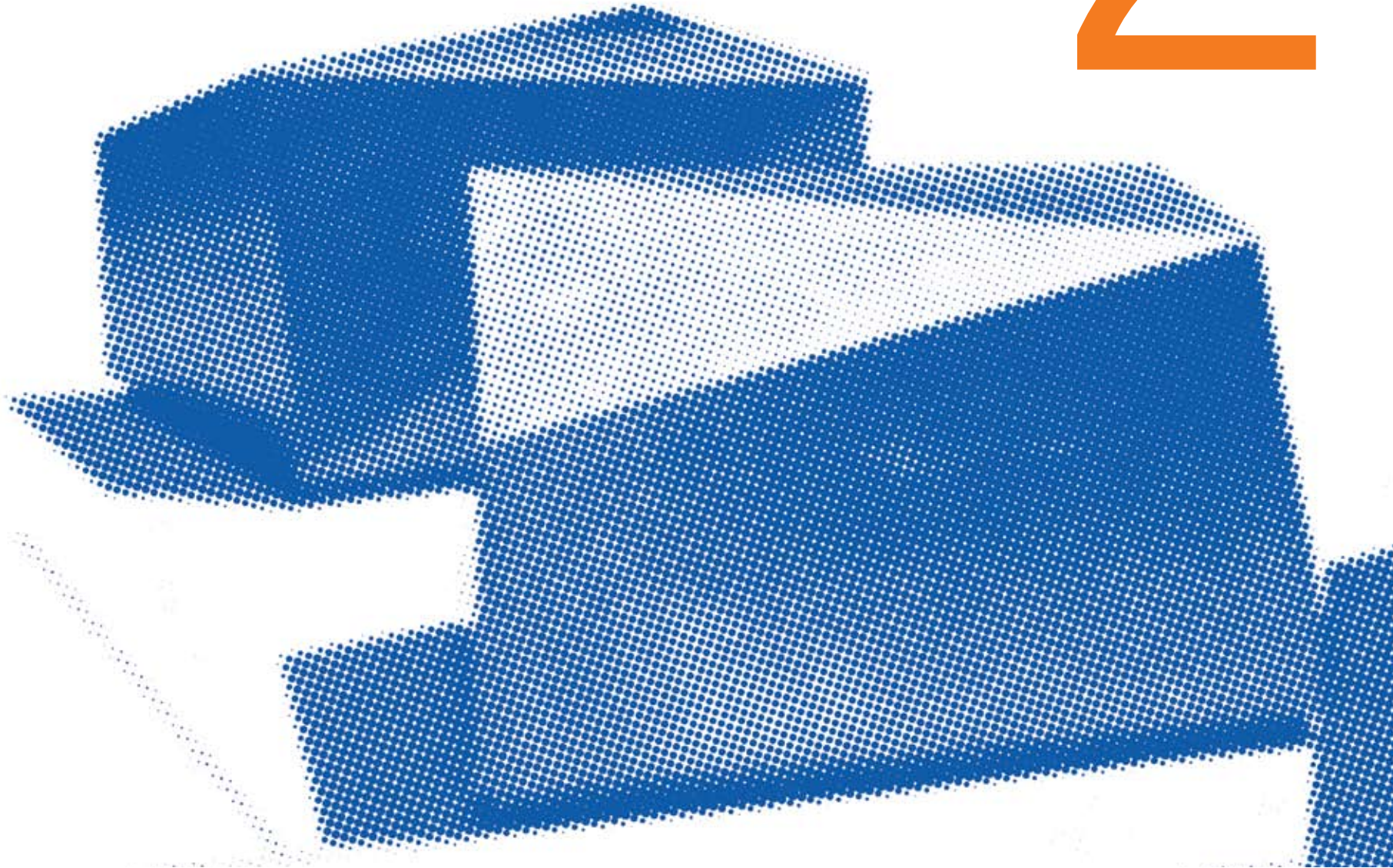


**Chapter 2**  
**Guidelines for Elements and Innovation**

# 2



# Chapter 2

## Guidelines for Elements and Innovation

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# Guidelines for Elements and Innovation

## INTRODUCTION

The previous chapter outlined key “hallmarks,” or principles, for meaningfully integrating site security into the design process in order to support larger goals. This chapter presents the key elements that form the building blocks for effective site security. Together, these chapters provide the concepts and elements necessary for successful site security design; the implementation steps will be discussed in Chapter 3.

GSA follows security standards, developed by the Interagency Security Committee (ISC), that outline required analysis and performance benchmarks for federal buildings. Under the ISC Security Design Criteria, agency or contractor security experts perform risk assessments, blast analyses, progressive collapse analyses, and other assessments to identify threats and calculate a building’s response to them.

Although some federal agencies have security standards that differ slightly from or supplement the ISC criteria, all federal criteria generally address the same types of threats and countermeasures. However, performance criteria may vary in their assumptions about potential threats and the required performance level of a building’s structure and façade.

ISC criteria focus on deterring and mitigating threats, including explosive packages or vehicles; preventing and expelling attacks stemming from chemicals or biological agents; and controlling access to and improving surveillance in and around the property. The site security elements described in this chapter are meant to prevent these threats from reaching the vulnerable areas of a facility.

The concept of site “zones” is introduced here as the framework for this discussion of individual element types. Each element is described in detail in relation to its corresponding site zone. Each section also highlights recent innovations and new technologies to help formulate an integrated, comprehensive, and cost-effective approach that supports the hallmarks of this *Guide*.

## ZONES

By focusing on zones of the site, the design team can better understand context and how security elements and amenities in each zone contribute to the performance of elements in the others. This chapter presents a list of the particular elements found in each of six security zones, with guidelines for their use and best practices.

### Security Zones

Zone 1	Neighborhood
Zone 2	Standoff Perimeter
Zone 3	Site Access and Parking
Zone 4	Site
Zone 5	Building Envelope
Zone 6	Management and Building Operations

This broader view can guide decision-makers through a strategic, comprehensive, collaborative, and long-term-focused design process. The site security zones, as illustrated in Diagram 2.1 follow the physical organization of a site from the outside (Zone 1) to the inside (Zone 6). Each zone offers opportunities to increase site security and enhance site appearance and function. In the first

zone, the team considers the site's context within its neighborhood. For successive zones, the team explores opportunities to protect the site by making adjustments to its perimeter, circulation, and program and concludes by recommending changes in space planning or security operations, to minimize vulnerabilities.

## SUCCESSFUL SITE DESIGN

As Project Team members consider each zone during the site security design process, they must keep two crucial factors in mind:

**Comprehensive approach.** A long-term development strategy and a comprehensive site design should be developed early to provide sufficient funding (e.g., during the Feasibility Study for Prospectus-level projects) and guide the life of the project.

The team should integrate all aspects of the security requirements into the overall project requirements and design directives. Understanding all components that contribute to the plan is necessary to establish priorities and phased implementation if this becomes necessary.

**Flexibility.** Innovative design concepts should have the flexibility to respond to future changes in agency mission, operations, or budgets.

Since physical improvements have a longer usable life than initial planning assumptions, design solutions that are multifunctional and seamlessly integrated into the site and building are able to serve the facility efficiently over time, as needs change.

Best practice for site security design includes the selection of elements that support security functions in multiple ways, by providing the following:

**Physical deterrence.** Sites may include hardened perimeter elements that enforce the standoff zone, the distance between potential explosions and the building.

**Psychological deterrence.** Some sites are designed so that their security is very obvious and almost forbidding. For other sites, the team may choose a more subtle approach that does not call attention to the site as a potential target.

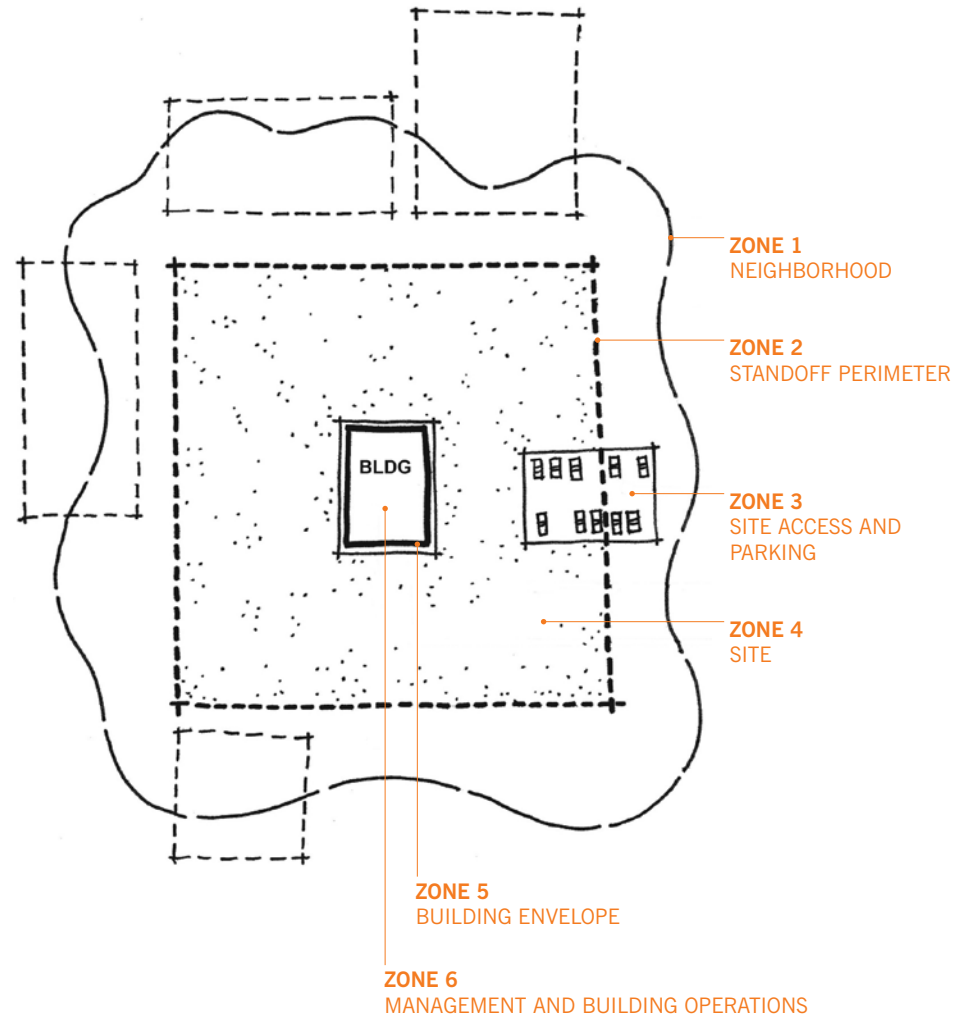
**Clear expectations for use.** Sites can be organized to indicate which types of activities are welcome and which are not.

**Support for observation, surveillance, and inspection.** Sight lines and vistas can be designed to provide natural opportunities for observation of those approaching the building, or to block views of sensitive areas.

**Acceptance of allowable risk.** If the Project Team determines that no reasonable means exist to significantly reduce a risk, the ISC criteria allow for acceptance of risk. Something can always be done, and the team has the ability to decide the extent of the chosen methods and actions.

## Diagram 2.1: Site Security Zones

This diagram shows a general representation of the six security zones superimposed on a hypothetical site. The dimensions and area of each zone and arrangement of elements vary per project, based on site conditions and project scope.



*The Interagency Security Committee (ISC) recognizes that federal buildings must connect with their communities in an open and accessible way. ISC promotes the philosophy that the multidisciplinary design team should take a realistic approach to the safety and security of federal office buildings. The team should consider urban design principles and cost-effectiveness, while acknowledging and accepting some risk.*

## Summary of Security Zones

### ZONES

### ELEMENTS/ACTIONS

#### ZONE 1 Neighborhood

This can be an area of one or more blocks surrounding a facility, depending on how the site is used. It may include streetscape, public spaces, parking lots, and other facilities that visitors frequent.

**Opportunities:** Site treatments include architectural, visual, and public-use cues. Neighborhood-based solutions, such as operational security and traffic guidance/control countermeasures, are also effective.

1. Coordinate with existing and proposed development plans, guidelines, and programs
2. Collaborate with other neighborhood security operations
3. Modify traffic conditions
4. Consider including public right-of-way in the standoff zone
5. Consider closing part or all of an existing street if necessary
6. Install temporary barriers for heightened levels of alert
7. Develop and coordinate personal safety programs

#### ZONE 2 Standoff Perimeter

A security perimeter keeps vehicle-borne explosives at a distance, thus reducing potential destruction and harm. Depending on the risk analysis, the perimeter may require secured or unsecured standoff.

**Opportunities:** Enhancements to the functionality and aesthetics of the site for the public, employees, and visitors are possible, while satisfying standoff needs.

1. Determine the level of protection needed, based on accepted risk
2. Ascertain the standoff zone location and dimensions
3. Establish a hardened perimeter where warranted, using
  - Bollards
  - Sculptural or seating barriers
  - Walls
  - Hardened street furniture
  - Fences
  - Topography
  - Dry moats
  - Collapsible surfaces
  - Water
  - Landscaping and plantings

#### ZONE 3 Site Access and Parking

Various elements and services provide and control access to a facility. This zone can include the inspection of both vehicles and visitors.

**Opportunities:** Satisfying security requirements can also promote effective access, natural surveillance, and increased convenience for those who use the facility.

1. Delineate drop-off and pick-up areas
2. Control site access by incorporating
  - Inspection areas
  - Retractable bollards
  - Gates
  - Guard booths
  - Sally ports
3. Monitor loading and service areas
4. Maintain clear access routes for first responders
5. Establish clear pedestrian circulation routes
6. Establish secure parking areas inside and outside the standoff perimeter
  - Garage parking
  - Surface parking
  - Wayfinding, lighting, and signage

## ZONES

## ELEMENTS/ACTIONS

### ZONE 4 Site

Once within the security perimeter, the site zone may provide an additional layer of elements, or hardening, to assist in deterring or preventing the destruction of or harm to a facility. With a sufficiently hardened perimeter, the site zone's primary role would be to serve more as a welcoming public space, with amenities, programs, and activities that serve building tenants, visitors, and the larger community.

**Opportunities:** Site features, such as reflecting pools, benches, and security pavilions on the site and inside the standoff zone perimeter, may offer enhanced security, safety, and amenities.

1. Design site amenities, such as furnishings, planters, water features, lighting, and vegetation, to serve multiple purposes
2. Create usable space
3. Designate weather-protected space for queuing at entries
4. Design security pavilions and other freestanding buildings to blend with the site's architectural character

### ZONE 5 Building Envelope

Control of heating, ventilation, and air-conditioning (HVAC) vents/air intakes; location and operation of entry and egress points; additional surveillance by security personnel or cameras; and lighting occur at the interface between site and building.

