



Risk Management Series

Site and Urban Design for Security

Guidance Against Potential Terrorist Attacks

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FEMA





ABOUT THE COVER

The Federal Complex in Chicago, Illinois, consists of three iconic Mies van der Rohe buildings and includes a large Alexander Calder sculpture. Security protection involved the design of effective security measures that harmonize with the unique architectural character of the complex.

SOURCE: PHOTOS AND DRAWINGS PREPARED FOR US GENERAL SERVICES ADMINISTRATION BY TENG AND ASSOCIATES, CHICAGO

RISK MANAGEMENT SERIES

Site and Urban Design for Security

Guidance Against Potential Terrorist Attacks

PROVIDING PROTECTION TO PEOPLE AND BUILDINGS



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FOREWORD AND ACKNOWLEDGMENTS

FOREWORD

The Federal Emergency Management Agency (FEMA) has developed this publication, *Site and Urban Design for Security: Guidance against Potential Terrorist Attacks*, to provide information and design concepts for the protection of buildings and occupants, from site perimeters to the faces of buildings. The intended audience includes the design community of architects, landscape architects, engineers and other consultants working for private institutions, building owners and managers and state and local government officials concerned with site planning and design.

Immediately after September 11, 2001, extensive site security measures were put in place, particularly in the two target cities of New York and Washington. However, many of these security measures were applied on an ad hoc basis, with little regard for their impacts on development patterns and community character. Property owners, government entities and others erected security barriers to limit street access and installed a wide variety of security devices on sidewalks, buildings, and transportation facilities. The short-term impacts of these measures were certainly justified in the immediate aftermath of the events of September 11, 2001, but traffic patterns, pedestrian mobility, and the vitality of downtown street life were increasingly jeopardized. Hence, while the main objective of this manual is to reduce physical damage to buildings and related infrastructure through site design, the purpose of *FEMA 430* is also to ensure that security design provides careful attention to urban design values by maintaining or even enhancing the site amenities and aesthetic quality in urban and semi-urban areas.

This publication, *FEMA 430*, is one of a series that addresses security issues in high-population private-sector buildings. It is a companion to the *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings (FEMA 426)*, which provides an understanding of the assessment of threats, hazards, vulnerability, and risk, and the design methods needed to improve protection of new and existing buildings and the people occupying them. Chapter 2 of *FEMA 426* provides guidance on site layout and design and discusses architectural and engineering design considerations for risk mitigation, starting at the property line, including the orientation and placement of buildings on the site. This publication represents an expansion of Chapter 2 and focuses in more detail on information useful to the site security design team.

In addition, this publication expands on Instruction Unit IX, “Site and Layout Design Guidance,” in the *Building Design for Homeland Security Training Course (FEMA E155)* and also summarizes some of the concepts in *Risk Assessment: A How-To Guide to Mitigate Potential Terrorist Attacks Against Buildings (FEMA 452)*. Some of the technical information on design against blast contained in the *Primer for Design of Commercial Buildings to Mitigate Terrorist Attacks (FEMA 427)* is also summarized. These publications are part of the FEMA Risk Management Series (RMS). See Chapter 1 for more details regarding the RMS publications.

The primary use of the concepts in this publication is for building sites, although some of the design measures discussed could be adapted for other types of site development. The information and recommendations contained in this document are:

- Not mandatory
- Applicable primarily to high-risk sites
- May not apply when they conflict with other hazards such as fire

This publication has been developed in collaboration with the the New York City Police Department (NYPD) and National Capital Planning Commission (NCPC). These organizations provided FEMA with information, graphics, photographs, and advice.

OBJECTIVES AND SCOPE

The objectives of this publication are to provide site design team members with information necessary to gain an understanding of the following topics:

- The FEMA risk assessment process for site design and building protection
- Explosive forces and stand-off
- A general understanding of strategies for protection that can be provided by site planning and design against vehicle-borne explosive attack
- Current design approaches for providing perimeter protection
- Current approaches to urban, semi-urban, and suburban site security design
- Examples of site design that provide security while at the same time preserving or enhancing site amenity and use

This publication focuses on site design aimed to protect buildings from attackers using vehicles carrying explosives. These represent the most serious form of attack. Large trucks enable terrorists to carry very large amounts of explosives that are capable of causing casualties and destruction over a range of many hundreds of yards. Perimeter barriers and protective design within the site can greatly reduce the possibility of vehicle penetration. Introduction of smaller explosive devices, carried in suitcases or backpacks, must be prevented by pedestrian screening methods.

Site design for security, however, may impact the function and amenity of the site, and barrier and access control design may impact the quality of the public space within the adjacent neighborhood and community. The designer's role is to ensure that public amenity and the aesthetics of the site surroundings are kept in balance with security needs.

This publication contains a number of examples in which the security/amenity balance has been maintained through careful design and collaboration between designers and security experts. Much security design work since September 11, 2001, has been applied to federal and state projects, and these provide many of the design examples shown. At present, federal government projects are subject to mandatory security guidelines that do not apply to private sector projects, but these guidelines provide a valuable information resource in the absence of comparable guidelines or regulations applying to private development.

Operations and management issues and the detailed design of access control, intrusion alarm systems, electronic perimeter protection, and physical security devices, such as locking devices, are the province of the security consultant and are not covered here, except as they may impact the conceptual design of the site. Limited information only is provided on some aspects of chemical, biological and radiological (CBR) attacks that are significant for site designers; extensive discussion of approaches to these threats can be found in *FEMA 426*.

