. Be sure that introduced security measures are effective.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Bollards and other barriers are ideally the first layer of defense in the urban environment so as to obtain the most stand-off possible.

Unit IX-B-28



Barriers and Bollards – Retractable Bollards

Retractable bollards are an excellent (though expensive) solution when the use of security elements is critical and the width of the street does nor allow their permanent placement.

Effective bollards must be carefully engineered with deep foundations and the additional depth required for retractability may cause problems with underground utilities and services, building basements extending under sidewalks in urban areas, and other structures that may exists under sidewalks that affect retractable bollard performance.

Unit IX-B-29

Barriers and Bollards -- Planters

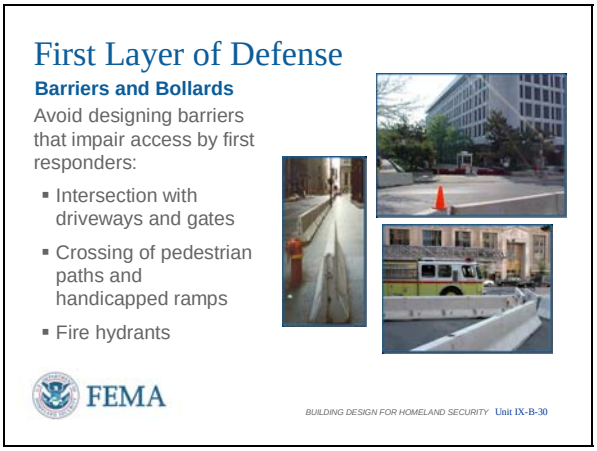
Bollards and planters can help create an appealing streetscape depending upon their design and the current environment in which they are installed.

When placed, make sure that they accomplish their function and distance between them is appropriate. The distance must allow free flow of pedestrians, but restrict flow of vehicles.

Fragmentation is always a concern with any barrier system, whether caused by bomb blast or vehicle impact.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-30



Barriers and Bollards – Jersey Barriers

Least desirable of barrier types

- Difficult to place and move
- No vehicle stopping capability unless tied to pavement with at least 4 pieces of #4 (1/2-inch diameter) rebar into pavement about 18 inches deep and/or tied together with steel cable (3/4 to 1-inch)
- Can cause sidewalk failure due to concentrated load and fact that sidewalk may be hollow underneath for storage or utilities
- Adds to fragmentation (barrier shatters) if vehicle bomb explodes next to barrier
- They impede access – pedestrians and first responders
  - Utilities (if placed on top of manholes)
  - Emergency access (fire trucks, ambulance, police)
  - ADA (Americans with Disabilities Act) access – crosswalks and ramps

Unit IX-B-31

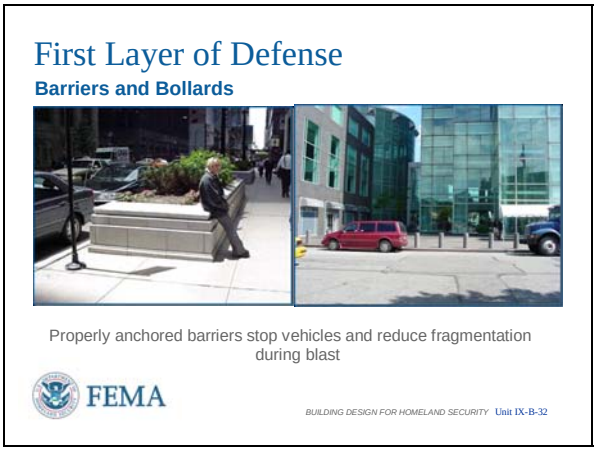
Barriers and Bollards

Other examples of architecturally pleasing barriers and planters. But even architecturally pleasing barriers require proper anchoring to ensure effectiveness. The planters on the left are in question as they look like they have forklift

The barrier on the left is by Rock Twelve Security Architecture

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-32



Barriers and Bollards

Bollards and planters can help create an appealing streetscape depending upon their design and the current environment in which they are installed.

When placed, make sure that they accomplish their function and distance between them is appropriate. The distance must allow free flow of pedestrians, but restrict flow of vehicles.

Fragmentation is always a concern with any barrier system, whether caused by bomb blast or vehicle impact.

Unit IX-B-33

Barriers and Bollards -- Bollards

When placed, make sure that they accomplish their barrier function with an appropriate distance of not less than 4 feet-between them.

Bollards placed in long unbroken rows present a monotonous appearance and may appear as a wall from some angles.

In an urban environment, bollards and barriers are ideally the first layer of defense to obtain the most stand-off possible.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-34

Yards and Plazas

Three generic site types will be found in the central business district of any large city.

- Buildings with zero setback and alleys. The building face is on the property line. An alley is a narrow street that divides a city block and provides service access to the side or rear of the building.
- Buildings with front yards. The building is set back from its property line and the space is usually landscaped. The building yard includes pedestrian entries and loading docks.
- Building with plazas. The building is placed within an open space that is publicly accessible.

Unit IX-B-35

Building Yard

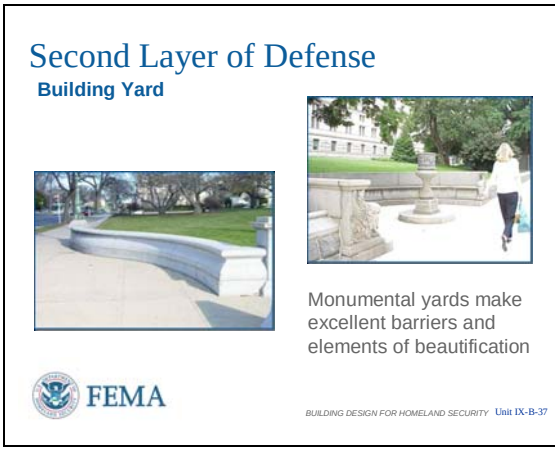
Some buildings have a “yard” between the building face and the sidewalk. The yard is within the property line and typically consists of a grassy or planted area adjacent to the building.

Yards are typical, narrow, of the order of 10 to 20 feet, providing some stand-off distance.

The yard may be flush or raised above the level of the sidewalk. A raised yard can provide a barrier to vehicles.

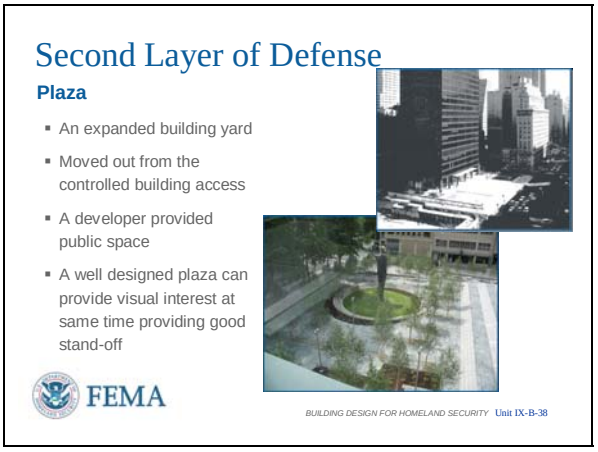
Major public buildings may have wide yards that are more of a landscaped forecourt that can offer reasonable stand-off distance. Yards are usually provided for governmental or institutional buildings in which coverage of the entire property may not be economically critical as is the case for private development.

