BUILDING SECURITY

HANDBOOK FOR ARCHITECTURAL PLANNING AND DESIGN

BARBARA A. NADEL, FAIA

2009 Kemper Award Winner

This book is a must-read for architects, landlords, security consultants and anyone else tasked with or interested in ensuring security and averting catastrophic loss.

Bernard B. Kerik, *40th Police Commissioner, New York City (Ret.)*

Whether planning for new construction, renovations, or security upgrades of existing facilities, ***Building Security: Handbook for Architectural Planning and Design*** is the definitive twenty-first century reference on security design, technology, building operations, and disaster planning. Award-winning architect and author Barbara A. Nadel, FAIA provides security design solutions for creating safe commercial, institutional, industrial, and residential buildings in the post-September 11, 2001, environment. Generously illustrated with 600 photos, drawings, tables, and checklists, this comprehensive compendium addresses protection from terrorism, natural disasters, chemical and biological agents, crime, and workplace violence, along with thorough, detailed coverage of

- Lessons learned from benchmark events
- Planning and design of over 20 building types
- Historic preservation security guidelines
- Home and business disaster planning, response, and recovery
- Emergency management and facility procedures
- Protective structural design
- Mechanical, electrical, and fire protection design
- Chemical and biological protection
- Construction site emergency response guidelines
- Technology and security design
- Codes, standards, and security guidelines
- Liability exposure after September 11, 2001

This essential volume is the single-source reference for architects, engineers, planners, building owners, facility managers, construction and real estate professionals, public officials, safety specialists, educators, and students seeking to create safe, secure, and well-designed environments. ***Building Security: Handbook for Architectural Planning and Design*** received the 2003 Milka Bliznakov Prize Commendation from the International Archive of Women in Architecture.

BUILDING SECURITY:

- **Illustrates how to assess and respond to threats from terrorism, natural disasters, emergencies,chemical and biological agents, crime, and workplace safety**
- **Provides one-stop reference on security planning, design, technology, building operations, disaster response, recovery, and crisis management**
- **Includes over 50 multidisciplinary contributors from over 30 professional firms, public agencies, and nonprofit organizations across the United States:**

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ARCHITECTURE

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ACHIEVING TRANSPARENT SECURITY

CHAPTER 1
LESSONS LEARNED FROM SEPTEMBER 11, 2001, AND OTHER BENCHMARK EVENTS

Barbara A. Nadel, FAIA
Principal, Barbara Nadel Architect
Forest Hills, New York

Those who cannot remember the past are condemned to repeat it.
GEORGE SANTAYANA (1863–1952)
Spanish philosopher

The only thing we have to fear is fear itself - nameless, unreasoning, unjustified terror which paralyzes needed efforts to convert retreat into advance.
FRANKLIN D. ROOSEVELT (1882–1945)
32nd U.S. President, during his first inaugural speech, 1933

In 1933, President Roosevelt told the world that only by confronting the biggest challenges head-on could they be defeated. Years later, twenty-first century global communities, linked electronically and through air travel, challenge free societies to resist threats to freedom and attacks on personal safety. The events of September 11, 2001, changed the way Americans and global citizens go about their daily routines, from entering an office building or attending a popular sporting event to visiting a national landmark or arriving at an airport. Increased terrorist threat levels have focused greater attention on defeating these threats head-on, by successfully integrating design, aesthetics, and public safety throughout the built environment.

Building security is based on identifying threats and vulnerabilities in order to determine the most appropriate methods of protecting people, buildings, assets, and ongoing operations. The primary goals of security are preventing or mitigating damage from terrorism, crime, and disaster, so that communities can maintain the flow of commerce and continue the rhythm of daily life. Reconciling these realities is often difficult. However, until global terrorism and natural disasters cease to pose threats to free societies and the built environment, building security will remain an important public concern.

SEPTEMBER 11, 2001

We shape our buildings; thereafter they shape us.
SIR WINSTON CHURCHILL (1874–1965)
BRITISH LEADER

On the morning of September 11, 2001, four hijacked airliners on different flight paths crashed into three buildings: the Twin Towers at New York City's World Trade Center (Fig. 1.1) and the Pentagon in Washington, D.C. (Figs. 26.1 to 26.6). The fourth plane, reportedly bound for the U.S. Capitol or the White House in Washington, D.C., crashed into a field in Shanksville, Pennsylvania. Approximately 3000 civilians at three sites were killed in those highly coordinated terrorist attacks. The events of that clear September morning changed history, indelibly altering U.S. public policy, homeland security, and building design (Table 1.1).

FIGURE 1.1 World Trade Center towers on September 11, 2001, at 9:05 a.m., looking south from 6th Avenue and Washington Place, New York, N.Y. (*Architect: Minoru Yamasaki with Emory Roth and Sons; photographer: Bruce D. Eisenberg, AIA.*)

TABLE 1.1 September 11, 2001, Timeline of Events

8:45 a.m.	Plane crashes into the North Tower of the World Trade Center (WTC), tearing a deep gash in the building and setting it afire.
9:03 a.m.	Second hijacked airliner crashes into the South Tower of the WTC, and explodes.
9:21 a.m.	All New York area airports, bridges, and tunnels are closed.
9:43 a.m.	Third plane crashes into the Pentagon; immediate evacuation begins.
10:05 a.m.	South Tower of WTC collapses.
10:10 a.m.	Portion of the Pentagon collapses; a plane crashes in a field outside Shanksville, Pennsylvania.
10:13 a.m.	United Nations New York headquarters evacuates 11,700 people (Fig. 1.2).
10:28 a.m.	North Tower of WTC collapses.
10:45 a.m.	All federal buildings in Washington, D.C., are evacuated.
4:10 p.m.	Seven WTC, a 47-story building, and others in the area are reported on fire.
5:20 p.m.	Seven WTC collapses, from damage to WTC across the street.

Source:www.cnn.com

This book is dedicated to the memory of all those who died from terrorism, by advancing the knowledge needed to prevent similar events from recurring. Over 100 multidisciplinary experts from across the United States have generously shared their knowledge about security in the post-9/11 built environment. The information is set forth in 31 chapters, organized in six sections: Achieving Transparent Security, Planning and Design, Engineering, Construction, Technology and Materials, and Codes and Liability. This chapter includes a summary of each area of expertise and lessons learned from benchmark events.

BALANCING SECURITY AND OPENNESS IN A FREE SOCIETY

U.S. Senator Daniel Patrick Moynihan began a national conversation about terrorism on March 25, 1999, at the U.S. General Services Administration (GSA) Design Awards, when he challenged the design community and the public "to keep our nerve in the face of obvious but scarcely overwhelming threat." As a lifelong champion of architecture and design excellence in the civic realm, Senator Moynihan's call for balancing security and openness in public buildings, to represent the values of a democratic society, was significant, particularly at a time and place when concrete barriers were the most visible and pervasive forms of building security in Washington, D.C. Years earlier, on the night of November 7, 1983, he recalled, a bomb exploded in the U.S. Capitol, in the hallway outside the Senate Chamber. Had the Senate been in session, a massacre would have occurred, but no one was hurt. Upon arriving at the scene the next morning, Senator Moynihan said, "They can blow up the building. But they cannot blow up the democracy."

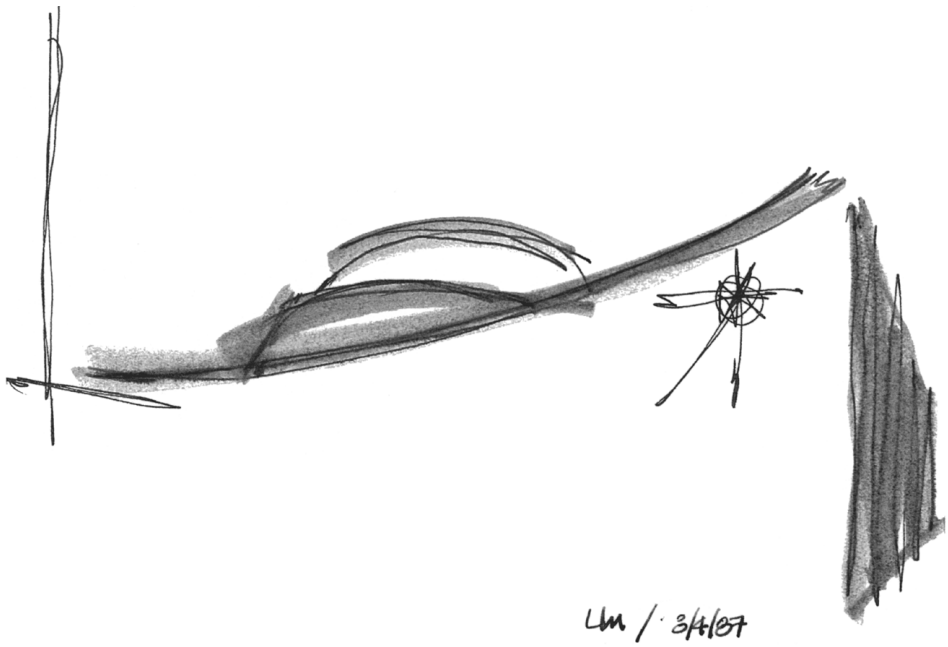

FIGURE 1.2 United Nations General Assembly Building, New York, New York. The graceful open-ended form, visible from the street and the East River, presents a courageous, simple, forthright face to the world. (*Architects: Le Corbusier, Wallace K. Harrison, Sven Markelius, 1950; pen and wash drawing by Stanley Stark, AIA.*)

Architecture is inescapably a political art, and it reports faithfully for ages to come what the political values of a particular age were. Surely ours must be openness and fearlessness in the face of those who hide in the darkness. Precaution, yes. Sequester, no. There is a risk to such a conversation. Call for more openness, and the next day there may be a new atrocity. But more is at stake than personal reputation. The reputation of democratic government is at stake.

DANIEL PATRICK MOYNIHAN (1927–2003)
U.S. Senator from New York
"Resolved: A National Conversation on Terrorism Is in Order," March 25, 1999.

The Guiding Principles for Federal Architecture
1. *Producing facilities that reflect the dignity, enterprise, vigor, and stability of the federal government*
2. *Avoiding an official style*
3. *Incorporating the work of living artists in public buildings*

JOHN F. KENNEDY (1917–1963)
35th U.S. President, proclaimed the Guiding Principles, authored by Sen. Daniel Patrick Moynihan, a member of the Kennedy administration, on May 23, 1962.

The *Guiding Principles for Federal Architecture* included a section, "The Redevelopment of Pennsylvania Avenue," calling for the revitalizing of Washington, D.C.'s grand axis (Fig. 1.3). President Kennedy proposed a thoroughfare that would be "lively, friendly and inviting, as well as dignified and impressive." Yet even in the 1960s, shortly after the Cuban missile crisis and the threat of nuclear war, a leaked internal draft document alleged that security in federal buildings was inadequate, and proposed that the buildings be closed to the public. During the 1960s, Washington, D.C., was an open city, and only the president and vice president received Secret Service protection. By the mid-1990s, after terrorist events in the United States and internationally, squad cars, armed officers, and concrete Jersey barriers routinely surrounded many federal buildings in Washington, D.C., and across the country.

Edward A. Feiner, FAIA, Chief Architect of the U.S. General Services Administration (GSA), the largest landlord, builder, and design client in the United States, has led the agency in advancing the Guiding Principles of Architecture, while promoting design excellence and implementing stringent security guidelines at federal courthouses and office buildings.

Public policy must strike an appropriate balance between security and openness. Public buildings must remain part of the public domain. They must represent the positive attributes of our democracy and our culture. They must welcome the American people to their governmental institutions and provide services in an environment that enhances mutual respect. Most importantly, public buildings are handed down from generation to generation. We should not convey to future citizens of this nation, or the world, that ours was a society obsessed with fear and that our government had to be cloaked in secrecy and physically protected from its people. In the end, the symbols of our institutions, cultural and governmental, are a lasting testimony of our times. They also create our times.

EDWARD A. FEINER, FAIA
Chief Architect, U.S. General Services Administration

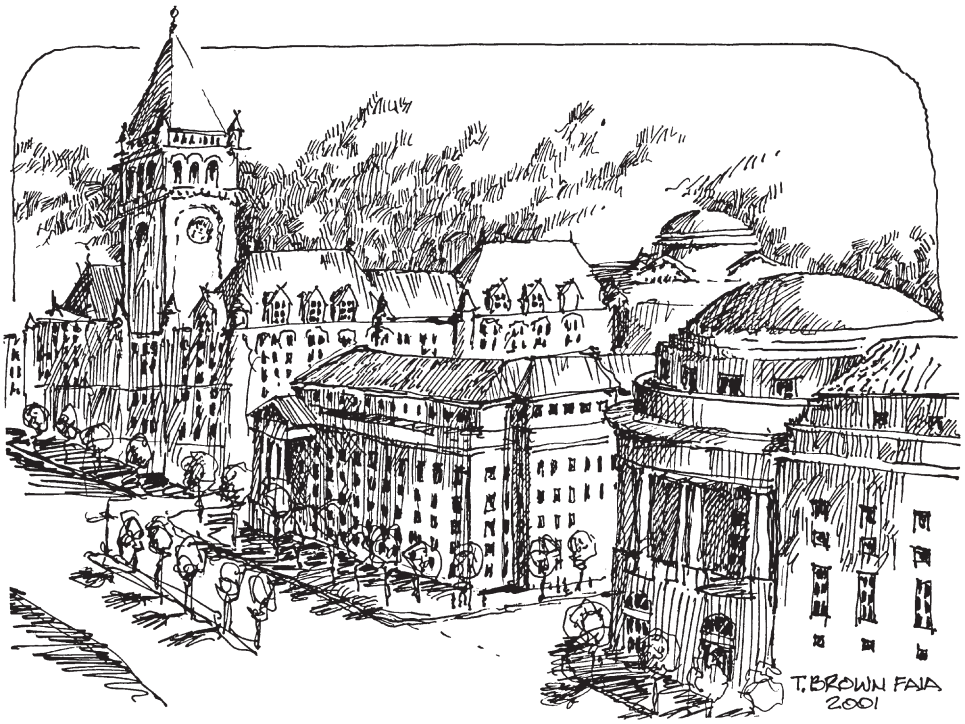

FIGURE 1.3 Federal Triangle and Old Post Office along Pennsylvania Avenue, Washington, D.C. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

With dangerous threats facing a global society, the need to balance security with openness, prudence, common sense, and preparation is crucial. Those responsible for public safety have a moral, professional, and legal obligation to remain cognizant of ways to ensure the greatest degree of security within the built environment. Highly effective security can be transparent or invisible to the public eye. Building security does not mean building bunkers or converting cities and national monuments into fortresses surrounded by concrete Jersey barriers.

