Unit IX
Site and Layout Design Guidance

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Unit Objectives

Identify site planning concerns that can create, reduce, or eliminate vulnerabilities and understand the concept of “Layers of Defense.”

Recognize protective issues for suburban site planning.

Compare the pros and cons of barrier mitigation measures that increase stand-off or promote the need for hardening of buildings at risks.

Unit Objectives

Understand the following critical issues:

- Need for keeping up with the growing demand for security design
- Benefits that can be derived from appropriate security design

References

FEMA Building Vulnerability Assessment Checklist, Chapter 1, page 1-46, FEMA 426

Site and Layout Design Guidance,Chapter 2, FEMA 426

FEMA 430, Site and Urban Design for Security, Guidance Against Potential Terrorist Attack

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Unit Objectives

Understand the following critical issues (continued):

- Benefits of adopting a creative process to face current design challenges
- Benefits of including aesthetic elements compatible with security and architectural characteristics of building and surrounding environment

References

FEMA Building Vulnerability Assessment Checklist, Chapter 1, page 1-46, FEMA 426

Site and Layout Design Guidance,Chapter 2, FEMA 426

FEMA 430, Site and Urban Design for Security, Guidance Against Potential Terrorist Attack

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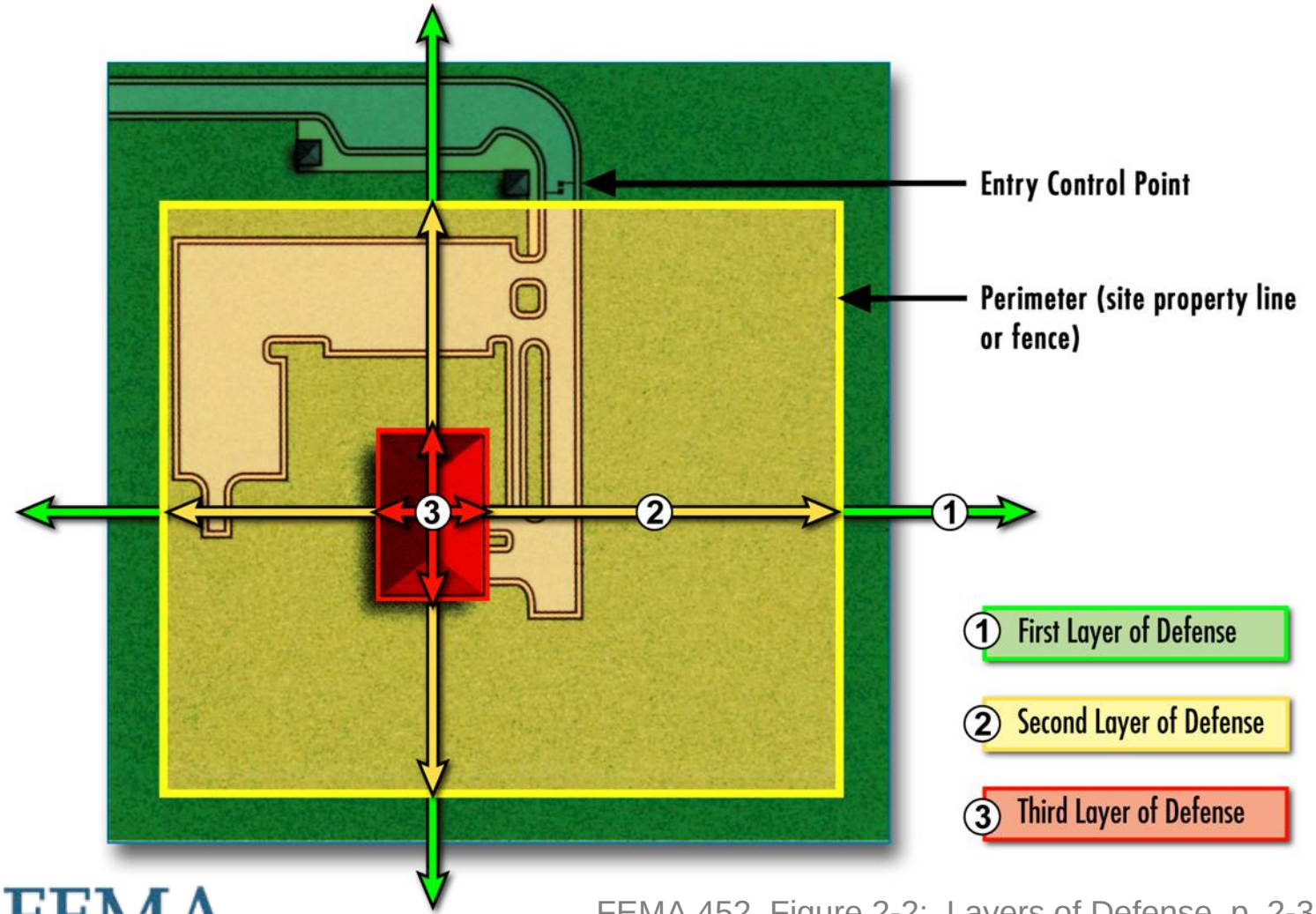
Layers of Defense



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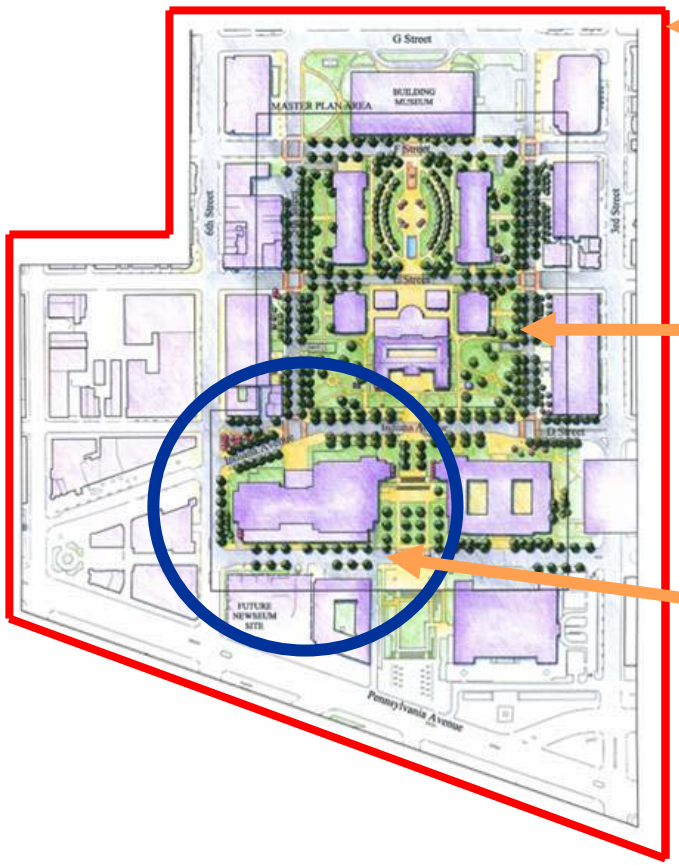
FEMA 452, Figure 2-2: Layers of Defense, p. 2-3