Sometimes small yards (within the property

INSTRUCTOR NOTES	CONTENT/ACTIVITY
	line) are matched with a wide sidewalk provided by the city.
Unit IX-B-36	**Building Yard**
	A typical raised, low planter that can act as a bench (or plinth wall that holds back soil or rock), as shown in the left photo, presents a significant barrier to small and medium-sized vehicles. The high stepped yard in the right photo, which is along the side of the building, is a significant barrier and could also act as a deflector of blast from a curbside vehicle.
Unit IX-B-37	**Building Yard**
	Security elements within the building yard should complement the building architecture and landscaping and should be designed so as to appear as well designed landscape objects rather than expressing security. The security elements should be located near the outer edge of the yard to maximize stand-off. Good examples of this are shown in these photos.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-38



Plaza

Extensive business district development with very large buildings began after World War II. The straight tower with no setbacks became fashionable, but new ordinances permitted building developers to construct taller buildings, with greater floor area, if a public plaza was incorporated. In fact, in Tokyo, new high-rises must ensure they do not completely block the sun from surrounding buildings.

In effect, the plaza became an expanded building yard. It was moved outside the controlled access space of the building and became public space provided by the developer.

The additional space provided by plazas enables a more effective second layer of defense to be achieved. Often an acceptable stand-off distance can be created on one or more faces of the building depending on the plaza /building layout.

Unit IX-B-39

Plaza

Here are additional examples of plazas with built-in barriers needed for terrain and security.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-40

Gatehouses

Gatehouses are to assist the screening of vehicles and pedestrians to ensure they have proper authorization for access. This can be at the first layer of defense (normally) or at any restricted perimeter

- Depending on the threat the gatehouse should be hardened, but at the very least PPE (personal protective equipment, like bullet-resistant vests) should be worn
- The elements – wind, rain, heat, cold make this job difficult enough that the gatehouse should provide a refuge with water, heat, and air conditioning, including a rest room
- Proper placement so that the guard can interact with drivers without having to cross the traffic lane and adequate throughput so that queues will not form waiting for access. Note that this gatehouse requires the guard to leave the gatehouse to check driver credentials.

Unit IX-B-41

Parking

Parking at the building, at an adjacent building, in a nearby parking garage have limited stand-off distance in the urban environment.

Hardening considerations come into play for each situation, whether it is the building face, adding bollards to maintain stand-off, or taking access control and column hardening actions in an urban parking garage.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-42

Significant structural damage to the walls and ceiling of the loading dock may be acceptable; however, the areas adjacent to the loading dock should not experience severe structural damage or collapse.

The top photo is a street closure that limits access to a service road with loading dock. The bottom photo is a large moving van parked on an urban street, probably waiting to get to a loading dock. The weapon yield capacity of this van is in the mid-5 figures range.

Parking – Loading Docks

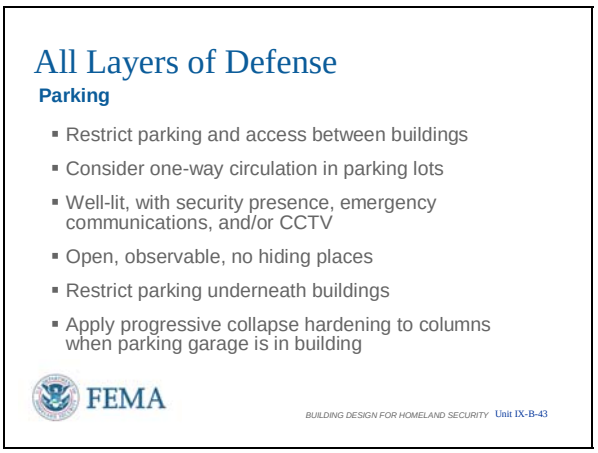
Loading docks and service access areas are commonly required for a building and are typically desired to be kept as invisible as possible.

Since larger vehicles can carry larger weapons, the issue is to screen the vehicles away from the urban area and escort them from the screening to the building.

Schedule deliveries to avoid queuing. In conjunction with local authorities and building tenants, consider shifting deliveries to time of day when building is not occupied. For example, deliveries are done during 1900-0500 when the building occupancy is from 0600 to 1800.

Use barriers and gatehouses for access control to allow final approach of vehicles to the loading dock.

Unit IX-B-43



Parking

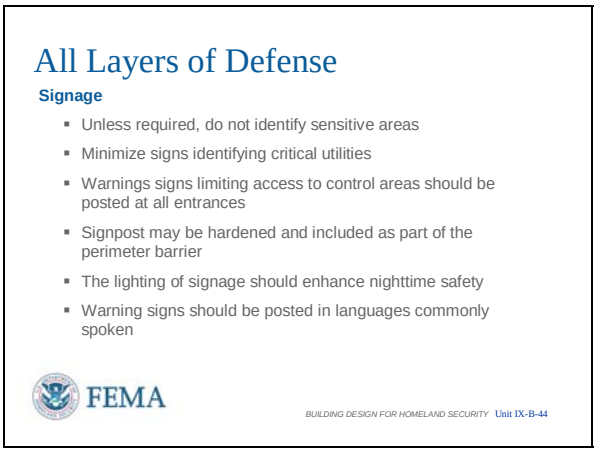
When designing parking, the following should be taken into consideration:

- Maintain stand-off distance from building
- Restrict parking from the interior of a group of buildings and away from any restricted area
- Avoid having parking near, within or underneath buildings – Consider hardening against progressive collapse if parking garage is in the building.
- Locate parking within view of occupied

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

buildings
- If possible, design the parking lot with one-way circulation that restricts straight-on high-speed approaches to buildings
- Provide signage to clearly mark separate entrances for different parking lots
- Keep parking areas well lit; use emergency communications, and/or CCTV

Unit IX-B-44



Whatever the strategy for signage, it is important that signage be developed in concert with other building design elements, be included in the building design palette, and designed and placed in coordination with all other materials. To reduce the potential of clutter, signage should be integrated with other streetscape elements and architectural elements. Access, maintenance, and adaptability should be considered in selection of signage systems. Periodically changes are required to signage content. A comprehensive signage plan should be tailored to the mission of the facility accompanying the FEMA 426 guidelines.

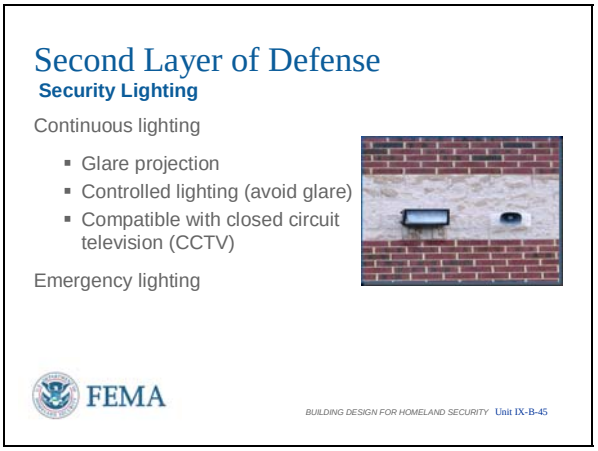
Signage

Building owners should determine how visible the project should be and corresponding implications for site signage. For some projects, a degree of anonymity may be part of the security strategy.