Terrorist tactics have ranged from truck bombs, biochemical hazards, snipers, explosives, small missiles, and suicide bombers, to weapons of mass destruction and using civilian aircraft aimed at prominent buildings and locations. As the opportunities and means for inflicting damage upon civilians and military installations increase around the world, security design, technology, surveillance, data collection, and operational policies become more sophisticated and noticeable within environments unaccustomed to constant monitoring.

Disaster Planning and Emergency Preparedness

In many communities, terrorism may not appear to be, or is often not considered to be, the primary threat to public safety. However, the 1995 bombing of Oklahoma City's Alfred P. Murrah Federal Building illustrated that America's heartland, far from major cities, is not immune to acts of terrorism perpetrated by those seeking to inflict damage upon civilians. Natural disasters, such as hurricanes, floods, tsunamis, tornadoes, wildfires, and earthquakes, also present life-threatening situations. Regardless of the threat, emergency preparedness, through disaster planning, response, and recovery, should be an integral part of every home and business.

BUILDING SECURITY THEORY AND PRACTICE

Three concepts are important when developing effective building security programs:

1. *Learn from the past.* Previous acts of terrorism, violence, and disasters are instructive because they point out what happens due to lack of preparedness, when risks are not fully considered or addressed. During the twentieth century, most building codes and standards did not anticipate the range or likelihood of terrorist threats, or the magnitude of destruction from natural disasters. The examination of what happened and why brings about important changes to building codes and industry standards, thereby improving public health, safety, and welfare, and preventing loss of life.

2. *Integrate design, technology, and operations*. Building owners and project teams determine security requirements by conducting a risk assessment and vulnerability analysis. This information is used to establish priorities and solutions for protecting sites and facilities. The most successful security programs integrate good design and appropriate technology with building operational policies and emergency procedures.

3. *Plan and design transparent security.* Security need not be obtrusive, obvious, or restrictive to be effective. Installing concrete barriers in front of buildings may discourage vehicular bomb threats, but will not necessarily ensure greater security within buildings unless other elements are addressed. Transparent security, not visible to the public eye, can be achieved through informed planning, design, and facility operations.

ACHIEVING TRANSPARENT SECURITY

Designing for security presents architects and engineers with a new set of infrastructure challenges. Physical barriers and visible protective elements for buildings and sites have long been familiar, striving to maintain the philosophy of openness and welcoming, particularly critical to public sector structures. As technological security solutions are developed, the need to identify and address their requirements in the earliest planning stages confirms what we have learned from expanding communications and infrastructures. Retrofitting is so complex, costly and disruptive that specialized professionals are necessary from the outset.

SARELLE T. WEISBERG, FAIA
New York architect

Lessons Learned from September 11, 2001, and Other Benchmark Events

The analysis of circumstances surrounding significant, or benchmark, events forms a knowledge base to inform design professionals, building owners, public officials, and managers about how to build and maintain safer, more secure buildings. The lessons learned from domestic and international incidents provide best practices that are useful during policy and budgeting decisions aimed at prevention or response to terrorism and disasters (Tables 1.2 and 1.3).

World Trade Center, 2001

As of 2004, 2749 people were known to have died at the World Trade Center on 9/11. The planning, design, and construction decisions made in the mid-1960s, some 35 years before the Twin Towers fell, contributed to how both buildings collapsed after being hit by planes full of jet fuel. The design

TABLE 1.2 Notable Incidents of International Terrorism

Israeli Olympian athletes killed by terrorists, Munich, Germany	September 5, 1972
U.S. Embassy bombing, Beirut, Lebanon	April 18, 1983
U.S. Marine barracks bombing, Beirut, Lebanon	October 23, 1983
Pan Am 103 bombing, Lockerbee, Scotland	December 21, 1988
World Trade Center bombing, New York City	February 26, 1993
Sarin gas in Tokyo subway system, Tokyo, Japan	March 20, 1995
Khobar Towers bombing, Dhahran, Saudi Arabia	June 26, 1996
U.S. Embassy bombings in Kenya and Tanzania	August 7, 1998
USS Cole bombing, Yemen	October 12, 2000
Terrorist attacks on the World Trade Center, New York City, and the Pentagon, Washington, D.C.	September 11, 2001

TABLE 1.3 Notable Incidents of Terrorism, Violence, and Disasters within the United States

U.S. Capitol explosion near Senate Chamber, Washington, D.C.	November 7, 1983
Hurricane Andrew, South Florida and Louisiana	August 1992
World Trade Center bombing, New York City	February 26, 1993
Alfred P. Murrah Federal Building bombing, Oklahoma City	April 19, 1995
Olympic Park bombing, Atlanta, Georgia	July 27, 1996
Abortion clinic bombing, Birmingham, Alabama	January 27, 1997
Shooting of ob-gyn Dr. Barnett Slepian, Amherst, New York	October 23, 1998
Columbine High School shootings, Littleton, Colorado	April 20, 1999
Cerro Grande, New Mexico, wildfires	May 2000
Terrorist attacks on World Trade Center, Pentagon	September 11, 2001
Anthrax mailings, New York and Washington, D.C.	September 2001
Snipers, Washington, D.C., area	October 2002
Power blackout in six northeastern states and Canada	August 14, 2003
Southern California wildfires	Oct.-Nov. 2003

determined the available means of egress used by first responders and building occupants to evacuate the buildings. Significantly, both towers remained standing for at least an hour after impact, allowing thousands of people to evacuate the buildings and survive. This was a marked improvement from the 1993 World Trade Center bombing, when 50,000 people evacuated the towers in three to four hours. After that event, additional life safety features were installed, and building evacuation drills were practiced every six months.

Acts of terrorism, violence, and disasters, globally and in the United States, have provided design professionals with technical data about why buildings fail, and how to make them safer. These events serve as building performance case studies, for use in establishing building security requirements and disaster planning activities. Among the most significant events before 9/11 were bombings at the World Trade Center, in Oklahoma City, and at the Khobar Towers.

World Trade Center Bombing, 1993

In February 1993, eight years before the Twin Towers collapsed, a truck bomb exploded on the second underground level of the World Trade Center's parking garage. The blast produced a 150-foot-wide crater, five floors deep in the parking basement, killing six people and injuring more than a thousand.

The explosion ruptured two main sewage lines from both towers and water mains from the air conditioning system. Over two million gallons of water and sewage were pumped out of the area. Initial assessments determined that the structural integrity of the North Tower needed prompt attention. Several biological and material safety hazards put responders and rescue teams at risk: raw sewage

from ruptured pipes, asbestos, mineral wool (a level 2 carcinogen), acid and gasoline from vehicles, small fires caused by short circuits, falling chunks of concrete, and sharp metal fragments from the building and the blast. The explosion also destroyed the underground chiller plant and backup emergency generator system. Primary and secondary systems were colocated underground, adjacent to each other, not remotely.

Lessons from WTC: Disaster Planning and Evacuation Practice Drills. The 1993 bombing caused the original building owner at the time, the Port Authority of New York and New Jersey, to change all the evacuation procedures, so as to guarantee that more people would exit the building faster. Changes included adding loudspeakers, emergency lights, intercom systems, reflector exit lighting, and practice drills every six months. Because of this disaster planning response, many building occupants were able to exit from the towers within an hour after the planes hit on 9/11.

Lessons from WTC: Underground Parking and Emergency Generator Locations. Public underground parking should not be located near critical building systems, emergency generators, or gas meters. After the 1993 bombing, WTC underground parking was limited to prescreened tenants and preauthorized deliveries at designated access points. Visitor, employee, and vehicular entry checkpoints were established, and all required identification. Locating emergency systems above grade, or on upper building floors, will avoid flood damage, but should a fire occur on upper floors, extinguishing the fire may be very difficult. Redundant building systems should be considered when possible in the event of an emergency or blast. Fire sprinklers should not branch off from main water supply lines where they might be vulnerable to failure in the event of an accident or explosion. Water mains and pumps should be plumbed so that if a break occurs in the main, water can reach the pumps by an alternate means.

Khobar Towers Bombing, 1996

In June 1996, a terrorist truck bomb explosion at the Khobar Towers, an American military installation in Dhahran, Saudi Arabia, caused 19 deaths and hundreds of injuries. According to an unclassified government report, Mylar window film was scheduled to be installed at the complex, but had been delayed because a commander believed the threats were not high enough to warrant immediate installation, and the fence barrier, combined with the building setback, would be adequate to mitigate damage from an explosion. Evacuation plans and warning systems had not been practiced, posing a security breach. Due to host nation concerns about noise from the complex, the building lacked a fire alarm and siren alert system, which made the building noncompliant with U.S. Air Force standards. The report estimated that flying glass shards from the blast caused up to 90 percent of the fatalities.

Lessons from Khobar Towers: Blast-Resistant Glazing Systems and Preparedness. This incident raised awareness about the value of installing security window film, combined with laminated glass, to reduce fatalities in the event of a blast, especially for retrofits and existing buildings. Shatter-resistant window film can reduce injuries by holding glass pieces intact after they are broken, and preventing them from becoming lethal projectiles. Following applicable life safety regulations, building codes, and emergency preparedness procedures improves the chances that building occupants will survive and evacuate a building after a terrorist attack.

Oklahoma City Bombing, 1995

In April 1995, a truck bomb exploded in front of the Alfred P. Murrah Federal Building, killing 168 people and injuring hundreds of others. Shortly thereafter, the U.S. General Services Administration coordinated development of security guidelines for hardening buildings against blasts and other terrorist threats. The guidelines, *Vulnerability Assessment of Federal Facilities,* also known as *The Marshals Report,* were issued in June 1995. The findings resulted in a thorough evaluation of security mea-

sures for all federal buildings, and provided the initial road map for securing and classifying risks at over 1300 federal facilities owned or leased by the federal government. The guidelines contained in the report provided the basis for subsequent security measures and programs implemented by the federal government and other entities seeking security design standards.

Lessons from OKC: Security and Blast-Resistant Design. The Oklahoma City bombing marked the beginning of a national, industrywide approach to security planning and building design to combat terrorism. Technical evaluation and research focused on several architectural, engineering, and landscape design elements, including site planning and access; vehicular circulation; standoff distance, which refers to building setbacks that mitigate truck bomb damage; hardening of building exteriors to increase blast resistance; glazing systems to reduce flying glass shards and fatalities; and structural engineering design to prevent progressive collapse.

Security Master Planning (Chapter 2)

Security master planning addresses the fundamental concepts of building security and is the basis for developing detailed security plans for every building project. This preliminary planning phase identifies threats, vulnerabilities, and recommendations to protect people, buildings, and assets.

In response to terrorist attacks, the U.S. government developed criteria to assess security risks and design responses at federal facilities (Fig. 1.4). David V. Thompson, AIA, Vice President, and Bill McCarthy, AIA, Associate Vice President, of RTKL Associates, Inc., examine how public agencies and private-sector organizations can adapt the federal guidelines and risk analysis process to other projects. Site planning, blast, architectural and engineering design, security personnel, staff training, and emergency planning are addressed, along with mitigation strategies and security solutions.

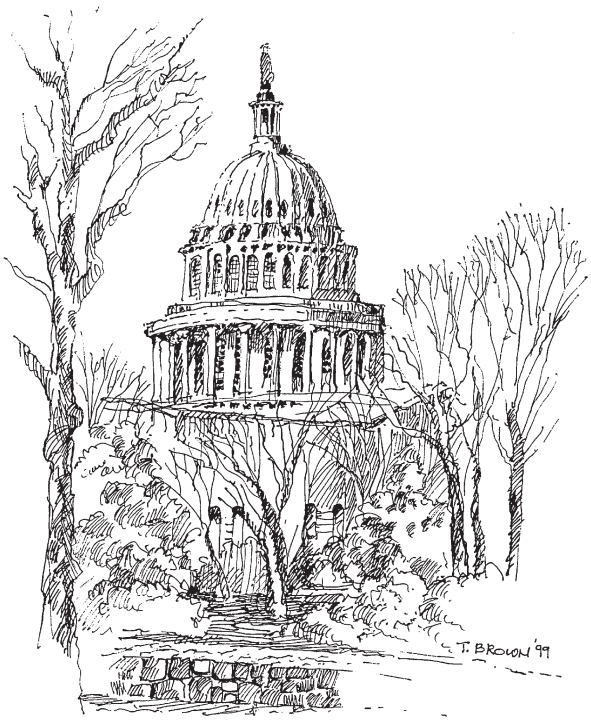

FIGURE 1.4 U.S. Capitol dome, Washington, D.C. *(Architects: William Thornton, Benjamin Henry Latrobe, and Charles Bulfinch, 1793-1829; pen and ink drawing: Terrance J. Brown, FAIA.)*

Crime Prevention through Environmental Design (Chapter 3)

In 1961, Jane Jacobs's classic, *The Death and Life of Great American Cities,* explored the correlation between safe, mixed-use, busy neighborhoods, and urban spaces designed with opportunities for residents to observe street activities. Ten years later, crime prevention through environmental design (CPTED) was defined as a technique to reduce fear and crime by promoting surveillance and safe neighborhoods (Fig. 1.5).

