Unit IX-A
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.

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Unit Objectives

Understand the following critical issues:

- Keeping up with growing demand for security design
- Understanding 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, Primer for Incorporating Building Security Components in Architectural Design

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Unit Objectives

Understand the following critical issues (continued):

- Adopting a creative process to face current design challenges
- Including aesthetic elements compatible with security and architecture 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, Primer for Incorporating Building Security Components in Architectural Design

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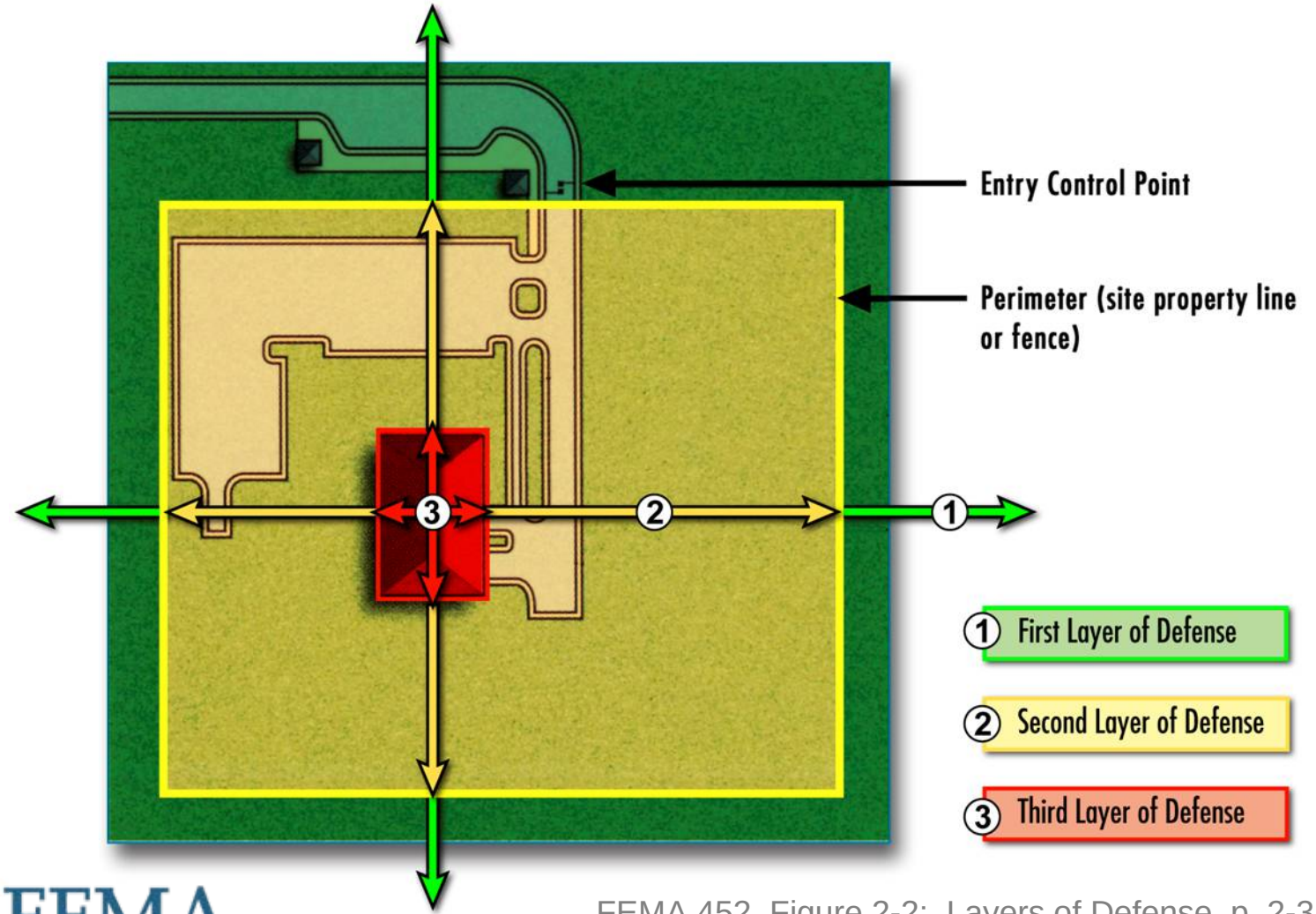
Layers of Defense



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

Layers of Defense

First Layer of Defense

Second Layer of Defense

High Security Building Third, Second, and First Layers of Defense

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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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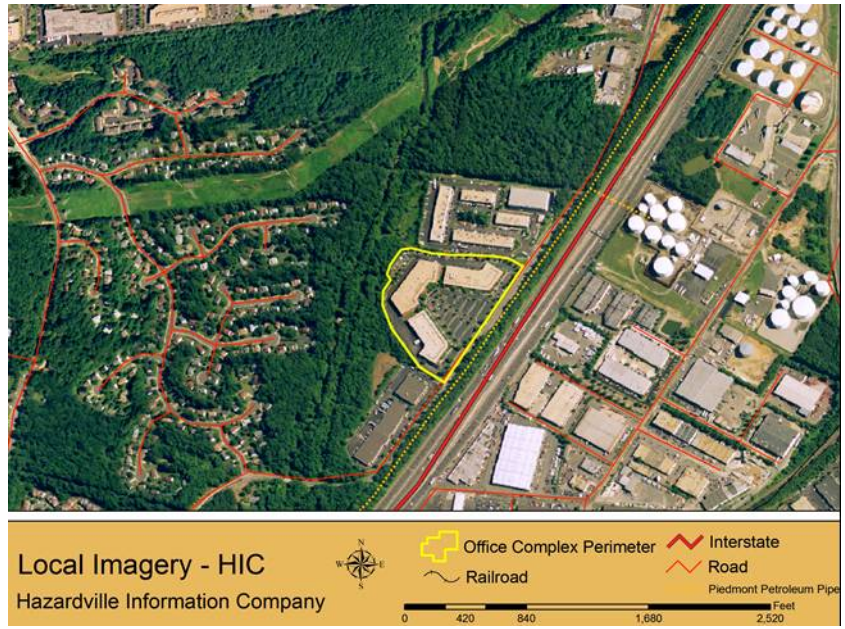
First Layer of Defense