- Unless required, signs should not identify sensitive areas.
- Minimize signs identifying critical utility complexes, such as power plants and water treatment plants.
- Warning signs should be posted at all entrances to limited, controlled, and exclusion areas.
- The wording on the signs should denote warning of a restricted area.
- Signs should be posted at intervals of no more than 100 feet or at entrance points only
- Signage may be mounted on other elements, such as walls to reduce the number of posts along the street or perimeter.
- Signposts may be hardened and included as part of the perimeter barrier.
- The lighting of signage may also enhance nighttime safety to those who come to the site during evening or early morning hours.
- Warning signs must use languages commonly spoken.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-45

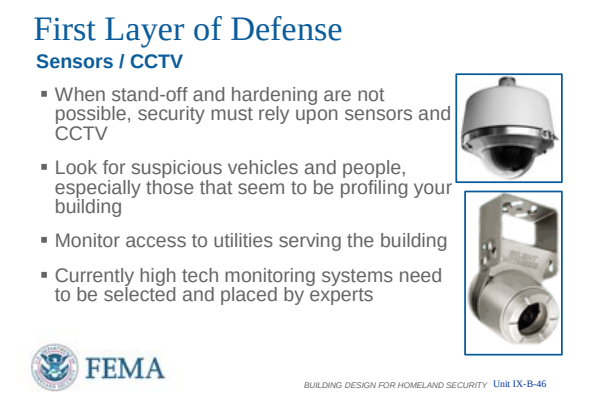


Security Lighting

Security lighting should be provided for overall site and building illumination to allow security personnel to maintain visual assessment during darkness. Lighting is desirable around areas such as entrances, loading docks, parking, etc. At entry points, a recommended minimum surface lighting average of 4 horizontal foot candles will help ensure adequate lighting.

Security lighting has different purposes – to blind, to allow vehicle inspection, to identify credentials, to support CCTV capabilities, etc. Thus, security lighting must be coordinated for all purposes.

Unit IX-B-46



Sensors / CCTV

Manned and electronic security increases deterrence and detection with attendant reduction in risk. It is the fastest technology to add and upgrade when selected, installed, and used properly.

It should cover vehicle, pedestrian, and utility entrances as all of these are potential approaches for terrorist tactics.

This will be covered in more detail under Electronic Security Systems later.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-47

Site Utilities

- Top Right – Open Gate allowing access to Critical Cooling Unit for Computer Center
- Lower Right – Exposed air conditioning systems
- Middle – antenna system for Emergency Operations Center accessible from the ground
- Lower Left – Exposed generator and natural gas regulators

Concealed or underground utilities are easier to protect than exposed or aboveground constructions. Fortunately, in the urban environment utilities are primarily underground.

Access to utilities should be protected or secure, allowing only authorized personnel access to perform maintenance and repair.

If physical security measures cannot limit access, then add sensors/CCTV to provide added protection.

The location and accessibility of site utilities directly impacts the vulnerability of systems to disruption and failure.

Incoming utility systems should have two entry points to the building for redundancy as required by criticality.

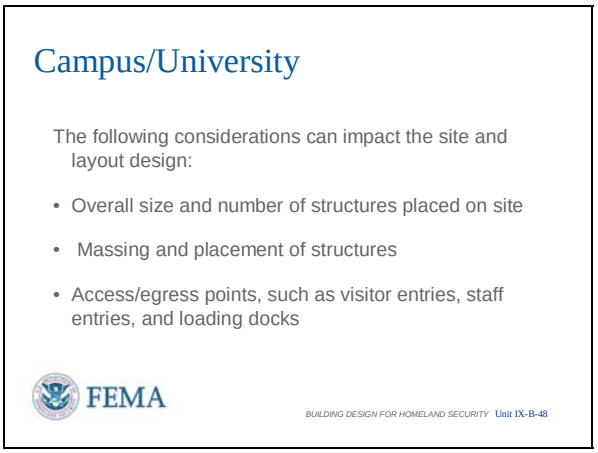
Looped versus radial distribution of utilities to the building allows for higher system reliability and faster repair by avoiding utility loss by a single incident.

When selecting locations for utilities, be aware of possible conflicts and spacing requirements both horizontally and vertically. In addition there can be demand for underground zones for

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

planting beds and foundations for hardened street furniture.

Unit IX-B-48

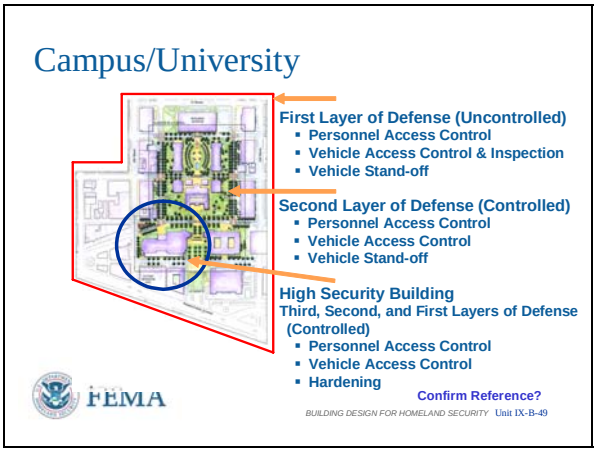


Campus / University

A campus or university style complex in an urban environment takes on many of the concerns of the suburban site.

- Placement of the structures on the site – how many, how large, what level of risk, and how integrated for their daily functions
- Access to the site for pedestrians and vehicles, and then access to the buildings, with circulation patterns from roadways to sidewalks to buildings

Unit IX-B-49



Campus / University

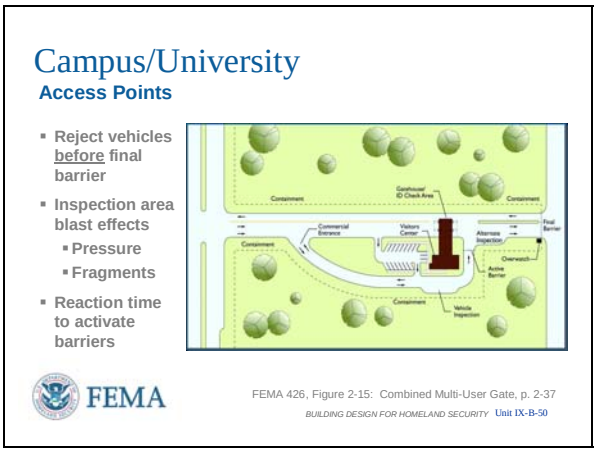
The same concepts for layers of defense in the urban environment have expanded options in the campus / university environment, just like the suburban situation.

Access control at the first layer to maximize stand-off for larger threats is the goal.

Add access control and stand-off barriers at each additional layer of defense to provide stand-off that results in minimal hardening of the building being required.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-50



Location selection for vehicular access and entry control for a building starts with an evaluation of the anticipated demand for access to the controlled site. An analysis of traffic origin and destination, and an analysis of the capability of the surrounding connecting road network, including its capacity to handle additional traffic, should then be performed. Expansion capacity should also be considered. The analysis should be coordinated with the state and local departments of transportation.

Two security measures that are overlooked are: First, allowing the vehicle to enter the site so that it can turn around and leave. A proper entry control point would never allow the vehicle to enter the site if it were not authorized. Second, there are multiple reaction times that must be added – guard recognition that vehicle is avoiding security, guard reaction to activate final barriers, and activation time from closed to open for the final barriers. The time delay from recognition to deployment must be less than the speed of the vehicle between the recognition point and the final barrier.

Campus / University -- Access Points

Gatehouses, lobbies, and guard posts should be provided with clear views of approaching traffic -- pedestrian and vehicular. Screening areas and entries may be located to offer more privacy and protection.

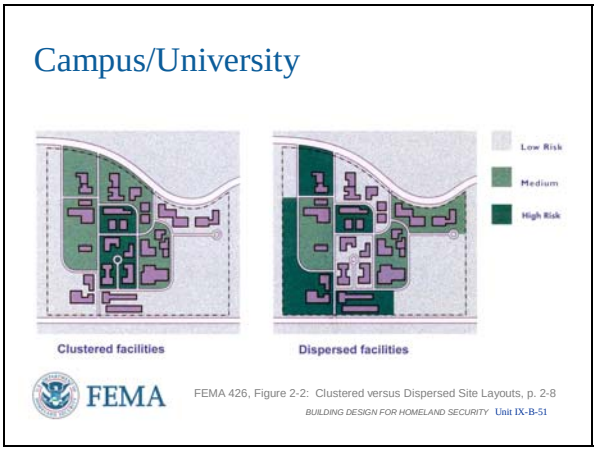
It is advisable to design circulation to separate different types of traffic and provide separate routes for staff, for visitors, and for deliveries. With the separation of vehicle types, security can more easily address differing needs for screening, observation, and potential threat mitigation.