Terri Kelly, Community Outreach and Support Director of the National Crime Prevention Council (NCPC), describes how community-based CPTED partnerships increase the quality of life through good design. CPTED principles provide low-tech design solutions that have been adapted by many communities, and embraced around the world as effective strategies for solving neighborhood crime problems.

Lessons from CPTED Principles. The need for crime reduction, access control, surveillance, and territorial reinforcement is common to all building types and communities. Use of CPTED during early planning phases can result in long-term capital savings, through reduced neighborhood crime and maintenance costs, and greater operational efficiency.

PLANNING AND DESIGN

A day spent without the sight or sound of beauty, the contemplation of mystery, or the search for truth and perfection is a poverty-stricken day; and a succession of such days is fatal to human life.

LEWIS MUMFORD (1895–1990)
U.S. urban planner, writer, and architectural critic

FIGURE 1.5 Old house, 1764, in historic neighborhood, Georgetown, Washington, D.C. (*Pen and ink drawing: Francis J. Sheridan, AIA.*)

Arenas, Sports Facilities, Convention Centers, Performing Arts Facilities (Chapter 4)

On September 5, 1972, at the Olympics in Munich, Germany, Palestinian terrorists entered the Olympic Village, killed two Israeli team members and later murdered nine other hostages. This act of terrorism illustrates the need for security at high-profile sports events. Before 9/11, most sports facilities had various internal security measures in place, tailored to the types of events and patrons anticipated, such as controlling the substances brought into a facility. Major league football and baseball events focused on in-house security to protect athletes and VIP attendees (Fig. 1.6).

Lessons from 9/11: Event Planning. Large public assembly venues that accommodate thousands of people are considered terrorist targets. The magnitude and costs stemming from the potential loss of life, damage, and liability prompted members of the International Association of Assembly Managers (IAAM) to develop security guidelines for venue operational policies and design requirements. Russ Simons, Principal, and Gerald Anderson, AIA, Senior Principal, with HOK Sport + Venue + Event, discuss these guidelines, outlining how assembly managers and design teams can perform risk assessments and vulnerability analysis for their facilities. Security standards developed with federal agencies call for securing facilities from the outside in, and address screening and control of people and objects.

The U.S. Department of Homeland Security created a classification system to monitor domestic and international threat levels at special events, such as the Olympics. A National Security Special Event (NSSE) designation enables facility managers and federal and local law enforcement to assess risks and threats, and modify design and security operations accordingly. Law enforcement coordination is integral to major event planning and implementation.

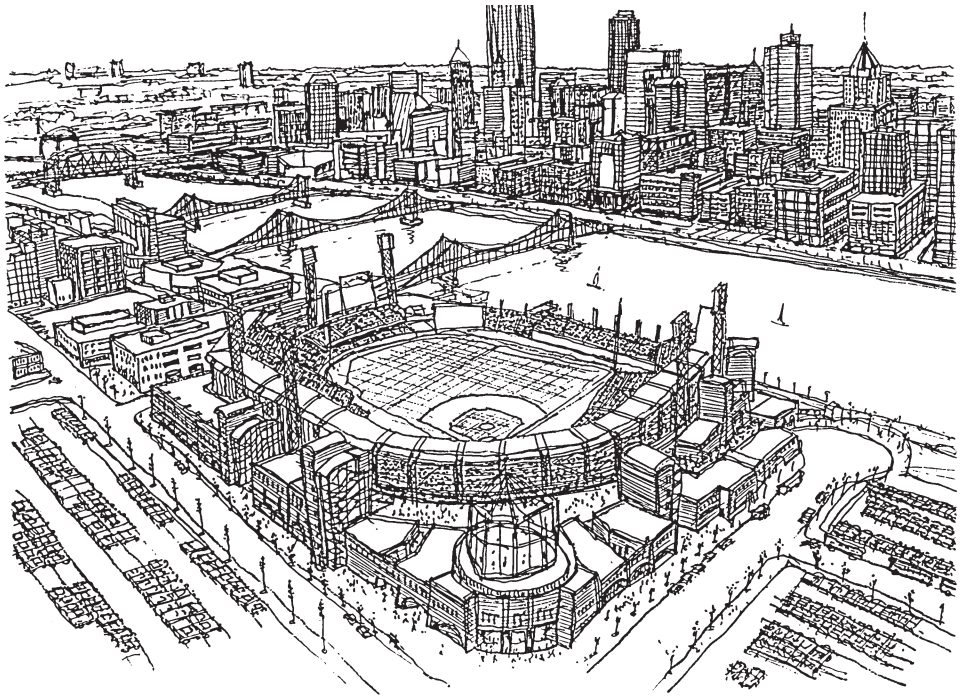

FIGURE 1.6 PNC Park, Pittsburgh, Pennsylvania. (*Architect: HOK Sports + Venue + Event; pen and ink drawing: Francis J. Sheridan, AIA.*)

Site and building security is subject to greater attention for large venues, and typically addresses perimeter site access, parking, and vehicular circulation policies; confirming and screening all deliveries; and prohibiting deliveries on event days. Building design issues include monitoring truck dock access; providing adequate public access, screening, and queuing areas to accommodate metal detectors; and rerouting underground building utilities away from loading docks and entries, in case of an explosion.

Commercial High-Rise Egress Systems (Chapter 5)

Since 9/11 and the collapse of the World Trade Center towers, few building types have received greater scrutiny for life safety and security improvements than commercial high-rises and related egress, or exiting, systems. Detailed design and engineering studies by public and private groups analyzed the factors that contributed to the challenges faced by first responders and occupants during evacuation before the buildings collapsed. In September 2003, the New York City Building Department and the New York City Task Force on Building Codes, composed of experts from government, and the design, construction, and real estate professions, issued a series of building design recommendations. Input was received from victims' families, World Trade Center attack survivors, academia, and special needs groups.

Carl Galioto, FAIA, Partner and Manager of the Technical Group at Skidmore, Owings & Merrill LLP, and a member of the task force, explains how to plan and design post-9/11 safety enhancements in a typical high-rise tower. Among the first new high-rise buildings to implement the building code recommendations will be Seven World Trade Center, replacing the building destroyed on 9/11, scheduled for late 2006 completion (Fig. 1.7).

FIGURE 1.7 Seven World Trade Center, New York, New York. (*Architect: Skidmore, Owings & Merrill. Image courtesy of Silverstein Properties, Inc., and Skidmore, Owings & Merrill. Rendering: Advanced Media Design.*)

Lessons from 9/11: Egress Systems. When completed, Seven WTC will include the following safety enhancements, developed in response to the events of 9/11: designed to prevent progressive collapse; reinforced concrete core; medium-density fireproofing; central fire-rated corridor; wider exit stairs; interconnected exit stairs; photoluminescent egress markings; battery-powered, low-level egress lights; internal antennae; and outside air filtration. Seven WTC will be a LEED- (Leadership in Energy and Environmental Design) certified high-rise building.

Lessons from 9/11: Building Codes Selected New York City Task Force on Building Code recommendations for high-rise construction include:*

1. Enhancing robustness and resistance to progressive collapse.
2. Prohibiting the use of open web bar trusses in new commercial high-rise construction.
3. Encouraging the use of impact-resistant materials in the construction of stair and elevator shaft enclosures.
4. Encouraging the inclusion of more stairwells or wider stairwells in buildings, as wide as 66 inches, to allow better building occupant exit flow.
5. Prohibiting the use of scissors stairs in high-rise commercial buildings with a floor plate of over 10,000 square feet.
6. Improving the marking of the egress path, doors, and stairs with photoluminescent materials and retrofitting existing exit signs with either battery or generator backup power.

*Sources: Zetlin & De Chiara, LLP; Carl Galioto, FAIA, Skidmore, Owings & Merrill.

7. Requiring controlled inspection to ensure that fireproofing is fully intact on all structural building members exposed by subsequent renovations to ensure continued compliance with applicable code requirements.
8. Requiring all high-rise commercial buildings over 100 feet without automatic sprinkler protection to install a sprinkler system throughout the building within 15 years.
9. Enhancing fire department emergency response communications in high-rise commercial buildings.
10. Requiring air intakes in all new construction to be located at least 20 feet above grade and away from exhaust discharges or off-street loading bays.

Courthouse Security (Chapter 6)

As symbols of government and icons of democracy, courthouses have always had a need for enhanced security. Courthouse violence can occur where prominent individuals are accessible to the public, or from internal threats within family or civil courts. Kenneth J. Jandura, AIA, Justice Principal with DMJM Design, and David R. Campbell, PE, Associate Principal with DMJM Technology, describe how separate circulation zones and entries eliminate security breaches for public, private, secure, and service areas. Distinct, monitored access points for judges and law enforcement personnel transporting defendants prevent the public from observing those entering and leaving the courthouse. During high-profile trials, anonymity is essential to jurors and witnesses, requiring alternative circulation routes.

Lessons from 9/11: Increased Security. Federal courthouses are subject to federal security criteria, especially regarding site perimeters, restricted vehicular access, setbacks, which include hardened building exteriors, blast-resistant walls and windows; and prevention of progressive collapse. After 9/11, most state governments issued mandates for counties to implement screening and other security measures. These increased costs, during a period of declining revenues, have forced counties to allocate resources from other budget items to pay for security, posing a challenge for many jurisdictions.

Federally Owned or Leased Office Buildings (Chapter 7)

Federal building security guidelines, developed for use at federal facilities, may be applied to facilities owned and operated by state and local governments and privately owned buildings renting space to federal agencies and federal contractors requiring security clearance. Terry Leach, AIA, Senior Security Specialist with DMJM, reviews the design criteria, building systems, and performance levels required to meet federal building security standards.

Lessons from OKC: Security Design. The Oklahoma City bombing resulted in security design criteria at federal facilities that focus on entry points; guard services and posts; parking; employee and visitor access; doors; walls, windows, and other openings; and lighting. Three protection levels—low and medium/low, medium, and higher protection—describe the characteristics and performance levels associated with each condition.

Lessons from 9/11: Technology. Electronic security systems should be integrated through a security management system, enabling all subsystems to communicate with each other. System components include security management, intrusion detection, access control, closed-circuit television, video imaging and identification, communications, and intercoms.

Health Care Security (Chapter 8)

As first responders to disasters, health care facilities and providers must be prepared to treat those needing prompt attention. Hospitals and health care facilities have traditionally addressed security regarding infant abduction, crime, workplace violence, narcotics storage, and protection of dementia

patients. After 9/11, providers added terrorism and biochemical warfare emergency preparedness criteria. Thomas M. Jung, RA, Director of the Bureau of Architectural and Engineering Planning, Division of Health Facilities Planning with the New York State Department of Health, describes how health care planning, regional response strategies, and decontamination facility design prepare health care facilities for terrorism, emergencies, mass casualties, and chemical, biological, and radiological attacks.

Lessons from 9/11: Hospital Response. The New York University (NYU) Downtown Hospital received the first wave of victims on 9/11, injured rescue workers, and those seeking refuge. The facility is located a few blocks from ground zero, and was affected by debris, dust, loss of utilities, and security restrictions. The hospital's emergency response is a case study for medical facilities and personnel affected by a terrorist attack, as follows:

1. *Prepare for regional disaster response.* Many injured people escaped Manhattan and sought medical care at 97 hospitals, mostly in the metropolitan New York area, and as far away as Canada. All hospitals within the region of a major disaster should prepare to treat the injured and communicate with law enforcement agencies to determine needs and resources.

2. *Use compatible communications technology and equipment.* After 9/11, cellular communications and telephone lines throughout New York City were interrupted and unreliable. Police and fire department radios were incompatible, which complicated information sharing. Communications technology and equipment must be tested to ensure reliability and compatibility within and among public agencies, health care facilities, cities, areas, and regions.

3. *Communicate with rescue services and security checkpoints.* Police and National Guard troops at security checkpoints delayed delivery of vital fuel for the NYU Downtown Hospital's emergency generators, and off-duty staff recalled to duty had difficulty in clearing the same checkpoints. Communications among law enforcement and health facility personnel must be maintained on reliable, secure equipment and lines.

4. *Manage volunteers and credentialed professionals.* Many unaffiliated medical and nursing personnel converged upon the hospital to volunteer. Without any way of verifying credentials, volunteers required oversight by known, qualified medical and nursing staff. A database of credentialed staff should be maintained by public and private entities within a facility and health care system on a regional basis and through professional organizations.

5. *Maintain emergency generators.* The hospital's rooftop generators had to be constantly cleaned of dust and debris and gauges and indicators physically monitored on a 24-hour basis. Emergency generator locations should allow routine monitoring and protection from damage, whether underground or on rooftops.

