Balancing Security & Sustainability
Goals to Achieve
High Performance Buildings

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What Is a High Performance Building?

Energy Policy Act, Section 914. Building Standards
- A building that integrates & optimizes all major high-performance building attributes, including energy efficiency, durability, life-cycle performance, and occupant productivity.

- A building that integrates and optimizes on a life cycle basis all major high performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
High-Performance Buildings

- Achieve long-term value and performance
- Are enduring assets in their communities
- Support and enhance human performance
- Reduce operating costs
- Are safe, secure, accessible
- Protect the environment
- Are the result of using a whole building approach

What are we getting now?

- Building codes are minimum
- One attribute is prominent while others are overlooked or trivialized
- Low Occupant satisfaction
- Lawsuits
- Premature failures of materials & systems
- Value of investment decreases while costs of operations & maintenance increase
Rating Systems

How do you measure the performance of your building? Who can you trust with confidence to certify critical aspects of your building?

- Green Buildings
  - LEED
  - Green Globes
  - Energy Star
- Building Security
  - PLUS/BSC
- Others

Also Professional Accreditations: AIA, PE, CEM, LEED AP, BSCP, Bd Cert NCE, etc.

To Do a Job Well
It Takes the Right Tools

- Building a Home
- Planting a Garden
- Baking a Cake

- If You are planning, designing, constructing, operating or maintaining a building …
The Whole Building Design Guide (WBDG) as a Tool

Your Complete Internet Resource to Integrated, 'Whole Building', Design Information and Tools.

The WBDG condenses the vast amount of Web-based data on building design, products, & systems into usable, up-to-date information.

Sustainable Buildings Industry Council

What is Whole Building Design?

- It is an Integrated Design Approach and a
- Integrated Team Process to achieve high-performance buildings

Premise: All building systems are interdependent
‘Whole Building’ Approach

- Materials, systems, and assemblies reviewed from many different perspectives
- Building components, sub-systems and materials are interdependent, can impact the total performance of the whole, and can perform ‘double duty’

NREL Solar Laboratory
Golden, CO

Integrated Project Team

- Comprehensive Stakeholder involvement throughout the building’s life cycle
- Evaluation for cost, quality-of-life, future flexibility, energy efficiency, overall environmental impact, productivity, creativity, and how the occupants will be enlivened

Mark O. Hatfield U.S. Courthouse
Portland, OR
Applying the Integrated Team Process

Who needs to be at the table at the outset of your project to ensure an integrated team process?
- Architect
- Landscape Architect
- Owner, Client, Tenants
- Engineers
- Programmers
- Interior Designer
- Contractor
- Specialists (Security, Telecom, Acoustics)
- Community Members or Other Stakeholders
- Operations and Maintenance Personnel
- Others???? (Real Estate Buyer)

Building Siting Issues

- Solar Access*
- Security (Standoff Distance, CPTED)
- Stormwater Management
- Public Transportation
- Occupant Amenities
- Compatible Functions
- Disaster Avoidance

*Building orientation for passive solar heating, daylighting, natural ventilation, views, and potential impacts of future development.

[Real Estate Purchaser must be informed!!!]

Note: Applies to Selecting an Existing Building, as well!
Cost / Influence Over the Quality of a Project

Influence early for optimal design outcome and reduced life-cycle cost.

Perform Business Planning
Perform Pre-Project Planning
Design and Construct Project
Operation & Maintenance

Major Influence
Rapidly Decreasing Influence
Low Influence
High
INFLUENCE

COST
Small
Low
High

Cost / Influence Over the Quality of a Project

WBDG Goal

... to provide centralized access and use of facility information in a knowledge based management environment, from a ‘whole building’ perspective.

WBDG Building Type Page on Research Laboratory
w/ direct links to: Govt. Lab; Vivarium; Therapeutic Envi; RP; Sustainable Lab Design RP, Security & Safety in Labs RP; etc.