Roadway network design that uses straight-line approaches to buildings may give approaching vehicles the opportunity to gather the necessary speed to ram protective barriers and crash into buildings. Possible solution: design approaches to be parallel to the façade, with berms, high curbs, trees, and other measures used to prevent vehicles from departing the roadway.

The existing terrain can have a significant impact on the suitability of a potential entry control point site. Flat terrain with no thick vegetation is generally preferred. A gentle rise in elevation up to the entry control guard building allows for a clear view of arriving vehicles. Consider how existing natural features such as bodies of water or dense tree stands may enhance perimeter security and vehicle containment, without restricting observation capability or allowing easier surveillance of the building by potential threat elements. Entry control spatial requirements vary, depending on the type, the traffic demand, and the necessary security measures.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-51

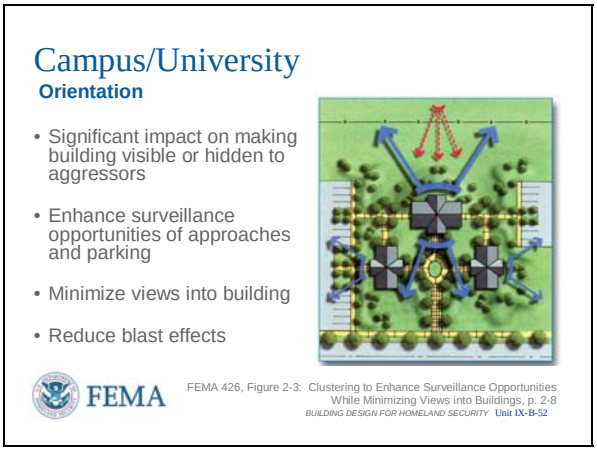


Campus / University – Clustered versus Dispersed Facilities

Depending on the site characteristics, the occupancy requirements, and other factors, buildings may be clustered tightly in one area, or dispersed across the site. Both patterns have compelling strengths and weaknesses.

Concentrating people, property, and operations in one place creates a target-rich environment, and the mere proximity of any one building to any other may increase the risk of collateral impacts. Additionally, the potential exists for the establishment of more single-point vulnerabilities in a clustered design than would exist in a more dispersed pattern. However, grouping high risk activities, concentrations of personnel, and critical functions into a cluster can help maximize stand-off from the perimeter and create a "defensible space."

Unit IX-B-52



Campus / University -- Orientation

Orientation is the building's spatial relationship to the site, its orientation relative to the sun, and its vertical or horizontal aspect relative to the ground.

- How many times have you seen aluminum foil on windows because the afternoon summer sun overcomes the air-conditioning capacity along that side of a building?

The physical positioning of a building relative to its surroundings may seem subtle, but can be a greater determinant of security.

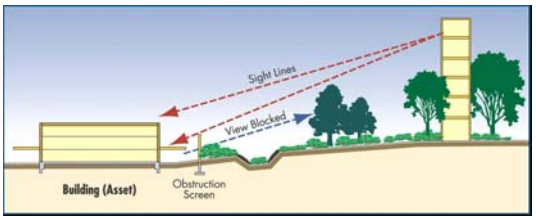
Good site design, orientation, and building placement should allow building occupants to look out of the facility while minimizing views into the building.

The proximity of a vulnerable façade to a parking area, street, adjacent site, or other area

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

that is accessible to vehicles and/or difficult to observe can greatly contribute to its vulnerability.

Unit IX-B-53



Campus / University -- Siting and View Relationships

Landscape and urban design inherently define the "line of sight" in a space. Operational security is not a traditional element of master planning, but managing the threat of hostile surveillance is a significant consideration in protecting people, property, and operations. With careful selection, placement, and maintenance, landscape elements can provide visual screening that protects sensitive operations, gathering areas, and other activities from surveillance without creating concealment for covert activity.

These techniques seek to deny aggressors a "line of sight" to a potential target, either from on or off site. This increases the protection of sensitive information and inhibits operation of stand-off weapons. In addition to the use of various screening options, anti-surveillance measures (e.g., building orientation, landscaping, screening, and landforms) can also be used to block sight lines.

The design should maximize opportunities for internal surveillance of site perimeters and screening of internal areas from external observation. Topography, relative elevation, walls, and fences are design elements that can open and close views. Vegetation can open, close, or block views, not only for security purposes but also to provide beauty and to support wayfinding. As a rule of thumb, vegetation should be very high or very low, to keep views open. Vegetation at the base of buildings and structures should be designed and maintained to prevent explosives from being hidden from view – easily see a briefcase

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

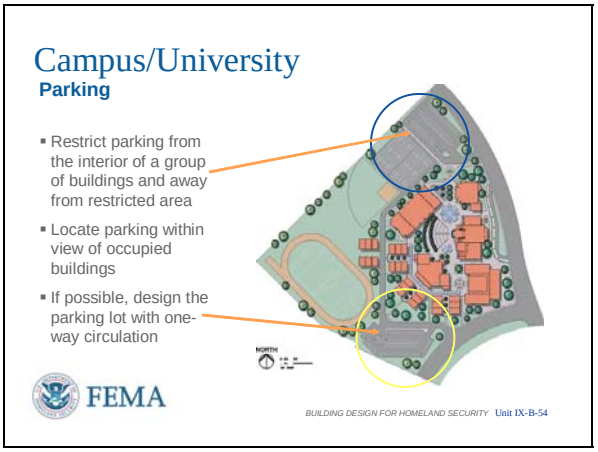
or a backpack.

Landforms can have a direct bearing on the security of a facility. They can be either beneficial (e.g., an elevated site that may enhance the surveillance of the surrounding area), or detrimental to anti-surveillance.

Generally speaking:

- For security purposes, buildings should not be sited immediately adjacent to higher surrounding terrain or buildings if at all possible.

Unit IX-B-54



Campus / University -- Parking

Building placement on the site must balance stand-off distances; relationship to adjacent streets and buildings; siting of utilities, parking areas, and driveways; as well as access to parking and loading areas.

There are three primary types of parking facilities, all of which present security trade-offs.

- Surface lots can be designed to keep vehicles away from buildings, but they consume large amounts of land and, if constructed of impervious materials, can contribute greatly to stormwater runoff volume. They can also be hazardous for pedestrians if dedicated pedestrian pathways are not provided.
- In contrast, non-street parking is often convenient for users and a source of revenue for local governments, but this type of parking may provide little or no setback.
- Finally, garage structures provide revenue and can be convenient for users, but they may require structural measures to ensure blast resistance as well as crime prevention measures to prevent street crime.

Although the cost of land suggests that the construction of a garage below a building

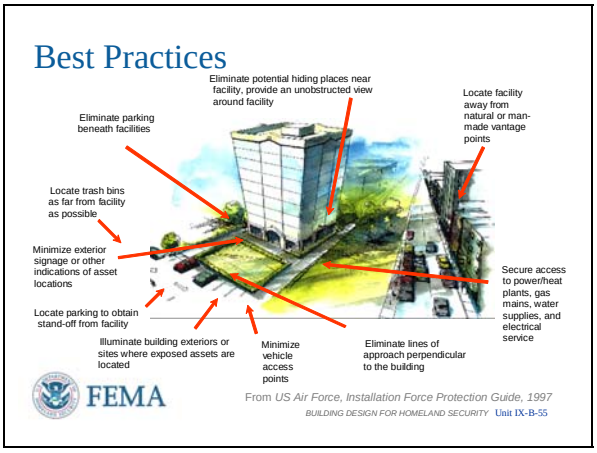
INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

(either underground or aboveground) may be the most economically viable approach for many developments, they can be highly vulnerable to vehicle-borne weapons, endangering the building above. If garages must be used, human security procedures (e.g., vehicle searches) and electronic systems (e.g., closed circuit television) may be necessary.