6. *Maintain adequate medical supplies for mass casualties and injuries.* After 9/11, the hospital's supply of medical equipment, portable oxygen tanks, and paper goods used to treat victims was very low. Metropolitan hospitals must anticipate a large patient influx at once, types of emergency supplies required, and plan for storage and access on demand.

7. *Filter recirculated air to isolate interiors.* The hospital was forced to initiate a complete shutdown of the heating, ventilating, and air conditioning (HVAC) system to isolate the interior environment from outside contamination. If recirculated air is adequately filtered, health care services should be able to continue operations, subject to the buildup of carbon dioxide, which should be monitored. HVAC design should examine controlling extreme conditions of outdoor dust and debris.

8. *Ascertain presence of special needs populations near a disaster.* The loss of utilities and elevator service after the attacks was a hardship at the high-rise senior residence adjacent to the hospital. Staff provided meals and primary medical care to this dependent population for some time. Health care facilities should know their neighbors in the community and work with outreach groups to provide assistance.

9. *Prepare for extended post-disaster recovery time.* Long after 9/11, New York City area hospitals provided mental health services to survivors and rescue workers, especially for post-traumatic stress disorder and physical disabilities. Even after treating disaster victims, a high level of readiness and ongo-

ing services may need to be maintained, to care for rescue personnel injured in the response and recovery efforts. Staffing plans must consider an extended response.

Lessons from 2003 Blackout: Disaster Planning. During the August 2003 power outage that affected the northeastern United States and Canada, some problems occurred within health care facilities, primarily due to inadequate fuel for generators and equipment breakdowns. The post-9/11 attention to disaster planning minimized the impact at New York State hospitals and nursing homes. Hospitals and nursing homes reviewed the need for upgrades and repairs; extended emergency power and adequate capacity for anticipated demands; maintained minimum fuel levels; reviewed regional impact to area hospitals; and ensured that the emergency circuits support communication systems.

Historic Preservation Guidance for Security Design (Chapter 9)

Maintaining the unique character and features of historic structures is a challenging, costly hurdle to overcome during security retrofits. Successfully integrating new security features into existing buildings requires careful planning and attention to historic details, materials, spaces, and context. Balancing these diverse needs, while protecting occupants and operations within historic structures, is an ongoing concern.

Sharon C. Park, FAIA, Chief, Technical Preservation Services, National Park Service of the U.S. Department of the Interior, and Caroline R. Alderson, Program Manager, Center for Historic Buildings, U.S. General Services Administration, describe how successful approaches to security design for historic buildings have been achieved at federal buildings and landmarks. Established preservation standards and guidelines, along with methods for preventing and managing natural disasters at heritage sites, are a sound starting point for planning security improvements at historic properties (Fig 1.8).

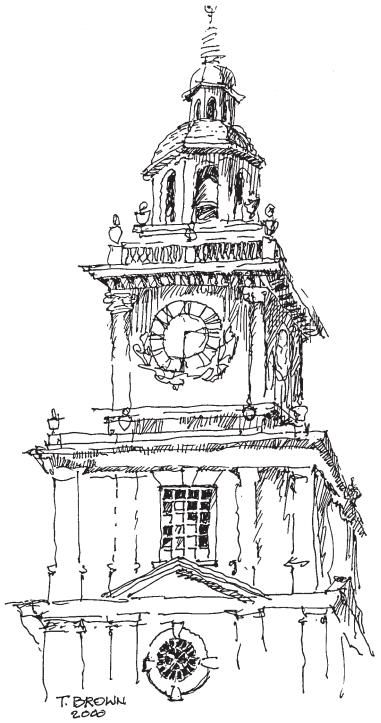

FIGURE 1.8 Clock tower at historic Independence Hall, where the Declaration of Independence was signed, Philadelphia, Pennsylvania. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

Lessons after 9/11: Historic Properties. The destruction of the World Trade Center and portions of the Pentagon, a registered National Historic Landmark, heightened awareness about the vulnerability of America's cultural icons and heritage properties, as follows:

1. *Document historic buildings and store copies off-site.* Several important landmark buildings were extensively documented using photo laser scanning, which an experienced team can usually accomplish within a week. Even buildings not of landmark status should be documented photographically with as much detail as possible for potential replacement of all or parts of the damaged building or artwork. Documents should be updated periodically and a copy kept off-site, along with other copies of drawings and photographs.

2. *Use tall, open spaces as smoke evacuation chambers*. When New York City's historic Tweed Courthouse, near City Hall, was completely renovated in the late 1990s, the historic rotunda was designated as a smoke evacuation chamber. This was useful on 9/11, as smoke engulfed Lower Manhattan. The rotunda's design features and fire shutters maintained building indoor air quality during evacuation. Mechanical vents should be closed to stop smoke from coming inside when heating and ventilating systems are shut down during evacuation.

3. *Reduce glass fragmentation casualties with blast-resistant windows, shades, and wall liners.* At the Pentagon, injury to employees occupying renovated areas was greatly reduced by blast-resistant windows and a proprietary fabric lining that had been installed under the new wall surfaces to prevent fragmentation. Reinforced columns remained in place and office

walls hardened in the renovations completed prior to 9/11, including areas immediately adjoining the area of impact, held for 35 minutes prior to collapsing, allowing employees time to vacate the building. Collapsing ceilings and fixtures caused most injuries.

Hospitality Facility Security (Chapter 10)

Hospitality properties, from hotels, motels, and casinos to conference centers and resorts, are designed to be open and welcoming to guests, visitors, and the public (Fig. 1.9). For these same reasons, they are vulnerable to crime, terrorism, and violence. Facility managers and owners must balance the need for security and make visitors and guests feel comfortable and safe.

Bradley D. Schulz, AIA, principal of KGA Architecture, observes that gaming properties must protect their operating license and meet strict requirements to ensure that the license is not jeopardized. Slot machines and gaming tables move large sums of money through the facility at all hours, and require closed circut television (CCTV) and at least two employees during servicing and counting. Predictable routines make money more vulnerable to theft, and movement should occur at different times on different days.

Lessons from 9/11: Employee Background Checks. After 9/11, terrorism became a major concern among hotel and gaming property owners, who often have a workforce of several thousand people, and a high turnover rate. Once considered a minor issue, background checks of five to ten years are conducted for many workplaces, as employees could be tied to terrorism, employee pilferage, and theft from guests.

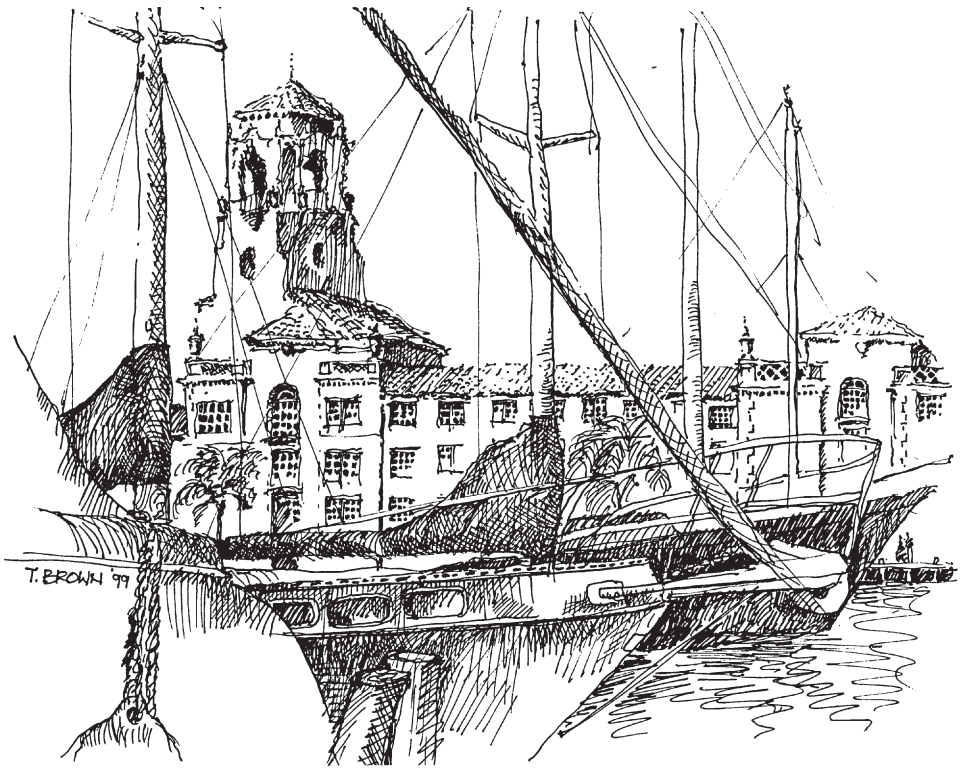

FIGURE 1.9 Renaissance Vinoy Resort, St. Petersburg, Florida. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

Multifamily Housing (Chapter 11)

After 9/11, Lower Manhattan's Battery Park City and other residential properties near ground zero remained closed to tenants for months, forcing residents to find other places to live. Federal agency warnings later identified apartments as possible soft targets or potential terrorist staging grounds, causing landlords, real estate professionals, and apartment management executives to review property operating and security procedures. James W. Harris, former Vice President, Property Management, of the National Multi Housing Council/National Apartment Association Joint Legislative Program (NMHC/NAA JLP) developed operating guidelines as an industry resource.

Lessons from 9/11: Property Management. Multifamily housing owners and real estate professionals should remain aware of activities by monitoring internal reporting, resident communications, unit inspections, contractors and employees, resident applicant verification, cooperation with law enforcement, and security for common, public, and community spaces (Fig. 1.10).

Home and Business Security, Disaster Planning, Response, and Recovery (Chapter 12)

Disaster planning and emergency preparedness are necessary activities for every home, workplace, and public facility (Fig. 1.11). Home and business security addresses various threats, from burglaries, terrorism, and power outages to natural disasters capable of leveling communities, such as floods, hurricanes, tornadoes, and wildfires. To avert personal and economic losses, disaster planning is best begun long before a crisis occurs, enabling individuals and business owners to recover and rebound quickly. Ongoing planning items should include reviewing insurance policies, life safety and building code compliance, and adequacy of safe room shelters, communications, evacuation plans, and emergency supplies.

Barbara A. Nadel, FAIA, explains how home and business security results from integrating design with disaster preparation, response, and recovery activities. Design professionals must under-

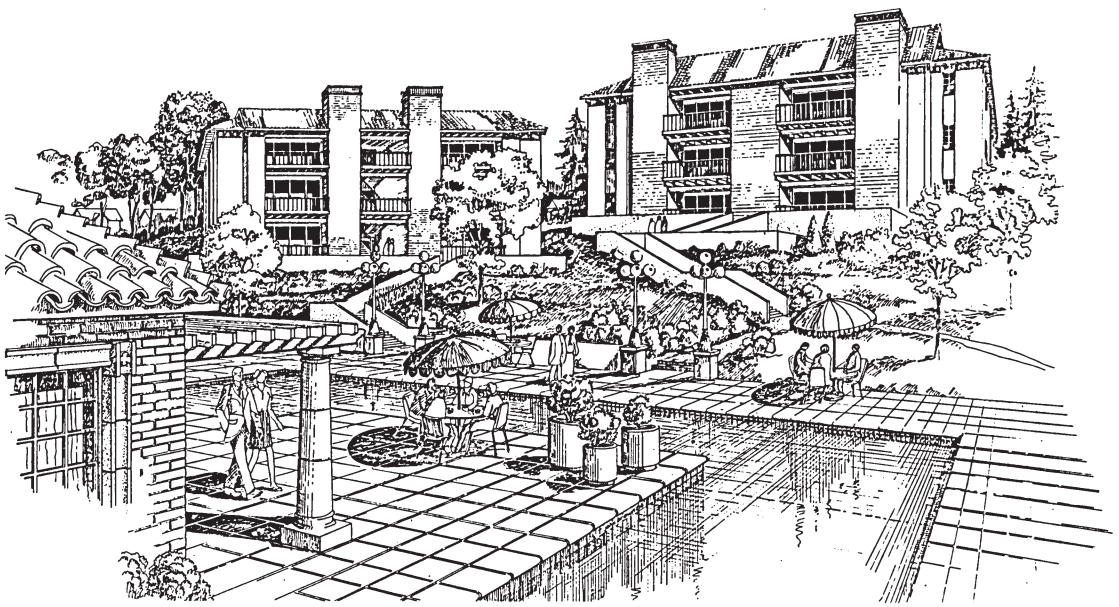

FIGURE 1.10 Multifamily housing complex (proposed), El Paso, Texas. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

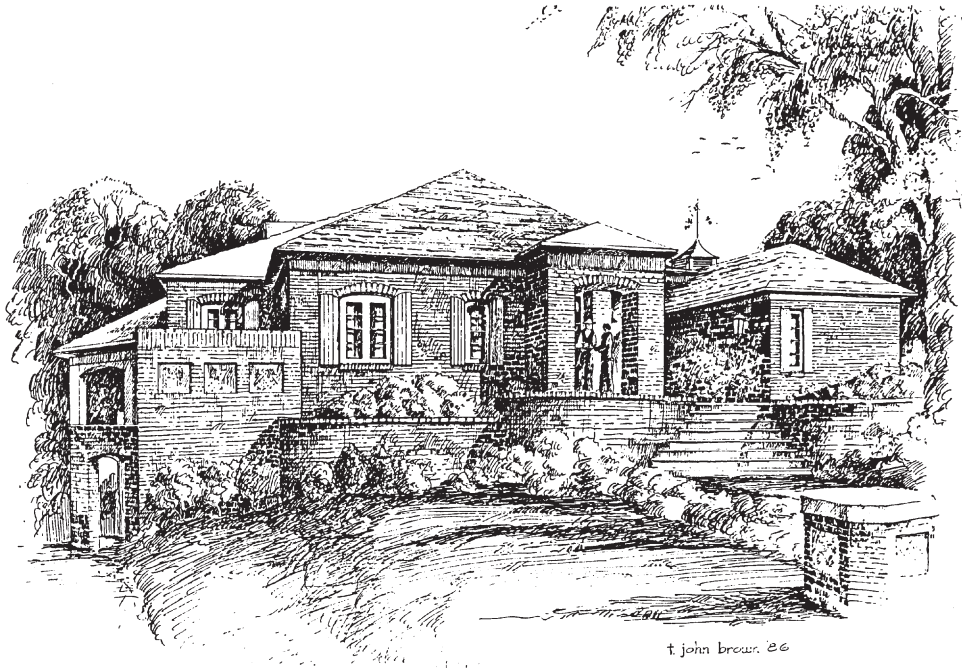

FIGURE 1.11 Brick residence, Albuquerque, New Mexico. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

stand the scope of work and risks involved when volunteering professional services. Disaster planning experts Charles F. Harper, FAIA, Principal of Harper Perkins Architects, and Terrance J. Brown, FAIA, Senior Architect with ASCG, Inc., provide disaster response and recovery strategies for floods, hurricanes, tornadoes, and wildfires. Frank Musica, Esq., Risk Management Attorney, and Paul V. Riccardi, Publications Specialist with Victor O. Schinnerer & Company, Inc., provide information on professional liability, insurance coverage, emergency response, and managing a crisis through effective public relations for design and construction professionals, building owners, and public officials responsible for building security.