CCB Documents
VA Research Laboratory Des. Guide
NIH Design Policy and Guidelines
HHS Biosafety in Microbiological and Biomedical Laboratories

NGS
ISEA Z358.1—Emergency Eyewash
and Shower Equipment
ANSI/AIHA—Z9.5 for Laboratory Ventilation
NFPA 45—Fire Protection for Laboratories using Chemical

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Design Objectives

- Accessible
- Aesthetic
- Cost-Effective
- Functional/Operational
- Historic Preservation
- Productive
- Secure/Safe
- Sustainable
Secure/Safe Branch

Sustainability- and Security/Safety-Related Pages in WBDG

- Achieving Sustainable Site Design through Low Impact Development
- Air Barrier Systems in Buildings
- Air Decontamination
- Balancing Security/Safety & Sustainability Objectives
- Building Integrated Photovoltaics
- Cost Impact of the ISC Security Criteria
- Daylighting
- Designing Buildings to Resist Explosive Threats
- Distributed Energy Resources
- Electric Lighting Controls
- Energy Efficient Lighting
- Blast Safety of the Building Envelope
- CBR Safety of the Building Envelope
- Glazing Hazard Mitigation
- High-Performance HVAC
- Mold and Moisture Dynamics
- Retrofitting Buildings to Resist Explosive Threats
- Security and Safety in Laboratories
- Sun Control and Shading Devices
- Sustainable Laboratory Design
- Sustainable O&M Practices
- Threat/Vulnerability Assessments and Risk Analysis
- Water Conservation
- Windows and Glazing
UFC/Isc Security Design Criteria Overview and Comparison

Introduction

An effort to minimize the likelihood of mass casualties from terrorist attacks, two similar, yet distinct, sets of criteria have been established by different branches of the federal government to guide owners and responsible parties in the implementation of suitable measures that appropriately balance facility construction and use with improved safety and security of the facility occupants.

The federal government has implemented the Interagency Security Committee (ISC) Security Design Criteria. The ISC Security Design Criteria was developed to ensure that security issues are addressed during the planning, design, and construction of all new Federal Facilities, new Federal Office Buildings, and major renovations. This federal criteria has been extended to also cover leased facilities.

Similarly, the Department of Defense (DoD) has implemented antiterrorism security requirements to meet its specific needs. Contained within the United Facilities Criteria (UFC) and Unified Facilities Criteria (UFC/NSF) are 4.4 series of security engineering UFC that deal with antiterrorism and physical security. In general, the UFC and UFC/NSF criteria are designed for use by the three services and other DoD agencies. The UFC documents establish procedures to be used for the design, construction, operation, maintenance, and modernization of all DoD facilities. The UFCs are comprehensive and address all major aspects of facility construction and operation.
Impact of WBDG as a Tool

In 2008, WBDG had 2,400,000 visitors
[average of 250,000 visitors a month]

For 2009 – averaging 300,000 v/m

And 20,800,000 downloads
[1.7 million pdf downloads a month]

For 2009 – averaging 2.1 million d/m

Interaction Between Security/Safety & Sustainability Objectives

• These objectives appear in every Federal project to varying degrees
• Conflicting requirements lead to compromises and tradeoffs
• Synergies can be found when considered early in the project development process

SITE    WATER    ENERGY
MATERIALS    IEQ
Site Tradeoffs

A facility's risk can be increased and security can be compromised by:

- siting it in an urban area to protect greenfields and preserve habitat and natural resources;
- locating carpool/vanpool parking and bike racks nearby to promote alternative transportation;
- constructing under-building parking to minimize habitat disturbance; and
- installing covered walkways and landscaping to reduce heat islands and control erosion.

On the other hand, security measures such as

- building setbacks, or standoff distances, to create protective building perimeters and to restrict access;
- installing barriers (e.g., bollards, reinforced planters, and site furnishings) to withstand assaults by moving vehicles; and
- locating parking areas in remote areas and/or eliminating under-building parking areas to minimize blast effects from potential vehicle bombs

usually result in increased development of open space, habitat disturbance, and possibly erosion.
Site Synergies

- Landscaping elements such as retention ponds and berms can be used to control erosion, manage stormwater, and reduce heat islands while also serving as physical barriers to control access to a building and to deflect the effects of a blast.

- Crime Prevention Through Environmental Design (CPTED) is a strategy that uses natural access control, natural surveillance, and territoriality & boundary definition to reduce the opportunities & fear of predatory stranger to stranger crime & improve the quality of life.

- Early coordination of sustainable site design with CPTED is critical to avoid conflicts between the two strategies.

Site Considerations

Security, Sustainability, Acoustics

- Provide noise barriers that can also comply with sustainable development principles and can meet security requirements for standoff distance from buildings.