Parking structures open to the public should be sited and evaluated with concern for stand-off from other buildings, screening from critical operations and sensitive areas that might be observed from within the parking structure, and as a point of access or staging for use of weapons or explosives. Progressive collapse can become a concern in parking structures.

If stand-off distance is needed between a building and a First Layer controlled perimeter, placing parking in this area is an excellent use of the available space, as shown in this graphic.

Unit IX-B-55



Page 2-52 of FEMA 426 provides a comprehensive list of security/protection measures that can be taken – increasing in *protection, cost, and level of effort* – that complements this graphic on Site Mitigation Measures.

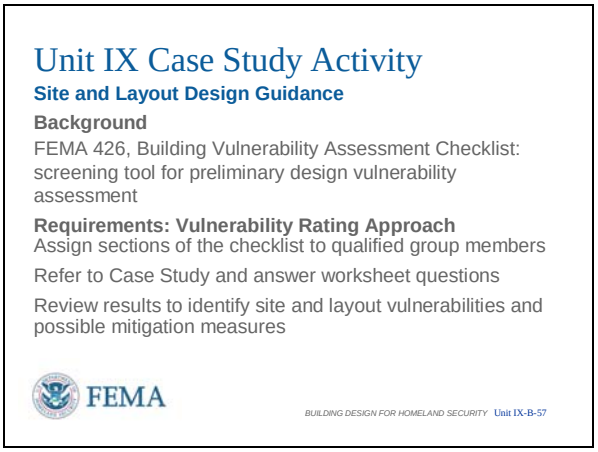
Best Practices

To summarize:

- A broad spectrum of mitigation actions can be taken – with a wide range of cost, protection provided, and level of effort required by the asset owner.
- The nominal ranking of mitigation measures on Page 2-52 provides a framework for the identification of short-term and long-term measures that can be taken.
- This is a great summary slide and can be found in FEMA 426 and the Air Force Installation Force Protection Guide on your Student Reference CD.

INSTRUCTOR NOTES | **CONTENT/ACTIVITY**

Unit IX-B-56



Refer participants to **FEMA 426**, the Unit IX Case Study activity in the Student Manual.

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

There are 42 questions to answer by the team and then confer. With an average of 7 team members this means each member answers about 6 questions or about 5 minutes per question during their 30 minutes of research.

Student Activity

The **Building Vulnerability Assessment Checklist in FEMA 426** can be used as a screening tool for preliminary design or existing building vulnerabilityassessment. The checklist includes questions that determine if critical systems will continue to function to enhanc e deterrence, detection, denial, and damage limitation, and if emergency systems will function during a threat or hazard situation.

Activity Requirements

- Continue working in small groups.
- Assign sections of the checklist to the group member who is most knowledgeable and qualified to perform an assessment of the assigned area.
- Refer to the Case Study to determine answers to the worksheet questions.
- Then review results to identify vulnerabilities and possible mitigation measures.

Take 45 minutes to complete this activity broken down as 30 minutes of research and 15 minutes of group interaction to compare information and discuss mitigation measures. Solutions will be reviewed in plenary group, taking about 15 minutes to ensure no group is drastically off track.

Transition

Unit X will cover Building Design Guidance.

UNIT IX-B -- CASE STUDY ACTIVITY: SITE AND LAYOUT DESIGN GUIDANCE (Urban Version)

The **Building Vulnerability Assessment Checklist in FEMA 426 (Table 1-22, pages 1-46 to 1-93)** can be used as a screening tool for preliminary design vulnerability assessment of the site where the building is located and the layout of the building on that site. It can also be used for assessment of an existing building and its site. The checklist includes questions that determine if critical and emergency systems will continue to function to enhance deterrence, detection, denial, and damage limitation during and after a threat or hazard situation.

Requirements

Assign sections of the checklist to the group member who is most knowledgeable and qualified to perform an assessment of the assigned area. Refer to the Appendix B Case Study to determine answers to the questions. Then review results as a team to identify vulnerabilities and possible mitigation measures.

> OPTIONAL for On-Site Courses depending upon venue and course attendees: [This indented portion is not included in the standard student manual SM Unit IX-B and should be included if this venue occurs]
>
> (1) Combine the student activity time for Unit IX, Site and Layout Design Guidance with Unit X, Building Design Guidance, after Unit X using the time not used for Course Exam and Course Exam Review.
>
> (2) In the student activity time slot after Unit IX (at the end of Day 2) have a Plenary Group/Roundtable/Interactive Discussion with students providing experiences, legal restrictions, lessons learned, success stories, design impediments, common vulnerabilities, and other items of interest applicable to the course that is happening in their communities. The instructor(s) will capture the main points on an easel pad/white board for review at the end of the session and for recording to incorporate into the Urban Case Study as appropriate.

1. Complete the following components of the **Building Vulnerability Assessment Checklist (FEMA 426, Table 1-22, pages 1-46 to 1-93)**, which address site and layout.

   > **Note**: There are 42 questions below (**18** in Section 1, **4** in Section 2, and **20** in Section 5), so it is recommended that the team split up the questions among themselves taking 5-7 questions each and review the Appendix B Case Study for answers. Apportion the available time for gathering the answers and then provide each other the answers while performing the two actions below.

2. Upon completion of these portions of the checklist, refer back to the vulnerability ratings determined in the Unit IV Case Study Activity and, based on this more detailed analysis,

decide if any vulnerability rating needs adjustment. Adjust the Risk Matrix poster accordingly for vulnerability rating and risk rating.

3. Select mitigation measures to reduce vulnerability and associated risk from the site and layout perspective.

4. Estimate the new risk ratings for high risk asset-threat pairs (as adjusted in step 2 above) based on the recommended mitigation measures.

Section	Vulnerability Question	Guidance	Observations
1	**Site**		
1.1	What major structures surround the facility (site or building(s))? What critical infrastructure, government, military, or recreation facilities are in the local area that impact transportation, utilities, and collateral damage (attack at this facility impacting the other major structures or attack on the major structures impacting this facility)?	**Critical infrastructure to consider includes:** **Telecommunications infrastructure** Facilities for broadcast TV, cable TV; cellular networks; newspaper offices, production, and distribution; radio stations; satellite base stations; telephone trunking and switching stations, including critical cable routes and major rights-of-way **Electric power systems** Power plants, especially nuclear facilities; transmission and distribution system components; fuel distribution, delivery, and storage **Gas and oil facilities** Hazardous material facilities, oil/gas pipelines, and storage facilities **Banking and finance institutions** Financial institutions (banks, credit unions) and the business district; note schedule business/financial district may follow; armored car services **Transportation networks** Airports: carriers, flight paths, and airport layout; location of air traffic control towers, runways, passenger terminals, and parking areas Bus Stations Pipelines: oil; gas Trains/Subways: rails and lines, railheads/rail yards, interchanges,	*The HazardCorp Building is located in the downtown business district of a major urban city. There are several commercial iconic properties, several government offices, and various high-density attractions within a 5-mile radius of the building. In the immediate vicinity of HazardCorp Building are two residential condominiums, four office buildings, and a hotel. There are additional office buildings, hotels, and parking structures within easy walking distance.* *As with many major cities, there is significant water access to various locations within 5-mile radius of the building and the river is within 0.05 miles of the building. Because of the water, ground access is constrained by bridges, tunnels, and ferries.* *While two major airports are over 5 miles from the building, what is not shown are 8 heliports and two skyports inside the 5-mile radius. A metropolitan subway also serves the business district and the nearest station is two blocks from the building.* *There is significant shipping serving the various ports carrying all types of materials*