Layers of Defense



First Layer of Defense (Uncontrolled)

- Personnel Access Control
- Vehicle Access Control & Inspection
- Vehicle Stand-off

Second Layer of Defense (Controlled)

- Personnel Access Control
- Vehicle Access Control
- Vehicle Stand-off

High Security Building

Third, Second, and First Layers of Defense (Controlled)

- Personnel Access Control
- Vehicle Access Control
- Hardening

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Layers of Defense

Layers of Defense	Survey Surroundings	Access Points	Layout / Site Considerations	Barriers / Bollards / Fencing	Gatehouses / Screening	Sidewalks and Curbs	Street Furniture	Yards and Plazas	Roadways	Parking	Signage	Security Lighting	Sensors / CCTV	Site Utilities
First Layer														
Second Layer														
Third Layer														

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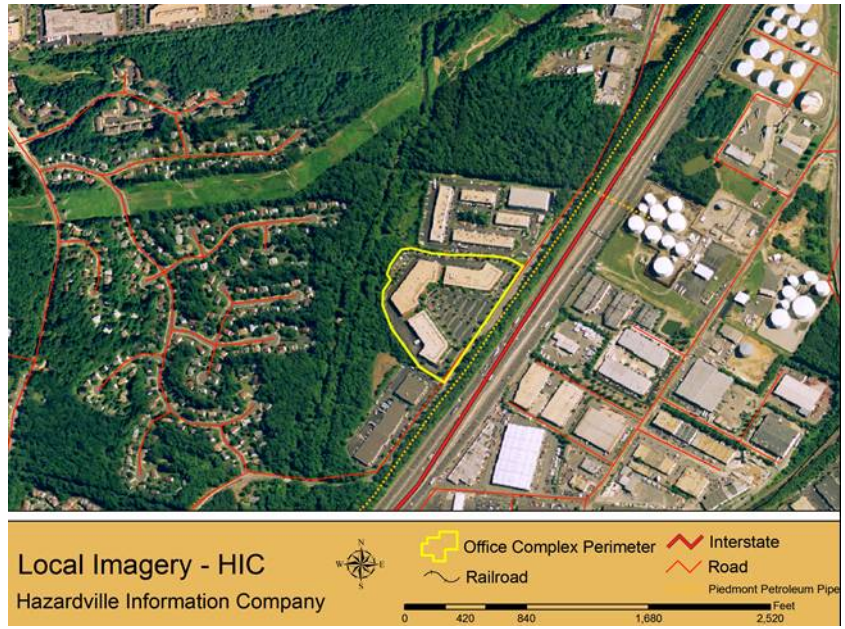
First Layer of Defense

Survey Surroundings / Data Collection

- **360 degrees - all directions**
- Overhead and underground utilities and structures
- Use GIS and local authorities to understand surroundings
  - Buildings
  - Infrastructure
  - Geographic/topographic elements



FEMA 426, Figure 2-1: Example of Using GIS to Identify Adjacent Hazards, p. 2-5

First Layer of Defense

Access Points

- Have commercial vehicle gates if possible
- Provide traffic calming
- Avoid high speed approaches
- Control angles of approach
- Prevent unauthorized access
- Avoid traffic queuing
- Have equal security capacity for exit

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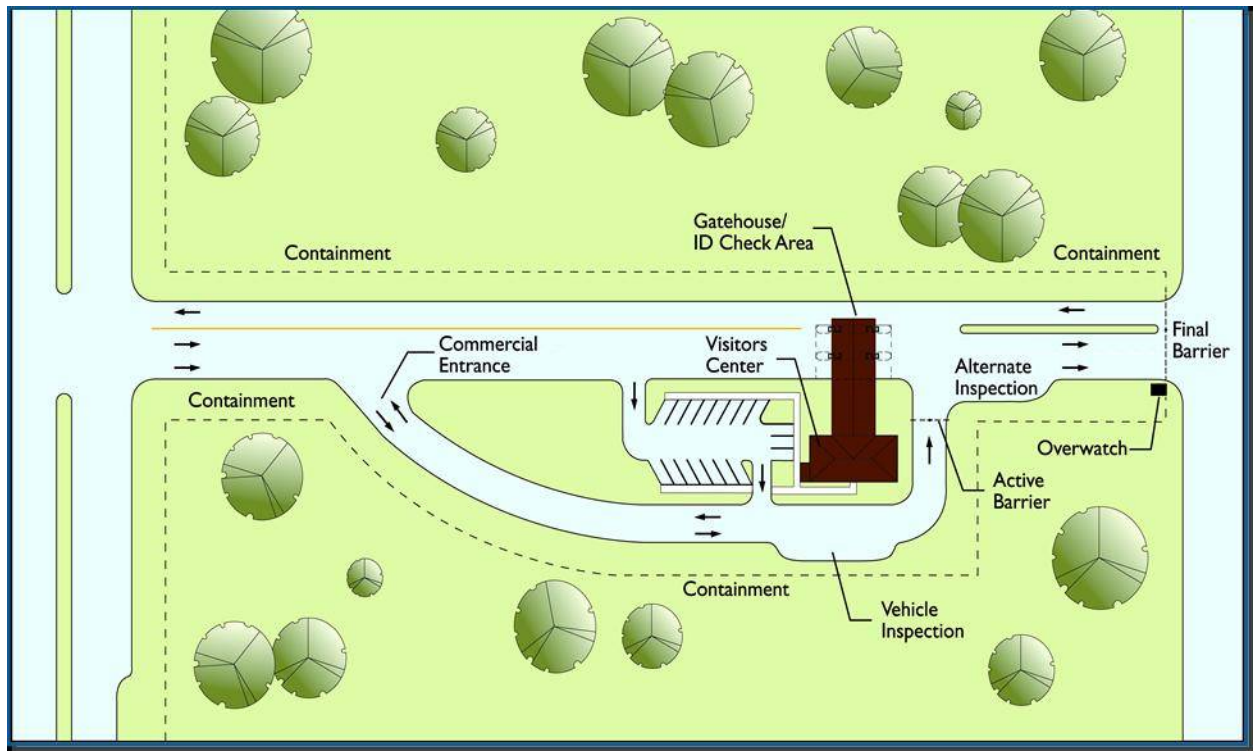
First Layer of Defense

Access Points

- Reject vehicles <u>before</u> final barrier
- Inspection area blast effects
  - Pressure
  - Fragments
- Reaction time to activate barriers



FEMA 426, Figure 2-15: Combined Multi-User Gate, p. 2-37

Second Layer of Defense

The following considerations can have an impact in the layout site design:

- Clustered versus dispersed facilities / functions
- Orientation
- Siting and view relationships