Lessons from 9/11: Records Protection. After 9/11, residents and businesses in Lower Manhattan were forced to evacuate their premises and relocate for months before being allowed to return to their buildings. Many lost all records and files and had to recreate information through clients, customers, and consultants, if duplicates did not exist. Backing up records and data, and off-site storage, expedite business continuity after a disaster.

Lessons from 2003 Blackout: Communications. The August 2003 power outage affected over 50 million people across 9300 square miles in six northeastern states and parts of Canada, leaving many without power for two days or more. Hard-wired, corded phones maintain phone service without electricity, when cell phones do not work. Homes and businesses should prepare for outages of 48 hours or longer, and maintain emergency supplies.

Lessons from Disaster Response: Providing Volunteer Services. Design professionals who volunteer after an emergency should be aware of potential liability. Many states lack volunteer protection acts, or Good Samaritan laws, affording immunity to licensed professionals who provide services during an emergency. Some professional liability policies may cover an insured firm in a volunteer capacity in the same way the firm would be covered when providing services for a fee. Firms should

check professional liability coverage and state laws regarding volunteer services. Professional societies can advocate for Good Samaritan laws in state legislatures before disasters occur, to facilitate rapid emergency response when needed, protect the public health, safety, and welfare, and minimize liability risks to architects and engineers.

Lessons from 2000 New Mexico and 2003 California Wildfires. Devastating wildfires caused billions of dollars in damages and destroyed thousands of homes, businesses, and buildings. Architects, homeowners, building officials, and insurers in fire-prone areas must be familiar with applicable codes, design criteria, and fire-resistant materials when rebuilding structures. The scale and duration of the fires emphasized the need for disaster and recovery planning.

Lessons from 1997 Great Plains Flood. Rising tides from blizzards and spring floods inundated river valleys in Minnesota and the Dakotas, setting 100-year flood records, and devastating small, rural communities. Flooding disrupted water, sewage, and electrical services; blocked transportation routes; and caused power outages and evacuation of over 50,000 people. Protecting potable water supplies and sanitary systems was easier for communities with existing disaster plans. During recovery, the Midwest Assistance Program prepared a Flood Emergency Action Procedures (FEAP) manual, outlining tasks for flood preparation during fall of the previous year. The FEAP should be updated regularly to reflect infrastructure improvements, flood protection, equipment, emergency contacts, hazardous materials, and evacuation plans.

Industrial Facilities and Office Buildings: Safety, Security, Site Selection, and Workplace Violence (Chapter 13)

Security at industrial facilities, manufacturing plants, offices, and civic facilities relies on protecting people and assets, continuing operations, and preventing litigation. During the site selection process, building owners should review local crime statistics, adjacent land use, and liability concerns from relocation incentive programs. Integrating facility planning, design, and security policies will contribute to worker safety at site and building entries on large campuses, high-rises, and well-lit parking areas (Fig. 1.12).

Since the 1990s, workplace violence by employees and domestic partners has caused many employers to develop security procedures to protect against violence, industrial espionage, theft, and terrorism. Industrial employers are often concerned about threats from downsizing, layoffs, outsourcing, restructuring, striking workers, and replacing employees with temporary workers. Barbara A. Nadel, FAIA, describes how workplace safety can be improved by implementing crime prevention through environmental design principles, including layering security levels inward from site perimeters to building interiors, and communicating security procedures to all employees so they know what to do during a crisis or emergency.

Lessons from 2003 Blackout: Review Egress and Life Safety Systems. During the blackout, many commercial buildings were dark and exit paths were not always apparent, especially where emergency power did not cover all building zones. Employers and facility managers should review all life safety codes and ensure that emergency generators and building egress systems are functional.

Lessons from 2003 City Hall Shooting: Security Screening Policy. After 9/11, security screening was installed in most New York City government and high-rise buildings. In July 2003, a city councilman brought a visitor to City Hall. Despite high security and law enforcement presence, the visitor entered City Hall carrying a concealed handgun because by prior agreement, elected officials and guests were exempt from going through metal detectors. Shortly after arrival, the visitor used his concealed handgun to kill the councilman. A police officer in the council chamber immediately shot and killed the visitor. Until the facts were determined and terrorism ruled out, Manhattan mass transit networks were closed, causing great disruption. The policy was changed, requiring that everyone who entered City Hall go through metal detectors, with the goal of preventing future incidents.

FIGURE 1.12 Skyline, Chicago, Illinois. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

Lobby Security Design: First Impressions (Chapter 14)

Regardless of building type and function, lobbies provide visitors with their first impressions of an organization and facility (Fig. 1.13). Federal building lobbies are the initial line of defense against terrorism and violence directed at the government, federal employees, and the public. Although security screening stations have been installed in federal courthouses since the mid-1980s, screening stations in many federal office buildings were hastily pieced together to provide added security after the 1995 Oklahoma City bombing. Equipment and furniture in federal facilities were often haphazardly arranged to fit within a variety of vestibules and lobby configurations. This effort provided building security, but frequently looked chaotic.

GSA instituted the First Impressions program in 1998 to ensure that all federal facilities presented a positive first impression to those entering the building, conveying professionalism, conscientiousness, and security. Ten case studies of federal courthouses across the U.S., selected by Casey L. Jones, GSA's Director of the First Impressions Program, illustrate best practices of how lobby designs for new and renovated buildings ensure that design excellence and security standards are met.

Lessons from Oklahoma City and 9/11: Lobby Design. Security screening and metal detectors installed within federal facilities after 1995 were enhanced after 9/11. Important design elements to review during lobby design include entrances, separation of entrance and exit paths; adequate queuing space; the free zone, or space between an exterior plaza and secure interior areas; screening station locations, arrangement, and operations; metal detectors and x-ray machines; and the secure area, which starts immediately after visitors pass through the security station.

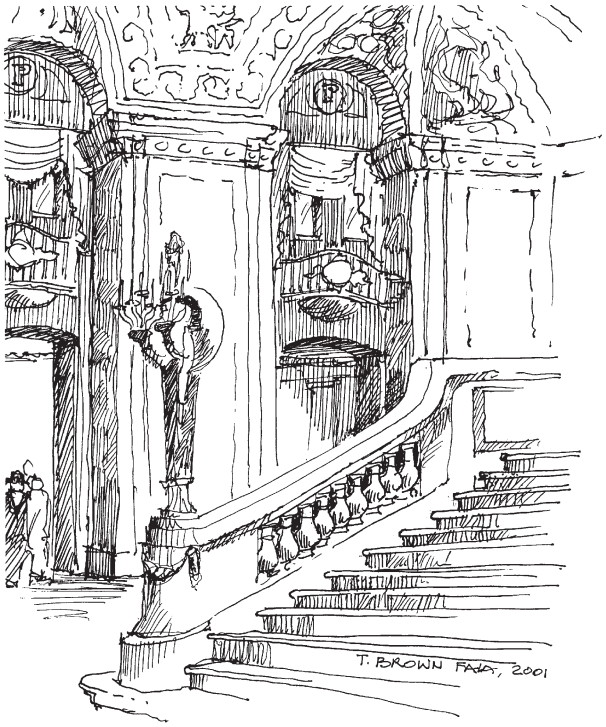

FIGURE 1.13 The rich interior texture of the Palmer House Hotel lobby creates a welcoming first impression, Chicago, Illinois. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

Museum and Cultural Facility Security (Chapter 15)

Museums and cultural institutions are more than places to enjoy art; they are high-volume tourist destinations, offering restaurants, retailers, multimedia shows, film screenings, and receptions (Fig. 1.14). With so many scheduled activities, museum professionals are concerned about security of irreplaceable art, artifacts, and public safety during an emergency. Arthur Rosenblatt, FAIA, Principal of RKK&G Museum and Cultural Facilities Consultants, Inc., explains how museums can protect priceless art from theft and intruders with electronic technology to detect changing environmental conditions without compromising building aesthetics.

Lessons from 9/11: Electronic Technology. Twelve types of detectors are commonly used for museum security. Detectors do not protect anything, but identify an activity and issue an alarm to a security control center, which alerts security personnel to respond and investigate.

Perimeter Security: The Aesthetics of Protection (Chapter 16)

Security in the urban landscape can be achieved though innovative use of public art. After the Oklahoma City bombing, in response to vandalism, crime, and terrorism, visible security often consisted of installing concrete Jersey barriers in urban areas with high-risk buildings and landmarks (Fig. 1.15). Cumulatively, perimeter barriers can overwhelm attractive or imposing structures and turn pleasant streetscapes or plazas into oppressive spaces. Deborah Bershad, Executive Director, and Jean Parker Phifer, AIA, former President, of the Art Commission of the City of New York discuss how to successfully integrate perimeter security and urban design elements, through cooperation of city agencies and a Percent for Art Program.

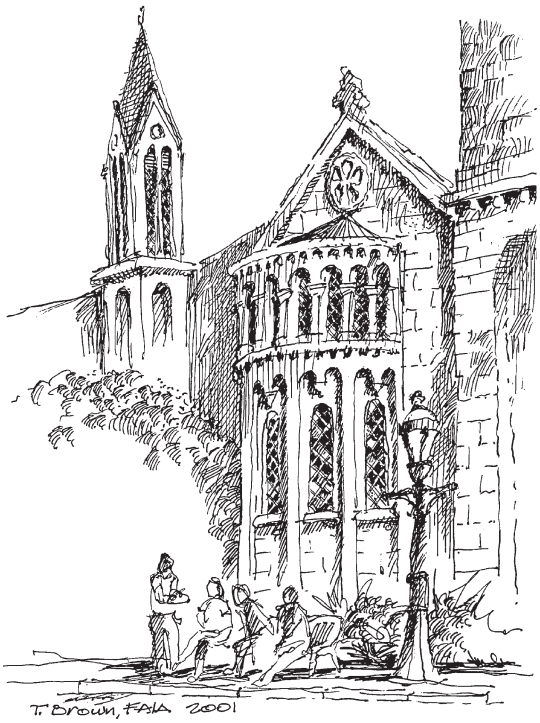

FIGURE 1.14 The Castle, Smithsonian Institute, 1857, twelfth-century Romanesque-style national museum, Washington, D.C. (*Architect: James Renwick, Jr., pen and ink drawing: Terrance J. Brown, FAIA.*)

FIGURE 1.15 Concrete barrier limits vehicles at Federal Plaza, Duane Street, Lower Manhattan, New York. (*Photographer: Mark Ginsberg, AIA.*)

Lessons from 9/11: Integrating Security and Public Art. Bollards or barriers are generally installed near the curb of urban site perimeters. Artists and designers can intersperse bollards with planters, benches, or trees, where clearances allow, to deemphasize security and mitigate the repetition of identical elements. By commissioning artists and sculptors, unique design solutions engineered for security standards have been used effectively as bollards, walls, fences, and gates at many public facilities, including schools, subway stations, and courthouses.

Religious Institutions and Community Centers (Chapter 17)

Religious and community institutions provide social and spiritual services to people of all ages and backgrounds (Fig. 1.16). They are stabilizing influences in communities, operating over long hours, seven days a week, and must be secure and welcoming. Because of the open nature of most religious institutions and the range of employees and the visitors using them, security may be viewed as an affront to the organization's spiritual mission. Valuable religious items, books, documents, and cash are kept within religious facilities and need to be secured. Violent threats against religious groups, facilities, and members require a collaborative security effort.

Steven C. Sheinberg, Coordinator for Security Awareness Programs and Special Assistant to the National Director, and Morris Casuto, Regional Director with the Anti-Defamation League, describe how religious institutions and community centers can implement preventive security planning, design, and operational policies. An overview of indicators and emergency response procedures for car and truck bombs, suicide bombers, and weapons of mass destruction is also included.