Section	Vulnerability Question	Guidance	Observations
		tunnels, and cargo/passenger terminals; note hazardous material transported Traffic: interstate highways/roads/tunnels/ bridges carrying large volumes; points of congestion; note time of day and day of week Trucking: hazardous materials cargo loading/unloading facilities; truck terminals, weigh stations, and rest areas Waterways: dams; levees; berths and ports for cruise ships, ferries, roll-on/roll-off cargo vessels, and container ships; international (foreign) flagged vessels (and cargo) **Water supply systems** Pipelines and process/treatment facilities, dams for water collection; wastewater treatment **Government services** Federal/state/local government offices – post offices, law enforcement stations, fire/rescue, town/city hall, local mayor's/governor's residences, judicial offices and courts, military installations (include type-active, Reserves, National Guard) **Emergency services** Backup facilities, communications centers, Emergency Operations Centers (EOCs), fire/Emergency Medical Service (EMS) facilities, Emergency Medical Centers (EMCs), law enforcement facilities **The following are not critical infrastructure, but have collateral damage potential to consider:** **Agricultural facilities**: chemical distribution, storage, and application sites; crop spraying services; farms and ranches; food processing, storage, and distribution facilities	*for use in Hazard City and transshipment to other locations. In conjunction with the ports and the transshipment of goods, there is extensive railroad trackage, some as close as within 1-1/2 miles of the building. The area around Hazard City is the No. 4 intermodal port in the Western Hemisphere. Intermodal means the ability to move freight from train to truck and back again. An intermodal port ties together ship, rail, and truck freight transfers.* *There are extensive tank farms east and west of HazardCorp Building on the other side of the river in the respective directions.* *There is also a high concentration of police in the area due to multiple jurisdictions having authority.* *A fire station is within 1/4 mile of the building and seven hospitals are within 3 miles.*

Section	Vulnerability Question	Guidance	Observations
		Commercial/manufacturing/ind-ustrial facilities: apartment buildings; business/corporate centers; chemical plants (especially those with Section 302 Extremely Hazardous Substances); factories; fuel production, distribution, and storage facilities; hotels and convention centers; industrial plants; raw material production, distribution, and storage facilities; research facilities and laboratories; shipping, warehousing, transfer, and logistical centers **Events and attractions**: festivals and celebrations; open-air markets; parades; rallies, demonstrations, and marches; religious services; scenic tours; theme parks **Health care system components**: family planning clinics; health department offices; hospitals; radiological material and medical waste transportation, storage, and disposal; research facilities and laboratories, walk-in clinics **Political or symbolically significant sites**: embassies, consulates, landmarks, monuments, political party and special interest groups offices, religious sites **Public/private institutions**: academic institutions, cultural centers, libraries, museums, research facilities and laboratories, schools **Recreation facilities**: auditoriums, casinos, concert halls and pavilions, parks, restaurants and clubs (frequented by potential target populations), sports arenas, stadiums, theaters, malls, and special interest group facilities; note congestion dates and times for shopping centers References: *FEMA 386-7, FEMA*	

Section	Vulnerability Question	Guidance	Observations
		SLG 101, DOJ NCJ181200	
1.2	Does the terrain place the building in a depression or low area?	Depressions or low areas can trap heavy vapors, inhibit natural decontamination by prevailing winds, and reduce the effectiveness of in-place sheltering. Reference: *USAF Installation Force Protection Guide*	The building is not in a depression or low area, but on flat terrain in an urban canyon where wind flow is constrained by the numerous high-rise buildings. Thus, the urban landscape can have the same effect as a depression or low area.
1.3	In dense, urban areas, does curb lane parking place uncontrolled parked vehicles unacceptably close to a building in public rights-of-way?	Where distance from the building to the nearest curb provides insufficient setback, restrict parking in the curb lane. For typical city streets, this may require negotiating to close the curb lane. Setback is common terminology for the distance between a building and its associated roadway or parking. It is analogous to stand-off between a vehicle bomb and the building. The benefit per foot of increased stand-off between a potential vehicle bomb and a building is very high when close to a building and decreases rapidly as the distance increases. Note that the July 1, 1994, Americans with Disabilities Act Standards for Accessible Design states that required handicapped parking shall be located on the shortest accessible route of travel from adjacent parking to an accessible entrance. Reference: *GSA PBS-P100*	Yes, there is limited uncontrolled curb lane parking around the building. The HazardCorp Building is bounded by city streets with high traffic volumes. On the east side of the plaza is a drop off zone where no parking is allowed and building stand-off is 80 feet. On the north and west sides of the building for the whole building block, parking is restricted to government vehicles only with designated parking spaces. Double parking next to the government vehicles provides 15 feet of stand-off on the north side and 10 feet of stand-off on the west. Commercial parking is allowed on the south side in support of the loading dock and stand-off is 10 feet.
1.4	Is a perimeter fence or other types of barrier controls in place?	The intent is to channel pedestrian traffic onto a site with multiple buildings through known access control points. For a single building, the intent is to have a single visitor entrance. Reference: *GSA PBS-P100*	There is no fence or other barrier controls for pedestrians around the building. There are nine entrances into the building (three main door entrances, four entrances to retail spaces, the loading dock, and two entrances into underground parking) Under the building there are stairs and elevators with access controls that allow entrance into the building.

Section	Vulnerability Question	Guidance	Observations
1.5	What are the site access points to the site or building?	The goal is to have at least two access points – one for passenger vehicles and one for delivery trucks due to the different procedures needed for each. Having two access points also helps if one of the access points becomes unusable, then traffic can be routed through the other access point. Reference: *USAF Installation Force Protection Guide*	Deliveries are limited to the loading dock which is under the control of building security. Passenger vehicles have two entrances to the underground parking – one on the west side and one on the south. This is a good arrangement in case a problem occurs at one of the entrances.
1.7	Is there vehicle and pedestrian access control at the perimeter of the site?	Vehicle and pedestrian access control and inspection should occur as far from facilities as possible (preferably at the site perimeter) with the ability to regulate the flow of people and vehicles one at a time. Control on-site parking with identification checks, security personnel, and access control systems. Reference: *FEMA 386-7*	Entrances to the building that do not go past the current security desk have access control. Designated elevators, including one service elevator, have card readers and PIN (Personal Identification Number) keypads for movement to and from access controlled floors. To get the elevator to move to a specific floor you have to press the floor key, read your card, and enter your PIN. In addition, there is a Duress PIN that alerts building and floor security that an authorized person is moving to a controlled floor with a security problem. Two of the designated building elevators with access controls serve the underground parking levels. The elevators will not move upward with someone in the car unless proper access is accepted. The elevators reset to the lobby automatically when there is no additional weight sensed in the elevator car. The elevators serving the underground parking that is not under the building have no access control equipment installed. The underground parking

Section	Vulnerability Question	Guidance	Observations
			entrances and exits have automated controls with lightweight drop arms to issue tickets upon entrance and to take payment upon exit. There are no other access controls.
1.8	Is there space for inspection at the curb line or outside the protected perimeter? What is the minimum distance from the inspection location to the building?	Design features for the vehicular inspection point include: vehicle arrest devices that prevent vehicles from leaving the vehicular inspection area and prevent tailgating. If screening space cannot be provided, consider other design features such as: hardening and alternative location for vehicle search/ inspection. Reference: *GSA PBS-P100*	There is no ideal space for inspection of vehicles coming to this building. The street on the west side could have a direction change – to the north, to allow more space to inspect tenant vehicles that want to park underneath the building. This is not ideal because of limited stand-off (10 feet). Vehicles approaching the loading dock can be inspected on the east end of the south-side street in the curb lane. This would provide more stand-off (60 feet), but may not be sufficient based upon the weapon yield that can be carried in a delivery truck. One approach would be to use the triangular landscaped street traffic control space northwest of the building as an inspection point, with the concurrence of neighbors and local authorities. Stand-off would be 220 feet from the HazardCorp Building, but only 60 feet from Office Building G.
1.10	What are the existing types of vehicle anti-ram devices for the site or building? Are these devices at the property boundary or at the building?	Passive barriers include bollards, walls, hardened fences (steel cable interlaced), trenches, ponds/basins, concrete planters, street furniture, plantings, trees, sculptures, and fountains. Active barriers include pop-up bollards, swing arm gates, and rotating plates and drums, etc. Reference: *GSA PBS-P100*	There are no vehicle anti-ram devices for the site or the building.