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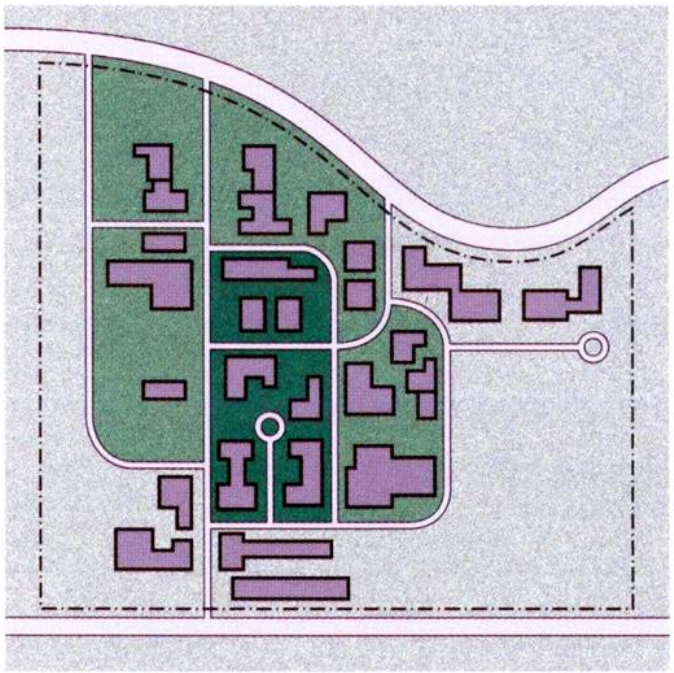
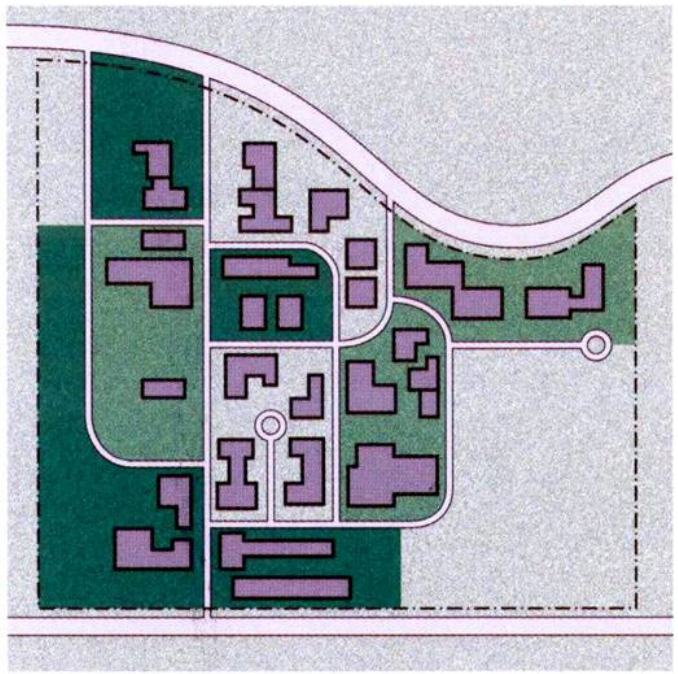
Second Layer of Defense

Layout/Site Considerations



Clustered facilities



Dispersed facilities

Low Risk

Medium

High Risk

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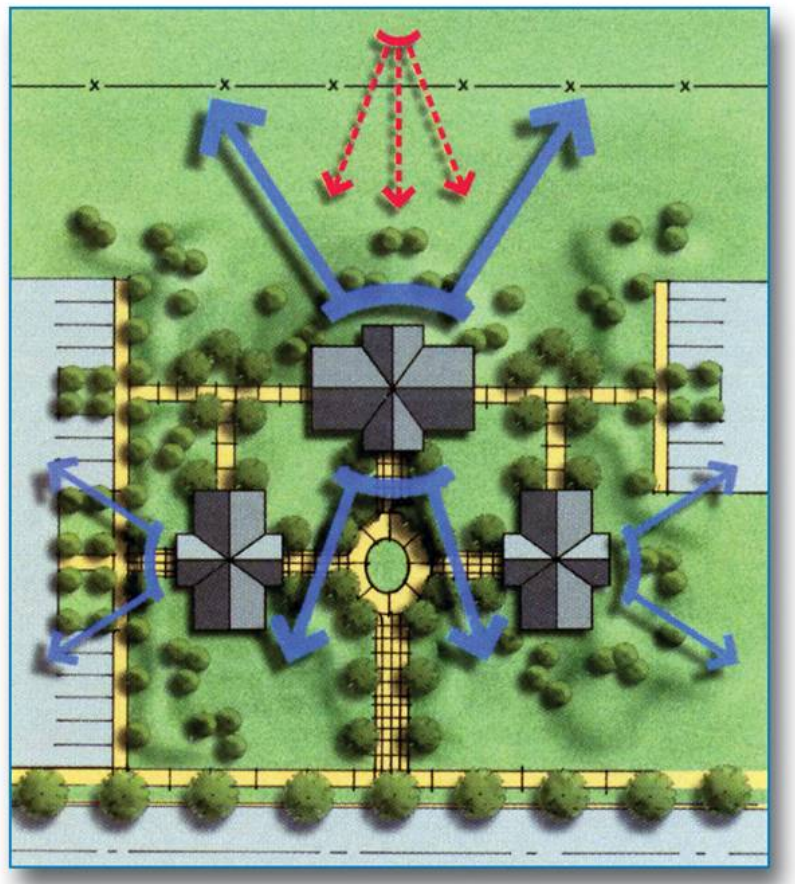
FEMA 426, Figure 2-2: Clustered versus Dispersed Site Layouts, p. 2-8