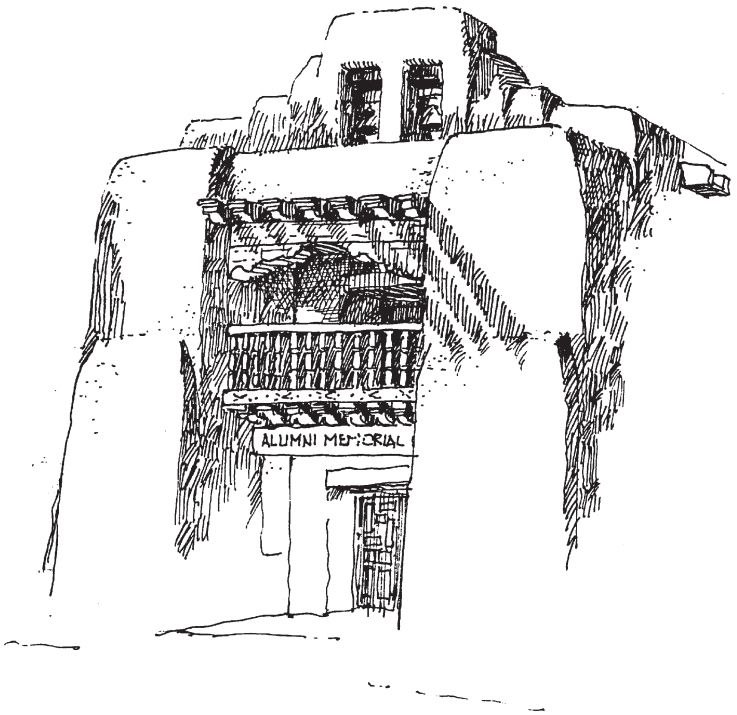

FIGURE 1.16 The Franciscan Mission-style Memorial Chapel honors alumni killed in the nation's wars, University of New Mexico, Albuquerque, New Mexico. (*Pen and ink drawing: Terrance J. Brown, FAIA.*)

Lessons from 9/11: Target Hardening. Synagogues and Jewish institutions have long remained vigilant against terrorism, violent threats, explosions, suicide bombers, and vandalism. After 9/11, violence against religious facilities continued around the world, confirming the need for target hardening to discourage attacks. Institutions should not reveal security measures, but should provide clear evidence of security features. Target hardening tactics include visible alarm systems, security patrols, and vehicles; perimeter fencing and lighting; a well-maintained facility appearance; and regular presence of local law enforcement on or near the grounds.

Research Facilities: Security Planning (Chapter 18)

Research facilities must balance several security threats, such as preventing industrial espionage, containing hazards and risks, and keeping proprietary information inside the premises (Fig.1.17). Rapid advances in technology have made laboratories targets for outsiders and foreign governments attempting to acquire intellectual property, bypassing the costs of research and development. Controversy over some forms of research and the use of animals for experiments have led to vandalism by activist groups, primarily to disrupt operations. Research facility experts, Regis Gaughan, P.E., Managing Partner; Joseph Calabrese, P.E., former Principal; and Stanley Stark, AIA, Managing Partner of HLW International, LLP, address how to secure research facilities, create safe workplaces, and control access to hazardous functions through design and technology.

Lessons from 9/11: Airborne Contamination of Building Systems. Since 9/11, the federal government and scientific and technical communities have proposed or adopted heightened security measures for research facilities. In January 2002, the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) issued a report, *Risk Management Guidance for Health and Safety under Extraordinary Incidents*, in response to terrorism and anthrax contamination. Findings

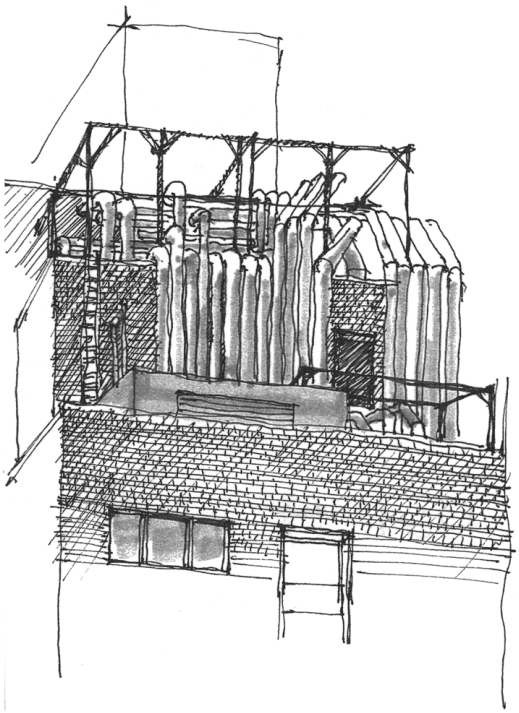

FIGURE 1.17 Biomedical research building infrastructure, Arnold and Marie Schwartz International Hall of Science, Memorial Sloan-Kettering Hospital, New York, New York. (*Pen and wash drawing: Stanley Stark, AIA.*)

include ways to minimize airborne contamination in building systems through HVAC system design, filtration, and enhanced building egress paths.

Retail Security Design (Chapter 19)

Regional malls, big-box retailers, and large public gathering places are vulnerable to terrorist threats, especially during crowded peak shopping season. Retail destinations must convey openness and hospitality to customers and employees, without making them feel vulnerable to terrorism, property crime, or violence. Terrorism is relatively new to American retailers, but property owners and security directors in Northern Ireland, Israel, and other countries have dealt with terrorism for decades. The majority of threats against retail facilities will likely remain traditional property or personal crimes, such as assault, criminal activities, robbery, theft, vandalism, and violence. Jeffrey J. Gunning, AIA, Vice President, and Lance K. Josal, AIA, Senior Vice President, of RTKL Associates, Inc., explain how to create welcoming and safe environments, while deterring terrorism and crime, through attention to risks, vulnerability, lighting, parking, entrances, technology, and operational security policies.

Lessons from 9/11: Terrorist Threats in Retail Environments. After 9/11, emerging retail concerns in the United States expanded to include violent threats to intimidate shoppers and disrupt operations, armed raids, bombings, biochemical hazard contamination, shootings, mass violence, and property damage. Effective security strategies include applying CPTED principles and tenant participation to monitor commercial properties.

School Security: Designing Safe Learning Environments (Chapter 20)

The need for school security is illustrated by incidents of violence, guns, teenage street crime, and child abductions. School violence can be reduced through carefully designed grounds, playfields, building exteriors, and interior program spaces, using CPTED principles. Low-tech design strategies, such as site perimeter control, clear sight lines, good lighting, surveillance, landscaping, and low shrubs, will deter graffiti and improve neighborhood quality of life (Fig.1.18).

Thomas Blurock, AIA, Principal of Thomas Blurock Architects, observes that learning is directly related to the size of the school community, with smaller schools of 500 students or fewer providing more learning opportunities and greater security. Interaction improves when students take responsibility for each other, creating a safer learning environment. Thoughtful design of circulation areas, hallways, administration areas, common spaces, classrooms, toilet rooms, and locker rooms further enhances school security, in concert with school operational policies.

Lessons from 1999 Columbine High School Shootings. Educational professionals consider this violent incident, in which several students and teachers were killed, to be an isolated case of psychological dysfunction. Early intervention by parents, teachers, and peers will prevent some tragedies from happening. Emergency preparedness, district policies, and school procedures should be implemented and shared with parents, students, and personnel.

Lessons from 9/11 and 2003 blackout: School Emergency Management Centers. Disaster planning for large school systems includes creating emergency management centers to monitor activities and communicate with officials during a crisis. The New York City Department of Education created an emergency management center at the Lower Manhattan headquarters and a satellite facility at another location for crisis management at their 1200 facilities.

Women's Health Centers: Workplace Safety and Security (Chapter 21)

Violence has been a fact of life for women's health centers in the United States since the early 1970s. For years, health centers and clinics have fortified their facilities and operations to protect employees

FIGURE 1.18 Cooper Union for the Advancement of Science and Art, Astor Place, New York, New York. (*Architect: Frederick A. Peterson, 1859; pen and ink drawing: Francis J. Sheridan, AIA.*)

and patients from ongoing threats of violence, arson, firebombs, vandalism, assaults, blockades, death threats, anthrax, bioterrorism, snipers, and from killing health providers and their families. In the 1990s, in Canada and New York, snipers using rifles shot five doctors through a rear glass window or door at their homes. In October 1998, ob-gyn Dr. Barnett Slepian was murdered in his home outside Buffalo, New York. His killer was sentenced in 2003.

Barbara A. Nadel, FAIA, describes how women's health centers can successfully achieve a balance between security and accessibility, despite the challenges posed by groups and individuals. Patients and personnel entering and leaving clinics have been targeted for harassment and injury. The 1994 federal Freedom to Access Clinic Entrances (FACE) Act prohibits clinic violence by providing legal grounds for prosecuting those who threaten clinics and religious facilities. The FACE Act offers the same protection to pro-choice and pro-life crisis centers, abortion clinics, physicians' offices, health clinics, and access to places of worship without harassment. The law established criminal and civil penalties, including prison time and substantial fines.

Lessons from Clinic Violence: Clinic Security. Nonprofit organizations have developed security design strategies and procedures to protect patients, staff, and daily operations. Dian J. Harrison, MSW, President and CEO, and Therese Wilson, Vice President, External Affairs at Planned Parenthood Golden Gate (PPGG) in San Francisco, California, created a security handbook for employees and volunteers, applicable to any workplace experiencing violent threats. Policies and checklists include staff training on handling incoming mail and suspicious packages, ensuring facility access, and documenting all threats in written reports to be filed with law enforcement agencies. Several PPGG clinics, designed by Anne Fougeron, AIA, of Fougeron Architecture, San Francisco, California, integrate design excellence with transparent and visible security to create welcoming and safe environments.

ENGINEERING

It is the engineer's responsibility to be aware of social needs and to decide how the laws of science can be best adapted through engineering works to fulfill those needs.

JOHN C. CALHOUN, JR., FASEE
U.S. petroleum engineer,
Texas A&M University educator

Protective Design of Structures (Chapter 22)

Notable incidents of terrorism and attacks on American facilities, and the thorough engineering analysis performed after every event, have typically resulted in improved building performance, with the goal of enabling a structure to withstand blast, and allow swift, complete building evacuation. Progressive collapse is an initial local failure that spreads from element to element, eventually resulting in the collapse of an entire or disproportionately large part of a structure.

Protective design of buildings occurs by integrating various means of mitigating threats and force protection from blast, fire, ballistic attack, and illegal entry into architectural and engineering design criteria. Protection is generally achieved through a combination of standoff, redundancy, and hardening. Standoff refers to building setbacks from public streets to mitigate the impact of truck bombs. Redundancy is necessary for preventing progressive collapse. Hardening and energy absorptive shields enhance critical structural elements where standoff alone is insufficient to reduce threats to tolerable levels. Each strategy alone can be effective, but the best solution combines all three (Fig. 1.19). Structural engineers Richard L. Tomasetti, PE, Co-Chairman of The Thornton-Tomasetti Group, and John Abruzzo, PE, Vice President, LZA Technology and The Thornton-Tomasetti Group, examine protective design and the lessons from three significant events involving damaged and collapsed structures.

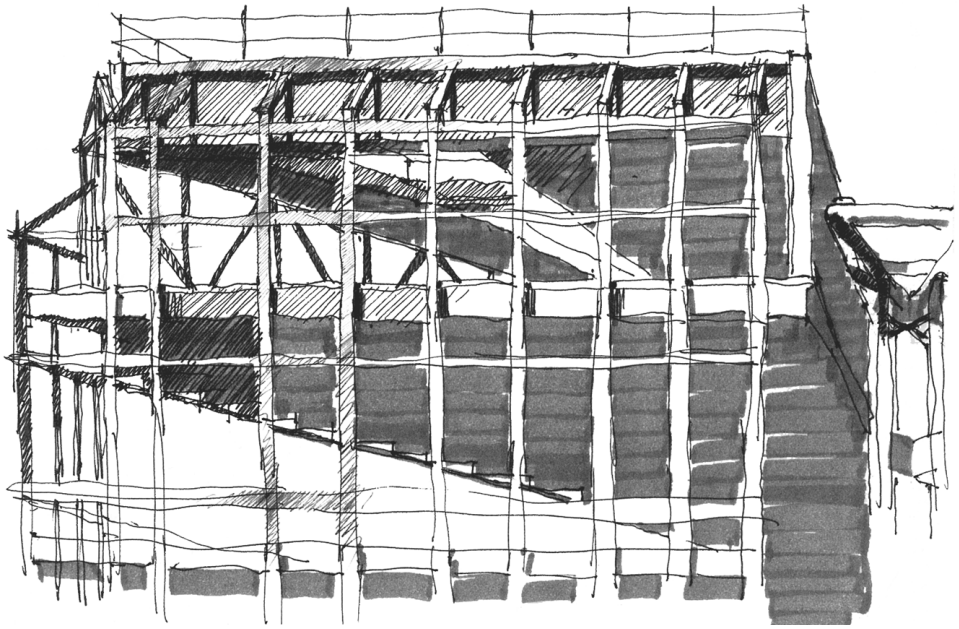

FIGURE 1.19 Jacob K. Javits Convention Center structural frame under construction, 1983, New York, New York. (*Architect: I. M. Pei, pen and wash drawing: Stanley Stark, AIA.*)

Lessons from Oklahoma City: Influence Area. The collapse of a substantial part of the Alfred P. Murrah Federal Building showed that progressive collapse must be avoided. The loss of life due to the building collapse far exceeded the loss of life directly attributed to the blast. New designs should incorporate more redundancy to accommodate the loss of a perimeter column.