Survey Surroundings / Data Collection

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



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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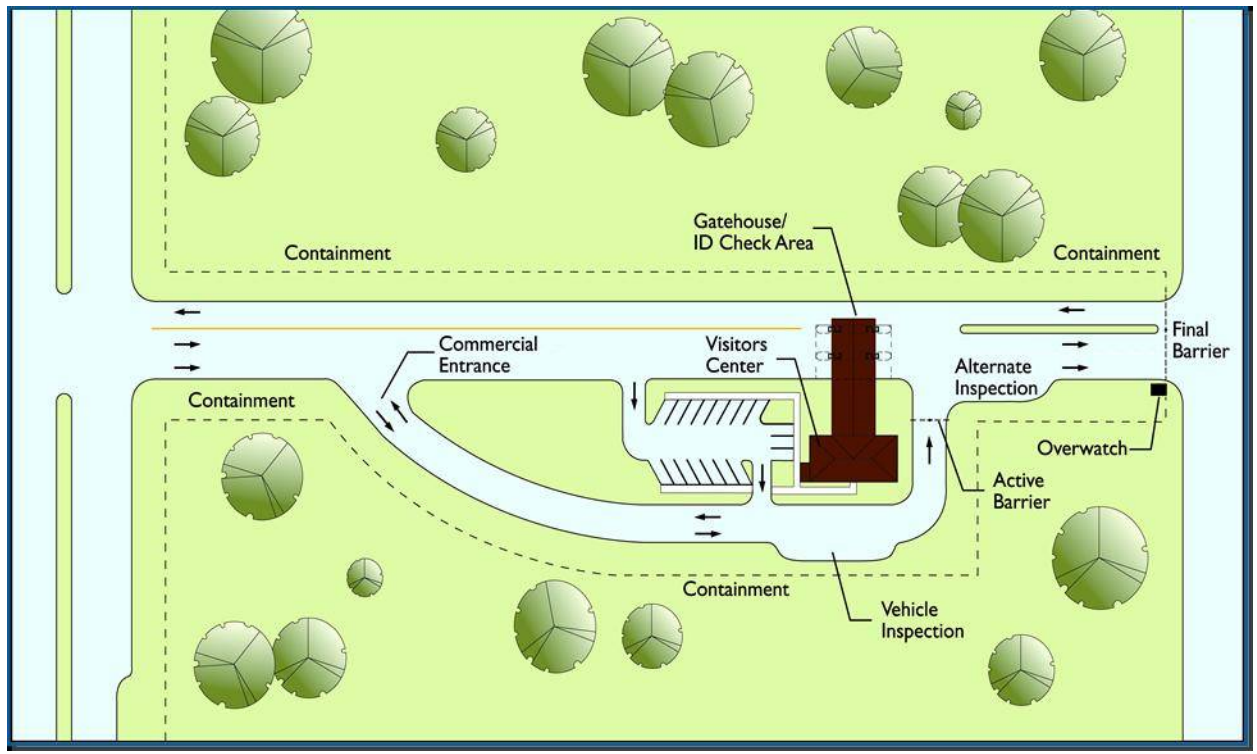
First Layer of Defense

Access Points

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



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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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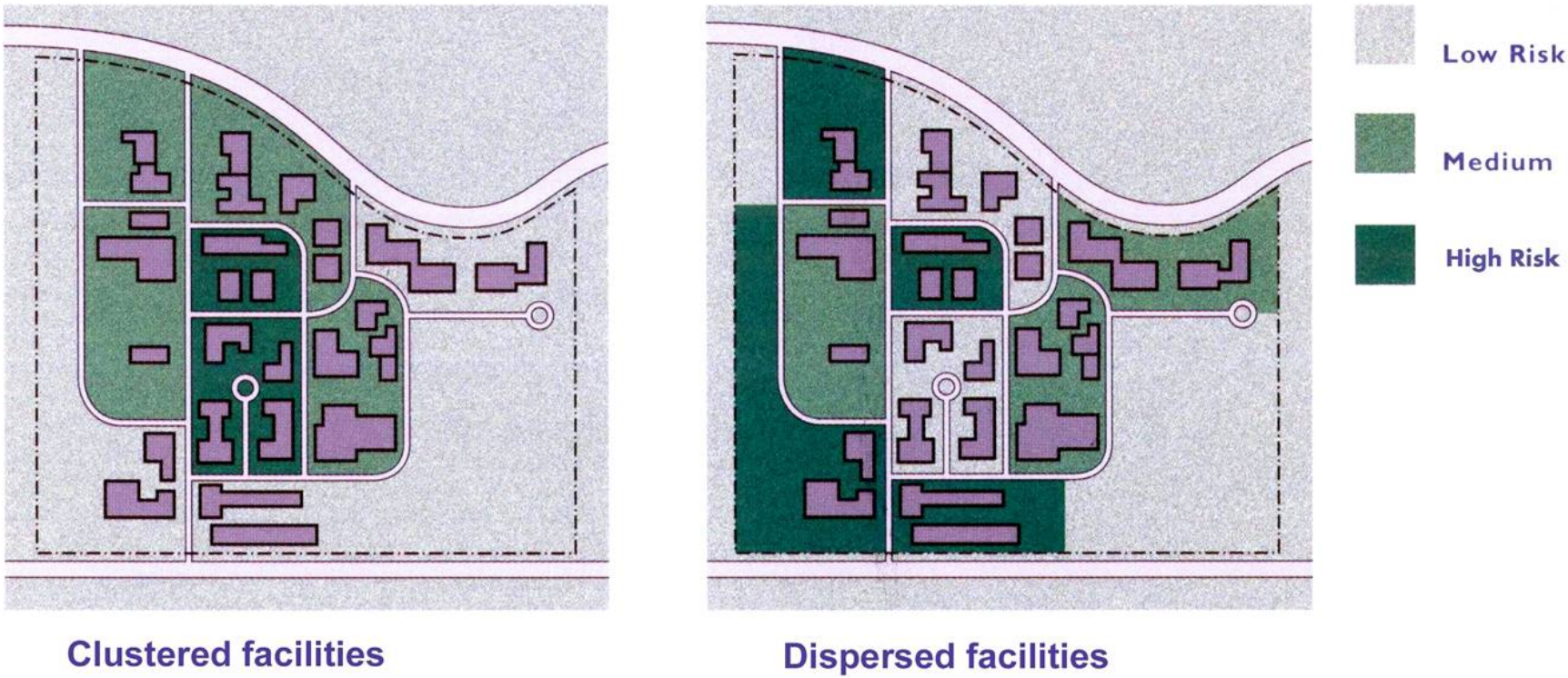
Second Layer of Defense