Second Layer of Defense

Layout/Site Considerations

Orientation

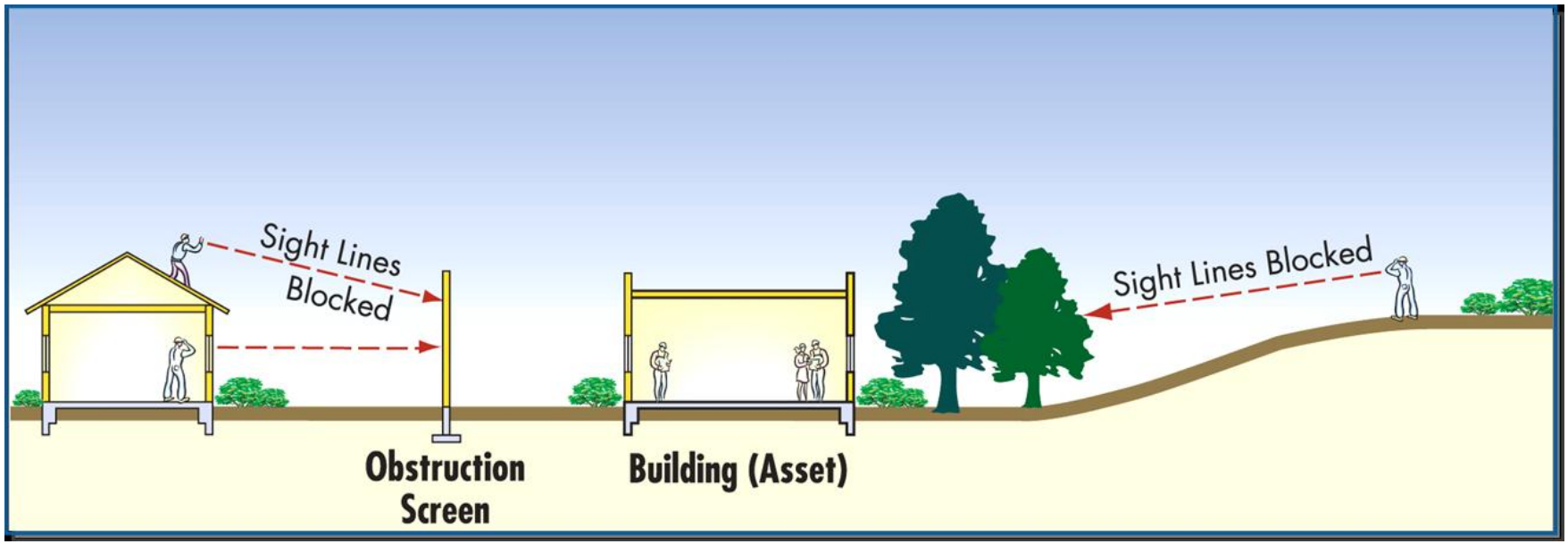
- Significant impact on making building visible or hidden to aggressors
- Enhance surveillance opportunities of approaches and parking
- Minimize views into building
- Reduce blast effects



FEMA 426, Figure 2-3: Clustering to Enhance Surveillance Opportunities While Minimizing Views into Buildings, p. 2-8

Second Layer of Defense

Layout/Site Considerations



Siting and View Relationships

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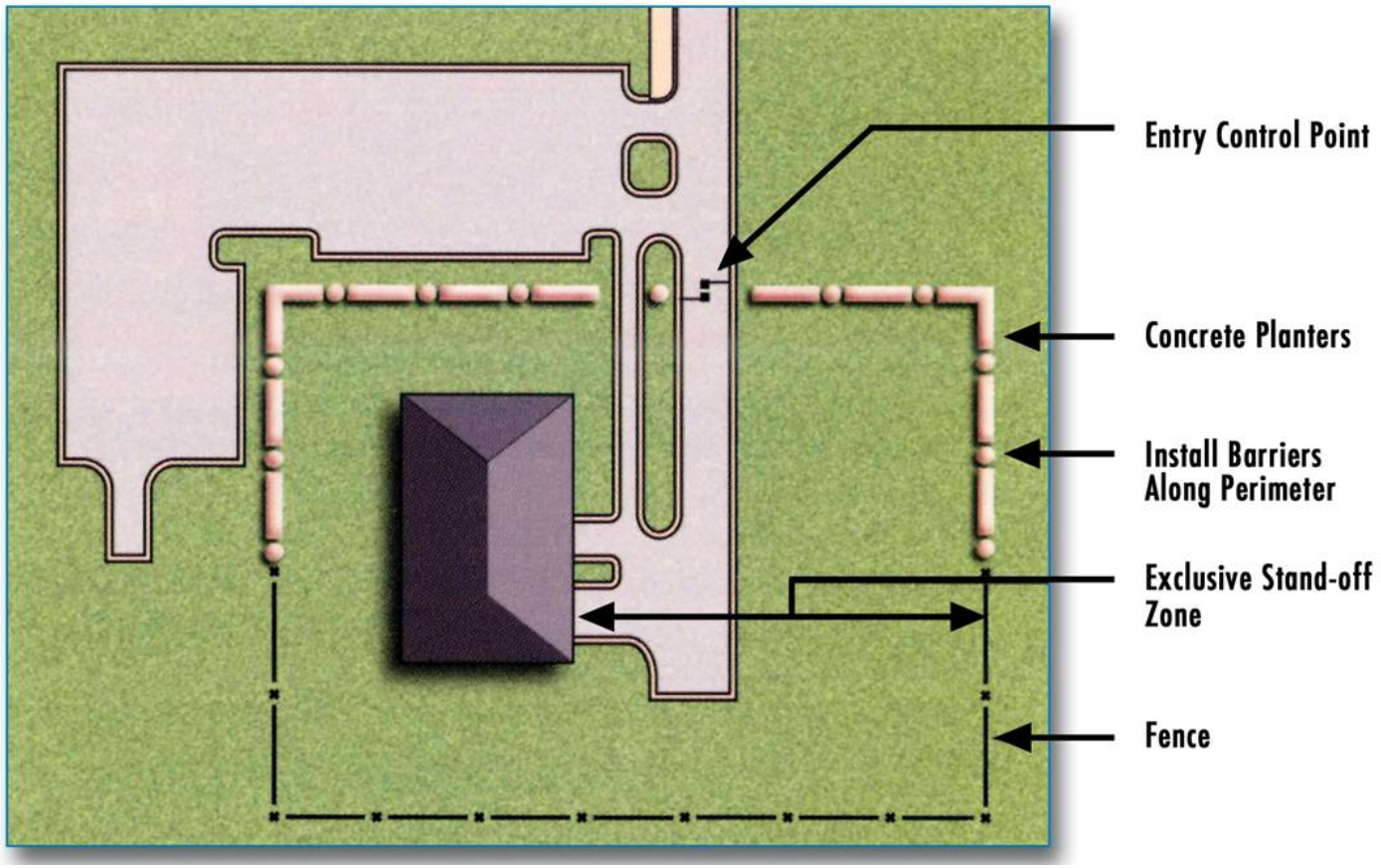
FEMA 426, Figure 2-5: Blocking of Site Lines, p. 2-20

Second Layer of Defense

Barriers/Bollards/Fencing



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FEMA 426, Figure 2-11: Application of Perimeter Barrier Elements, p. 2-28

First/Second Layer of Defense

Barriers/Bollards/Fencing - Passive

Source: Yodock Wall Company

Source: Yodock Wall Company

First/Second Layer of Defense

Barriers/Bollards/Fencing - Active

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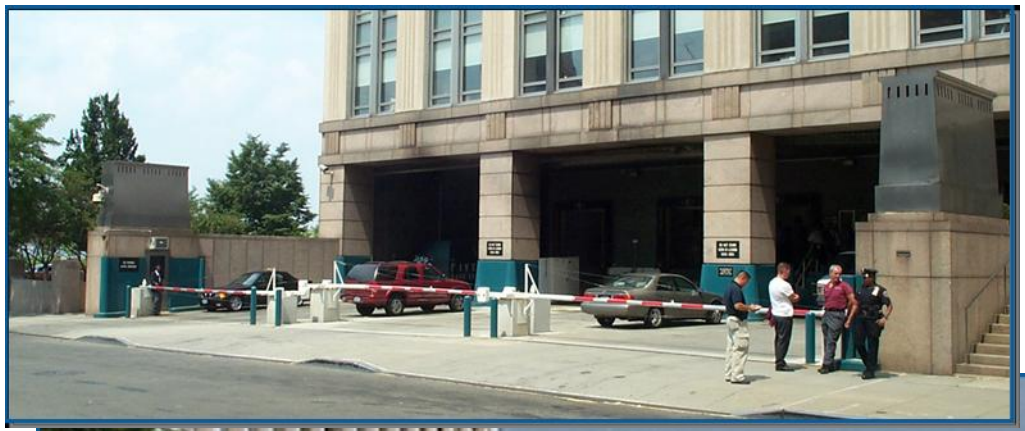
First/Second Layer of Defense