Lessons from 9/11: World Trade Center Collapse. Redundant structural systems perform well under duress. The World Trade Center towers remained standing after the initial impact of the aircraft because their highly redundant perimeter tube structure redistributed the load around the damaged areas. The collapse of the towers indicates that other assumptions regarding the interaction of fire and structure need to be considered for future threats. It is generally acknowledged that steel frame buildings with fire protection will endure a building fire because the typical office environment does not provide enough fuel to sustain a fire for the duration needed to cause structural failure. Means of preventing large deliveries of fuel, either from aircraft or storage within the building, must be improved. Much of the spray-on fire protection was abraded from the steel during the aircraft impact and explosion, leaving the steel unprotected. For future terrorist threats, improved fire protection should be considered.

Hardening and increased redundancy of egress routes, emergency equipment, and emergency systems (electrical, mechanical, communication, and sprinkler) will enable a better emergency response. Typically, these systems are protected against fire by fire-rated drywall enclosures. Hardening these enclosures to blast and impact should be considered.

Lessons from 9/11, the Pentagon: Structural Design. Areas of the Pentagon directly impacted by the aircraft exhibited severe and extensive damage to the columns. The collapse of the floor above was significantly more limited. This has been attributed to three factors: (1) Redundancy of the reinforced concrete floor framing systems in the form of flexural continuity of the beams and girders through the columns, along with the ability of the nonload-bearing exterior wall to carry floor load; (2) Short spans between columns that limit the remaining span should a column be removed; and (3) Spiral reinforcement of the concrete columns that increase the capability of the column to carry axial load after sustaining damage due to blast and impact.

Lessons from Oklahoma City: Brisance. Brisance, the crushing or shattering effect of a high explosive on brittle materials, accounted for the failure or disappearance of the column closest to the blast at the Murrah Federal Building in Oklahoma City. This column segment was never recovered and is believed to have disintegrated. The dynamic blast pressures at this column were calculated to be well in excess of the compressive strength of the concrete. Because the quantity of the explosive was large, brisance occurred even though the column was nearly 20 feet from the bomb. However, much smaller bombs can produce similar effects when placed nearer to the columns. Increased standoff, a steel jacket, or a blast shield can provide an effective means of mitigating brisance.

Mechanical, Electrical, Fire Protection Design (Chapter 23)

As one of the most essential and transparent security building elements, engineering systems provide many aspects of life safety and security. System responsiveness depends on availability, design, use of appropriate technology, maintenance, and knowledgeable facility staff capable of operating sophisticated building systems. Emergency generators supply power to critical building and life safety systems that must maintain operations during utility power loss, including fire pumps, elevators, smoke management systems, emergency egress lighting, and fire alarm systems. Introducing fresh air through air intake louvers to the ventilation system provides a high level of indoor air quality. Ventilation systems could distribute airborne contaminants, biochemical hazards, and particles to all points throughout a building, posing serious health hazards, and therefore must be planned appropriately.

Andrew Hlushko, PE, Senior Vice President with Flack + Kurtz, discusses the impact of mechanical, engineering, and fire protection systems on building security and the life safety recommendations that arose from the events of 9/11. Fire command centers provide vital information to local fire departments

that respond to emergencies. The fire command center is typically colocated with the central security control center at the main building entrance. Should this area become inaccessible due to an external or internal event, the emergency response team may not have access to necessary information.

Lessons from 9/11: Airborne Contamination. Mechanical isolation of areas with dedicated HVAC systems, such as mailrooms and loading docks, will limit the likelihood of contaminants entering through these semipublic zones and infiltrating entire buildings. Systems serving these spaces should have dedicated air intakes, could be provided with higher ventilation rates, and should not transfer air to other building areas. Additional precautions include protecting air inlets, recording of visitors for future notification of exposure, and filtration only for extreme threats.

Lessons from 9/11: Air Intake Grilles. Louvers and air intake grilles should be located high above grade level, where they will be inaccessible to those seeking to introduce hazardous materials into building air distribution system. GSA guidelines require louvers to be located at least 40 feet above grade. The New York City Department of Buildings WTC Building Code Task Force recommends locating air intakes in new construction at least 20 feet above grade, and away from exhaust discharges or off-street loading bays.

Lessons from 9/11: Building Information Cards. The New York City Department of Buildings WTC Building Code Task Force recommended that all high-rise office buildings maintain a building information card, listing vital facility information. The information would be located at the fire command center, readily accessible to the responding fire department. Categories of information include: occupancy, building statistics, elevators, stairways, communications, fire safety, water supply, utilities, temporary considerations, hazardous materials locations, ventilation, and a schematic plan for indicating locations of elevators, mechanical equipment rooms, access stairs, and standpipes.

Chemical and Biological Protection (Chapter 24)

Chemical and biological (CB) terrorism is a challenging threat, due to the high level of uncertainty associated with the problem and the solution. CB agents unleashed in or near buildings, large gatherings of people, or within mass transportation systems are of greatest concern to cities and high-risk targets where small amounts can inflict widespread damage and fatalities. Air, water, food, or surfaces can be used to introduce CB agents and toxic industrial chemicals into building systems.

Michael C. Janus, PE, Manager of Engineering Applications and Operations, and William K. Blewett, Chief Engineer, at Battelle Eastern Science and Technology Center, examine CB building protection, including characteristics of CB agents, protection components affecting building design, and a prototype case study in Salt Lake City, Utah. Integrating building protection systems for chemical-biological hazards involves air filtration, detection, decontamination zones, and airflow management. Design elements affecting protective capabilities against CB agents include air intakes and penetrations; tight building envelope design; mailrooms, lobbies, receiving areas; entry screening areas; vestibules; mechanical rooms, and high-efficiency filter units.

Lessons from 1995 Tokyo Subway Sarin Gas Attack. During the morning rush of March 20, 1995, members of a religious cult released sarin gas in the Tokyo subway system, killing 12 and hospitalizing over 5000. Sarin gas is a highly toxic nerve agent developed by Nazi scientists in the 1930s, believed to be more toxic than cyanide gas. The incident involved devices disguised as a soft drink can, briefcase, white plastic bag, and gas can wrapped in newspaper, set to go off on five subway cars on three different lines. This was the most serious terrorist attack in Japan's modern history, causing massive disruption and fear in a society with a low crime rate. The attack illustrated how easily a small group with limited means can engage in chemical warfare. Two lessons concerned the absence of decontamination plans or facilities, and lack of disaster planning, emergency response, and practice drills.

1. *Lack of decontamination facilities.* Over 1350 emergency medical technicians (EMTs) were dispatched after the attack, and 135 were secondarily affected. At a hospital, 23 percent of the medical staff complained of symptoms and secondary exposure signs. Had a 100 percent sarin solution been used instead of 30 percent, secondarily exposed EMTs and medical staff would have died. Decontamination facilities and personal protective equipment in the prehospital and hospital settings would have been useful in reducing additional exposure. Hospitals should provide staff with protective equipment and supplies enabling them to treat patients without getting contaminated, estimate the types and amounts of supplies needed to accommodate mass casualties at once, and store these items to allow rapid access on short notice.

2. *Lack of disaster planning.* Japan is a highly structured society, but the attack revealed a lack of coordination and confusion among agencies and organizations. Fire departments, police, metropolitan governments, and hospitals acted independently, without communications. After the attack, the Japanese government developed the Severe Chemical Hazard Response Team. Disaster planning for CB attacks, through interagency coordination and practice drills by all first responders, health care facilities, and public officials, is essential for emergency preparedness.

Lessons from 9/11: Anthrax Letters. In the fall of 2001, several letters containing anthrax were sent to U.S. senators and the American media, in Washington, D.C., New York City, and Florida. Five people died, and 23 people contracted anthrax from the letters. As a result, many organizations created mailroom policies for package delivery and letter screening. The anthrax contamination of postal buildings and machinery caused widespread service disruption, highlighting the need for CB sensors and facility decontamination procedures.

CONSTRUCTION

Engineering is a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it elevates the standard of living and adds to the comforts of life. This is the engineer's high privilege.

HERBERT HOOVER (1874–1964)
31st U.S. President and mining engineer

Construction Cost Estimating for Security-Related Projects (Chapter 25)

After risk analysis and vulnerability assessments are conducted, and security recommendations are identified, building owners and the project team determine the costs for building security features. For new construction and renovations, identifying security costs should occur during early project phases to maintain budget control. The scope of work and related costs required for each proposed security measure, and an alternative, should be defined and evaluated.

Elizabeth J. Heider, AIA, Vice President, Skanska USA Building Inc., explains how to develop cost estimates for security design elements in new construction, based on the process used for hardening of federal buildings. Critical security elements include standoff distance, site perimeter with vehicular entry, site perimeter surveillance, lobbies; loading docks and mailrooms, progressive collapse; building exteriors and windows; roofing; and mechanical, electrical, fire protection, and life safety systems.

Lessons from 9/11: Cost Estimating Hardening of buildings, and related security needs, often result in added costs for new construction and retrofit projects. Security-related costs address only the elements needed to secure a building from terrorist threats, as projects must comply with applicable building

and life safety codes. A standardized approach to estimating security design elements allows building owners to determine the level of risk they wish to assume and to closely monitor construction costs.

Construction: Emergency Response Lessons Learned from September 11, 2001 (Chapter 26)

Within hours of the collapse of the World Trade Center towers, the City of New York asked AMEC Construction Management Inc. to assist in the demolition and cleanup of the WTC site and the Customs Building (WTC 6). The company mobilized on September 12, 2001, and established a round-the-clock operation to remove site debris.

AMEC had been working at the Pentagon before 9/11 on the renovation and restoration of Wedge One, and was on-site when the plane hit the building. Blast-resistant windows and a steel reinforcing system installed along the exterior wall were credited with saving lives at the time of impact. The company responded to the attack within minutes by rescuing survivors, constructing isolation barriers, installing shoring in portions of impacted areas; supplying debris removal equipment; and establishing an emergency communications system.

Both sites required coordination with hundreds of subcontractors, engineers, police, firefighters, city officials, and federal regulatory, military, and investigative personnel. Lewis J. Mintzer, former AMEC business development director, collected information gathered from employees at both sites and created an in-house emergency response handbook with detailed checklists for use where evacuation, rescue, and demolition are required. Several photographs, taken by AMEC at both sites, illustrate the mass destruction and dangerous conditions faced by construction crews at ground zero and the Pentagon.

Lessons from 9/11 for the Construction Industry Construction companies, especially those working at government and high-profile sites which may be terrorist targets, should be prepared to provide emergency response services. Like any complex construction or demolition project, emergency response efforts must be carefully planned, scheduled, and managed. Implementing protocols for constant communication and coordination by all parties involved is essential for efficient response. A series of checklists, covering tasks throughout three phases of the response effort, can assist construction managers and project team members in navigating the complex sequence of events: (1) General activities are proactive measures applicable to any emergency response. (2) Immediate emergency response activities apply to the first 48 hours after a catastrophic event, especially for a rescue and recovery mission. (3) Follow-up emergency response activities can occur from 48 hours to two weeks after an event. Each of the three phases addresses scope, scheduling, budget, and cost; project management, resources, and communication; and quality assurance, quality control, and safety.

TECHNOLOGY AND MATERIALS

Where a new invention promises to be useful, it ought to be tried.
THOMAS JEFFERSON (1743–1826)
3rd U.S. President and architect

It is only with the heart that one can see rightly; what is essential is invisible to the eye.
ANTOINE DE SAINT-EXUPERY (1900–1940)
French pilot and poet

Security Technology (Chapter 27)

The best performing security sensor is a human being, but security personnel can be a costly component of facility operations (Fig.1.20). When vulnerabilities, risks, budgets, and security master

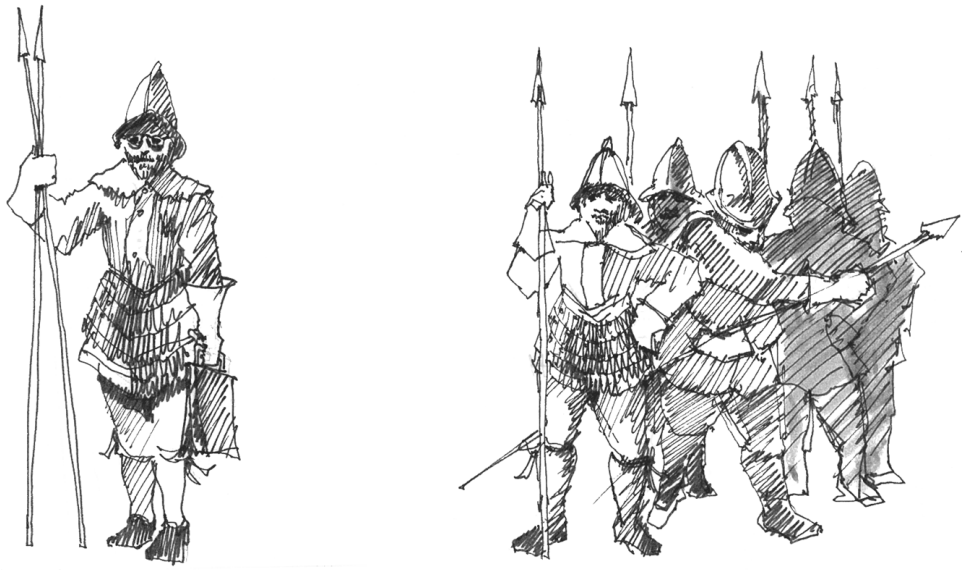

FIGURE 1.20 New World management meets Old World security personnel; the Conquistador-in-chief leading his armored executive team. (*Pen and wash drawing by Stanley Stark, AIA.*)

planning solutions are defined, building owners and design teams must determine which security technology applications meet their needs. Technology will deter, detect, delay, and assess an intruder or enemy attack. Sophisticated sensors and monitoring equipment provide continuous coverage, speed, and the ability to detect even the slightest change in an environment. Round-the-clock security patrols represent ongoing operational costs. Technology, coupled with good design allowing clear sightlines and observation capabilities, is a one-time capital investment. In the long term, advanced technology reduces operating costs, increases security coverage, and provides multiple functions and programming capabilities, such as sending alarms when further investigation is needed.