**Opportunities:** Security improvement may also increase everyday safety of the site.

1. Prevent access to vents/air intakes
2. Design emergency egress to allow easy evacuation from a facility
3. Place cameras and light fixtures to maximize visibility
4. Harden the building structure and envelope
5. Design orientation and massing of building to lessen impact of explosion

### ZONE 6 Management and Building Operations

Building programs and layout can be modified to increase security, such as moving high-risk tenants to the interior of the facility. Additional security personnel can also be added to increase surveillance.

**Opportunities:** Modifications to space planning and building operations can reduce some risk, without changing the site itself.

1. Design for flexibility in building programming and space planning
2. Consider guards and alternative security operations when faced with site and cost constraints
3. Choose no mitigation and accept risk when it is neither practical nor plausible to harden site elements or the exterior of a facility

# Zone 1

## Neighborhood

Site design should always begin with an evaluation of the neighborhood in which the site is located. Designers and security experts must understand existing conditions, including urban fabric, infrastructure, and current uses; plans and programs for the area; potential risks; and opportunities for shared solutions with other facilities.

The federal government has a responsibility to adopt security measures that do not detract from the existing character of the neighborhood, but blend seamlessly and even improve the public realm, where possible. Moreover, the surrounding context provides opportunities to introduce off-site security elements with local partners.

When looking at this zone, design teams should consider the “opportunity costs” that various countermeasures may impose on a community.

Response to risk with road closures, repetitive hardened elements, or relatively large setback distances may be warranted in some cases, but these strategies do impose drastically on a neighborhood’s appearance and function. Likewise, lower-quality temporary solutions can undermine a neighborhood’s sense of community, promote a feeling of fear, and impede accessibility.

Instead, design teams should consider alternatives that mitigate the negative impacts of increased site security. A family, or common palette, of streetscape elements can seamlessly add to the security of an area, while contributing to the larger neighborhood context and integrating into, instead of cluttering, the public realm.

*The aesthetics and composition of security features should respond to the existing rhythm of the neighborhood, reflecting its character and typologies. One size does not fit all. Well-chosen elements contribute to the success of a secure, coherent streetscape.*

Where multiple federal buildings are located near each other, common or similar streetscape elements can make navigation between buildings easier and define their relationship to one another. Moreover, street closures can be minimized when project teams consider multi-building sites as a district, perhaps only closing one street between two buildings and developing this space to benefit the local neighborhood.

Likewise, while downtown federal buildings may provide the best location for a particular agency and the surrounding community, these sites often have limited ability to provide vehicular standoff distances. Instead of considering only street closures as a solution, Project Teams should evaluate how such sites could be treated more holistically, with the city as a partner in determining security measures.

Changes that can emerge from such partnerships may include modifying roadway conditions to prevent high-speed run up toward buildings, altering permitted hours of delivery, sharing lighting and camera operations, developing overlapping patrols by security guards, and including street parking as part of the security buffer around a federal building.

### Neighborhood Elements/Actions

1. Coordinate with existing and proposed development plans, guidelines, and programs
2. Collaborate with other neighborhood security operations
3. Modify traffic conditions
4. Consider including public right-of-way in the standoff zone
5. Consider closing part or all of an existing street if necessary
6. Install temporary barriers for heightened levels of alert
7. Develop and coordinate personal safety programs



## ELEMENTS AND EXAMPLES

### 1. Coordinate with existing and proposed development plans, guidelines, and programs

Every Project Team should work closely with local officials, community groups, and others to support existing and proposed plans, guidelines, and programs. Such collaborative efforts increase the success for the neighborhood overall, as well as each project. GSA has developed an excellent track record in this regard, and its Urban Development/Good Neighbor Program can provide guidance to Project Teams.

### 2. Collaborate with other neighborhood security operations

Just as other buildings and activities in the neighborhood have the potential to increase vulnerability, the opposite is also true. Each nearby building has resources that can benefit others across the neighborhood. The possibilities vary from a coordinated approach to traffic control to shared cameras and guard patrols. In these cases, agencies will typically create a Memorandum of Understanding/Memorandum of Agreement with partnering agencies to define the terms of a unified approach to security, coordinate the various players, and establish accountability.

### 3. Modify traffic conditions

Speed tables, curvilinear roadway alignment, medians, and other traffic calming devices can reduce the potential to defeat standoff barriers by managing the speed and movements of vehicles approaching the site. Roadway or driveway realignments can eliminate perpendicular approaches to a facility. And street modifications can limit the size and type of vehicles that may approach certain neighborhoods or specific streets by making passage physically impossible.

To help determine opportunities for these solutions, Project Teams should collaborate closely with local officials (including departments of transportation and public works) and employ vector analysis, a technique used to evaluate the angle of approach and potential vehicle size and speed that can threaten a facility. Vector analysis helps determine structural requirements for vehicular barriers and the value of adjustments to street alignments. By controlling



Off-site traffic calming strategies may eliminate the very possibility of high-speed, direct approach to a federal facility, thus reducing the need for robust, expensive countermeasures. For example, medians can divert traffic, and traffic circles can force slower speeds. Cooperation with local departments of transportation and public works is essential when planning such measures.



*Vector analysis provides useful information about how street design can work in concert with physical barriers to prevent vehicles of a certain size and speed from reaching a site. Reducing the achievable size and speed allows the design team to be more flexible when selecting perimeter security measures. This technique is a key tool in determining a comprehensive site design and eliminating unnecessarily robust countermeasures.*

a vehicle's speed and direction, and by determining exactly what each security measure must protect against, the number and size of physical countermeasures can be strategically reduced, as well as their associated cost and aesthetic impact.

#### 4. Consider including public right-of-way in the standoff zone

Project Teams frequently incorporate public sidewalks within the standoff distance to increase this distance when there is inadequate depth within the building yard. Teams must carefully evaluate this strategy because it impacts both the character and functionality of the neighborhood zone by pushing security countermeasures into public space.

Negative impacts may include obstructing public space, restricting or altering pedestrian access and circulation, and changing the feel of the streetscape. Barriers and defensive elements placed in the public right-of-way frequently convey a feeling of fear and separation from the community. If countermeasures must be located on public property, they should blend with the existing neighborhood design and use patterns to protect without impinging on their surroundings.

On-street parking restrictions or sidewalk widening can also help achieve required standoff distances. However, Project Teams must discuss these strategies with city government and local

transportation and planning agencies to determine whether they are compatible with local transportation requirements.

Transportation studies may be necessary to determine whether any mitigation is required to lessen the impacts these solutions can have on neighborhood parking needs or traffic patterns. Great care must be taken not to impede pedestrian movement and public use along the sidewalk or into federal facilities. Security location and design should always seek to minimize adverse impacts to the public domain.

#### 5. Consider closing part or all of an existing street if necessary

Lane closures are a common countermeasure, but one that has considerable impact on a community. At an existing building, Project Teams must carefully assess the impact that a lane or street closure will have on the overall neighborhood and local traffic conditions. With new projects requiring site acquisition, Project Teams must give substantial weight to the necessity of street closure when rating sites. A well-chosen site that precludes street closure also avoids the substantial negative costs associated with it.

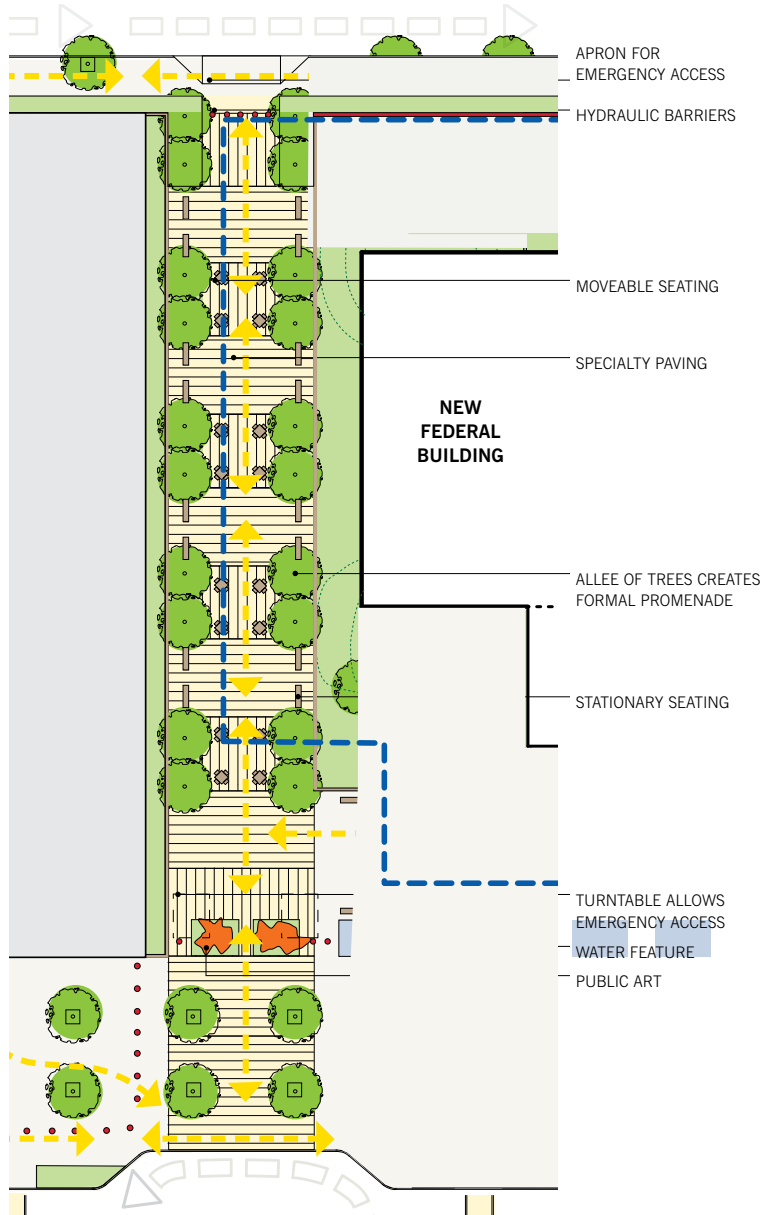
While closing streets and sidewalks may create adequate setbacks for one or more buildings, doing so may only reduce risk, not eliminate it, and the vitality and economic performance of the entire neighborhood may suffer. Rerouted traffic places new loads on nearby streets, businesses lose access to their customers, and

*When risk is sufficient to require the closing of a public street, it is sufficient to require appropriate project investment to make that street closure work well with the neighborhood.*



This public street, located between an existing courthouse and a new federal lease construction project, was closed to enhance perimeter security. Working with the city, the Project Team redeveloped the street into a public plaza. Both parties now are working together to manage programmed activities in the space, providing amenities to federal users and an adjacent retail district.

Diagram 2.2: Street Closure



The decision to permanently close a street should be made only after thorough analysis, and with a commitment to the cost and care needed to ensure that the neighborhood gains something functional from the closure, such as a new public space. Here, the street is converted to pedestrian use. It is lined with shade trees, provides a combination of stationary seating and moveable tables and chairs, and accommodates multiple activities. This investment is sufficient to meet security needs, while mitigating community impacts by providing new public space to serve both adjacent federal buildings and the neighborhood.

*Off-site tradeoffs? Just as Project Teams understand the internal tradeoffs among countermeasures, risk, and cost, responsible design requires that they also consider the off-site tradeoffs associated with decisions. For example, most security experts would recommend against expensive countermeasures in a case where the gain in risk reduction would be minimal. But what about a similar case, such as a street closure, where the neighborhood, rather than the project, bears the cost of the countermeasure? These costs—including traffic, circulation, and aesthetic impacts—must be considered in the security decision-making process.*

local governments often request compensation for lost parking meter revenue if parking lanes are closed.

Most local governments would have significant concerns about a road closure. Before implementing this approach, carefully consider whether an innovative combination of measures or a different site can prevent the closure of a street, while still mitigating the identified risk. If no alternative exists, Project Teams must minimize all negative impacts and commit to the cost and care needed to ensure that the neighborhood gains something substantial from the closure, such as a new public space (see Diagram 2.2). The Project Team should proceed only after early and effective collaboration with local stakeholders.

*Strategies for responding to changing threat levels should be incorporated into the discussion from the beginning of the planning and design process.*

*In many cities, “temporary” security measures are still littering sidewalks and building entrances years after their placement. When installing temporary security measures, management and security staff should establish a plan for their use, maintenance, and removal, or their transition to long-term solutions.*

#### 6. Install temporary barriers for heightened levels of alert

During heightened levels of alert, federal agencies must respond based on the Homeland Security Advisory System (HSAS), the Department of Homeland Security’s color-coded alert system. Changes in the alert level may require quick action so that potential risks can be avoided. For example, at the urgent request of user agencies under heightened alert, GSA Property Managers must sometimes quickly install temporary barrier elements or enact other security procedures. Examples include temporarily closing public streets and sidewalks, increasing screening and inspection, or limiting access to parking.



Jersey barriers and temporary fencing invariably have negative visual impacts, which long-term use exacerbates (above). Customized barriers are less obtrusive, since they better complement their architectural context (far left), but no temporary barrier should become permanent. Project Teams must provide for their timely removal or upgrade and indicate these plans to building users (left).

To ensure that these temporary solutions are introduced thoughtfully, the Project Team should plan for their use and removal in the comprehensive site design. When these temporary measures are accounted for from the early stages of project planning, they can be implemented quickly and safely, with minimal impact on the site and surrounding neighborhood.

## 7. Develop and coordinate personal safety programs

While prevention of terrorist attacks may be the most demanding goal of site security design, personal crimes are far more likely to affect employees and visitors. Design and management strategies that support safety throughout the neighborhood may reduce the occurrence of personal crimes.

Such strategies include improved lighting of the site and its surroundings, increased surveillance and security patrols, and maximized public use of the site to provide “eyes on the street.” Each plays an important role in enhancing the daily security of employees and visitors. These responses require coordination with local partners, such as Business Improvement Districts and municipal police.