Layout/Site Considerations



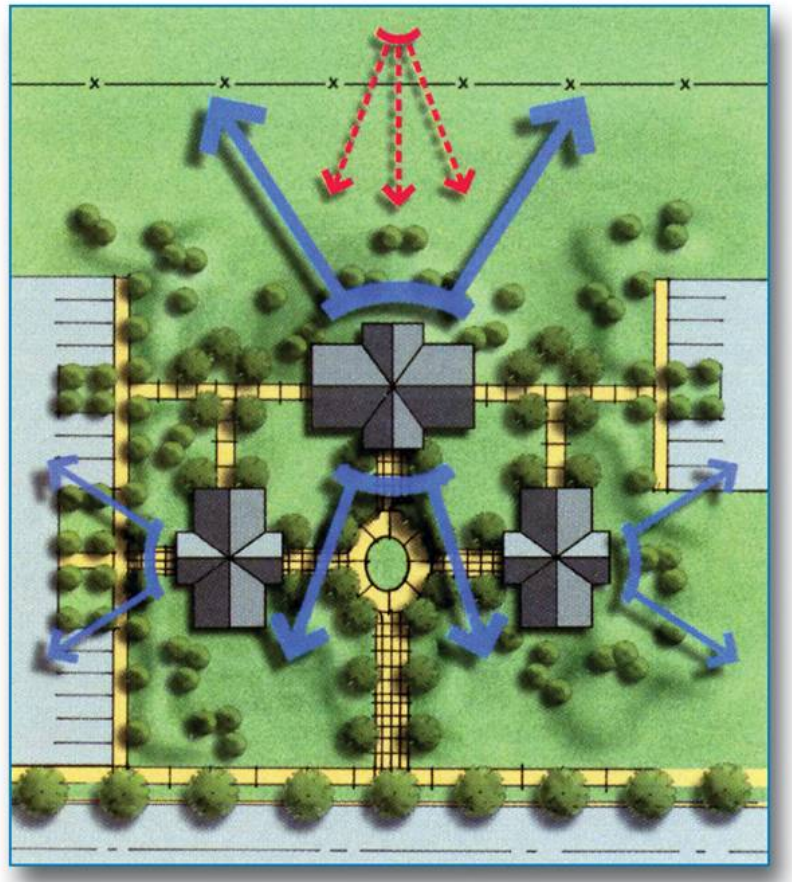
FEMA 426, Figure 2-2: Clustered versus Dispersed Site Layouts, p. 2-8

Second Layer of Defense

Layout/Site Considerations

Orientation

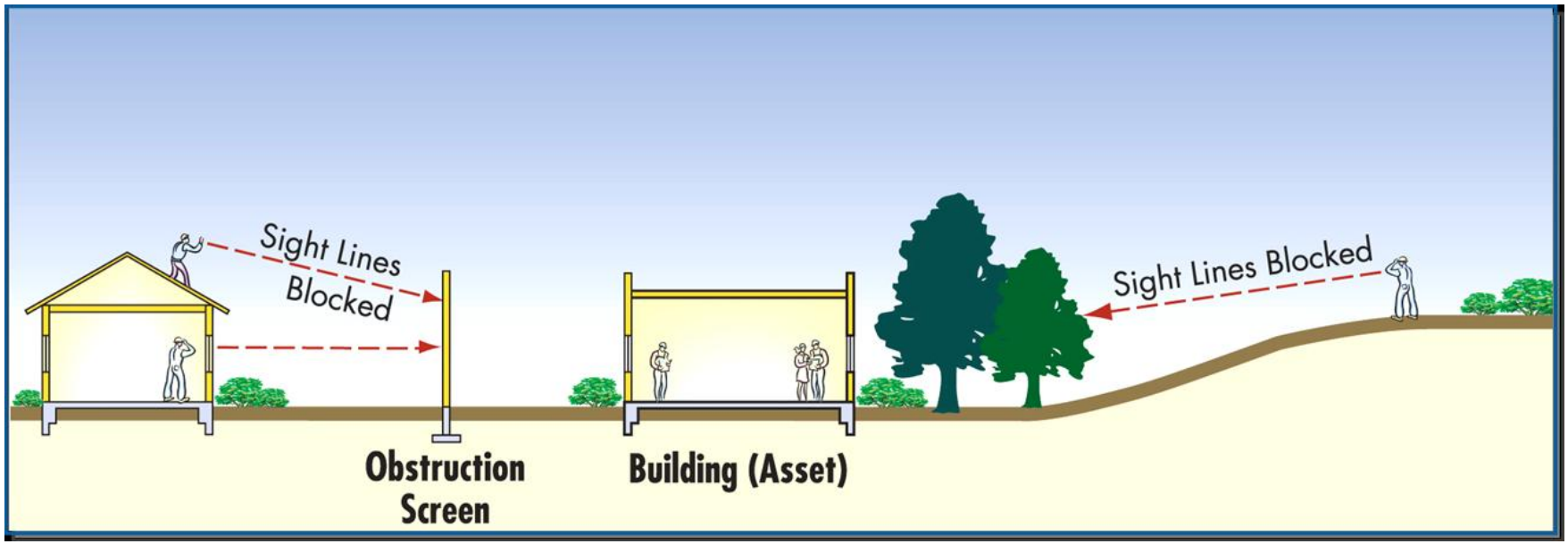
- Significant impact on making building visible or hidden to aggressors
- Enhance surveillance opportunities of approaches and parking
- Minimize views into building
- Reduce blast effects



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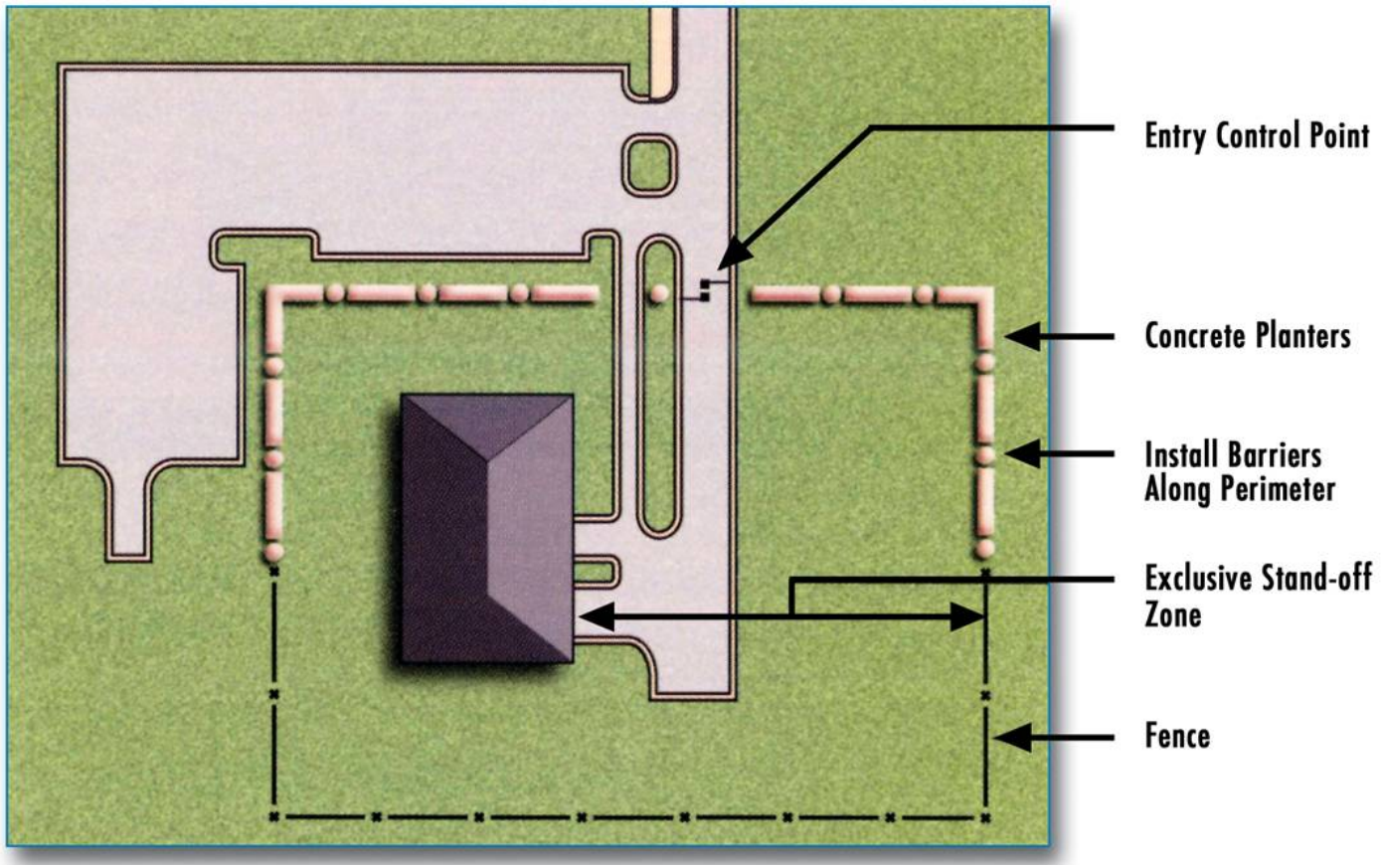
FEMA 426, Figure 2-5: Blocking of Site Lines, p. 2-20