ORGANIZATION AND CONTENTS

This publication can be supplemented as needed with more extensive technical resources, and references are provided both in the text and in Appendix B.

Chapter 1 discusses some basic design issues for site-related elements. It begins by noting the evolution of site security design from the medieval castle to today's measures, and leads to a discussion of the impact of security needs on site amenity and function. It describes current programs, strategies, and publications devoted to site protection, and follows with

short summaries of selected terrorist attacks on buildings throughout the world that provide specific lessons learned. A set of governing principles is followed by a discussion of the need for the integration of site security design with more familiar issues of site planning and design.

Chapter 2 outlines the basics of the FEMA risk assessment process, the first steps in determining the necessary measures to be designed and implemented. The chapter first discusses the determination of “acceptable risk” and follows by outlining a five-step process that culminates in the selection of risk mitigation options. An explanation of explosive forces leads to a discussion of the importance of stand-off distance. Finally, strategies for the cost management of site security are outlined. The current absence of mandatory codes dealing with physical security is noted, leading to the need for a performance-based approach to security design.

Chapter 3 emphasizes that site security designers should look beyond the project boundaries to seek to incorporate community resources and create design in harmony with the community values. The chapter begins by a discussion of the layers of defense concept, which structures the general approach to site security design. This is followed by a listing of the key elements of security protection that are developed in detail in later chapters. A discussion of the community context within which security design must be implemented looks at four main issues: designing in tune with the community context, respecting existing conditions, working with stakeholders, and the impact of regulatory requirements. Examples of site design are shown that illustrate the issues discussed in the text.

Chapter 4 discusses a major element of security design – that of providing a secure perimeter defense for the site. This discussion is in two parts. First, general issues of barrier system design are described, with emphasis on striking a balance between security needs and the preservation of the amenity and day-to-day functions of the site. This section ends with a description of the present barrier crash test standards. This leads to the second and major part of the chapter that describes and illustrates the various types of passive and active barriers that are currently available and in use.

Chapter 5 discusses the security design of open sites that incorporate a perimeter barrier and a vehicular approach to the building assets and on-site parking. This is the clearest expression of the three layers of defense model, which may take the form of a site for a single building or a campus type with a number of buildings that are widely dispersed. The site within the barrier forms a controlled access zone in which the design of the entry control points is critical. Within this zone, major design tasks include building placement (for new projects), orientation, sight lines, grading, and drainage. Other design issues include signage, parking, loading docks and service areas, physical security lighting, site utilities, and landscaping.

Chapter 6 discusses the special case of security design in the central business district in which space for stand-off distance may be severely limited or non-existent. Three generic site types are typical: buildings with zero setback and alleys, buildings with yards, and buildings with plazas in which a larger public open space is provided on the site by the developer. Layers of defense for these sites are very compressed but still exist.

Appendix A provides a short outline of the origins and application of “Crime Prevention through Environmental Design” (CPTED) procedures that are currently used by a number of communities in the United States to assist in reducing everyday crime.

Appendix B provides a number of references, publications, and web pages that are useful in augmenting the information provided in the text.

Appendix C provides a list of abbreviations and acronyms that are used in this document.

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Principal Authors:

Christopher Arnold, FAIA, RIBA, Building Systems Development, Inc., Palo Alto, California

Mary Ann Lasch, FASLA, Gensler Architects, Washington, D.C.

Project Team:

Milagros Kennett, Project Officer, Risk Management Series (RMS) Publications, FEMA/ Department of Homeland Security, Washington, D.C.

Susan Tubbesing, Executive Director, Project Director, Earthquake Engineering Research Institute, Oakland, California

Marjorie Greene, Special Projects Manager, Project Coordinator, Earthquake Engineering Research Institute, Oakland, California

Eloise Gilland, Earthquake Engineering Research Institute, Copy Editor, Oakland, California

Tony Alexander, Graphics Consultant, Graphics, Palo Alto, California

Wanda Rizer, design4impact, Publication Design and Graphics, Abbottstown, Pennsylvania

Contributors:

National Capital Planning Commission, Washington, D.C.

Randall Atlas, AIA, CPP, Atlas Safety and Security Design, Miami, Florida

Heather Modzelewski, ASLA, Gensler Architects, Washington, D.C.

External Review Panel:

Counterterrorism Division, New York City Police Department, New York City, New York

Amar Chaker, Ph.D., American Society of Civil Engineers, Reston, Virginia

Dr. Mohammed Ettouney, PE, Weidlinger Associates Inc., New York City, New York

Douglas Hall, PSP, Smithsonian Institution, Washington, D.C.

Michael Kaminskas, PE, BSCP, Raytheon UTD, Springfield, Virginia

Martha Lea, ASLA, LEED AP, EDAW, Inc., Alexandria, Virginia

Eric Letvin, PE, Esq., CFM, URS Corporation, Linthicum, Maryland

David Levy, RA, AICP, National Capital Planning Commission, Washington, D.C.

Elizabeth Miller, ASLA, AICP, National Capital Planning Commission, Washington, D.C.

Donald L. Moffett, State Department R&D Program, Bureau of Diplomatic Security, Physical Security Division, Washington, D.C.

Christine Saum, AIA, National Capital Planning Commission, Washington, D.C.

Lloyd Siegel, AIA, Department of Veterans Affairs, Washington, D.C.

Dr. Robert Smilowitz, PE, Weidlinger Associates, New York City, New York

John Sullivan, Jr., PE, Portland Cement Association, Washington, D.C.

Graeme Waitzkin, Rogers Marvel Architects, LLC, New York City, New York

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