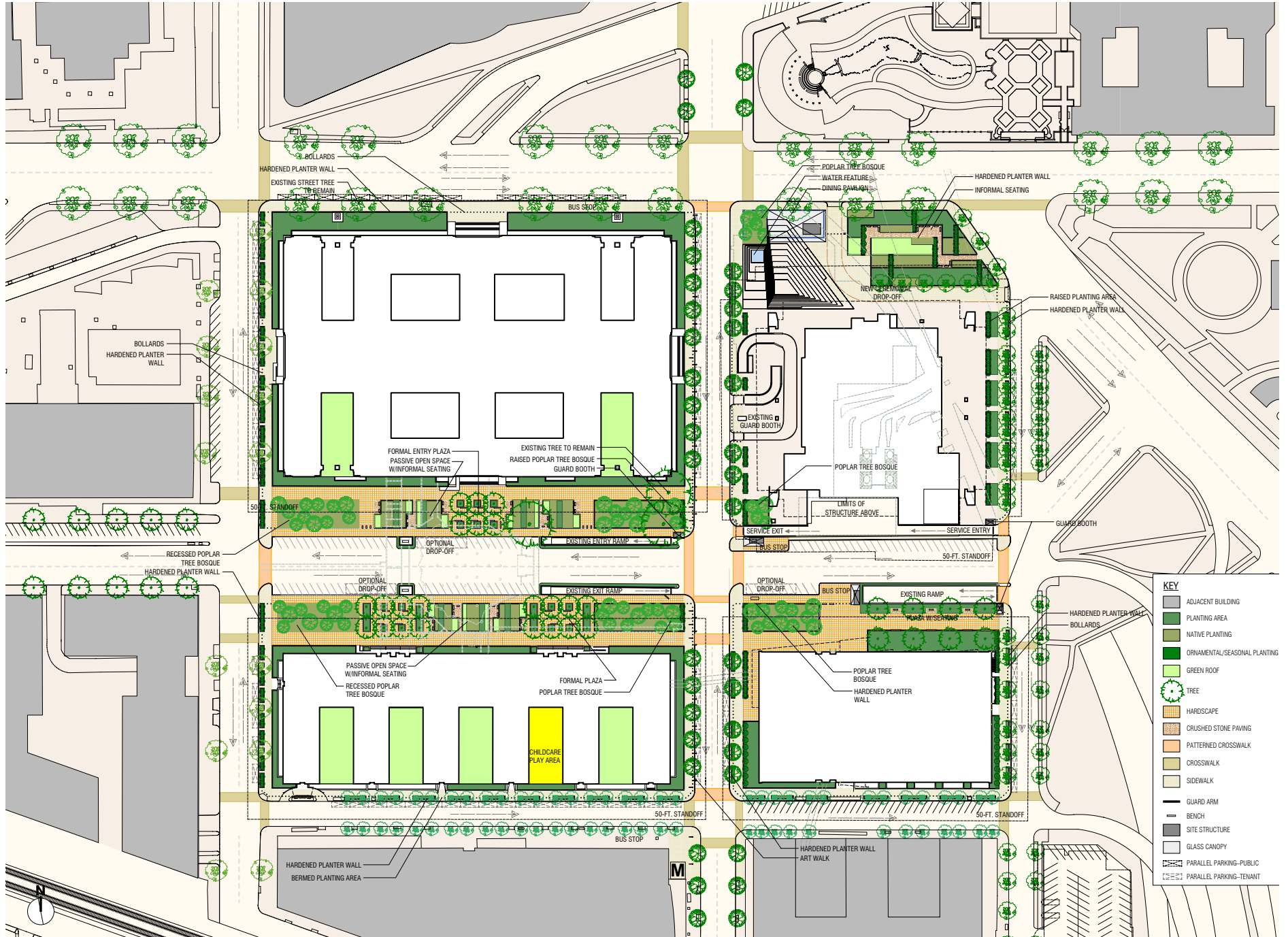
The full value of public use is realized not just in the vitality it contributes to a site, but also in the natural surveillance created by numerous “eyes on the street.” A clean, well-lighted place is one that citizens claim as their own, noticing—and reporting—unusual occurrences, thereby helping to prevent criminal activity.

## OPPORTUNITIES

Looking outside the site for design and security solutions can be a powerful problem solver, but is an often over-looked opportunity. In urban locations, there is sometimes little room for on-site security improvements, but a significant potential for solutions that benefit both the federal government and local communities. Important partners in such efforts are local Business Improvement Districts (BIDs). Agencies can contract with local BIDs to provide increased security patrols around buildings and landscape maintenance, among other services. Such operational measures may be the best defense against risks where physical solutions are difficult to introduce, and have minimal negative impact upon their surroundings.



The significant cost of frequent security patrols can be tempered by partnerships with local Business Improvement Districts (BIDs), an oft-overlooked opportunity. BIDs typically provide such services throughout a larger business area at a reasonable cost to property owners. Such precinct-wide efforts ensure a broader view of security, useful since many crimes do not begin and end at only one site.



## Zone 2

# Standoff Perimeter

The secured standoff zone protects buildings and their occupants against potential vehicle-borne explosives by creating a perimeter barrier capable of stopping vehicles at a specified distance from the building. The only way to determine this distance is to perform a blast analysis (for existing facilities) or a blast design (for new facilities) based on the risk assessment and the minimum stand-off required to meet the desired level of protection. Because blast impacts diminish with distance, barrier placement is an important consideration for reducing the damage to the building and its occupants from a potential explosion.

The best approach to designing the standoff perimeter is to consider the entire site comprehensively; that is, to achieve enhanced site design and urban design objectives while providing the needed security countermeasures. An integrated design and security strategy increases both safety and the overall quality of the facility. Part of this strategy is determining a site-specific design family that features a common style and materials appropriate for the project, offering diverse elements that relate. These include security elements, site amenities, and overall landscape design.

Different urban and site conditions call for variations in the location of the standoff perimeter (left). For example, it may be inappropriate to locate barriers along the curb of a street with major civic and historic significance, but less problematic to do so on an adjacent, minor street. For this reason, Project Teams must never consider one edge at a time. Comprehensive, long-term planning provides the holistic vision needed for a thoughtful design that meets all objectives.

As you consider where to locate the standoff perimeter, keep in mind that many existing facilities may not have adequate site area to provide the recommended standoff distance on all sides. For example, sites may have adequate standoff distance in the front yard, but much less depth available at the side or rear yard. Depending on adjacent uses and conditions, reduced standoff may be acceptable, or even unavoidable, for some portions of the property.

### Standoff and Setback

- “Standoff” and “setback” are similar terms with distinct meanings. Standoff is the distance between a structure and a physical barrier designed to protect it, while setback refers to the distance between a structure requiring protection and another building, the curb, a vehicle, or another object, but not necessarily a hardened perimeter.
- “Secured” standoff indicates the use of a hardened deterrent or barrier to prevent vehicles of a certain size and speed from breaching the standoff perimeter.
- “Unsecured” standoff refers to deterrents and design approaches, such as on-street parking restrictions, that enhance security, but are not designed to stop a vehicle. The resultant solution may not prevent a breach of the perimeter, but will give the impression of increased security and observation and may deter parked vehicular attacks. Effective use of both strategies in concert can improve quality of life, reducing both the incidence and fear of crime.

*When is it appropriate to use unsecured standoff? If it is physically impossible to provide recommended standoff distances, other methods can provide unsecured standoff, which may offer limited protection from vehicular attack. For example, access to adjacent curbs can be limited to government vehicles only. Or on-site parking can be restricted to permitted vehicles, making it more difficult for an unknown vehicle to access the unsecured standoff area.*

*The placement of the secured standoff line has significant cost implications, as well. Looking at Diagram 2.3, for example, the linear footage of the various perimeter options would vary by more than 100 linear feet—with direct cost impacts. Long-term risk reduction and site performance might be more important in this case, but these costs must be considered in every case.*



Sensitivity to context is crucial when introducing new security elements, particularly where historic buildings are concerned. Existing building features and materials (top) should inform the design and placement of new security elements (bottom). A kit-of-parts approach can be useful in such cases, to facilitate consistent implementation over time.

Where sufficient space is available to achieve the desired standoff, the placement of hardened elements should maintain clear pedestrian circulation patterns and clear paths to entrances and exits, while minimizing off-site impacts. Where the recommended standoff cannot be achieved because of lack of space or subsurface conditions, decisions on standoff distances must be made based on risk mitigation. Alternatives often include hardened barriers at the building yard line, curb line, or some other predetermined boundary edge.

On-street parking sometimes falls within the standoff zone, especially in urban areas where space is limited. In some cases, it is necessary to remove, relocate, or restrict on-street parking to preserve a sufficient distance between the facility and its secured perimeter.

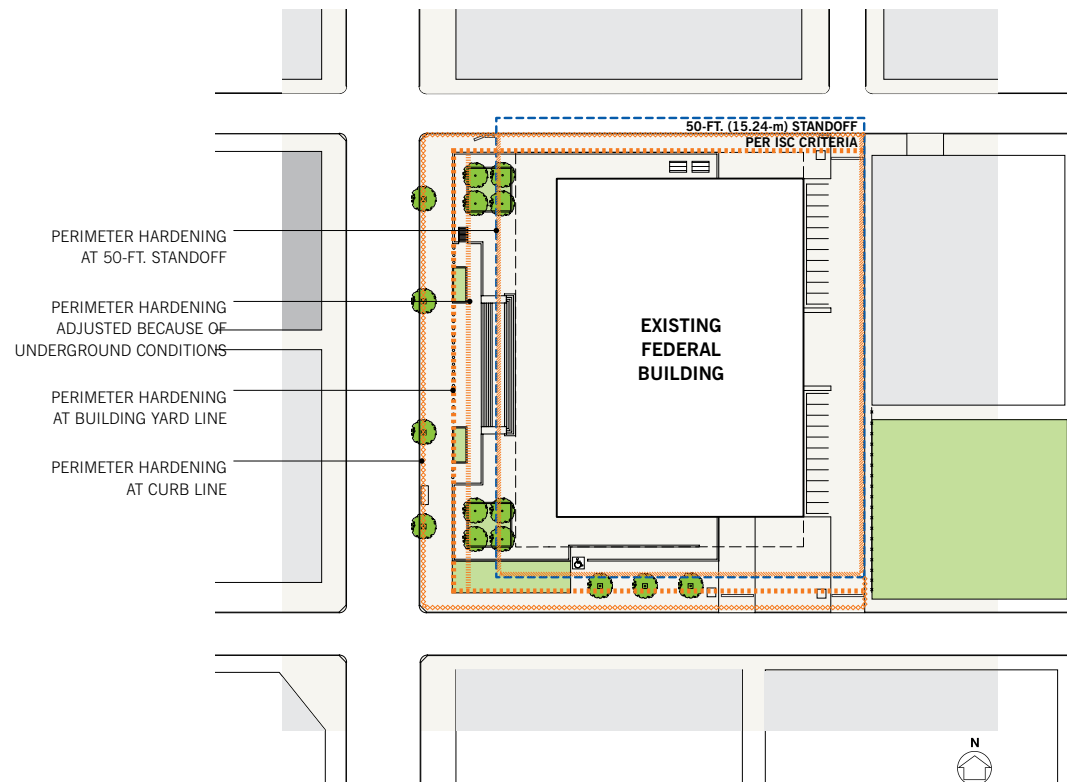


## Diagram 2.3: Setback Options

In response to unique site constraints and opportunities, the standoff determined by a blast analysis may not be achievable on every side of a building. In determining the standoff perimeter on all sides of the site, one must balance risk mitigation with other impacts. The urban example shown here demonstrates various standoff options, including those that achieve the ISC-recommended standoff, alternatives that place hardening at the building and curb lines, as well as hardening that accommodates subsurface conditions, such as utilities.

Note the location of the desired 50-foot standoff on each side of the building. The standoff on the north perimeter is not achievable

without significantly altering the street—a major decision that should be made only after extensive consultation with local officials. On the west perimeter there is a smaller design decision to make, but with important cost and design implications: Should the hardened perimeter be placed at the curb, the yard line, at the 50-foot line (which would bisect the stairs), or closer to the building? Design teams must carefully analyze such decisions in terms of their impact on the entire site, including the balance between daily use and exceptional circumstances.



*Teams should consider whether it makes sense to incur significant project costs or impose significant neighborhood impacts to expand a perimeter from 30 feet to 100 feet on one side, when other sides of the perimeter can only achieve 30 feet. It may be more appropriate to apply limited resources to hardening portions of the structure, adding surveillance, or reconfiguring the space within the building.*

*A perimeter barrier is not designed to control smaller explosive threats that may be carried by an individual. It is designed to stop vehicles with the capacity to carry much larger explosives. Within the perimeter barrier, there may be opportunities to deter or observe the approach of potential person-borne threats. The building entry and inspection security systems must be designed to facilitate such opportunities.*

### Standoff Perimeter Elements/Actions

1. Determine the level of protection needed, based on accepted risk
2. Ascertain the standoff zone location and dimensions
3. Establish a hardened perimeter, where warranted

### ELEMENTS AND EXAMPLES

#### 1. Determine the level of protection needed, based on accepted risk

The level of protection and the amount of standoff are facility and site specific. Under ISC criteria, most new or extensively modernized GSA buildings require a 50-foot standoff, depending on such factors as tenant operations, facility size, and location. For an existing building, the necessary standoff is determined by a blast analysis based on risk assessment and desired level of protection. The ideal amount of protection may be unattainable because of actual conditions, and the Project Team must mitigate or accept risk where optimum standoff cannot be achieved.

#### 2. Ascertain the standoff zone location and dimensions

The achievable standoff distance is ascertained based on the risk assessment, blast analysis (for existing buildings), blast design (for new facilities), and a desired level of protection. It may vary on each side of a building, based on a number of factors: existing conditions and site elements, different levels of threat, the location and arrangement of key operations, and available space. When mitigation is not a viable option, the choice may be to accept the risk and improve the site for an appearance of greater security.

#### 3. Establish a hardened perimeter, where warranted

Perimeter barriers are key countermeasures for site security because they effectively keep potential vehicle-borne explosions at a distance. In addition, they are easier to implement than retrofitting the building and its structural and glazing systems. Both the location and the structural design of the barriers are key performance considerations. The ISC criteria, risk assessment, and other analyses establish such barrier performance criteria. These standards specify the size and speed of vehicles a barrier must protect against, as well as the ideal standoff distance.

While the perimeter barrier concept is straightforward, the implementation seldom is, because of the complexities of site, context, and budget. After completing the risk assessment, if the team decides that one or more frontages call for hardened perimeters, then the team can establish the barriers with site or structural elements that have been specially engineered to stop a vehicle. Before barriers are installed, designers, structural engineers, blast consultants, and security professionals must collaborate to ensure that the countermeasures satisfy specific requirements.

Barrier options include retaining or plinth walls, cable fences, planters, benches, trash containers, lampposts, and bollards. Earth berms, steep slopes, moats, trenches, or thick plantings of trees may also be used as barriers if they satisfy the countermeasure requirements.

In all cases, Project Teams must remember that most barriers require a deep footing as part of their structural system. In urban areas, utility infrastructure beneath the sidewalks may restrict the location and feasibility of installing reinforced barriers.

Ideally, select a mix of barrier elements in harmony with specific site, architectural, or neighborhood conditions. Layering a variety of barrier elements can be more successful than implementing a monotonous row of any single element. Using vector analysis, the team can identify where the most robust perimeter hardening is needed and where other options are appropriate.