Second Layer of Defense

Barriers/Bollards/Fencing



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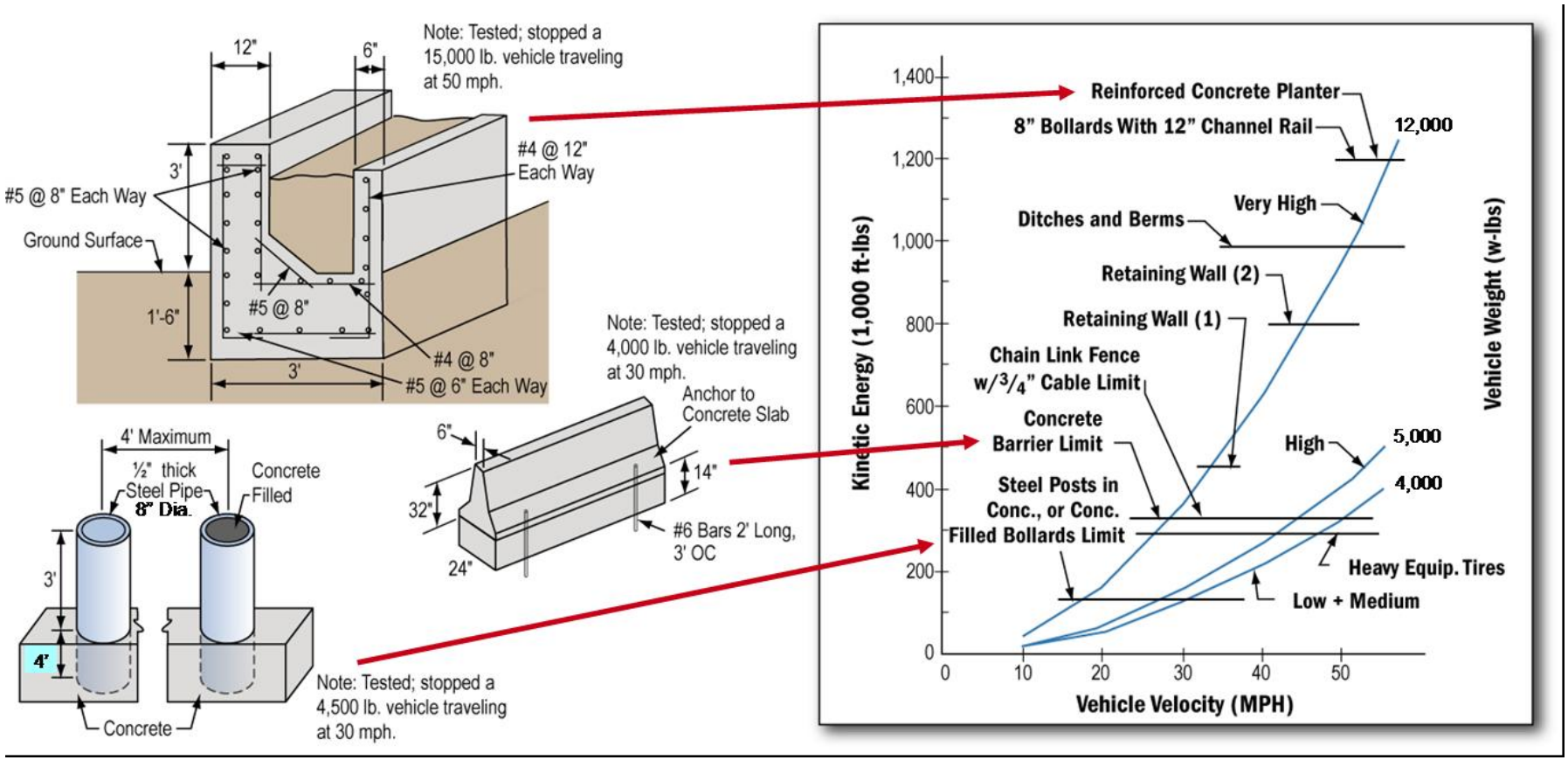
FEMA 426, Figure 2-11: Application of Perimeter Barrier Elements, p. 2-28