Rotating Drum, Drop Arm, and Rotating Plate Vehicle Barriers

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First/Second Layer of Defense

Barriers, Bollards, and Fencing

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

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First/Second Layer of Defense

Barriers, Bollards, and Fencing

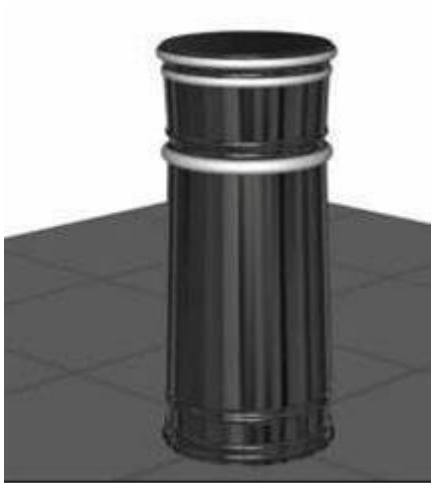
- Fixed bollards
- Retractable bollards
- Planters

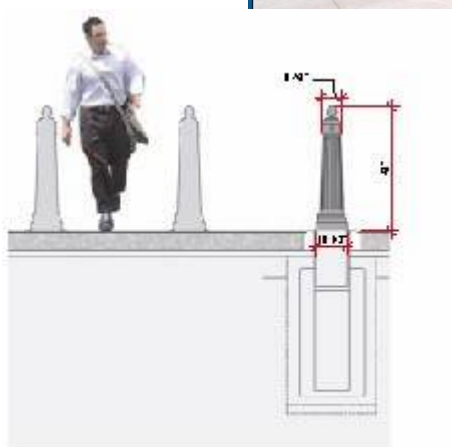
Fixed bollards

First/Second Layer of Defense

Barriers, Bollards, and Fencing

Retractable





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First/Second Layer of Defense

Barriers, Bollards, and Fencing

Planters

- If well designed, planters can be an element of beautification
- Ensure barriers are properly anchored to stop vehicles and configured to reduce fragmentation

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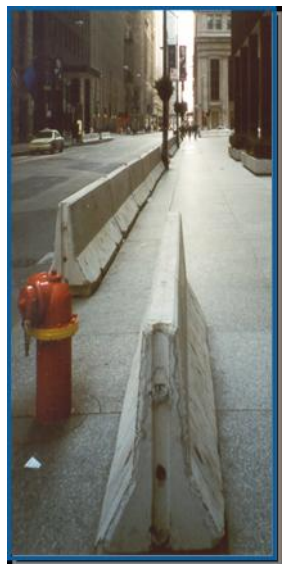
First/Second Layer of Defense

Barriers, Bollards, and Fencing

Avoid designing barriers that impair access by first responders:

- Intersection with driveways and gates
- Crossing of pedestrian paths and handicapped ramps
- Fire hydrants



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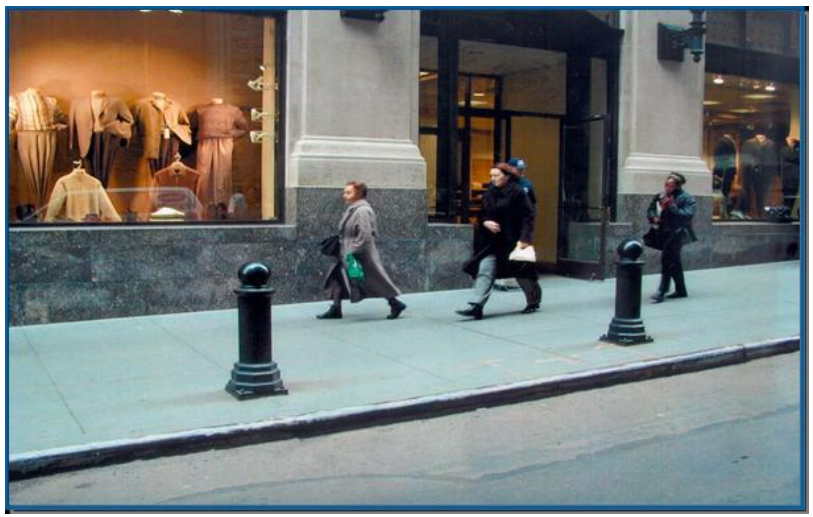
First/Second Layer of Defense

Barriers, Bollards, and Fencing

Long expanses of bollards should be carefully designed and sited to avoid monotony



Bollard spacing should ensure no vehicles can get through

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First/Second Layer of Defense

Barriers, Bollards, and Fencing

Fencing

- Delineates layer of defense
- Demarcates stand-off required
- Provides access control
- Augments existing security
- Channels vehicle/pedestrian traffic
- Enhances electronic security

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First/Second Layer of Defense

Gatehouses/Screening

Access control with human intervention

- Hardened as determined by threat
- Protection from elements
- Located to minimize queuing

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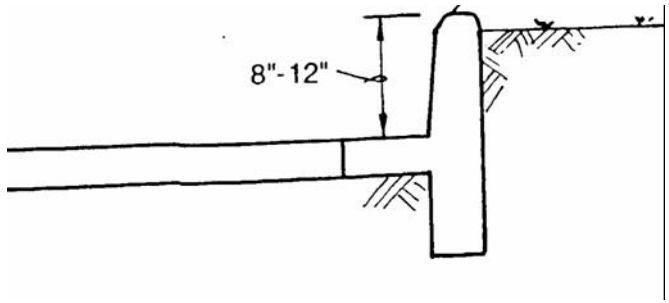
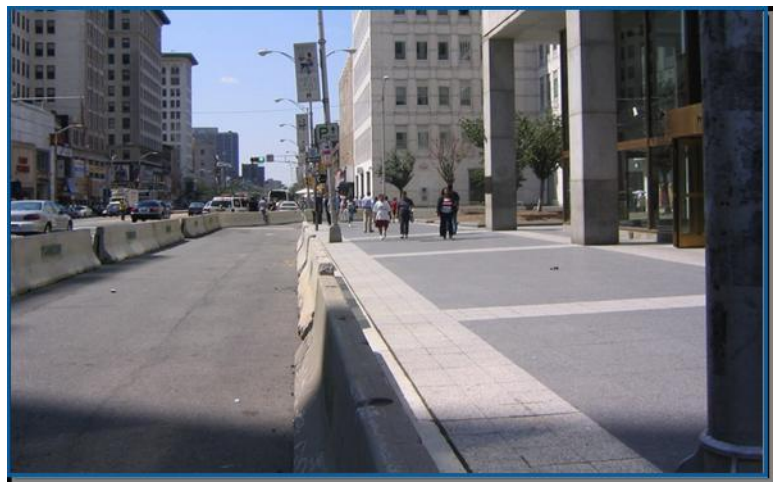
First/Second Layer of Defense