This section discusses the following perimeter barrier elements:

- Bollards
- Sculptural or seating barriers
- Walls
- Hardened street furniture
- Fences
- Topography
- Dry Moats
- Collapsible surfaces
- Water
- Landscaping and plantings



Decorative casings may improve the appearance of bollards, but designers must consider their resulting profile, as well as materials and colors. Without careful design, decorative casings add considerable girth (top left), resulting in overly bulky installations (middle left). Before final design, construction mock-ups can be helpful.



*Be smart, but do not overthink it. Over the past few years, many site security plans included bollards, without sufficient forethought or need. On the other hand, the overriding desire to avoid the use of bollards can lead to the introduction of different, but arguably more obtrusive, elements, such as massive benches or oversized planters. A combination of elements that are less massive and more flexible may be more successful.*

When designing the standoff perimeter, thoughtful placement of elements is as important a consideration as material selection. In some cases, positioning elements at the property line crowds site features and access (bottom left), so placement in the public right-of-way is more appropriate. More often, placement in the public right-of-way adds considerable functional and visual clutter (bottom middle). Where it does not introduce significant additional risk, placement in the building yard offers the most graceful solution (bottom right).

## Things to Consider When Choosing Standoff Zone Barrier Elements

When the recommended countermeasure is standoff distance, the first response is often to install some bollards near the curb. A more complete analysis would first consider the following:

### Establish the standoff zone limits.

Use these boundaries to determine where the barriers should and can be placed. Consider the particular vulnerabilities of the building. Rather than just installing a line of barriers at the edge, determine whether there is room to layer barriers across a broader zone.

### Determine what site elements exist.

Various familiar elements might be placed at the location of the perimeter barrier, such as benches, lampposts, parking meters, signs, bus stops, and planters, to name a few. Consider how some or all of these elements can be reinforced so that they double as security barriers. In addition, be sure to allow sufficient room to open the door of a car parked near the curb and easy access to ramps, for persons with disabilities.

### Check underground conditions.

Bollards and all hardened site elements are effective at stopping vehicles because they have underground structural systems. Are there any existing utilities (e.g., water, sewer, electric, communications), vaults, or basements that restrict the subgrade conditions? Is there adequate depth and space for the foundation?

### Remember the “big picture.”

Once the general locations of the barriers and a list of the potential elements are known, begin to study their placement on the site. Instead of one long line of bollards, consider a mix of elements layered within the standoff zone. Study a number of possibilities. Here is a chance to create a site design that provides everyday benefits to federal employees and the public, not just a defense against an attack that may (hopefully) never occur.

### Select a family of similar materials and styles.

When choosing bollards and other hardened site elements, as well as site furniture, be sensitive to the existing site's character. Elements can be composed of many materials, or custom designed to blend with overall site materials and architectural style. For instance, bollard design can incorporate an ornamental sleeve that adds texture or color to match other site elements. The selection should be consistent with the design and materials of the buildings, site, and neighborhood. Sleek aluminum bollards in front of a Beaux-Arts federal building will detract from the historic character of the building and its environs.

### Consider the spacing between site elements.

No matter what types of elements are finally chosen, it is essential that their arrangement maintains the normal flow of pedestrian activity and allows for universal accessibility, while preventing uncontrolled vehicular access.

**Bollards.** A bollard is essentially a structural steel post or reinforced concrete casing solidly anchored into the ground, using a deep foundation. Bollards are capable of stopping a vehicle, restricting vehicular access, and protecting landscaped property. For decorative purposes, a casing is often added to give architectural character in terms of volume, shape, finish, and color.

Although bollards are a convenient and popular element for creating secure perimeters, they have some significant disadvantages when compared to other barrier elements. Often an afterthought or quick fix, with little or no design and architectural integration with the site, bollards are overused in today's landscape. Long lines of repeating bollards can be monotonous, unattractive, and visually obtrusive. Where possible, designers should consider hardening other required site elements, such as lampposts, walls, or benches, to perform double duty. These items can be layered with bollards, blending more efficiently into the existing landscape.

Retractable bollards can control authorized entry to a site. They operate hydraulically, electrically, pneumatically, or manually, but require higher levels of maintenance, including periodic inspection and testing of their mechanical and electrical systems. Both the quality and consistency of maintenance are important considerations when manual or motorized retractable bollards are part of an emergency access route. A faulty bollard could cause life-threatening delays in an emergency.

Look at the larger context and how the bollard will be used when choosing styles, placement, and installation methods. The treatment of the surface around the bollard will play an important role in its effectiveness and in how people will perceive the character of the bollard and the space it defines.

The ISC has not rated and tested individual bollard systems for their ability to withstand vehicular impact. Since designers and engineers must calculate the performance of various systems and recommend alternatives during design, this provides a great deal of flexibility.

The Department of State certifies bollards for use in its embassy and facility design, requiring that a bollard be certified to stop most vehicles completely, while retaining enough integrity to continue operation after impact (to deter a second attack). However, domestic installations for most federal properties do not need that level of performance.

Designers should avoid oversizing or overengineering bollards for the site conditions and protection levels. Such practices add unnecessary costs to the project and often detract from the aesthetics of the site. Here, vector analysis can play a fundamental role in reducing the required robustness of the element, while providing the same protection.

*On some projects, designers may be able to create custom perimeter barriers that coordinate with building and public space design. Other projects may require premanufactured elements. In either case, Project Teams must select a style that is appropriate for their project.*



Mounting surfaces play a fundamental role in how bollards "read." Even high-quality bollard treatments won't present well if surrounding surfaces are of inferior quality (far left). However, otherwise-austere bollard designs can work quite well when paired with appealing surface treatments (right three).

Sculptural barriers create visual interest by differing from, yet complementing, their context, while walls work best in concert with the surrounding landscape. Both can also double as attractive, comfortable seating options.



*Jersey barriers are the concrete barriers frequently used in front of federal buildings. Often implemented as a temporary deterrent, they may also have a psychological effect, promoting a sense of fear. If permanently anchored and structurally engineered, Jersey barriers may function as a vehicle restraint, but they are not an acceptable substitute for bollards or other reinforced structural elements.*

*As a new, integrated vocabulary of security elements and installation methods develops, it becomes easier to incorporate the standoff zone into the fabric of the surrounding community context.*

**Sculptural or seating barriers.** Hardened barriers can be constructed in many shapes and forms, while still functioning with bollard-like performance. When well designed, these can be attractive and provide a short-term place for sitting, leaning, or stopping. Natural rocks or boulders serve a similar purpose. Such barriers become sculptures and objects of interest, improving the streetscape while improving security.

**Walls.** Structurally reinforced walls can serve dual purposes. They are hardened perimeter elements that also function as retaining walls, seating, plaza edges, or an extension of a building's architecture.

In designing such walls, the Project Team's structural engineer must collaborate with other team members to ensure that the wall meets performance criteria, while providing an attractive amenity. Typically, walls should be integrated into the building yard at a height suitable for sitting or include an integrated bench at an appropriate seating height. So that they do not become monotonous, or restrict pedestrian access to the building yard, walls can be intermittent and interspersed with bollards or other elements, as appropriate. Walls higher than 20 inches, although effective, are likely to raise design and contextual issues and should be discussed with local stakeholders.



**Hardened street furniture.** Street furniture, including benches, lampposts, parking meters, bus stops, and signposts, among other elements, can be hardened in order to serve double duty as perimeter security countermeasures.

Planters are also commonly employed for this purpose. They can be designed to work in combination with furniture, such as benches, creating a pleasant seating area with interesting landscape features. However, planters also have limitations. First, planters should be secured in place to meet their performance requirements, taking into consideration any below-grade infrastructure. Second, planters come with a maintenance requirement and are only attractive when the plants within are well maintained. Avoid this element unless there is a commitment of manpower and budget to maintain it.

Hardened street furniture should be chosen and placed with the same care given to bollards or walls. Avoid repetitive use of hardened elements to ensure an attractive visual impact and a reasonable cost. In most cases, hardened street furniture is most effective in combination with other perimeter elements.

**Fences.** Fences can deter both people and vehicles from entering a site. Chosen with care, they can also serve as decorative elements to screen or visually alter the appearance of hardened perimeter elements.

Incorporating fences into perimeter security involves a variety of considerations, all dependent on the level of security required. These include the impact on the lines of sight to and from the facility, the incorporation of gates and entry points, and the selection of materials.

Fences should be used only in special situations because of their significant visual and symbolic impact; however, where they are necessary, fences should be made as unobtrusive as possible. Painting the fence fabric and structure black can minimize their visual impact, allowing employees and visitors to focus on the building, landscape, and other elements beyond the fence. Different types and heights of fences minimize their presence; selection should be based on site conditions, the risk protected against, the existence of topographical or natural barriers, and the likelihood of an attack.

Low, steel-cable fences are less obtrusive solutions that can also serve as vehicular crash barriers or augment other types of fencing. Such fences entail cables attached horizontally along the length of the fence at car bumper height, terminating at a metal eye bolt, which is sunk into a sturdy concrete cube buried underground. This reinforcement prevents a vehicle from breaking through the barrier. The design includes the expectation that the cable and fence material will move on impact, but not break. Consequently, the team must take this amount of deflection into consideration when placing the barrier. With this or any fence, Project Teams must be careful to account for subsurface conditions.

In high-security contexts, vibration detection can be applied to a fence to detect potential intruders. If someone attempts to climb the fence, or reaches through and snips the wire, an alarm is triggered. A key component of this surveillance method is the use of pole-mounted cameras, both fixed and moveable, so that security personnel may quickly see the source of any alarm. This system tends to be complex, sophisticated, and expensive.

Fences restrict visibility both into and out of a site and denote exclusion, so they must be used only where absolutely necessary. A fence should match its architectural context and maintain some degree of transparency to minimize such negative impacts.



*The National Capital Planning Commission (NCPC) in Washington, DC, has developed a catalog that illustrates several examples of hardened streetscape objects. Some of the items have been tested to ensure satisfactory performance and are available from a number of vendors. The intent is to provide families of streetscape elements that work together to protect, while imbuing a site with a welcoming sense of place. For more detailed information, visit [www.ncpc.gov](http://www.ncpc.gov).*

*The topography of a site can be shaped to direct or control blast away from at-risk structures. In many cases, earthworks may be less expensive than structural solutions if adequate land area is available. They are most effective on large sites with generous setbacks.*



Topographic security solutions are among the least obtrusive, for they often appear to be simply part of the landscape design. Additionally, their adaptability means that they can function in almost any context. Subtly sloping tree lawns, playful earth berms, and variegated retaining walls are some of the many landscape treatments that both stop vehicular approach and enhance site design quality.

**Topography.** The topographic changes typical in many site design projects, such as shaping the site to ensure adequate drainage; protect trees; balance cut and fill; and provide suitable elevations for roadways, parking, and buildings, also present many opportunities to unobtrusively enhance security. Berms, steep slopes, ridges, depressions, and decorative landscape elements can all serve as perimeter barriers, preventing vehicular access, while varying the side edge. Such elements may provide seating or support programmed activities and blend into the topographic variation already typical at most sites.

When planning topographic changes, Project Teams should consider their impact upon sight lines and visibility. For example, elevated sites enhance surveillance and make vehicular approach difficult, but also make a building more conspicuous. Likewise, depressions in the landscape, such as drainage channels and ditches, block automobiles, while providing possible areas of concealment. These issues are hardly insurmountable; topography is an invaluable component of comprehensive security and, like other countermeasures, must be incorporated thoughtfully.





**Dry moats.** Sunken walkways and low ditches (with or without water) and walled ditches or ha-has (invisible from a distance) are all historic fortification strategies that designers may weave into today's innovative landscape security plans. These hidden standoff zone barriers protect a site and its inhabitants by preventing vehicular access, without disturbing or obstructing the site's aesthetic continuity.

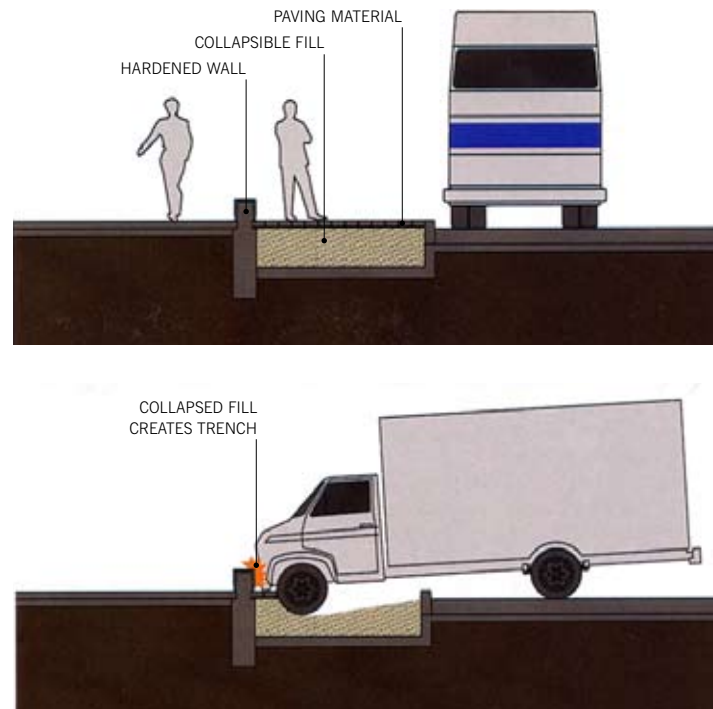
**Collapsible surfaces.** A modern take on the idea of hidden barriers, collapsible surface devices support crowds of pedestrians and even police horses, but not the weight of a vehicle. This technology adapts a unique concrete material originally designed to stop runaway planes. As an unwanted vehicle drives upon the collapsible area, the surface compresses. The compressed material slows the vehicle, while instantly lowering its angle of approach. A hardened subsurface wall integrated into the system stops the vehicle should its momentum carry it through the collapsible surface.

This technology can easily be integrated into an urban setting with minimal negative impact, particularly when a new or existing building has enough setback. At Battery Park City in New York, a security design firm applied this technology using a patented material. Since collapsible surfaces appear as conventional pavers—surface treatments include plantings and cobblestones—they need not impinge on the existing landscape. Moreover, because any vehicle entering a collapsible surface will sink, designers can shorten barrier walls or even bury them entirely underground where there is enough room.

Collapsible surface technology is relatively new, but tests have shown it to be an extremely effective solution. Other adaptations of the material, as in staircases designed to collapse under the weight of a vehicle, show promise.

## Diagram 2.4: Collapsible Paving

Collapsible paving is one of the most promising new security countermeasures because it supports visually and physically open, pedestrian-friendly streetscapes. This technology consists of a concealed trench containing a patented collapsible fill covered by a specially designed paving material. The paving is indistinguishable from standard landscape finishes and will sustain the weight of pedestrians, but will collapse under the weight of vehicles, trapping them in the trench. In the diagram below, a crash-rated, hardened concrete wall that also functions as a bench forms the back of the collapsible sidewalk trench. The collapsible surface allows for a shorter, less obtrusive wall or even a wall buried entirely underground where there is sufficient setback distance. In order to prevent accidental driving on the collapsible surface, such as by delivery or utility trucks, designers may incorporate visual or physical cues, such as groundcover flower pots or benches.