First/Second Layer of Defense

Barriers/Bollards/Fencing - Passive



First/Second Layer of Defense

Barriers/Bollards/Fencing - Passive

Source: Yodock Wall Company

Source: Yodock Wall Company

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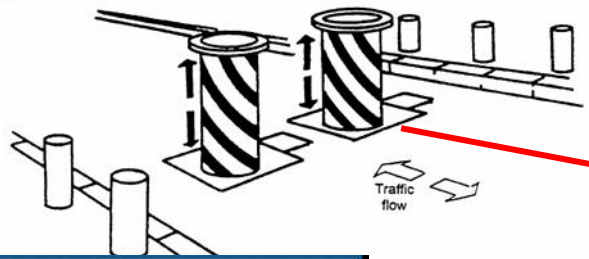
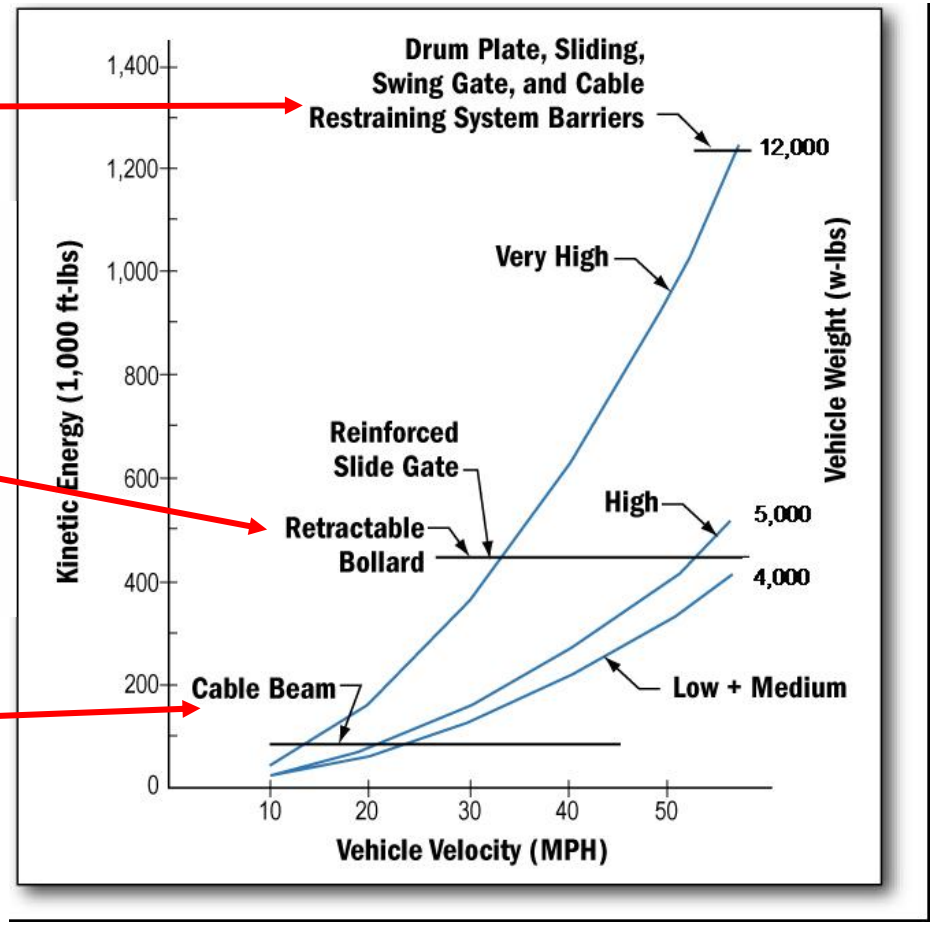
First/Second Layer of Defense

Barriers/Bollards/Fencing - Active



Source: Delta Scientific Corporation



First/Second Layer of Defense

Barriers/Bollards/Fencing - Active

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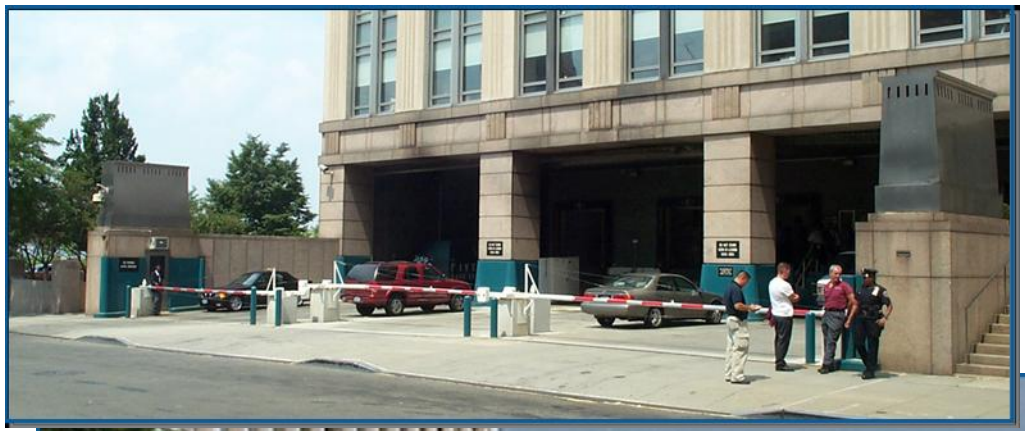
First/Second Layer of Defense



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

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

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First/Second Layer of Defense

Barriers, Bollards, and Fencing

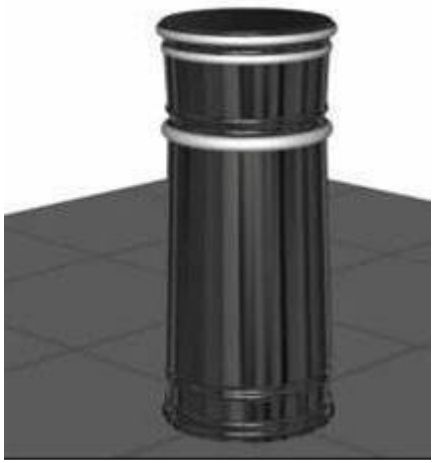
- Fixed bollards
- Retractable bollards
- Planters

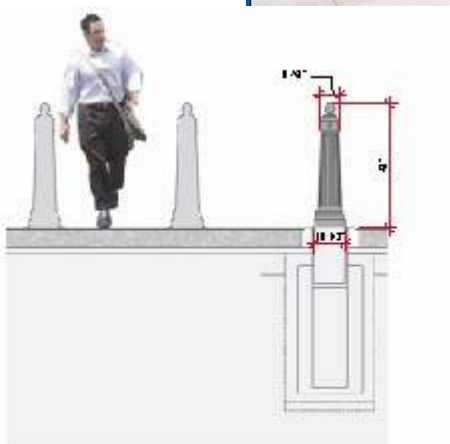
Fixed bollards

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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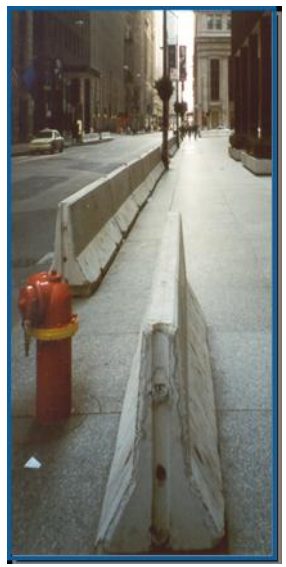
First/Second Layer of Defense