Sidewalks and Curbs

- Creating stand-off in lieu of hardening is usually less expensive
- High curbs can keep vehicles from departing roadway
- Do not remove curbside parking unless additional stand-off absolutely required





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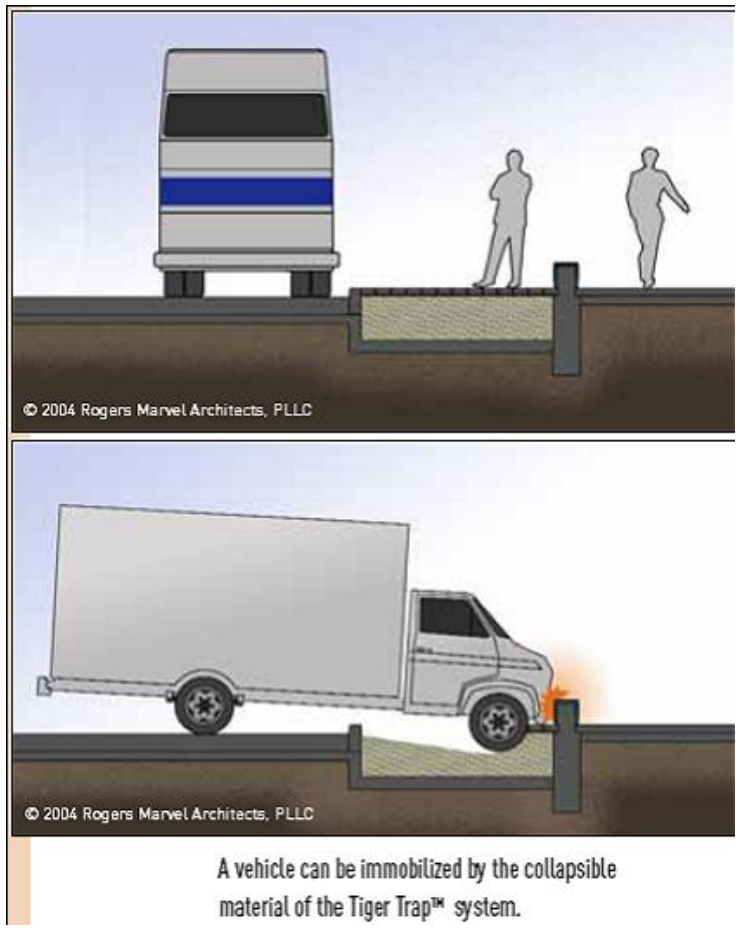
First/Second Layer of Defense

Sidewalks and Curbs

An alternate to visible barriers/bollards/fencing is collapsible sidewalks using low-strength concrete



A vehicle can be immobilized by the collapsible material of the Tiger Trap™ system.

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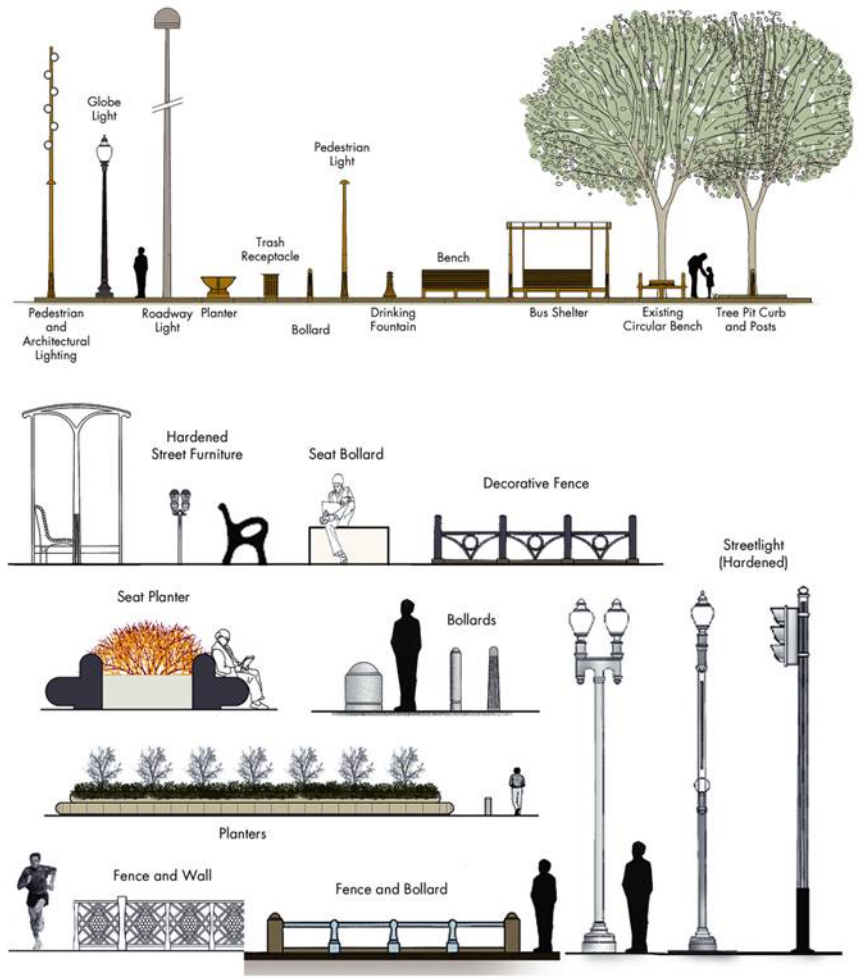
First/Second Layer of Defense

Street Furniture

Streetscape can be used to increase security. Hardened elements that become security elements