*In some cases, storm water basins may offer opportunities beyond management of runoff. They can support wildlife and appropriate vegetation, become an aesthetic amenity, function as security barriers, and possibly evolve into a sustainable site feature, filtering storm water for reuse on-site.*

**Water.** Fountains, pools, and other decorative water features are suitable as countermeasures, but require additional structural components and regular maintenance. For instance, a water feature with a hardened wall around it can both provide protection from vehicles and create a landscape amenity. Natural water features, such as ponds, lakes, rivers, and streams, can also keep vehicles outside the standoff perimeter when they are carefully integrated into overall landscape design.



Water features are popular site amenities that lend themselves well to physical hardening. Such features can create variety along a standoff perimeter, as in a small pool with reinforced benches (top), or can form an entire hardened edge, made less obtrusive because of its active nature (bottom).



Storm water management areas, used for the detention and retention of site runoff, highlight the opportunity Project Teams have to improve the environmental performance of a building, while enhancing the effectiveness of standoff zones. Project Teams should consider how landscape features—such as vegetation and topography—designed to surpass storm water management regulations can also prevent vehicular approach.

**Landscaping and plantings.** Plants have long been used as tools in the arsenal of security design. Sharp-leaved, thorn-bearing plants and dense hedges create natural barriers and repel aggressors. They integrate well into landscapes and are relatively inexpensive. However, thick vegetation also has drawbacks. Dense plantings in close proximity to a building can screen illicit activity, and some ground cover, especially when more than 4 inches tall, may be used to conceal weapons. Project Teams must ensure that vegetation does not block important sight lines or create attractive hiding places.

Generally, plantings are most successful when used as part of a layered solution. Very dense vegetation may deter vehicular approach when combined with reinforced barriers and can screen other countermeasures. Trees, shrubs, and other plant materials create secure spaces that are also welcoming and attractive. Their type and arrangement should integrate smoothly with adjacent styles and materials. This is particularly important in historic districts, where landscape design may be a significant component of a building's historic fabric.

Existing landscape features are also an important consideration when adding new plantings. Mature trees are a valuable resource that should be protected, where possible, to maintain the integrity of the neighborhood. Additional plants or trees must be carefully selected to weave into the context and to relate to existing street tree systems. Native and drought-resistant plants should be considered to meet the project's sustainability goals.

Below ground, Project Teams employing vegetation must heed possible conflicts between plantings and underground utilities or barrier footings. As large plants and trees grow, their root systems can conflict with subsurface conditions, undermining both utilities

and the plants' health. Project Teams must perform a careful study of existing underground conditions before making decisions regarding planting areas. Arborists can provide essential information about the underground clearance specific species require.

Above ground, Project Teams must coordinate vegetation with security cameras, site lighting, and lines of sight to avoid areas of concealment. Security experts and designers should collaborate to create landscape designs in which plantings, light distribution, view corridors, and cameras all work together. Part of this coordinated solution is the continued maintenance of vegetation after planting, for a poorly maintained landscape detracts from both aesthetics and security. Overgrown shrubs and trees offer attractive hiding places and limit visibility. Such overgrowth can also hinder first responders from accessing the building and site quickly in the event of an emergency. Project Teams must establish a plan for care and maintenance as they design the site.



Specimen plants, native trees, and attractive shrubs help screen or soften security elements, while making unwanted passage more difficult. Thoughtfully chosen vegetation also contributes to sustainability goals and overall site appearance. However, each of these benefits depends upon frequent maintenance, so teams should establish a plan for care from the outset.

*While dense plantings and trees may be effective vehicular barriers, they are not a 1:1 replacement for bollards or other hardened elements. They should be used together with hardened elements to create a comprehensive, integrated solution.*

*The “protective vegetation” tactic is only successful when plantings are well maintained. Although vegetative planters and berms enhance the appearance of a site and provide security, they require regular care and attention to ensure that they have adequate soil, moisture, and growing conditions. Regular trimming and arbor care are crucial to prevent vegetation from becoming overgrown and, thus, a potential hiding place.*

## Summary of Standoff Perimeter Barrier Elements

ELEMENT	ADVANTAGES	DISADVANTAGES	TIPS
<b>Bollards</b>	<ul style="list-style-type: none"> <li>■ Have proven performance</li> <li>■ Are permeable for pedestrians</li> <li>■ Are available in high- and low-cost options</li> </ul>	<ul style="list-style-type: none"> <li>■ Are overused</li> <li>■ Sometimes are oversized</li> <li>■ Are often installed at tight, urban locations where achieved setback does not significantly reduce risk</li> <li>■ Require deep foundations that may conflict with underground utilities</li> </ul>	<ul style="list-style-type: none"> <li>■ Do not overspecify performance requirements</li> <li>■ Use vector analysis to determine appropriate performance requirements for different areas of the site</li> <li>■ Take aesthetic cues from building and neighborhood context</li> <li>■ Do not rely on bollards exclusively; layer with other elements and create a varied edge</li> </ul>
<b>Sculptural or seating barriers</b>	<ul style="list-style-type: none"> <li>■ Can double as informal seating</li> <li>■ Are flexible</li> <li>■ Create visual interest</li> <li>■ Do not appear to be security</li> </ul>	<ul style="list-style-type: none"> <li>■ Require deep foundations that may conflict with underground utilities</li> </ul>	<ul style="list-style-type: none"> <li>■ Design the feature to harmonize with the character of the site (e.g., choice of materials, shapes, sizes)</li> </ul>
<b>Walls</b>	<ul style="list-style-type: none"> <li>■ Can serve dual purpose as security and amenity</li> <li>■ Can double as informal seating</li> <li>■ Enable security to become part of the landscape and, therefore, unobtrusive</li> </ul>	<ul style="list-style-type: none"> <li>■ Require continuous deep foundations that may conflict with underground utilities</li> <li>■ May impact lines of sight to and from a facility</li> </ul>	<ul style="list-style-type: none"> <li>■ Choose a design and materials that continue or accent the character of site architecture and other site amenities</li> <li>■ Ensure that the design satisfies barrier requirements by collaborating with a structural engineer during team decision-making process</li> <li>■ Mix with permeable barrier elements where access is needed (e.g., at entry points)</li> </ul>
<b>Hardened street furniture</b>	<ul style="list-style-type: none"> <li>■ Can serve a dual purpose as security and amenity</li> </ul>	<ul style="list-style-type: none"> <li>■ Requires regular maintenance to be effective aesthetically</li> <li>■ Is easy to overscale and overengineer</li> </ul>	<ul style="list-style-type: none"> <li>■ Develop a family of elements (e.g., bollards, benches, lighting)</li> <li>■ Do not overuse</li> <li>■ Avoid overdesigning and overengineering</li> </ul>
<b>Fences</b>	<ul style="list-style-type: none"> <li>■ Can provide high levels of security</li> <li>■ Are made of various materials to suit different styles and applications</li> <li>■ Can deter individual intruders</li> </ul>	<ul style="list-style-type: none"> <li>■ May impact lines of sight to and from a facility</li> <li>■ May weaken secure perimeter (e.g., at gates and entry points)</li> <li>■ Create a closed-off appearance if too high, particularly in urban contexts</li> </ul>	<ul style="list-style-type: none"> <li>■ Choose different heights and types of materials for specific areas of the site, depending on the level of risk and likelihood of attack</li> <li>■ Use in high-security sites where individual intruders, rather than vehicles, are a threat</li> <li>■ Consider vigilant surveillance or patrols where fences are not appropriate</li> </ul>
<b>Topography</b>	<ul style="list-style-type: none"> <li>■ Can limit access to site and serve as a perimeter barrier when shaped thoughtfully</li> <li>■ Enables security to become part of the landscape and, therefore, unobtrusive</li> </ul>	<ul style="list-style-type: none"> <li>■ Can create areas of concealment</li> </ul>	<ul style="list-style-type: none"> <li>■ Consider sight lines and visibility carefully when designing the topography of a site to avoid creating areas of possible concealment</li> </ul>
<b>Dry moats</b>	<ul style="list-style-type: none"> <li>■ Allow for elimination or reduction of walls or bollards</li> <li>■ May be less visually intrusive</li> </ul>	<ul style="list-style-type: none"> <li>■ Require greater perimeter depth compared to hardened elements</li> <li>■ Restrict pedestrian movement across site</li> </ul>	<ul style="list-style-type: none"> <li>■ Use in areas with sufficient setback</li> <li>■ Combine with low walls, possibly designed as seats, where there is limited setback</li> </ul>

ELEMENT	ADVANTAGES	DISADVANTAGES	TIPS
<b>Collapsible surfaces</b>	<ul style="list-style-type: none"> <li>■ Provide invisible barriers beneath usable space</li> <li>■ Allow free circulation and uncluttered site</li> <li>■ Extend perimeter into public sidewalks without negative impacts</li> </ul>	<ul style="list-style-type: none"> <li>■ May require greater perimeter setback depth, depending on site conditions or use of low walls</li> <li>■ Requires that service vehicles (e.g., maintenance and landscaping trucks) avoid collapsible areas</li> <li>■ May be insufficient to support temporary seating for special events</li> </ul>	<ul style="list-style-type: none"> <li>■ Incorporate low walls or low bollards to decrease required setback depth</li> <li>■ Where setback is sufficient, eliminate use of aboveground walls</li> <li>■ Coordinate placement with first responders</li> </ul>
<b>Water</b>	<ul style="list-style-type: none"> <li>■ Can also serve as amenity (e.g., fountains, decorative pools, and other water features)</li> <li>■ May help to achieve sustainability goals (e.g., retention basins)</li> <li>■ Enables security to become part of the landscape and, therefore, unobtrusive</li> </ul>	<ul style="list-style-type: none"> <li>■ Requires regular maintenance</li> <li>■ May become a drowning hazard</li> </ul>	<ul style="list-style-type: none"> <li>■ Coordinate placement of storm water management areas to enhance security topographically</li> <li>■ Consider how natural water features, particularly on suburban sites, can be incorporated into comprehensive site security</li> <li>■ Structurally harden features so that they provide unobtrusive protection against vehicles</li> <li>■ Consider how fountain will look when not in operating season</li> </ul>
<b>Landscaping and plantings</b>	<ul style="list-style-type: none"> <li>■ Can create natural, repellent barriers, while enhancing the beauty of the landscape</li> <li>■ Can screen hardened elements to lessen their visual impact</li> </ul>	<ul style="list-style-type: none"> <li>■ Requires regular maintenance</li> <li>■ May block sight lines</li> <li>■ Can provide attractive hiding places</li> <li>■ May conflict with underground utilities</li> </ul>	<ul style="list-style-type: none"> <li>■ Use plants as supplementary protection in concert with hardened barriers</li> <li>■ Use to create a seamless aesthetic transition to surrounding neighborhood</li> <li>■ Select low-maintenance, sustainable materials</li> </ul>

## INNOVATION

There are numerous new technologies and products currently under development that offer promising solutions for integrated site security. For example, designers have employed new techniques for anchoring bollards and other hardened elements where underground conditions limit available depth. These include shallow foundation systems and thin turntables that can spin barriers 180 degrees to allow approved vehicular passage. Both meet security requirements, while providing more flexible alternatives for the implementation of standoff countermeasures. Both also show the innovations that result when Project Teams shape their vision for security outside what has been done before, creating vital, safe sites and clever, inspiring solutions.

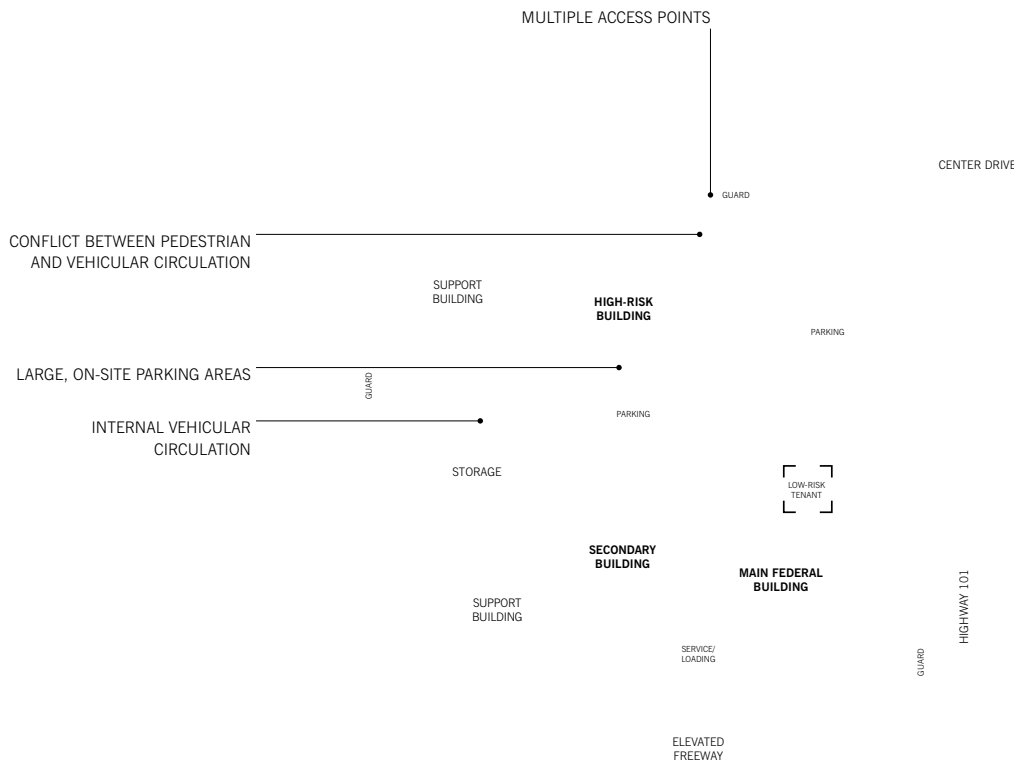
Shallow-mount perimeter systems, which require less than 18 inches of below-surface depth, provide the same performance as traditional barriers and offer greater flexibility in placement. Turntable systems are one such solution; they support a variety of surface treatments and accommodate occasional vehicular access where required.



## Zone 3

# Site Access and Parking

Topography, pedestrian and vehicular circulation routes, checkpoints and access points, vistas, sight lines, and signage all contribute to effective site access and circulation and, in turn, to the success of the standoff perimeter. Project Teams must design site access to minimize conflicts between pedestrians and vehicles, maximize efficient passage for both daily activity and emergency response, and retain control over who enters the site.