Section	Vulnerability Question	Guidance	Observations
1.13	Does site circulation prevent high-speed approaches by vehicles?	The intent is to use site circulation to minimize vehicle speeds and eliminate direct approaches to structures. Reference: *GSA PBS-P100*	The HazardCorp Building has streets on each side. The west side has the slowest approach speed as the street is so close to the building and a sharp turn to strike the building will require slowing down. The north, east, and south roads allow higher approach speeds. The north and south streets allow a vehicle at high speed to strike the building at a shallow angle with little speed reduction. The plaza on the east side of the building allows high-speed vehicles on the north, east, and south streets to jump the curb and strike the plaza building entrance at high speed.
1.14	Are there offsetting vehicle entrances from the direction of a vehicle's approach to force a reduction of speed?	Single or double 90-degree turns effectively reduce vehicle approach speed. Reference: *GSA PBS-P100*	There are no offsetting vehicle entrances of note. The north pedestrian entrance, the west vehicle entrance, the loading dock, the south pedestrian entrance, and the south vehicle entrance all require 90 degree turns in order to enter the structure. Designated parking already identified provides some additional protection, especially on the north and west sides. Commercial vehicles waiting for off-load on the south side provides some protection against high-speed vehicles.
1.15	Is there a minimum setback distance between the building and parked vehicles?	Adjacent public parking should be directed to more distant or better-protected areas, segregated from employee parking and away from the building. Some publications use the term setback in lieu of the term stand-off. Reference: *GSA PBS-P100*	Adjacent public parking is that parking associated with the next building or site that is not under the control of the owners of the building being assessed. The stand-off distance varies depending upon the side of the building being considered, but varies from 10 feet to 80 feet closer to the building. The street width adds stand-off (30 to 60 feet) to the adjacent parking on the other side of the

Section	Vulnerability Question	Guidance	Observations
			streets.
1.16	Does adjacent surface parking on site maintain a minimum stand-off distance?	The specific stand-off distance needed is based upon the design basis threat bomb size and the building construction. For initial screening, consider using 25 meters (82 feet) as a minimum with more distance needed for unreinforced masonry or wooden walls. Reference: *GSA PBS-P100*	With parking only providing stand-off of 10 to 80 feet, the design basis threat must be evaluated at these distances to determine hardening required to limit damage.
1.17	Do standalone, aboveground parking garages provide adequate visibility across as well as into and out of the parking garage?	Pedestrian paths should be planned to concentrate activity to the extent possible. Limiting vehicular entry/exits to a minimum number of locations is beneficial. Stair tower and elevator lobby design shall be as open as code permits. Stair and/or elevator waiting areas should be as open to the exterior and/or the parking areas as possible and well lighted. Impact-resistant, laminated glass for stair towers and elevators is a way to provide visual openness. Potential hiding places below stairs should be closed off; nooks and crannies should be avoided, and dead-end parking areas should be eliminated. Reference: *GSA PBS-P100*	There are no aboveground parking garages. However, many of the concerns apply to the underground parking, especially observability of stair towers and elevator lobbies serving the parking levels.
1.18	Are garage or service area entrances for employee-permitted vehicles protected by suitable anti-ram devices? Coordinate this protection with other anti-ram devices, such	Control internal building parking, underground parking garages, and access to service areas and loading docks in this manner with proper access control, or eliminate the parking altogether. The anti-ram device must be capable of arresting a vehicle of the designated threat size at the speed attainable at the location. Reference: *GSA PBS-P100*	There are no anti-ram devices installed at underground parking entrances. The Administration Office on the first floor is pre-notified of all deliveries to the Loading Dock. During allowed delivery hours a Building Management representative monitors the Loading Dock and commercial parking area.

Section	Vulnerability Question	Guidance	Observations
	as on the perimeter or property boundary to avoid duplication of arresting capability.		All entries, especially the Loading Dock, are covered by color CCTV systems with DVR (Digital Video Recording).
1.19	Do site landscaping and street furniture provide hiding places?	Minimize concealment opportunities by keeping landscape plantings (hedges, shrubbery, and large plants with heavy ground cover) and street furniture (bus shelters, benches, trash receptacles, mailboxes, newspaper vending machines) away from the building to permit observation of intruders and prevent hiding of packages. If mail or express boxes are used, the size of the openings should be restricted to prohibit the insertion of packages. Reference: *GSA PBS-P100*	No street furniture identified around the building or on the plaza.
1.20	Is the site lighting adequate from a security perspective in roadway access and parking areas?	Security protection can be successfully addressed through adequate lighting. The type and design of lighting, including illumination levels, is critical. Illuminating Engineering Society of North America (IESNA) guidelines can be used. The site lighting should be coordinated with the CCTV system. Reference: *GSA PBS-P100*	Security lighting is coordinated with CCTV requirements to ensure good quality pictures, both on the monitors and on recordings. This lighting is where CCTV cameras are installed at entrances of the building and parking.
1.21	Are line-of-sight perspectives from outside the secured boundary to the building and on the property along pedestrian and vehicle routes integrated with landscaping and green space?	The goal is to prevent the observation of critical assets by persons outside the secure boundary of the site. For individual buildings in an urban environment, this could mean appropriate window treatments or no windows for portions of the building. Once on the site, the concern is to ensure observation by a general workforce aware of any pedestrians and vehicles outside normal circulation routes or	There is ample opportunity for observation of critical assets and functions observable though perimeter windows in the urban environment around the HazardCorp Building. The upper floors are at less risk due to the nearby buildings being about half as tall as the HazardCorp Building.