William G. Sewell, RCDD, Senior Vice President at DMJM Technology, describes the characteristics and applications for various types of security technology. These categories include passive and electronic site perimeter fencing; access control methods to deter intruders, biometric technology, to verify identity, revolving door portals, to limit entry access, weapons detection, such as metal detectors used at airports and in lobbies, industrial and transportation applications, to screen for explosive materials; and closed circuit television to record images. Manufacturers have refined and upgraded many types of technology to address terrorism threats, including video processing, detection sensor technology, and computer program monitoring systems.

Lessons from 9/11: Technology During and after the World Trade Center evacuation, the handheld radio technology used by first responders failed to operate and was incompatible with other systems used in the vicinity. Firefighters and building occupants on upper floors did not know about the events unfolding on the ground and in the adjacent tower. First responders must be adequately trained to react in situations where communications are limited. Emergency response preparedness must include early coordination of equipment, before purchasing new systems. Thorough testing and compatibility of handheld portable radio technology, communication systems within a facility, and hard-line communications to law enforcement and medical response teams are also critical.

Lessons from 9/11: Pentagon Renovations. On 9/11, smoke was a problem during egress, and exit signs were not visible. Arrow-shaped electro-luminescent floor strips along baseboards leading to

exits were installed during renovations. The strips emit a nightglow light and remain on emergency power, like those on aircraft. Other security measures include chemical-biological sensors connected to the control center, highly redundant uninterrupted power service, and two complete communications systems for backup if one stops functioning.

Selecting and Specifying Security Technology Products: A Primer for Building Owners and Facility Managers (Chapter 28)

Owners and facility managers responsible for the purchase and installation of security technology face the daunting task of selecting and specifying products from many available options in the marketplace. Whether for a single building or a multi-site network of facilities seeking to standardize products and operations, managers must be aware that the technology they select may have future life and death implications in an emergency, and improper maintenance or failure to operate properly may result in litigation (Fig.1.21). Organizations will benefit from creating a structured process to identify, evaluate, and recommend appropriate technology products, rather than relying solely on subjective sales pitches by consultants, vendors, and manufacturers. Francis J. Sheridan, AIA, Director, Division of Facilities Planning and Development for the New York State Department of Correctional Services, describes how building owners can evaluate, select, and specify security technology products.

Lessons from the Corrections Industry. The 1990's prison construction boom prompted development of new security products. Correctional facility administrators have installed sophisticated security products for decades, such as perimeter fencing, motion detectors, electronic locking systems, video monitoring, card access, communications systems, and security glazing. Establishing a product evaluation committee to review and field-test technology and equipment has proved to be cost-effective and oper-

FIGURE 1.21 Octagon Museum, American Architectural Foundation headquarters, Washington, D.C., www.archfoundation.org/octagon. (*Architect: Dr. William Thornton, built 1799-1801; pen and ink drawing: Francis J. Sheridan, AIA.*)

ationally efficient, especially for installations of a single product at multiple sites. Before investing in a technology system, owners should schedule a trial run to evaluate how products perform under heavy use or extreme climate conditions, and review maintenance and staff training agreements.

Glazing and Security Glass Applications (Chapter 29)

Glazing and window systems for all building types are selected based on potential threats and vulnerabilities (Fig. 1.22). The effects of blasts, burglaries, ballistics, hurricanes, and earthquakes can be mitigated with properly designed laminated glass construction, tailored to meet specific needs, such as energy conservation and sound reduction qualities. Blast windows are suitable for buildings considered terrorist targets and other adjacent structures that may also be impacted by the blast. These windows can significantly reduce or eliminate the need for building reinforcement, especially in retrofits, allowing installation to be completed in a short time with minimal disruption.

F. John W. Bush, Director of Laminated Products and Development; Sue Steinberg, Vice President, Corporate Communications, from Oldcastle Glass; and public relations consultant Catherine Kaliniak describe how to select the most appropriate type of laminated glass to protect against threats, while addressing aesthetics, security, and high-performance criteria.

Lessons from Hurricane Andrew, 1992. Hurricane Andrew caused economic devastation in south Florida. The glazing industry learned that building pressurization following damage to windows and doors was the main cause of failure. Wind-borne debris caused windows to break, allowing high wind pressure to lift off roofs and destroy walls. After thorough testing to meet industry standards, hurricane-resistant glass is now accepted by all model building codes for high wind speed coastal areas.

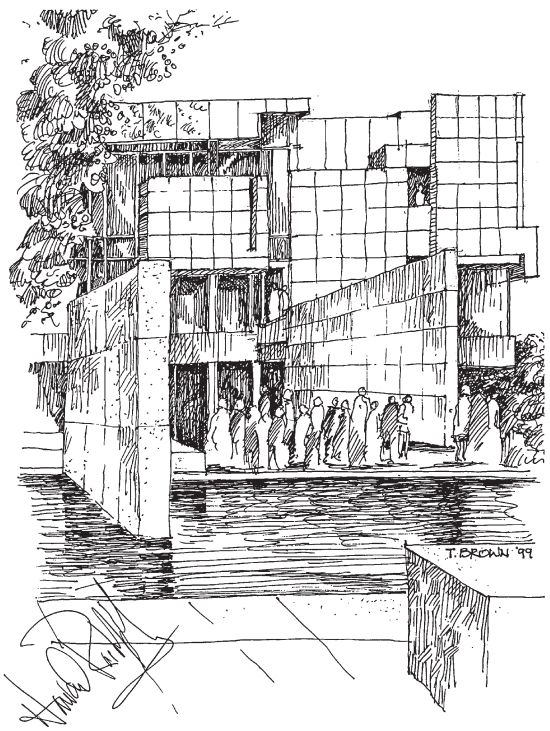

FIGURE 1.22 Rachofsky House, Dallas, Texas. (*Architect: Richard Meier & Partners, Architects; pen and ink drawing, Terrance J. Brown, FAIA.*)

Lessons from Oklahoma City Bombing, 1995. After the explosion, shock from the blast wave impacted the area around the Murrah Federal Building. Many victims suffered severe cuts and lacerations because flying glass shards were blown out of windows. Use of laminated glass, as a component of blast-resistant glazing design, reduces glass-related injuries and protects building occupants.

CODES AND LIABILITY

Every man owes a part of his time and money to the business or industry in which he is engaged. No man has a moral right to withhold his support from an organization that is striving to improve conditions within his sphere.

PRESIDENT THEODORE ROOSEVELT (1858–1919)
26th U.S. President

Codes, Standards, and Guidelines for Security Planning and Design (Chapter 30)

Despite the many nationally and locally accepted codes, standards, and guidelines covering design, construction, and life safety, no single security code exists, applicable to privately owned structures. Federal agencies generally have security design and operational standards, but most state and local government facilities do not. Without any binding codes or mandates addressing security systems in the private sector, building owners must decide on the level of risk they are willing to assume and pay for, and rely on recommendations from consultants and in-house security professionals. Many industry standards and security guidelines are available for adaptation to commercial buildings. Walter Adams, CPP, and Deborah A. Somers, Senior Security Consultants, at Sako & Associates, Inc., provide a survey of available building security industry resources and describe how to create a comprehensive security plan.

Lessons from 9/11: Security Planning. Security plans mitigate risk and represent a tradeoff between operational freedom and restriction. Building security planning and design standards should be documented, in case proof is required for insurance or liability purposes. Records should be kept off-site from the building being covered.

Lessons from 9/11: Emergency Response Planning. Emergency preparedness and planning should include worst-case scenarios, such as power outages, circumstances where key people are inaccessible, and building evacuation during life-threatening situations. Employees and tenants should be included in emergency practice drills and encouraged to be alert for unusual packages and surveillance attempts on properties.

Liability Exposure after September 11, 2001 (Chapter 31)

Since 9/11, design professionals have been forced to examine security issues and consider what steps they should take to protect themselves from liability risks. With limited exceptions, governmental entities have not revised building codes, and the courts have not addressed the extent to which the standard of care has evolved since 9/11. Informed design professionals can minimize their liability exposure by understanding sources of potential liability, appreciating how their responsibilities as design professionals may have changed since 9/11, and allocating risk during contract drafting and negotiation (Fig. 1.23).

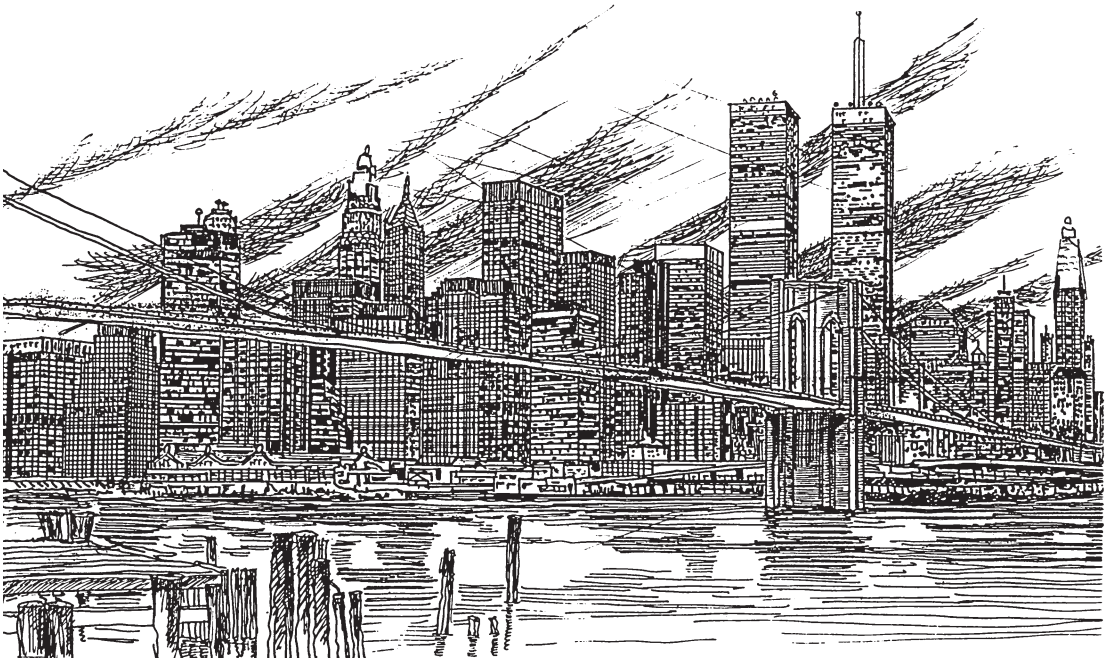

FIGURE 1.23 New York City skyline, with World Trade Center and Brooklyn Bridge, before 9/11/01. (*Pen and ink drawing: Francis J. Sheridan, AIA.*)

Michael S. Zetlin, Esq., Partner, and Noelle Lilien, Esq., Associate Attorney with Zetlin & De Chiara LLP, identify issues related to security design and liability for design professionals, and provide sample letters to illustrate suggested steps to minimize future litigation risks.

Lessons from 9/11: Good Samaritan Laws. After 9/11, volunteer architects and engineers in and around New York City risked personal safety to help others. These volunteers faced substantial liability exposure because they were personally liable for any claims that may have arisen as a result of their services. As volunteers, they were not covered by their employers' professional liability policies. As of 2004, only 14 of 50 states in the United States provide immunity for volunteer design professionals responding to emergencies. In contrast, most states have enacted Good Samaritan statutes immunizing Certified First Responders, Emergency Medical Technicians (EMTs), and other medical professionals from liability if they render first aid or treatment during an emergency. Design professionals can support enactment of Good Samaritan laws for engineers and architects in their states and jurisdictions.

Lessons from 9/11: Terrorism Insurance Coverage. After 9/11, insurance companies excluded coverage for terrorism acts, rendering such coverage unobtainable or prohibitively expensive. To remedy this situation, the insurance industry and construction trade groups pushed for federal legislation to provide financial assistance from the federal government in the event of another terrorist attack. In November 2002, the Terrorism Risk Insurance Act, or H.R. 3210, was signed into law, providing coverage for catastrophic losses from terrorist attacks. The Act states that the federal government would create a one-year program (with a two-year extension) whereby the government would provide up to $100 billion in loans to the insurance industry to cover losses from future terrorist attacks.

CONCLUSION

Millions of men have lived to fight, build palaces and boundaries, shape destinies and societies; but the compelling force of all times has been the force of originality and creation profoundly affecting the roots of human spirit.

ANSEL ADAMS (1902–1984)
U.S. photographer

The body of knowledge contained in this volume is multidisciplinary and applicable to any number of building types and properties. By learning from the past; integrating design, technology and operations; and planning for transparent security where appropriate, everyone involved with public safety will be better equipped to create secure buildings that enhance the built environment and promote good design.

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Architectural Renderings

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- Stanley Stark, AIA, Managing Partner, HLW International, LLP, New York, New York

Photographs

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Seven World Trade Center

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- Ken Lewis, Associate Partner, Skidmore Owings & Merrill, New York, New York

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