Site security in this zone keeps potential vehicle-delivered threats away from federal facilities wherever possible, while maintaining connections with public transportation systems. Successful strategies do this by controlling the movements and location of uninspected vehicles, whether passing by the site, dropping off or picking up passengers at the site, or entering the site.

With the design of on-site parking and access points, Project Teams can eliminate direct lines of approach, control vehicle speed, and reduce the necessity for robust barriers. In addition, the same systems that ensure security can also guide visitors and employees to their destinations (e.g., parking lots or building entries), with clear paths and appropriate wayfinding information. The following are some key strategies for achieving these objectives:

- **Maintain the integrity of the standoff zone.** Determine which vehicles are permitted to cross the perimeter barrier and where they are permitted to cross.
- **Ensure access for first responders.** Design site circulation to enable emergency vehicles to reach those in need, quickly and efficiently.
- **Provide adequate room for inspection.** Maintain access to public streets and sidewalks during stopping and queuing.
- **Include separate loading and service paths.** Ensure that other transportation paths do not intersect these areas.
- **Establish pedestrian circulation routes.** Maintain clear paths to and from the site, between buildings, and from parking areas to building entrances.

### Diagram 2.5: Site Circulation

Clear circulation is always important, especially on a large site with multiple access points and internal vehicular circulation. This diagram shows the existing conditions on a site with large areas of on-site parking, an unclear hierarchy of routes, and multiple conflicts between pedestrian and vehicular traffic that create both security concerns and issues of personal safety. Test Case 4 in Chapter 4 illustrates a solution that addresses these conditions.

## Site Access and Parking Elements/Actions

1. Delineate drop-off and pick-up areas
2. Control site access by incorporating
  - Inspection areas
  - Retractable bollards
  - Gates
  - Guard booths
  - Sally ports
3. Monitor loading and service areas
4. Maintain clear access routes for first responders
5. Establish clear pedestrian circulation routes
6. Establish secure parking areas inside and outside the standoff perimeter
  - Garage parking
  - Surface parking
  - Wayfinding, lighting, and signage

Perimeter elements must not block easy access to curbs by either pedestrians or wheelchair users (left). In high-traffic areas, designers should look for ways to position or stagger elements to meet security performance requirements, while allowing for comfortable circulation (right).



## ELEMENTS AND EXAMPLES

### 1. Delineate drop-off and pick-up areas

Drop-off and pick-up areas should be outside the standoff perimeter and designed so pedestrians can move easily from their buses and cars to building entries. Care should be taken when installing barriers along public sidewalks and near curbs to ensure that there is adequate room for car doors to open and people to exit. Moreover, barriers must never obstruct ramps for persons with disabilities, including curb cuts at sidewalks, and must be spaced to allow wheelchairs to pass between repetitive elements, such as trees and bollards.

### 2. Control site access

To maintain the integrity of standoff, site security must keep uninspected vehicles outside perimeter barriers at all times, while ensuring access for approved vehicles. Controlled access points are key to this strategy; they allow entry onto the site where appropriate, yet maintain a secure perimeter. In addition to physical measures, Project Teams must plan for the operational aspects of site access. Policies should be in place to inspect all unauthorized vehicles before they reach garage and service entrances on-site, especially when parking is located underneath the building.

**Inspection areas.** A site must accommodate inspection and vehicle queuing without impeding public streets and sidewalks. Security and public use can coexist when Project Teams provide space outside the standoff zone for these activities. Such checkpoints and their operations should be inconspicuous, with limited visibility afforded to those outside the process.

**Retractable bollards.** Retractable bollards are reinforced barriers that retract into the ground, allowing the entry of emergency response vehicles or authorized visitors to the site. They provide clear lines of sight and pedestrian passage, but may appear monotonous if combined with regular bollards. Project Teams that specify retractable bollards must select proven technology that is both mechanically sound and able to withstand vehicular impact. The security functionality of this solution depends on its successful operation, so building managers must commit to consistent maintenance of the mechanical systems that operate the bollards.

*Perimeter barriers near bus stops must allow sufficient room for the deployment of bus lifts for persons with disabilities. Otherwise, such passengers must disembark in the street, creating a potentially dangerous situation.*

*All controlled-access areas should be located outside public rights-of-way (streets and sidewalks) and must include space designated for vehicle queuing. Limit the number of vehicular entry points to facilitate access control. On an existing site, this can be achieved by closing or combining entry points.*

*Hydraulic plate barriers—operable “clamshell style” steel plates—are sometimes used in place of retractable bollards because they can be surface mounted and may be less expensive. While they may be appropriate for temporary or remote installations, they tend to be visually inappropriate for urban uses.*

Underground conditions play a fundamental role in determining whether retractable bollards are the appropriate solution for access control. They require a significant amount of clear space underground to accommodate the foundation and to accept the retracted barrier. Teams should complete a thorough survey to determine the exact location of underground utilities before selecting and placing retractable barriers.

**Gates.** Gates function as entry control points for vehicles and pedestrians; among all elements composing a standoff perimeter, they are one of the most commonly breached. Thus, Project Teams must carefully design gates to allow entry, while providing

adequate security. A variety of products on the market are crash-rated to absorb the force of an oncoming vehicle. These include cantilevered sliding gates and vertical lift gates, for use where space is at a premium. When choosing a gate, take into account the building materials used in the facility and in the surrounding neighborhood. The gate should be as unobtrusive as possible and harmonize with the existing palette.

It is good practice to designate separate entry gates and different levels of security for personnel, visitors, and commercial traffic. Designated entrances also support automated entry, which is more efficient, alleviating delays and concentrating inspection and staffed security booths where they are most useful. Magnetic access card readers are one common choice in such situations; they are sturdy and reliable. They have largely replaced slot card readers, which are easily vandalized, and radio-controlled systems, which may jam. However, whenever automation is in place at site entry points, Project Teams must provide back-up systems, should a power outage occur.



Pop-up bollards can provide perimeter protection, while permitting controlled access for emergency or delivery vehicles (left). Although clamshell-style barriers are less costly and require shallower mounting depths, they are uniformly unattractive and, in most cases, should be avoided or screened where possible (right). A better option may be a turntable type system (see page 47).





**Guard booths.** Guarded entry, staffed by security personnel, involves a more hands-on approach to security. A guard station, or booth, provides a point of implementation for searches, identification, verification, and access control. However, this form of hands-on security has a price tag. Gates monitored with card access control are probably less secure than those with a staffed guard booth, but they generally have lower operating costs.

Often, guard booths are placed at entry points, especially in high-security situations. Security personnel inspect vehicles and pedestrians before they are allowed to enter. Entrances may be outfitted with a vehicular barrier that is recessed into the ground and activated with a hydraulic arm, or some other type of controllable barrier. If the security staff senses a problem, they can trigger the barrier, preventing the vehicle from driving onto the site. Because of safety concerns, vehicles and pedestrians generally should not share the same entrance. Overlapping circulation might put pedestrians at risk, and it is difficult to oversee both types of traffic simultaneously.

Guard booth design should reflect the same architectural character as the facility being guarded. Booths should be an extension of the building, harmonizing with the other site elements and the surrounding context, and should not obstruct or occupy public space. If possible, inspection areas should be sheltered to enable thorough, unhurried inspections during inclement weather.

**Sally ports.** A sally port, or small controlled space with front and rear entries, is used to restrict access to one person or vehicle at a time. This strategy provides a high degree of control, allows time to check credentials, and makes it difficult for intruders to pass into the protected area on the coattails of the person in front of them. This type of entry is usually reserved for high-security areas, such as prisoner transfer areas in courthouses.



Guard booths and other outbuildings should reflect the design of the structure they protect. Contextual solutions also may increase the safety of guards, for they can easily incorporate other site elements, such as hardened walls. A custom-designed guard booth is worth the additional investment it may require.

*It may be beneficial to close certain entrances during off-peak hours to conserve staff resources. If this approach is taken, clear and visible signage must communicate when entrances are open to prevent confusion.*

## Summary of Access-Control Elements

ELEMENT	ADVANTAGES	DISADVANTAGES	TIPS
<b>Inspection areas</b>	<ul style="list-style-type: none"> <li>Can accommodate queuing and inspection without impeding public streets and sidewalks when on-site, but outside standoff zone</li> </ul>	<ul style="list-style-type: none"> <li>Require additional personnel and operating costs</li> </ul>	<ul style="list-style-type: none"> <li>Limit visibility of the checkpoints and their operations by those outside the process</li> </ul>
<b>Retractable bollards</b>	<ul style="list-style-type: none"> <li>Are flexible in controlling access and emergency egress</li> </ul>	<ul style="list-style-type: none"> <li>Require substantial, regular maintenance and can appear monotonous if combined with other bollards</li> </ul>	<ul style="list-style-type: none"> <li>Ensure consistent, expert maintenance because mechanisms are sensitive</li> </ul>
<b>Gates</b>	<ul style="list-style-type: none"> <li>Allow for controlled access and inspection</li> </ul>	<ul style="list-style-type: none"> <li>Require monitoring (either human or electronic) to prevent unwanted access</li> </ul>	<ul style="list-style-type: none"> <li>Match style to context</li> </ul>
<b>Guard stations</b>	<ul style="list-style-type: none"> <li>Allow for live monitoring and inspection and on-the-spot, immediate action in the event of an emergency</li> </ul>	<ul style="list-style-type: none"> <li>Require additional personnel and operating costs</li> </ul>	<ul style="list-style-type: none"> <li>Match style to neighborhood or building architectural style and materials</li> </ul>
<b>Sally ports</b>	<ul style="list-style-type: none"> <li>Provide double-layered lockdown during inspection</li> </ul>	<ul style="list-style-type: none"> <li>Increase the time needed to process people and vehicles</li> <li>Require ample space for queuing</li> <li>Are suitable only for low-traffic areas</li> </ul>	<ul style="list-style-type: none"> <li>Site carefully to allow for queuing and visibility of approach</li> </ul>

### 3. Monitor loading and service areas

Ideally, Project Teams should separate loading and service areas from other traffic flows, such as controlled parking and emergency response, to avoid circulation conflicts. This helps ensure that any individual who breaches security elsewhere will not also have access to service areas. Moreover, service and loading areas should be inconspicuous, both to reduce potential threats and to limit their impact on the surrounding community.

Loading and service areas need careful monitoring since the nature of delivery vehicles entails inherent risk. The design of these areas should allow sufficient space for inspection and queuing, including pull-over lanes where necessary.

### 4. Maintain clear access routes for first responders

When establishing the entry points and barriers that make up the standoff perimeter, it is essential to maintain access routes for first responders. Review and consider local emergency access/evacuation plans to ensure that first responders will be able to reach the site and the building easily, even if some entrances are obstructed.

### 5. Establish clear pedestrian circulation routes

Every site needs to accommodate pedestrian circulation, whether visitors arrive on foot or in a wheelchair, or from a vehicle drop-off point, a parking lot, a public sidewalk, or mass transit. Perimeter barriers, gates, and driveways must ensure that accessibility is not impaired in any way.



Where pedestrian circulation must be clearly denoted and controlled, it also should be attractively integrated with overall site features.

Pedestrian circulation should clearly guide visitors and those making deliveries to their destination and direct them away from areas where they are not permitted. Achieve legibility by defining clear pathways through the use of hardscape and landscape elements, well-designed signage, and good lighting.

## 6. Establish secure parking areas inside and outside the standoff perimeter

Due to the threat of vehicle-borne explosives, parking presents a special problem. None of the three common types of parking facilities—garage (underground or aboveground), surface lots, and on-street parking—is free of security issues. So parking areas must always be designed and operated to ensure the integrity of the standoff zone and to manage the movements of uninspected vehicles efficiently.

Parking within the standoff zone usually should be restricted to employees or permit holders, although high security may preclude this option as well. In some locations, inspection of every vehicle entering the site may be necessary; this is particularly true where internal or underground parking is concerned, since both present increased risks. Limited parking entries help decrease these risks, by easing both the inspection process and overall site surveillance, but should remain separate from service access.

When parking is outside the standoff perimeter but within the optimal setback area due to site conditions, parking must be restricted or redesigned, or Project Teams must accept little or no mitigation. If this occurs on a tight urban site with on-street parking or an adjacent surface lot, the situation may be improved by developing parking regulations in cooperation with local officials. Tenant-only street parking provides extra setback with less impact on the urban context, while respecting local transportation needs. Unscreened visitor parking should be kept at the farthest distance possible, without being inconvenient.

The personal safety afforded by a site is a very real priority, as important as protection against terrorist threats. Project Teams should plan all parking entries in relation to emergency and first response plans. Inspection areas should include adequate space for vehicle queuing, outside public rights-of-way and emergency access routes. Pedestrian circulation to and from parking areas—both on-site and off—should be well lit, well marked with signage, separated from driveways, and convenient for visitors and employees.

**Garage parking.** Although common in cities due to the high cost of land, garage or structured parking carries the highest security risk. Parking garages off-site, but nearby, may provide effective observation points or staging zones for potential attacks. Where such garages exist, Project Teams should consider partnering with local officials or neighbors to screen garage façades that face vulnerable facilities.

On-site garages for inspected or permitted vehicles reduce these risks. Unlike federal workspaces, parking garages are not subject to setback requirements and may be suitably placed on the lot line. Consider how such a structure can help lessen the negative impact of a significant standoff, particularly when attractively screened and combined with retail or food service on the ground floor. All garages should include common crime-prevention

*Locate and design loading docks, garages, and service areas so that large vehicles do not have access to areas beneath buildings. If this is not possible, harden such areas against blast to limit damage to adjacent areas in the event of an explosion. In addition, allow sufficient egress for occupants in an emergency. For example, if a crisis occurs on a garage ramp, it should not block all access to or from the garage.*

Though adjacent parking may make security design more complicated, measures to reduce threats can have the added benefit of enhancing otherwise dull infrastructure. For example, screening a parking garage both eliminates potentially dangerous vantage points and increases visual interest (top), while outleasing part of a large surface parking lot for a public use, such as a basketball court, increases natural surveillance, eliminates unwanted vehicular access, and blends a federal facility into its community (bottom).



*Straight-line or perpendicular approaches should be avoided in parking areas to prevent vehicles from generating the speed necessary to penetrate a building or its defenses.*

methods, such as CCTV, adequate lighting, active patrol by security personnel, and sufficient ventilation.

**Surface parking.** Surface parking requires large amounts of valuable space and is difficult to monitor. Furthermore, surface parking can add significantly to the amount of storm water runoff generated on-site, a negative environmental impact that requires additional land and expense to mitigate.

Where such parking lots are necessary, Project Teams should carefully consider how to mitigate these impacts. For example, if more land is available than is needed, the addition of a vital public space on a portion of the lot can help blend the site into the surrounding neighborhood, while increasing ground permeability.

