

Principles of Information Security, Fourth Edition

Chapter 9 *Securing Physical Assets*

If someone really wants to get at the information, it is not difficult if they can gain physical access to the computer or hard drive.

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Learning Objectives

- Upon completion of this material, you should be able to:
 - Discuss the relationship between information security and physical security
 - Describe key physical security considerations, including fire control and surveillance systems
 - Identify critical physical environment considerations for computing facilities, including uninterruptible power supplies

Introduction

- Physical security addresses design, implementation, and maintenance of countermeasures that protect physical resources of an organization
- Most controls can be circumvented if an attacker gains physical access
- Physical security is as important as logical security

Introduction (cont'd.)

- Seven major sources of physical loss:
 - Extreme temperature
 - Gases
 - Liquids
 - Living organisms
 - Projectiles
 - Movement
 - Energy anomalies

Introduction (cont'd.)

- Community roles
 - General management: responsible for facility security
 - IT management and professionals: responsible for environmental and access security
 - Information security management and professionals: perform risk assessments and implementation reviews

Physical Access Controls

- Secure facility: physical location engineered with controls designed to minimize risk of attacks from physical threats
- Secure facility can take advantage of natural terrain, traffic flow, and degree of urban development; can complement these with protection mechanisms (fences, gates, walls, guards, alarms)

Physical Security Controls

- Walls, fencing, and gates
- Guards
- Dogs
- ID cards and badges
- Locks and keys
- Mantraps
- Electronic monitoring
- Alarms and alarm systems
- Computer rooms and wiring closets
- Interior walls and doors

Physical Security Controls (cont'd.)

- ID Cards and Badges
 - Ties physical security with information access control
 - ID card is typically concealed
 - Name badge is visible
 - Serve as simple form of biometrics (facial recognition)
 - Should not be only means of control as cards can be easily duplicated, stolen, and modified
 - Tailgating occurs when unauthorized individual follows authorized user through the control

Physical Security Controls (cont'd.)

- Locks and keys
 - Two types of locks: mechanical and electromechanical
 - Locks can also be divided into four categories: manual, programmable, electronic, biometric
 - Locks fail and alternative procedures for controlling access must be put in place
 - Locks fail in one of two ways:
 - Fail-safe lock
 - Fail-secure lock



Programmable/mechanical



Electronic

Figure 9-1 Locks

Physical Security Controls (cont'd.)

- Mantrap
 - Small enclosure that has entry point and different exit point
 - Individual enters mantrap, requests access, and if verified, is allowed to exit mantrap into facility
 - Individual denied entry is not allowed to exit until security official overrides automatic locks of the enclosure