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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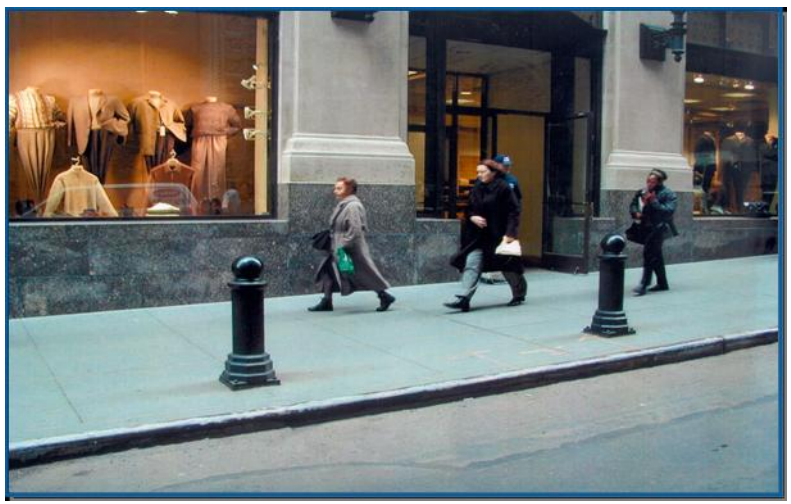
First/Second Layer of Defense

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

Pay attention to how bollards or fences turn the corner, intersect with driveways and gates, and cross pedestrian paths and handicapped ramps

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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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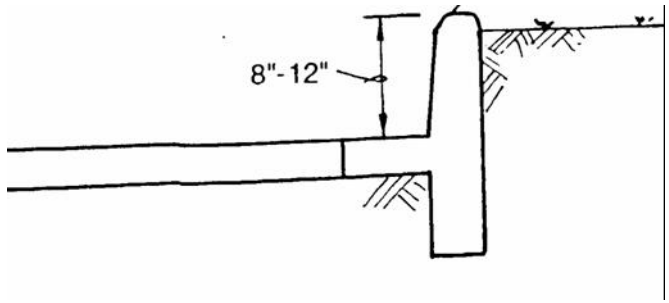
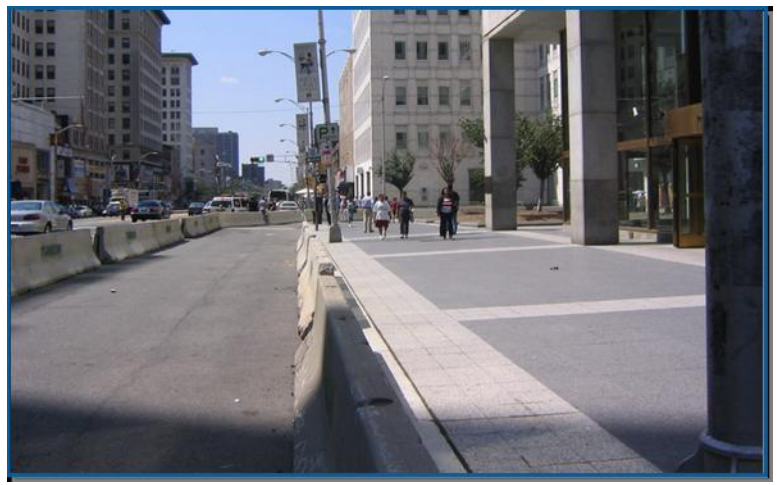
First/Second Layer of Defense

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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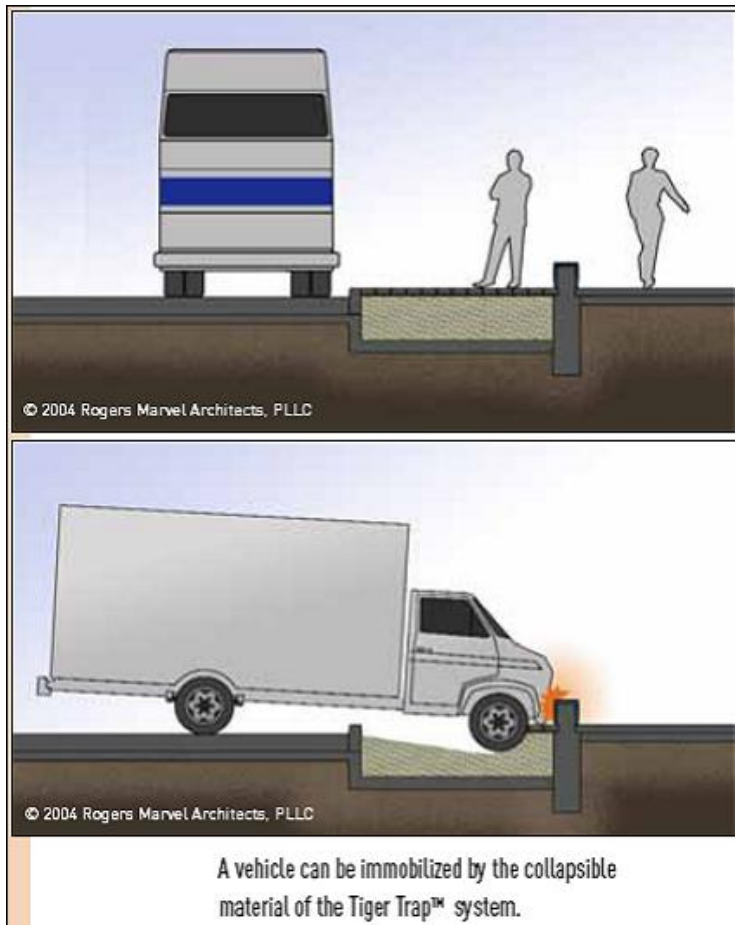
First/Second Layer of Defense