- Earth berms with low-growth, drought tolerant plants.

- Consider sound walls made of recycled content material to achieve noise control and sustainable development goals.
Balancing Security/Safety and Sustainability Objectives

Introduction
Since the early 1980's, sustainability has become an increasing priority for facilities projects. However, since the terrorist attacks of September 11, 2001, building owners and occupants are paying more attention to facility security and safety issues. On the surface, it may appear that security/safety design has little relationship to sustainable design. Yet, security and safety measures, such as those for anti-terrorism, must be considered within a total project context, including impacts on occupants and the environment, regardless of the level of protection deemed appropriate. Further, today's security design is based on a multi-hazard approach, that is, looking at the impact of all hazards on a project: natural, criminal, terrorist, and accidental.

This Resource Page aims to provide designers with an understanding of the interaction between security/safety and sustainability objectives by emphasizing the whole building or integrated design process, identifying areas of synergy and potential conflicts between sustainable and security/safety approaches, and highlighting sustainability opportunities within certain security/safety strategies. With this information in hand, the project team can define and understand the interrelationships between the project’s needs and achieve balanced design solutions that will minimize environmental impacts as well as ensure the health, safety, security, and comfort of building occupants.
Secure & Aesthetic

Tiger Traps, Ha-has, and NoGos protect without a visually overwhelming security presence

Security Design Strategies

• Security Issues must be addressed in concert with other design objectives and integrated into the overall building design early in the process to ensure a high-performance building [and site] with effective security.

Multi-Hazard Design

Look at impact of all hazards on project: Natural, Criminal, Terrorist, Accidental
### Site Security’s Importance in the Integrated Design Process

- Access roads, Parking, Vehicle barriers, Emergency vehicle access, Loading dock ramps
- Standoff Distance
- Perimeter & Building Entrance lighting
- Landscaping
- Balance with Project’s Accessibility & Sustainability Requirements

### Passive Survivability

The ability of a building to provide shelter during or after a major disaster event without electric power.

- Highly efficient thermal envelope
- Natural ventilation
- Overhangs (sun shades)
- Daylighting (light shelves)
- On-site potable water storage
- Renewable energy (PV, wind) (optional)
**Light Shelves / Shading Devices**

- When blast or snow loading are concerns, consider interior light shelves.
- Otherwise, light shelves & shading devices must be hardened.

**Security Lighting**

- Design to minimize light pollution / light trespass
- Use energy-efficient lamps & ballasts
- Employ shielded or full cutoff luminaires
- Results: increased visibility, reduced glare & minimum impact on the night sky
- For further energy savings, consider parking lot occupancy sensors
Exterior Lighting Example

The use of cut-off wall sconces and area lights and downlighting on the façade (rather than uplighting) minimizes light pollution.

Pole mounted pedestrian poles light walkways.

From: UFC 3-530-01, Design: Interior & Exterior Lighting & Controls

Crime Prevention Through Environmental Design (CPTED)

"The proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement of the quality of life."

CPTED as defined by the National Crime Prevention Institute

Strategy: Design security into the architecture!
Crime Prevention Through Environmental Design (CPTED)

There are four overlapping CPTED strategies.
1. Natural Surveillance
2. Territorial Reinforcement
3. Natural Access Control
4. Target Hardening

Employ CPTED as a process to reduce architectural vulnerability.

Green Walls & CPTED

• Vertical Gardens called “Vegitecture” can defeat natural surveillance
• If being considered for your project, be sure green walls do not block site lines or provide hiding places

Patrick Blanc's green wall on the Hotel du Department in Hauts-de-Seine, France
Signage

- Include aesthetic signage that directs people to authorized locations on site & in buildings, but …

- Don’t tell them more than they need to know!
E.O. 13423 Technical Guidance Five Guiding Principles

The five Guiding Principles address:
• Employing integrated design;
• Optimizing energy performance;
• Protecting and conserving water;
• Enhancing indoor environmental quality; and
• Reducing the environmental impact of materials.

To build from this and other accomplishments and to pave the way for future success, the President signed Executive Order 13423 “Strengthening Federal Environmental, Energy and Transportation Management” on January 24, 2007.