**Wayfinding, lighting, and signage.** The design of all parking areas should enhance natural surveillance and offer clear pedestrian circulation from parking to facility. Maximized visibility across, into, and out of a parking facility is key to successful security and personal safety, especially in standalone, aboveground situations. If a security station is provided, it should be located in a visible, public place, with a clear view of all entry and exit activity.

Indoor and outdoor facilities should include adequate lighting and signage. Lighting is one of the more passive forms of security that can be incorporated as part of the physical design of the facility and its site. In parking garages, high ceilings and long-span construction, in combination with light cores (openings in the center of the structure) and open stairwells, create a feeling of openness and increase the effectiveness of light as a security feature.

The Illuminating Engineering Society of North America (IESNA) has set minimum illumination levels for parking facilities. Project Teams may need to adjust these minimum light levels to address the required protection level for their specific facility. Further guidance on this topic can be found in the ISC criteria.

## INNOVATION

If possible, it is highly advantageous to design the access and circulation of a site in order to minimize the potential velocity of an approaching vehicle. Local partners, such as departments of transportation and public works, are key players in implementing off-site traffic calming measures, such as road realignments, raised crosswalks, and medians. These strategies help turn adjacent roadways into security elements, by preventing vehicles from achieving the speed necessary to breach protective barriers. This, in turn, can enable the use of less robust hardened elements at access points and elsewhere on-site.

Additionally, such calming measures (which also include high curbs, tree plantings, traffic circles, speed tables, and raised crosswalks) create a more pedestrian-friendly experience around a facility, making it easier for both employees and visitors to navigate the site and its surroundings. More sidewalk traffic means greater “eyes on the street” surveillance, while slower streets mean reduced liability. When these strategies are implemented, it is important that they do not impede access by first responder and other emergency vehicles, in the event of a crisis.



Off-site traffic control measures can moderate attainable vehicular speeds and angles of approach toward a secure perimeter. Developed through rigorous vector analysis, specially designed medians and traditional traffic calming devices, like speed bumps, reduce the force against which countermeasures must protect, enabling Project Teams to reconsider the robustness of site security elements.

## Zone 4

### Site

*The proper design and effective use of the built environment can lead to both a reduction in the fear and incidence of crime and an improvement in quality of life. This is the approach known as Crime Prevention Through Environmental Design, or CPTED. A vast resource of literature exists detailing the principles and practices behind this strategy.*

*GSA's facilities standards require that new buildings and major renovation projects meet the sustainability certification requirements of the LEED (Leadership in Energy and Environmental Design) Green Building Rating System®, which include many factors that site design can contribute to, such as water quality, energy efficiency, and renewable materials.*

While security measures are introduced to prevent events that hopefully will never occur, their design must accommodate on-site activities that take place every single day. These include simple navigation from the curb to the building, employee activities, and special events. Each contributes to the vitality of federal facilities and, in turn, enhances the quality of the workplace. Seeking a balance of security innovation and day-to-day practicality is fundamental in developing a successful site design.

This principle is especially important in Zone 4, since this area includes the majority of the usable site. In Zone 4, the threats addressed include individuals as well as vehicles. Here, a security project offers an opportunity to provide new amenities that increase building security, while making the site more attractive and vital.

#### SITE AND LANDSCAPE DESIGN FOR SECURITY AND SAFETY

Effective site planning and landscape design can create quality public spaces, while enhancing the security of the facility. Design elements that serve both purposes reduce the number of site components, as well as the overall cost of a site security design. The following site design principles contribute toward this end:

- **Organize site amenities** to encourage use, while selecting their type and arrangement in terms of the overall security goals for the site.
- **Provide clear sight lines** to and from entries and guard booths; screen high-security areas and other controlled-access zones.
- **Install lighting** that highlights design features, while providing needed light for pedestrian safety and security cameras.
- **Support the facility's occupant emergency plans** by developing level, open areas at egress points.

- **Establish circulation routes** that are clear and unimpeded, increasing the safety of building occupants and visitors.
- **Install adequate, clearly legible signs** to reduce confusion and assist visitors in finding their destinations.

#### SUSTAINABLE DESIGN

The built environment has a meaningful impact on the natural environment, the economy, and the health and productivity of those who interact with it. Environmentally sustainable materials and operations should be incorporated into site security designs whenever possible.

Many design solutions help achieve environmental goals on-site. For instance, retention basins can collect storm water for eventual reuse. Vegetation can reduce heat islands, while hardscapes can incorporate recycled materials. And, sensitive lighting design can minimize light pollution. In addition, hardening existing street furniture, walls, planters, and the building envelope recycles existing features for new purposes.

Design decisions can also impact broader sustainability, beyond the site itself, while aiding security. Connections to a variety of public transportation services close to the site and provision of transportation benefits to staff reduces traffic and vehicular presence in the city and on-site. Carefully orienting a building to take advantage of natural light, shading, and ventilation can be both cost-effective and energy efficient, while ensuring visibility and adding to the overall quality of the site.

#### Site Elements/Actions

1. Design site amenities, such as furnishings, planters, water features, lighting, and vegetation, to serve multiple purposes
2. Create usable space
3. Designate weather-protected space for queuing at entries
4. Design security pavilions and freestanding buildings to blend with the site's architectural character

## ELEMENTS AND EXAMPLES

### 1. Design site amenities, such as furnishings, planters, water features, lighting, and vegetation, to serve multiple purposes

The furniture and fixtures typically found within a site can function as countermeasures with proper hardening, or can help de-emphasize hardened security measures. Existing or carefully selected trees, plants, streetlights, fountains, kiosks, bicycle racks, parking meters, trash containers, bus shelters, and benches are some of the many elements that can contribute to both safety and comfort.

Some of these furnishings, including kiosks, benches, and trash containers, can be designed to fit over an engineered core and foundation, much like a bollard, boosting their structural integrity. Sculpture and public art can also function as hardened security barriers. These commonplace elements, when reinforced, serve two purposes, reducing the need for other, more obtrusive, countermeasures. However, as with any structural element, an underground survey is necessary to determine whether there is available space for the foundations that such barriers require, and designers must be careful not to make them inappropriately large.

Fountains, ponds, pools, and other water features can also function as site security elements when designed to stop oncoming vehicles



and arranged to selectively prevent access. For example, tank traps—low ditches that prevent vehicular access—are often filled with water, providing both security and an attractive landscape element.

Of course, where the perimeter itself provides sufficient protection from vehicles, internal site features need not be hardened. Instead, they can serve primarily as amenities, helping to soften the appearance of the perimeter elements.

In many cases, it is best to combine these strategies, using conventional hardened elements in combination with traditional amenities that do not need to be hardened.

Lighting is also an important consideration in this zone—when hardened, lighting elements can double as barriers, and when properly configured, lighting can help detect and deter intruders and improve visibility. Multiple lamps of moderate power provide better coverage than a few powerful lamps, while reducing glare and pools of shadow. In addition, a multiple-lamp design creates redundancy, necessary if a bulb blows out or fails. Because many crimes and terrorist acts are committed in broad daylight, lighting must be combined with a comprehensive security strategy.

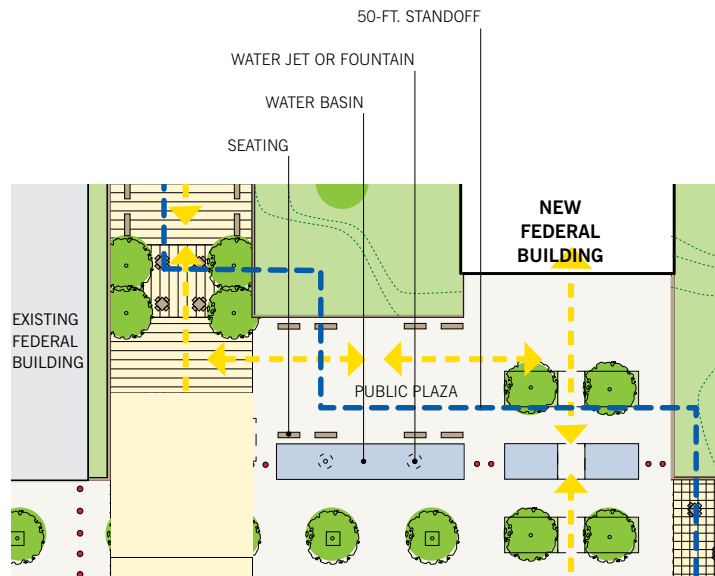


*When used as part of a perimeter barrier system, street furniture may need to be bulkier than usual to obtain the structural integrity required to also function as a security barrier. Designers, engineers, and manufacturers must collaborate to develop innovative designs that provide necessary protection, while enhancing the streetscape and inviting use.*

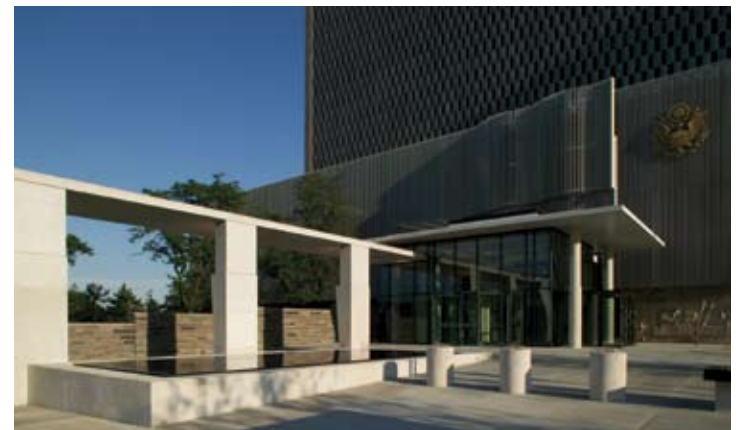
Inside the secure perimeter, Project Teams should maximize opportunities to create attractive, usable spaces. Plazas, parks, and other public areas provide amenities for building users and neighbors, while helping to integrate the perimeter with the site and its surroundings.

## Diagram 2.6: Water Feature

A water feature can be a security element and serve as a focal point in a public plaza, as shown here. Water jets or fountains create visual interest and pleasant sounds that can drown out the noise of traffic on a dense urban site. In this example, the water feature acts as a moat that deters vehicular approach by capturing an oncoming vehicle in a recessed trench.



Reinforced water features enhance a site, while serving unobtrusively as standoff protection. Such features can function as moats or walls without making this purpose obvious.





## Summary of Site Elements

ELEMENT	ADVANTAGES	DISADVANTAGES	TIPS
<b>Furnishings</b>	<ul style="list-style-type: none"> <li>■ Can double as security elements when appropriately hardened</li> <li>■ Serve as everyday site amenities, which help to soften the appearance of perimeter security</li> </ul>	<ul style="list-style-type: none"> <li>■ Are often overengineered for security function; can be too heavy and “chunky” when designed as security elements</li> </ul>	<ul style="list-style-type: none"> <li>■ Create a palette, or family, of site furnishings that harmonize with other site elements and the surrounding neighborhood</li> <li>■ Consider mixing conventional hardened elements at the perimeter with traditional amenities within the site to create variety and ease of use</li> </ul>
<b>Planters</b>	<ul style="list-style-type: none"> <li>■ Add color and interest, softening hard lines and helping to blend security into the overall site design</li> <li>■ Are available in a wide range of styles, to match buildings and landscape</li> </ul>	<ul style="list-style-type: none"> <li>■ Require regular maintenance</li> <li>■ Are frequently too large, impeding sidewalk access and creating unattractive visual bulk</li> </ul>	<ul style="list-style-type: none"> <li>■ Establish available maintenance resources, including Business Improvement Districts and management staff, before incorporating planters</li> </ul>
<b>Water features</b>	<ul style="list-style-type: none"> <li>■ Provide a barrier that also functions as a focal point or feature of interest</li> <li>■ Enhance security without seeming obtrusive</li> </ul>	<ul style="list-style-type: none"> <li>■ Require regular maintenance</li> <li>■ Require site conditions that can withstand the particular characteristics of water features</li> </ul>	<ul style="list-style-type: none"> <li>■ Design water features to blend with landscaping of the site</li> <li>■ Integrate seating or landscaping into the hardened walls of water features so that their security aspects are less apparent</li> </ul>
<b>Lighting</b>	<ul style="list-style-type: none"> <li>■ Adds an important layer to the security of a building and site, increasing visibility both for surveillance and for visitors</li> <li>■ Provides security and adds interest by accentuating signage and landscape elements, serving a dual purpose</li> <li>■ Serves as a physical barrier if hardened</li> </ul>	<ul style="list-style-type: none"> <li>■ Can lead to light pollution of the surrounding neighborhood (usually caused by overdesign)</li> </ul>	<ul style="list-style-type: none"> <li>■ Incorporate multiple lamps of moderate power for best coverage, while reducing glare and pools of shadow</li> </ul>

*Setbacks and Civic Responsibility: As the size of setbacks has grown, so has our responsibility to create attractive, usable spaces on this open land. Doing so requires sufficient planning and investment.*

## 2. Create usable space

Site design should provide functional outdoor spaces that welcome use by federal employees, visitors, and the general public. Such spaces mitigate the impact of perimeter security and demonstrate the accessibility of the federal government. For a federal building to function as a public amenity with a clear sense of place and a strong civic presence, the site design team should consider the following:

**Encourage public use.** Activities that populate the site provide “eyes on the street,” increasing both security and personal safety through informal surveillance.

**Provide public amenities, such as cafés, restaurants, and retail open to adjacent neighborhoods.** While creating a sense of welcome, these minimize the impact of setbacks.

**Activate street edges and underutilized areas of the site.** Lively public spaces in otherwise neglected areas increase the safety of building occupants and visitors by making federal facilities less conspicuous.

**Incorporate public art.** Art commissions can beautify public spaces, while minimizing or augmenting security solutions.

**Partner with community organizations.** Collaborations with local stakeholders generate public events, lead to cooperative security strategies, and avert problems that arise from unilateral solutions.

**Integrate the facility within its neighborhood context.** A facility that is part of the neighborhood is less of an isolated target, benefits from the surveillance network of the city, and is an attractive place to work because of nearby amenities.

Public spaces should encourage both active and passive use. Some spaces are appropriate for programmed events, while others lend themselves to spontaneous sunning, eating lunch, or simply passing through. Each should be designed to match its intended use.