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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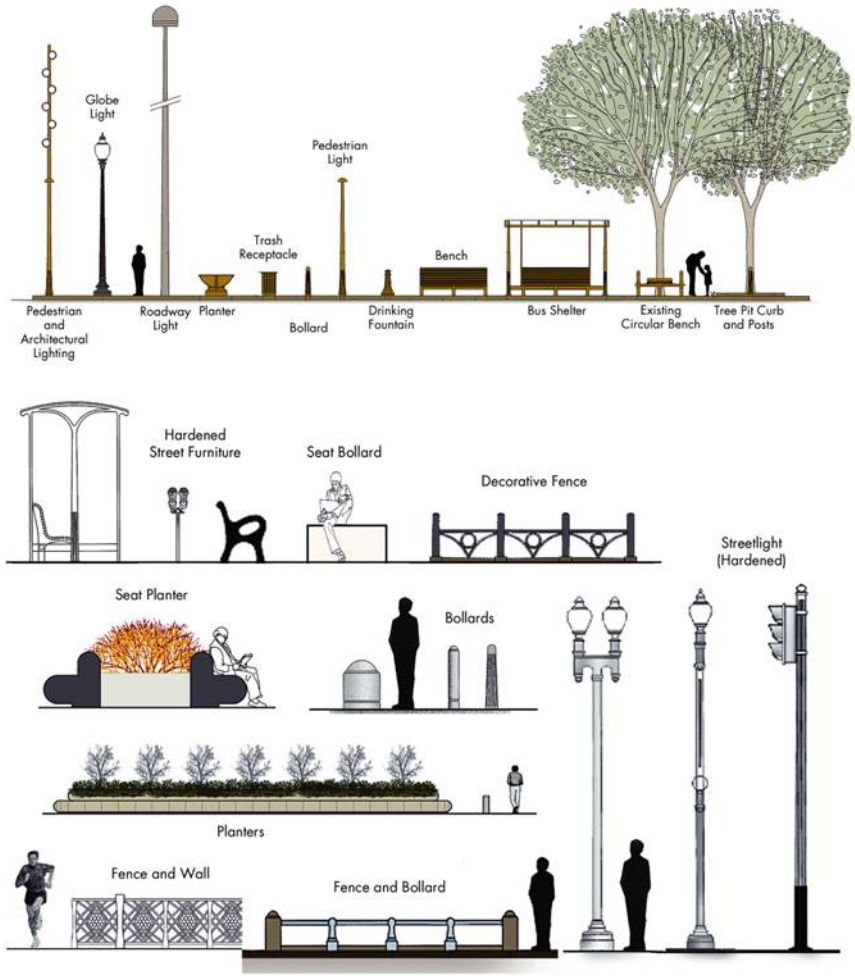
First/Second Layer of Defense

Street Furniture

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

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



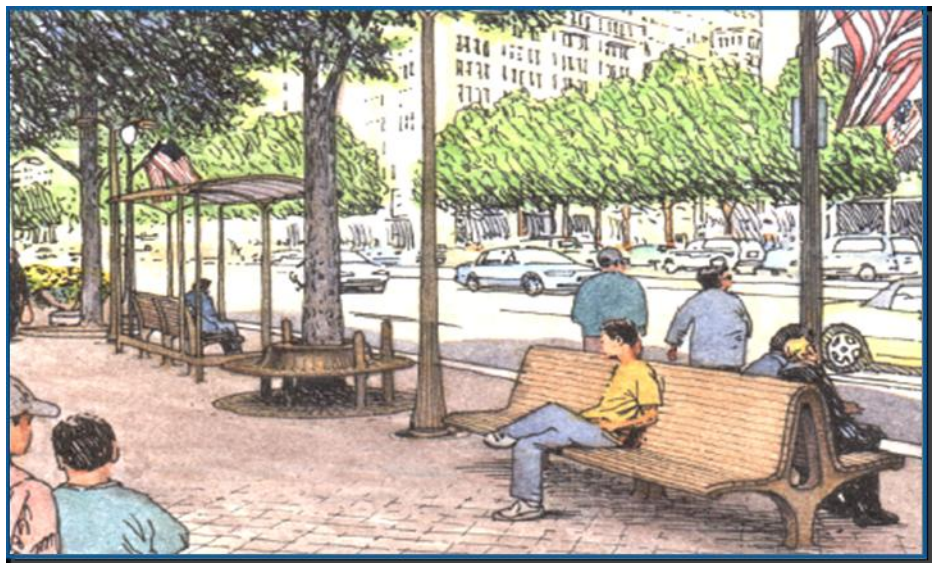
NCPC Streetscape Catalogue

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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First/Second Layer of Defense

Street Furniture

- Treatment of security elements should be compatible with existing elements
- Perimeter barriers can go hand-in-hand with streetscape improvements and plantings
- Appropriate design can blend security into existing streetscape; serving as amenities for tenants and neighbors

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Second Layer of Defense

- Buildings with front yards

- Buildings with plazas

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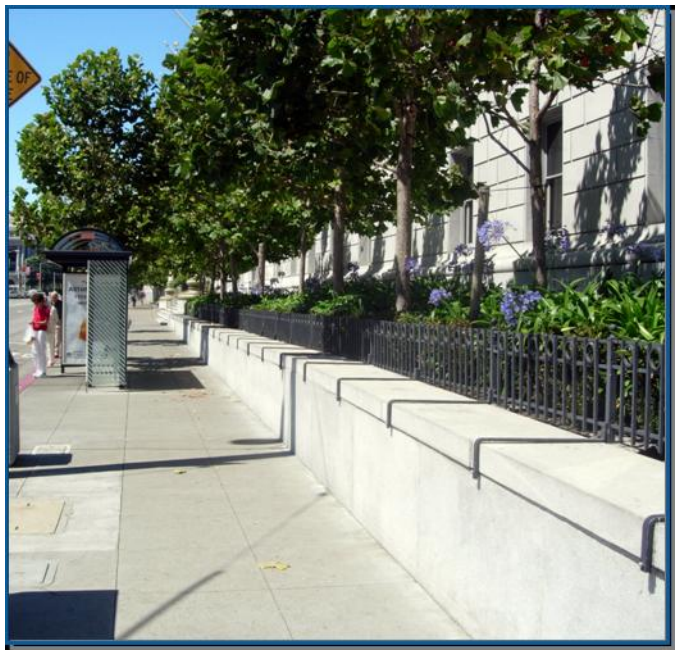
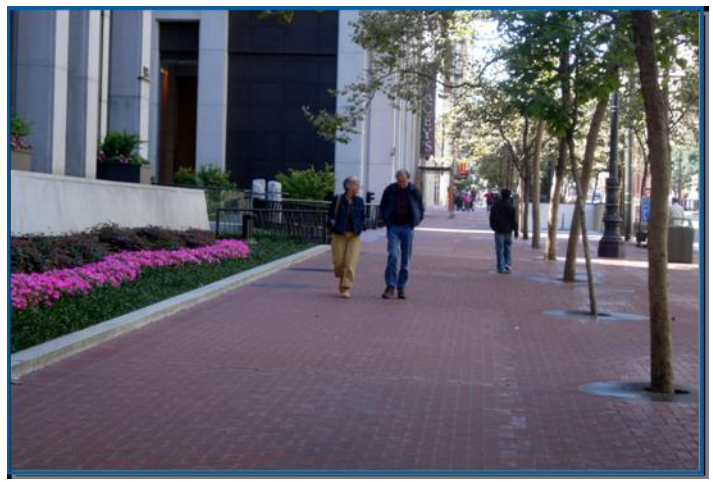
Second Layer of Defense

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

Second Layer of Defense

Parking

- Avoid parking too close to the building
- Design of good parking away from the building can avoid the need to harden the building
- Screening of vehicles and pedestrians at building may be necessary

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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