- Parking meters
- Streetlights
- Benches
- Planters
- Trash receptacles



NCPC Streetscape Catalogue

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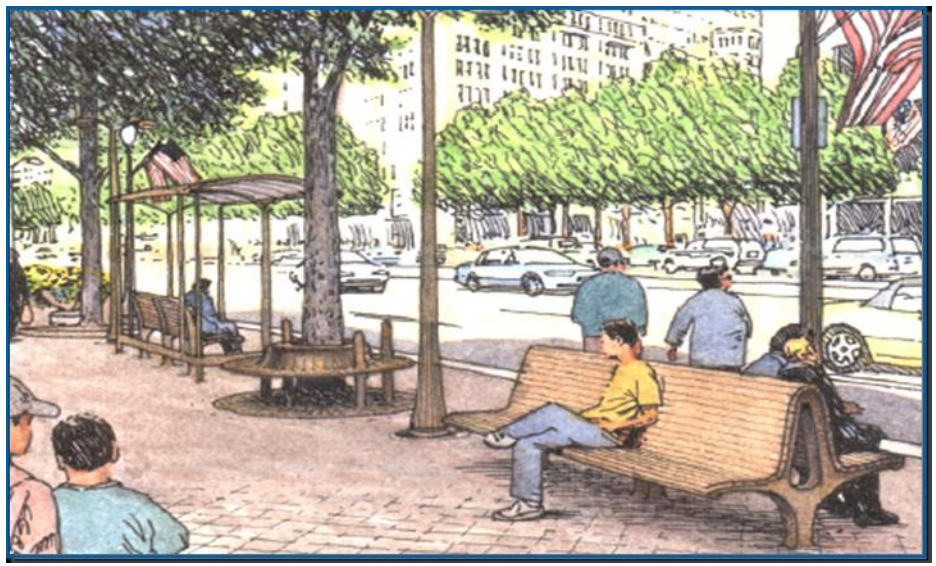
First/Second Layer of Defense

Street Furniture

Place streetscape security components at least 24 inches from edge of curb

- Allow for opening car doors
- Allow for pedestrian movement from car to sidewalk



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Second Layer of Defense

- Buildings with front yards

- Buildings with plazas

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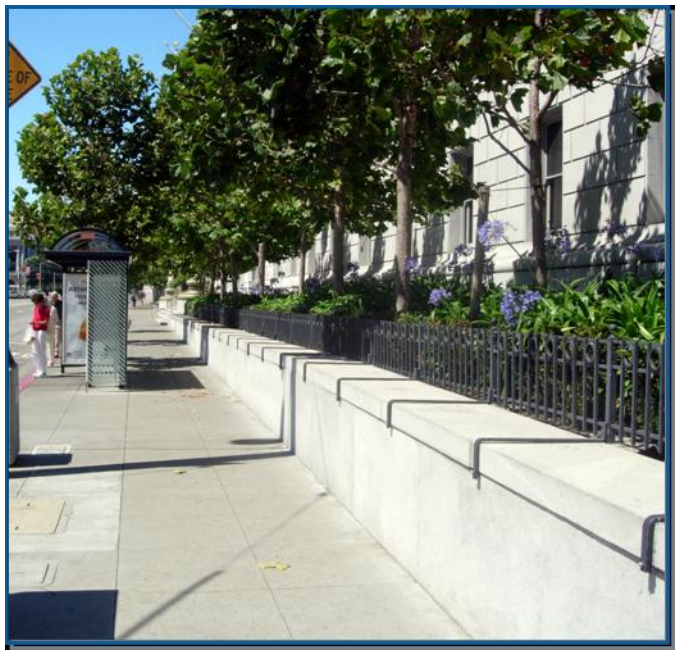
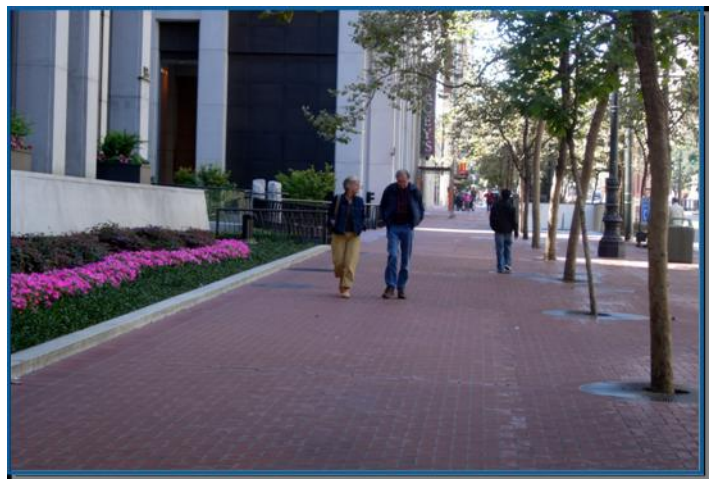
Second Layer of Defense

Building Yard



Narrow yard incorporating low stone wall and metal fence

- **Generally small**
- **Usually provided for governmental & institutional buildings**



Small yard with wide pavement that provide some useful stand-off

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Second Layer of Defense

Building Yard

Low planting makes a moderate barrier

High stepped yard on sloping site make a strong barrier

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Second Layer of Defense

Building Yard

Monumental yards make excellent barriers and elements of beautification

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Second Layer of Defense

Plaza

- An expanded building yard
- Moved out from the controlled building access
- A developer provided public space
- A well designed plaza can provide visual interest at same time providing good stand-off

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Second Layer of Defense

Roadways

- Minimize interruption or closure of street
- Ensure minimal conflict between pedestrian and traffic flow

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Second Layer of Defense

Parking

- Restrict parking from the interior of a group of buildings and away from restricted area
- Locate parking within view of occupied buildings
- If possible, design the parking lot with one-way circulation

Adapted from FEMA 452, Figure 2-4: Layers of Defense, p. 2-5

Second Layer of Defense

Parking

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Second Layer of Defense

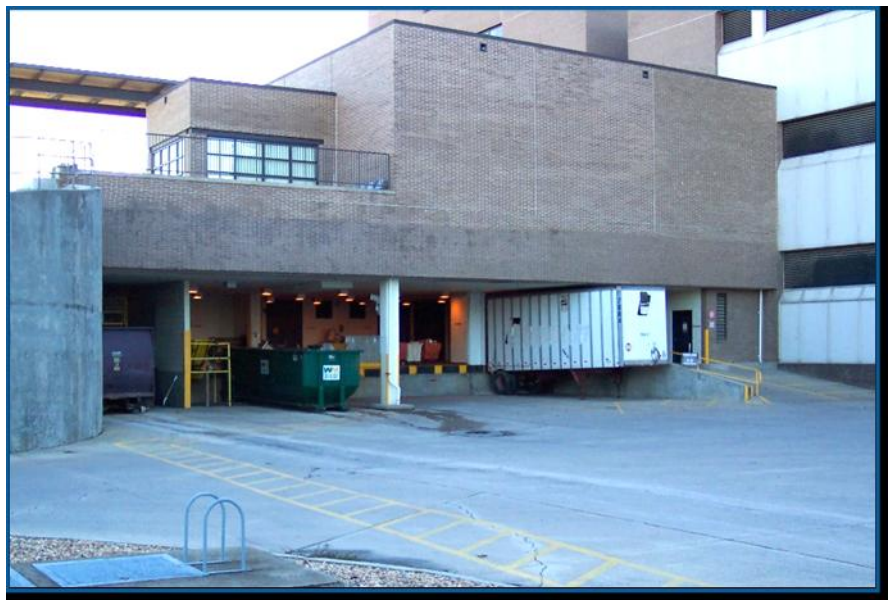
Parking

- Restrict parking and access between buildings
- Consider one-way circulation in parking lots
- Locate parking within view of occupied buildings
- Restrict parking underneath buildings
- Well-lit, with security presence, emergency communications, and/or CCTV
- Apply progressive collapse hardening to columns when parking garage is in the building