Section	Vulnerability Question	Guidance	Observations
		attempting to approach the building unobserved. Reference: *USAF Installation Force Protection Guide*	
1.23	Are all existing fire hydrants on the site accessible?	Just as vehicle access points to the site must be able to transit emergency vehicles, so too must the emergency vehicles have access to the buildings and, in the case of fire trucks, the fire hydrants. Thus, security considerations must accommodate emergency response requirements. Reference: *GSA PBS-P100*	The building is ringed by 20- to 24-inch water mains with hydrants on all sides of the building. There is nothing indicated that currently blocks access to the hydrants. However, future barrier considerations should take into account hydrant access.
2	**Architectural**		
2.1	Does the site and architectural design incorporate strategies from a Crime Prevention Through Environmental Design (CPTED) perspective?	**The focus of CPTED is on creating defensible space by employing:** **1. Natural access controls:** - Design streets, sidewalks, and building entrances to clearly indicate public routes and direct people away from private/restricted areas - Discourage access to private areas with structural elements and limit access (no cut-through streets) - Loading zones should be separate from public parking **2. Natural surveillance:** - Design that maximizes visibility of people, parking areas, and building entrances: doors and windows that look out on to streets and parking areas - Shrubbery under 2 feet in height for visibility - Lower branches of existing trees kept at least 10 feet off the ground - Pedestrian-friendly sidewalks and streets to control pedestrian and vehicle circulation - Adequate nighttime lighting, especially at exterior doorways **3. Territorial reinforcement:**	**Working**

Section	Vulnerability Question	Guidance	Observations
		- Design that defines property lines - Design that distinguishes private/restricted spaces from public spaces using separation, landscape plantings; pavement designs (pathway and roadway placement); gateway treatments at lobbies, corridors, and door placement; walls, barriers, signage, lighting, and "CPTED" fences - "Traffic-calming" devices for vehicle speed control **4. Target hardening:** - Prohibit entry or access: window locks, dead bolts for doors, interior door hinges - Access control (building and employee/visitor parking) and intrusion detection systems **5. Closed circuit television cameras:** - Prevent crime and influence positive behavior, while enhancing the intended uses of space. In other words, design that eliminates or reduces criminal behavior and at the same time encourages people to "keep an eye out" for each other. References: *GSA PBS-P100 and FEMA 386-7*	
2.2	Is it a mixed-tenant building?	Separate high-risk tenants from low-risk tenants and from publicly accessible areas. Mixed uses may be accommodated through such means as separating entryways, controlling access, and hardening shared partitions, as well as through special security operational countermeasures. Reference: *GSA PBS-P100*	**Working**
2.3	Are pedestrian paths planned to concentrate activity to aid in detection?	Site planning and landscape design can provide natural surveillance by concentrating pedestrian activity, limiting entrances/exits, and eliminating concealment opportunities. Also,	**Working**

Section	Vulnerability Question	Guidance	Observations
		prevent pedestrian access to parking areas other than via established entrances. Reference: *GSA PBS-P100*	
2.4	Are there trash receptacles and mailboxes in close proximity to the building that can be used to hide explosive devices?	The size of the trash receptacles and mailbox openings should be restricted to prohibit insertion of packages. Street furniture, such as newspaper vending machines, should be kept sufficient distance (10 meters or 33 feet) from the building, or brought inside to a secure area. References: *USAF Installation Force Protection Guide and DoD UCF 4-010-01*	**Working**
5	**Utility Systems**		
5.1	What is the source of domestic water? (utility, municipal, wells, lake, river, storage tank) Is there a secure alternate drinking water supply?	Domestic water is critical for continued building operation. Although bottled water can satisfy requirements for drinking water and minimal sanitation, domestic water meets many other needs – flushing toilets, building heating and cooling system operation, cooling of emergency generators, humidification, etc. Reference: *FEMA 386-7*	**Working**
5.2	Are there multiple entry points for the water supply?	If the building or site has only one source of water entering at one location, the entry point should be secure. Reference: *GSA PBS-P100*	**Working**
5.3	Is the incoming water supply in a secure location?	Ensure that only authorized personnel have access to the water supply and its components. Reference: *FEMA 386-7*	**Working**
5.4	Does the building or site have storage capacity for domestic water?	Operational facilities will require reliance on adequate domestic water supply. Storage capacity can meet short-term needs and use water trucks to replenish for	**Working**

Section	Vulnerability Question	Guidance	Observations
	How many gallons of storage capacity are available and how long will it allow operations to continue?	extended outages. Reference: *Physical Security Assessment for Department of Veterans Affairs Facilities*.	
5.5	What is the source of water for the fire suppression system? (local utility company lines, storage tanks with utility company backup, lake, or river) Are there alternate water supplies for fire suppression?	The fire suppression system water may be supplied from the domestic water or it may have a separate source, separate storage, or nonpotable alternate sources. For a site with multiple buildings, the concern is that the supply should be adequate to fight the worst case situation according to the fire codes. Recent major construction may change that requirement. Reference: *FEMA 386-7*	**Working**
5.6	Is the fire suppression system adequate, code-compliant, and protected (secure location)?	Standpipes, water supply control valves, and other system components should be secure or supervised. Reference: *FEMA 386-7*	**Working**
5.7	Do the sprinkler/standpipe interior controls (risers) have fire- and blast-resistant separation? Are the sprinkler and standpipe connections adequate and redundant? Are there fire hydrant and water supply connections near the sprinkler/standpipe connections?	The incoming fire protection water line should be encased, buried, or located 50 feet from high risk areas. The interior mains should be looped and sectionalized. Reference: *GSA PBS-P100*	**Working**

Section	Vulnerability Question	Guidance	Observations
5.8	Are there redundant fire water pumps (e.g., one electric, one diesel)? Are the pumps located apart from each other?	Collocating fire water pumps puts them at risk for a single incident to disable the fire suppression system. References: *GSA PBS-P100 and FEMA 386-7*	**Working**
5.9	Are sewer systems accessible? Are they protected or secured?	Sanitary and stormwater sewers should be protected from unauthorized access. The main concerns are backup or flooding into the building, causing a health risk, shorting out electrical equipment, and loss of building use. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.10	What fuel supplies do the building rely upon for critical operation?	Typically, natural gas, propane, or fuel oil are required for continued operation. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.11	How much fuel is stored on the site or at the building and how long can this quantity support critical operations? How is it stored? How is it secured?	Fuel storage protection is essential for continued operation. Main fuel storage should be located away from loading docks, entrances, and parking. Access should be restricted and protected (e.g., locks on caps and seals). References: *GSA PBS-P100 and Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.14	What is the normal source of electrical service for the site or building?	Utilities are the general source unless co-generation or a private energy provider is available. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**

Section	Vulnerability Question	Guidance	Observations
5.15	Is there a redundant electrical service source? Can the site or buildings be fed from more than one utility substation?	The utility may have only one source of power from a single substation. There may be only single feeders from the main substation. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.16	How many service entry points does the site or building have for electricity?	Electrical supply at one location creates a vulnerable situation unless an alternate source is available. Ensure disconnecting requirements according to NFPA 70 (National Fire Protection Association, National Electric Code) are met for multiple service entrances. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.17	Is the incoming electric service to the building secure?	Typically, the service entrance is a locked room, inaccessible to the public. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.18	What provisions for emergency power exist? What systems receive emergency power and have capacity requirements been tested? Is the emergency power collocated with the commercial electric service? Is there an exterior connection for	Besides installed generators to supply emergency power, portable generators or rental generators available under emergency contract can be quickly connected to a building with an exterior quick disconnect already installed. Testing under actual loading and operational conditions ensures the critical systems requiring emergency power receive it with a high assurance of reliability. Reference: *GSA PBS-P100*	**Working**

Section	Vulnerability Question	Guidance	Observations
	emergency power?		
5.19	By what means do the main telephone and data communications interface the site or building?	Typically communication ducts or other conduits are available. Overhead service is more identifiable and vulnerable. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.20	Are there multiple or redundant locations for the telephone and communications service?	Secure locations of communications wiring entry to the site or building are required. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.21	Does the fire alarm system require communication with external sources? By what method is the alarm signal sent to the responding agency: telephone, radio, etc.? Is there an intermediary alarm monitoring center?	Typically, the local fire department responds to an alarm that sounds at the station or is transmitted over phone lines by an auto dialer. An intermediary control center for fire, security, and/or building system alarms may receive the initial notification at an on-site or off-site location. This center may then determine the necessary response and inform the responding agency. Reference: *Physical Security Assessment for the Department of Veterans Affairs Facilities*	**Working**
5.22	Are utility lifelines aboveground, underground, or direct buried?	Utility lifelines (water, power, communications, etc.) can be protected by concealing, burying, or encasing. Reference: *GSA PBS-P100 and FEMA 386-7*	**Working**