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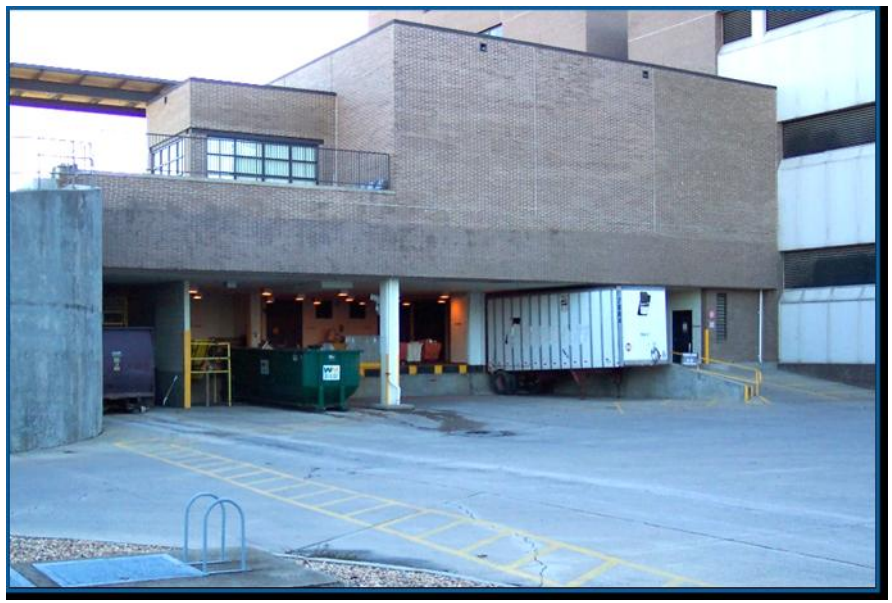
Second Layer of Defense

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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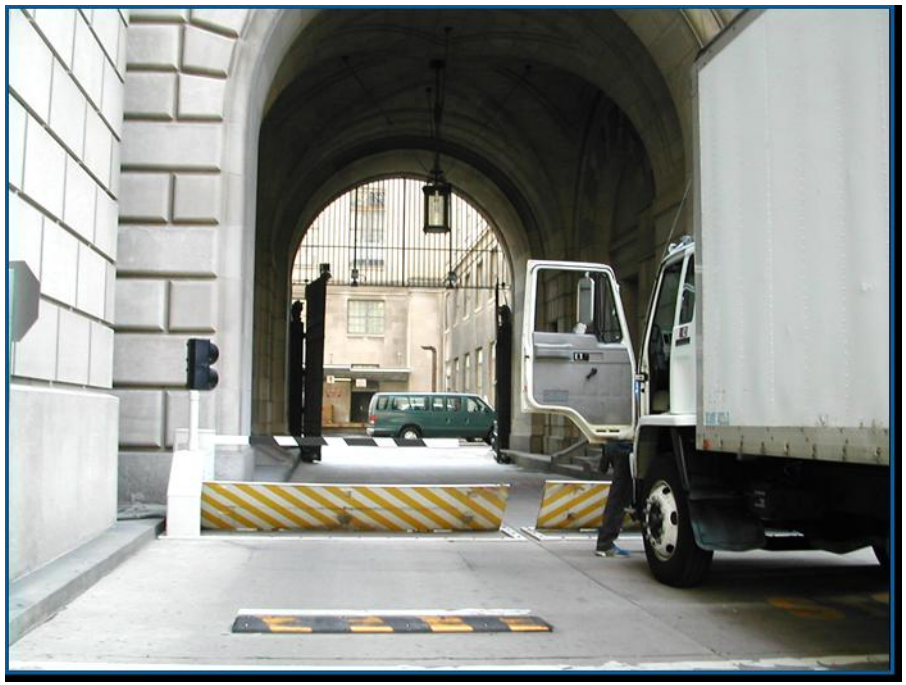
Second Layer of Defense

Parking - Loading Docks

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



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

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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Second Layer of Defense

Site Utilities

Control access to tanks of critical supplies on site

Place public address system/call boxes in parking lots and gathering areas to improve communications with security personnel

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Best Practices

Appropriate design can blend security into the existing streetscape and serve as amenities for tenants and neighbors

Treatment of the security elements should be compatible existing elements

Perimeter barriers can be hand-in-hand with streetscape improvements and street planting

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Best Practices

Avoid introducing inappropriate security elements that will make tenants and neighbors feel more vulnerable and can detract from surrounding architecture and streetscape

Signage and way-finding should be carefully designed to increase security

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Best Practices

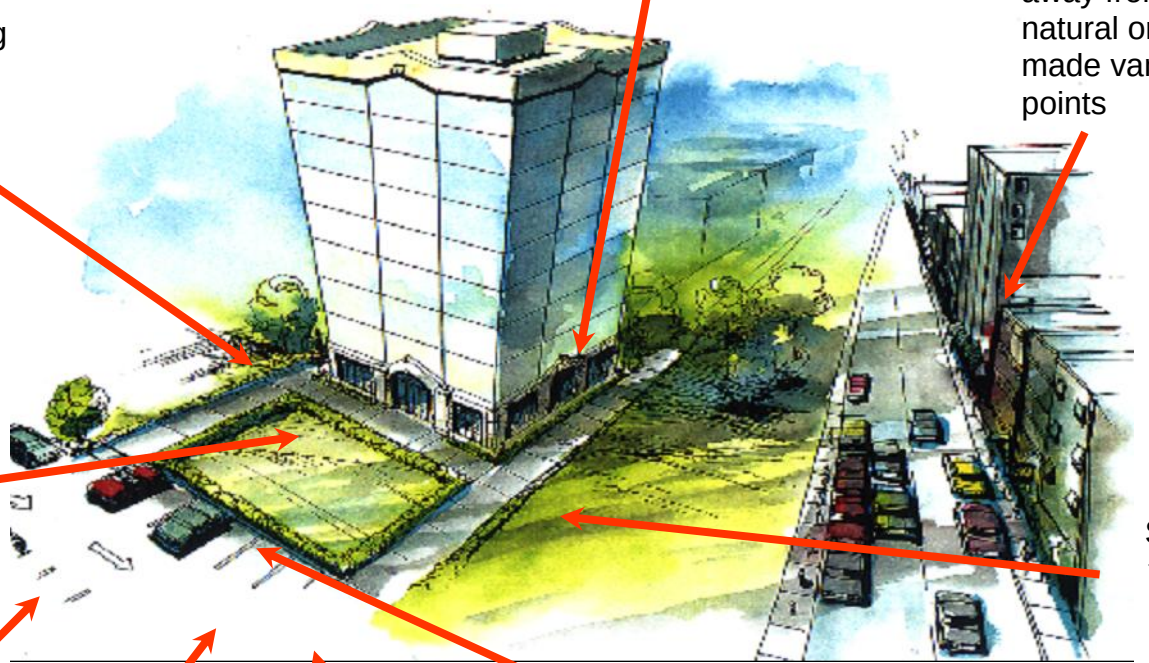

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Figure 2-16, Summary of Site Mitigation Measures, p. 2-53

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 GIS portfolio, and answer worksheet questions

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

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