In the area of sustainable design and high performance buildings, the new EO makes mandatory the five Guiding Principles of the MOU for all new construction and major renovations and sets an aggressive goal for applying these practices to existing capital assets over the next decade.
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Whole Building Design Charrette

Idea: Use WBDG for your next Design Charrette or Project Planning Meeting

Avoid conflict of choosing between Sustainable & Security* Goals

- Dollars are tight
- Regulations, laws, mandates, directives must be met

How to decide which way to go?
- Employ a single design strategy to achieve multiple design goals
- Use the integrated ‘whole building’ design approach

See WBDG.org: Balancing Security/Safety & Sustainability Objectives
The main objectives of sustainable design are:
- to avoid resource depletion of energy, water, and raw materials;
- prevent environmental degradation caused by facilities and infrastructure throughout their life cycle;
- Restore the site to predevelopment conditions;
- and create built environments that are livable, comfortable, safe, and productive.

Creating Sustainable Buildings Starts with Proper Site Selection

- Before deciding to build new, consider the reuse or rehabilitation of an existing building.
- The location, orientation, and landscaping of a building affect the local ecosystems, transportation methods, and energy use.

Beyond the patch of ground the building sits on, effective Sustainable Design considers the impact of the building on the campus/military base, the surrounding community, and the region.
Goals of Sustainable Site Planning
Employing the ‘whole systems approach’

- Minimize development of open space by the selection of disturbed land, brownfields, or building retrofits;
- Control erosion through improved landscaping practices;
- Reduce heat islands using landscaping and building design methods;
- Minimize habitat disturbance;

- Restore the health of degraded sites by improving habitat for indigenous species through native plants and closed-loop water systems;
- Incorporate transportation solutions along with site plans that acknowledge the need for bicycle parking, carpool staging, and proximity to mass transit. Encourage alternatives to traditional commuting; and
- Consider site security concurrently with sustainable site issues. Location of access roads, parking, vehicle barriers, and perimeter lighting, etc. are key issues that must be addressed.
Sustainable Site Design Considerations

“Low Impact Development” -- Water / stormwater management strategies:

– Storm Water Runoff Distribution
– Hardscape Materials and Curbs
– Recycling Rainwater and Runoff
– Predevelopment Hydrology

Can pervious pavement support emergency fire & rescue vehicles?

Source: Millennium Energy

Site Security Design

The next generation of design excellence
LEARNING OBJECTIVES

• Understand the overall intent and focus of the Site Security Design Guide

• Describe the intent of the Vision and Hallmarks of effective site security

• Identify resources within the Guide to support effective site security design

Public Space Aesthetics – Function - Viability
Vision & Hallmarks

1. **Strategic Reduction of Risk**

2. **Comprehensive Site Design**
   Multifaceted Opportunities. Community.

3. **Collaborative Participation**
   Multi-Disciplinary. Internal/External.

4. **Long-Term Strategy**
   Opportunistic Implementation. Vision.

Balancing Objectives

To strike a successful balance, creating public buildings that attain both security and openness, designers must consider the following:

- Carefully design a site for its daily functions
- Incorporate security elements as seamlessly as possible
- Allow for adjustments in protection in response to varying levels of threat
Comprehensive Site Design

- Develop an approach for the entire property that enhances both security and daily use
- Create a design palette and program of security and site elements
- Maximize multipurpose features that accomplish a security purpose and provide a visual & use amenity
- Offer windows of opportunity to coordinate with public works, neighboring projects, and future GSA investment
- Achieve wider goals for the property

This ensures a consistent approach, whether the plan is implemented in one or many stages. The result is a thoughtful, holistic solution.

ISC Security-Decision Making Process

This flow chart illustrates the main inputs and outputs in the security decision-making process, as outlined by the Interagency Security Committee. These outputs serve as the basis for additional analyses by the Project Team and the subsequent design of protective measures.
Early Security Measures – Moats

Built by Sir John Delamere in 1373. Supposedly modeled on the Bastille, Nunney Castle has one of the deepest moats in England
Why Did Moats Disappear?
Answer: Medieval War Engines

Trebuchets
And
Mangonel
at
Middelaldercentret
Denmark

Defense Intelligence Analysis Center
Bolling AFB, Washington, DC

Moats Are Making A Comeback!

- Integrates security & sustainable features
- Bio-retention pond – AT setback & reduces storm water runoff
- Force protection wall – local stone & earth berm
Let’s check out the WBDG!

Be sure to visit the site when you start your next project!

www.wbdg.org