Second Layer of Defense

Parking - Loading Docks

- Avoid trucks parking into or underneath of the buildings
- Keep dumpsters away from buildings
- Separate loading docks from building critical functions
- Design to prevent progressive collapse



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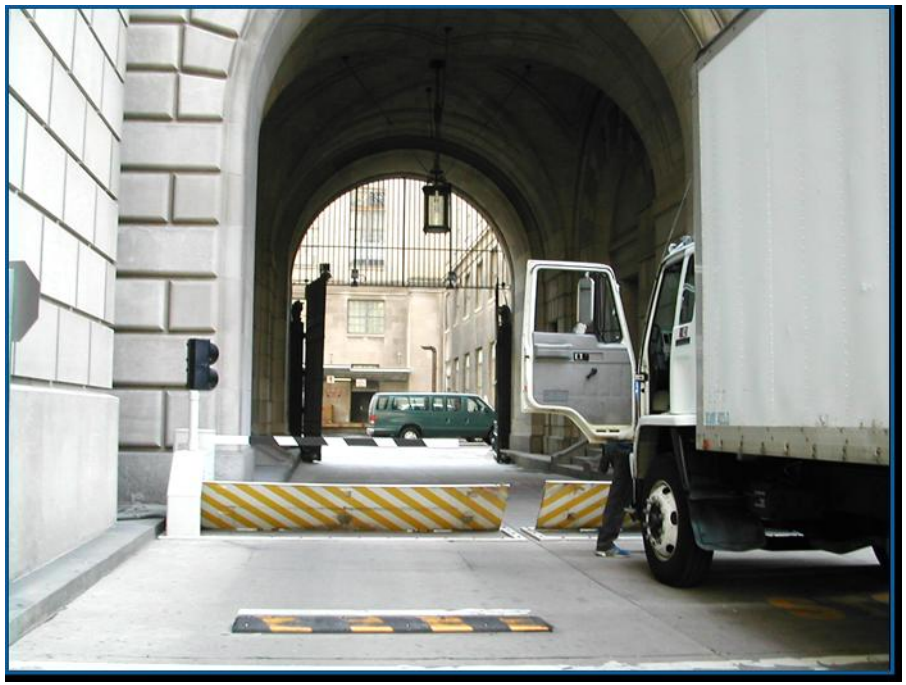
Second Layer of Defense

Parking - Loading Docks

- Ensure separation from critical systems, functions, and utility service entrances
- Provide sufficient area for screening vehicles and packages



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Second Layer of Defense

Signage

- Unless required, do not identify sensitive areas
- Minimize signs identifying critical utilities
- Warnings signs limiting access to control areas should be posted at all entrances
- Signpost may be hardened and included as part of the perimeter barrier
- The lighting of signage should enhance nighttime safety
- Warning signs should be posted in languages commonly spoken

First/Second Layer of Defense

Security Lighting

High-mast lighting at entry control points

Continuous lighting

- Glare projection
- Controlled lighting (avoid glare)
- Closed circuit television (CCTV)

Standby lighting

Movable lighting

Emergency lighting

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First Layer of Defense

Sensors / CCTV

- When stand-off and hardening are not possible, security must rely upon sensors and CCTV
- Look for suspicious vehicles and people, especially those that seem to be profiling your building
- Monitor access to utilities serving the building
- Currently high tech monitoring systems need to be selected and placed by experts

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Second Layer of Defense

Site Utilities

Second Layer of Defense

Site Utilities

- Concealed versus exposed
- Underground versus overhead
- Protect/secure versus accessible
- Surveillance if possible

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Best Practices

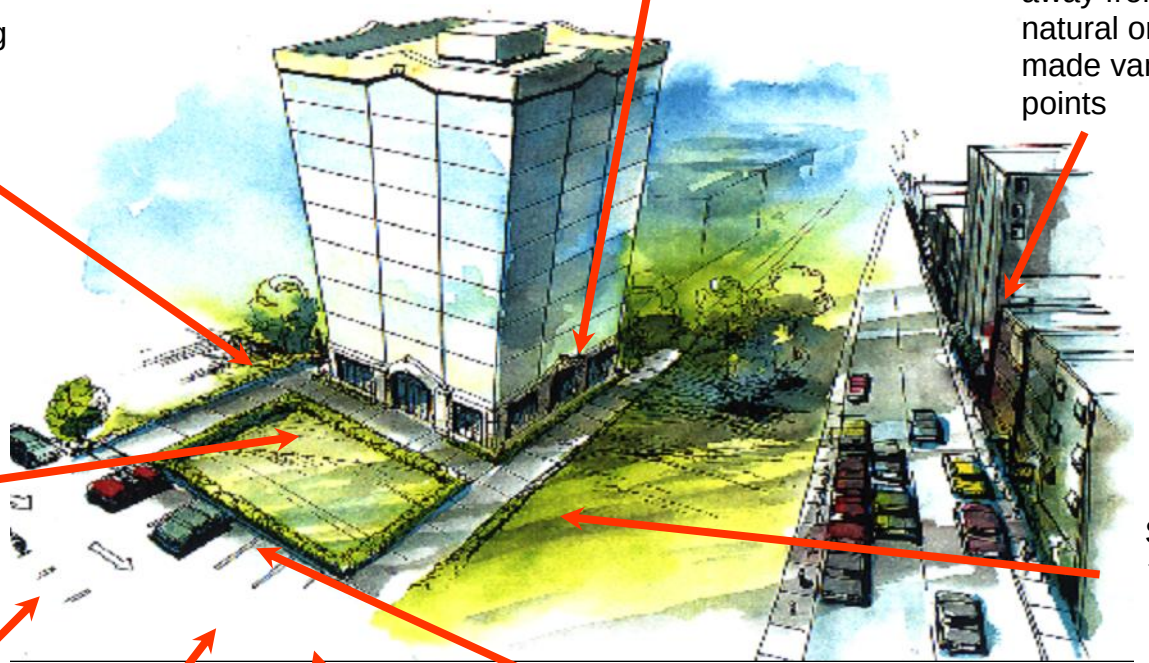

Figure 2-16, Summary of Site Mitigation Measures, p. 2-53

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Unit IX Case Study Activity

Site and Layout Design Guidance

Background

FEMA 426, Building Vulnerability Assessment Checklist: screening tool for preliminary design vulnerability assessment

Requirements: Vulnerability Rating Approach

Assign sections of the checklist to qualified group members

Refer to Case Study and answer worksheet questions

Review results to identify site and layout vulnerabilities and possible mitigation measures