## 3. Designate weather-protected space for queuing at entries

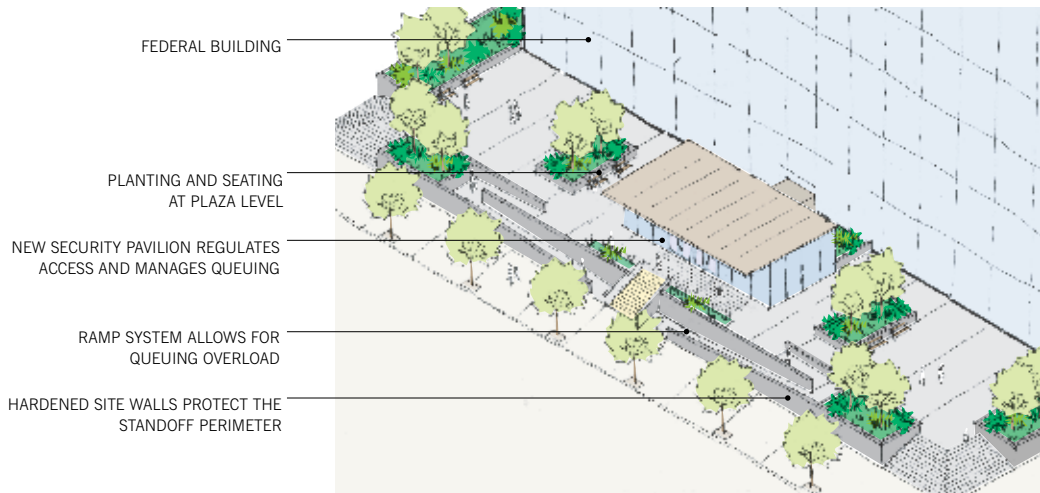
With most facilities maintaining strict policies for inspection and access control, space for queuing pedestrians is a concern. Any exterior queuing areas should offer shade and protection from wind and inclement weather, particularly if the facility routinely has large groups waiting to enter. Natural vegetation or designed

elements, such as trellises and loggia, create comfortable waiting areas that also contribute to the quality of the site.

In addition, queuing areas should clearly articulate where visitors are to stand while waiting and should direct lines away from entries in case emergency access is necessary. Consider how a fast and efficient interior screening process can prevent large groups waiting outside a building from becoming potential targets.

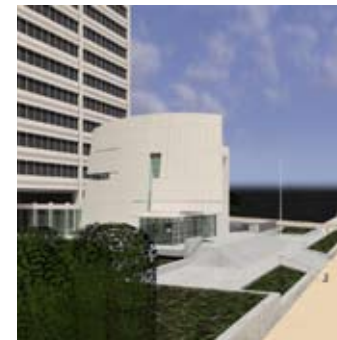
## 4. Design security pavilions and freestanding buildings to blend with the site’s architectural character

Pavilions designed for security screening make it possible to detect person-delivered explosives outside the envelope of an existing building, increase space for queuing, and improve the flow of security, while freestanding buildings help create attractive, functional public spaces with shopping and dining options. Project Teams must always design security pavilions or freestanding buildings, such as kiosks, to relate to the style and context of the site and existing structures. Similar materials, appropriate scale, and familiar design cues help these structures integrate with their sites and improve their functionality. In some cases, such as at monumental historic buildings, pavilions and freestanding buildings may not be appropriate.



### Diagram 2.7: Security Pavilion

Lobbies in older buildings often do not have adequate space to accommodate all of the equipment and queuing necessary for security screening. In addition, some lobbies may not be engineered to withstand the force of a package bomb. Here, security screening is relocated from the lobby to an exterior security pavilion, which protects the building against person-delivered explosives and manages queuing. The design of a security pavilion should always be considered in relation to the existing building's architecture, materials, and urban context.



Exterior security pavilions are an elegant solution where ground floor conditions make a facility vulnerable to progressive collapse. Such structures bring the security screening process out from under the building envelope. However, pavilions are not appropriate in all cases, especially where modifications to a façade would negatively impact the historic character of an existing building.





Standoff requirements may provide opportunities to introduce new uses, such as a freestanding restaurant (top), that turn larger building yards into an asset. Where setbacks are smaller but still significant, publicly accessible cafés and wrap-around retail at the building base, with interior structural hardening, help to bridge this distance and enliven otherwise blank walls (bottom).



## INNOVATION

Providing high-quality amenities to federal building customers and visitors presents significant challenges in its own right—and federal security requirements compound these challenges. Recent innovations rise to these challenges by finding opportunities in the security constraints themselves. One promising strategy involves constructing new service or concessions buildings on the site, in the areas reserved for standoff from the main building.

Recent projects have used this strategy to incorporate retail and restaurant facilities into new courthouses, federal buildings, and lease construction projects. These may be freestanding buildings on the site or first floor edge uses that are open to the public. The program can be derived from a building's internal food service requirements or leased to private vendors.

This approach offers several advantages: Because the outbuildings are not federal workplaces, they generally do not warrant the same setbacks or hardened construction. Furthermore, they may be placed at the property line to help the entire property respond to its urban context. Because they are outside the security screening zone for the workplace, they are directly accessible to the public. In turn, this accessibility provides more flexibility for the program, enlivens adjacent public space, and increases the customer base, all resulting in more favorable service hours and products.

Security must be carefully considered. For example, incorporating a public use at the base of the main building requires structural hardening of its adjoining walls, although this is neither difficult nor costly in new construction. On the other hand, if a building is placed at the perimeter, its structure and fixtures can provide options for more subtle design of hardened perimeter elements at that portion of the site. In either case, this innovative approach is helping Project Teams meet security needs, while providing much more value to their customers and communities.

# Zone 5

## Building Envelope

Most security features of the building's envelope are handled through structural analysis and building hardening, which are beyond the scope of site security design. The main role of site security design is to keep explosive threats at the standoff perimeter. However, some aspects of the building envelope do relate to the principles of site security. These elements are described below.

### Building Envelope Elements/Actions

1. Prevent access to vents/air intakes
2. Ensure accessibility at all entry and exit points
3. Design emergency egress to allow easy evacuation from a facility
4. Place cameras and light fixtures to maximize visibility
5. Harden the building structure and envelope
6. Design orientation and massing of building to lessen impact of explosion

### ELEMENTS AND EXAMPLES

#### 1. Prevent access to vents/air intakes

Separation of and protection for heating, ventilation, and air conditioning (HVAC) intakes are important parts of any security strategy. The HVAC system provides vital access to outside air; as a result, it is vulnerable to airborne security threats.

The ISC criteria specify requirements for placing air intakes to prevent the introduction of chemical or biological materials. In cases where this is impossible at existing buildings, Project Teams should consider installing site barriers to restrict access to these intakes. Examples of such protective barriers include walls, plantings,

and steep slopes. Approach this design issue with the same care regarding continuity of materials and relation to context as other security measures.

#### 2. Ensure accessibility at all entry and exit points

Building entry points are critical both for everyday circulation and in case of emergency. Regular and emergency exits should be well marked and easily accessible. To maximize security, balance the number of entry points so they can be monitored easily and offer adequate access and egress. Where possible, consider combining public and employee entrances to conserve resources and staff. Likewise, consider electronic card readers, which provide employee access, while allowing security personnel to focus on other priorities.

It is important that all entrances and circulation through the site comply with the requirements of the Architectural Barriers Act Accessibility Standard (ABAAS). According to GSA's *Facilities Standards for the Public Buildings Service (P-100)*, "The Architectural Barriers Act Accessibility Standard (ABAAS) is mandatory for all GSA projects. The A/E is responsible for checking to see whether there are local accessibility requirements. If they exist, the most stringent requirements will prevail between local and ABAAS."

#### 3. Design emergency egress to allow easy evacuation from a facility

When designing for security, it is important to keep in mind the requirements and circulation plans in place for emergency egress and first response. The occupant emergency plan and the site design should be compatible. Interior and exterior emergency routes should be clear and well marked, with comprehensive signage, to provide for quick response times. And, emergency egress doors should open onto level, unimpeded areas where occupants can safely and easily disperse away from a building. Considerations

*Specifics related to the hardening of a building, reduction of blast impact, blast-resistant glazing, and HVAC filters are not addressed here. This Guide focuses only on features that relate to the site. See ISC criteria for details on building-specific countermeasures.*

*Use plants, walls, and other barriers to prevent access to HVAC vents/air intakes if they are less than 30 feet above grade.*

*Facilitate efficient screening and ease of entry by considering the location, number, and visibility of access points.*



Various treatments mitigate the negative effects of a hardened façade, so a blank wall instead becomes an amenity for the building and its community. Some strategies include (clockwise from top left) designing “storefront windows” with exhibits, building a publicly accessible café with a hardened interior wall, treating the façade in a manner that creates visual interest, and providing a vertical water feature.



must also be made for persons with disabilities, allowing the most efficient means of egress in an emergency.

#### 4. Place cameras and light fixtures to maximize visibility

Closed-circuit television (CCTV) should be specifically designed for the intended application, with appropriate technology, resolution, performance, and durability against vandals and weather.

Project Teams must coordinate camera locations with GSA, Department of Homeland Security (DHS), U.S. Marshals Service (USMS), and the Property Manager to minimize impacts on architectural aesthetics, while maximizing the cameras' range. Usually, a variety of locations will allow necessary flexibility. Camera installation should also correspond to overall site lighting, since different levels of light are required depending on the type of cameras installed.

Appropriate lighting throughout the site and along the building enables observation of suspicious activities at a great distance and can deter criminal and terrorist behavior. Well-planned lighting makes unusual behavior more conspicuous. In particular, entries and secure areas must be carefully illuminated to maximize visibility in these key places.

Vegetation and other landscape elements must not interfere with lighting fixtures. Additionally, excessive glare or shadows can detract from visibility. Use fixtures that provide both security and landscape lighting, illuminating trees, statuary, and fences, as well as entrances and circulation routes. Provide layers of light in an urban setting, from standard street lighting to pedestrian-scale fixtures to small-scale bollard lights and feature lighting.

#### 5. Harden the building structure and envelope

At times, modification of the facility is the best strategy to reduce risk. Such alterations may change the requirements for site and perimeter countermeasures. While detailed modifications are outside the purview of this Guide, some typical options include hardening portions of the facility to reduce structural damage where the recommended standoff distance is not achievable and increasing the blast-resistant characteristics of doors, windows, and glazing.

Any hardening must be done in conjunction with analysis of the building performance based on the available standoff.

#### 6. Design orientation and massing of building to lessen impact of explosion

In addition to standoff distance and building hardening, designers and blast experts should consider the placement, massing, and orientation of the building itself as a strategy to mitigate blast impacts due to the characteristics of explosive pressure waves. For example, oblique angles and low-rise construction components may help to mitigate blast risk on sites that cannot achieve the desired standoff.

### INNOVATION

Thoughtful programming of the ground floor spaces in a federal building can help alleviate some risk factors, improving the security perimeter for the facility's federal customers. Carefully siting or relocating high-risk functions and reserving the ground floor for low-occupancy use can mitigate a certain amount of potential risk. If a building contains particularly high-risk areas, consider locating these within hardened walls inside the building itself, thus increasing achieved setback and buffer space between potential risk factors and the protected use.

*Where possible, building entries should be limited to centralize security oversight and located to protect against forced entry. Accessible entries should be located as close as possible to the building's main entry.*

*Coordinate building hardening with the architect and blast engineer, according to pertinent security criteria.*

# Zone 6

## Management and Building Operations

*Consider building occupancy patterns (e.g., M-F 9am-5pm) when assessing risk and countermeasures.*

In addition to preventative security design countermeasures, there are a variety of management actions that can help to secure a site and its users. While these may not have the physical presence of hardened barriers or topographic features, in many cases they play a considerable role in security design by proactively anticipating possible risks and removing those risks as much as possible. As Project Teams balance costs, aesthetic impacts, and any gains from traditional security measures, they should keep in mind the strategies listed in this section. Where site conditions and project budget resist any type of physical security countermeasures, these solutions and acceptance of inherent risk may be the only options.

Management and Building Operations Elements/Actions
1. Design for flexibility in building programming and space planning
2. Consider guards and alternative security operations when faced with site and cost constraints
3. Choose no mitigation and accept risk when it is neither practical nor plausible to harden site elements or the exterior of a facility

*A regular foot patrol by security personnel helps establish security oversight on a human level. Guards can both meet and greet staff and visitors and learn to recognize unusual circumstances. Their physical presence helps maintain ownership of the site.*

### ELEMENTS AND EXAMPLES

- 1. Design for flexibility in building programming and space planning**  
Reprogramming the location of activities within the facility by shifting high-risk functions to the interior of the site, off-site, or horizontally or vertically within the building can reduce negative impacts should an explosion compromise a facility's structure.

Some operations are more vulnerable than others. For example, a high-risk function should not necessarily occupy the most architecturally conspicuous portion of a facility. The ground floor

perimeter should be reserved for low-risk functions, such as concession services. On-site day care facilities should be carefully placed to maximize protection for young children. For more information, refer to the GSA publication *The Design of Childcare Facilities*.

Building programming and space planning should be flexible, accommodating inevitable change over the life of a facility and adjusting to varying levels of threat. Temporary programming can provide short-term public amenities in space emptied because of vulnerability.

- 2. Consider guards and alternative security operations when faced with site and cost constraints**

Building and security operations may be an effective way to detect, manage, and reduce risk, especially when site constraints and costs limit other possibilities. For instance, on tight urban sites that do not allow increased standoff, enhanced camera surveillance systems or increased frequency of patrols outside the building may be more realistic options. This security solution anticipates risks and relies on trained eyes when no physical solution is feasible.

Operational strategy is not a typical part of the project planning process. However, the Project Team must integrate this approach, as it forms an important part of any comprehensive site security strategy.

- 3. Choose no mitigation and accept risk when it is neither practical nor plausible to harden site elements or the exterior of a facility**

Risk can never be eliminated entirely. If the Project Team determines that a risk cannot be significantly reduced by any reasonable means, then the ISC criteria allow for acceptance of risk. The Project Team has the ability to decide what methods and actions to apply and to what extent.



## INNOVATION

Operational measures are the most effective countermeasure if they lead to the discovery and prevention of an attack. Coordinating surveillance, reporting suspicious activity, and maintaining collective “eyes on the street” may deter attacks against a building, as well as personal crime in a neighborhood. Close collaboration among federal security personnel, local police, and neighborhood watch programs would seem to have obvious benefits, yet is practiced less often than it should be.

The more proactive approach is on display at one very busy Department of Defense facility in a tight urban neighborhood. Facility commanders hold regular meetings with both official and unofficial local security organizations, trade information about upcoming events, discuss potential concerns, and maintain quick reporting mechanisms for responding to suspicious activity. This type of coordination expands the capability of the commanders to identify and react to threats before they occur. On a smaller scale, this same innovation can bring similar value to non-defense-related federal properties.



# Conclusion

These elements are the vocabulary of site security. The process for successfully introducing them is the subject of the next chapter. Project Teams that understand and implement both will create innovative site security designs that improve the daily life of employees and visitors as they ensure their security.



The elements of site security design are nuanced and complex. Their successful implementation depends on the extent to which Project Teams consider their use strategically, comprehensively, collaboratively, and over the long term. In the best projects, which enhance both safety and the quality of the public realm, mastery of these hallmarks is evident.