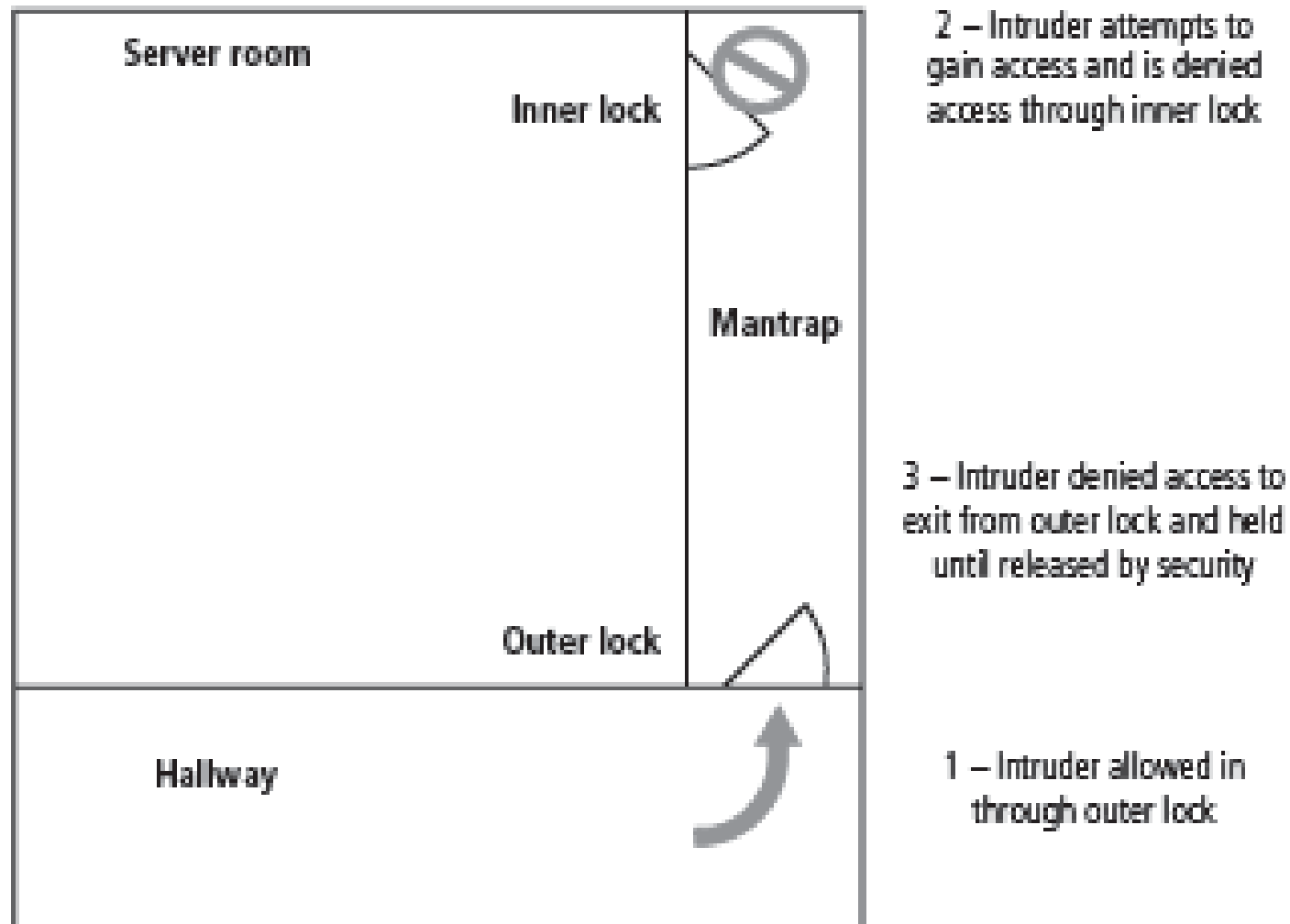


Figure 9-2 Mantraps

Physical Security Controls (cont'd.)

- Electronic Monitoring
 - Records events where other types of physical controls are impractical or incomplete
 - May use cameras with video recorders; includes closed-circuit television (CCT) systems
 - Drawbacks
 - Reactive; does not prevent access or prohibited activity
 - Recordings often are not monitored in real time; must be reviewed to have any value

Physical Security Controls (cont'd.)

- Alarms and alarm systems
 - Alarm systems notify when an event occurs
 - Detect fire, intrusion, environmental disturbance, or an interruption in services
 - Rely on sensors that detect event; e.g., motion detectors, smoke detectors, thermal detectors, glass breakage detectors, weight sensors, contact sensors, vibration sensors

Physical Security Controls (cont'd.)

- Computer rooms and wiring closets
 - Require special attention to ensure confidentiality, integrity, and availability of information
 - Logical controls easily defeated if attacker gains physical access to computing equipment
 - Custodial staff often the least scrutinized persons who have access to offices; are given greatest degree of unsupervised access

Physical Security Controls (cont'd.)

- Interior walls and doors
 - Information asset security sometimes compromised by construction of facility walls and doors
 - Facility walls typically either standard interior or firewall
 - High-security areas must have firewall-grade walls to provide physical security from potential intruders and improve resistance to fires
 - Doors allowing access to high security rooms should be evaluated
 - Recommended that push or crash bars be installed on computer rooms and closets

Fire Security and Safety

- Most serious threat to safety of people who work in an organization is possibility of fire
- Fires account for more property damage, personal injury, and death than any other threat
- Imperative that physical security plans examine and implement strong measures to detect and respond to fires

Fire Detection and Response

- Fire suppression systems: devices installed and maintained to detect and respond to a fire
- Flame point: temperature of ignition
- Deny an environment of heat, fuel, or oxygen
 - Water and water mist systems
 - Carbon dioxide systems
 - Soda acid systems
 - Gas-based systems

Fire Detection and Response (cont'd.)

- Fire detection
 - Fire detection systems fall into two general categories: manual and automatic
 - Part of a complete fire safety program includes individuals that monitor chaos of fire evacuation to prevent an attacker accessing offices
 - There are three basic types of fire detection systems: thermal detection, smoke detection, flame detection

Fire Detection and Response (cont'd.)

- Fire suppression
 - Systems consist of portable, manual, or automatic apparatus
 - Portable extinguishers are rated by the type of fire: Class A, Class B, Class C, Class D
 - Installed systems apply suppressive agents; usually either sprinkler or gaseous systems



When the ambient temperature reaches 140-150° F, the liquid-filled glass tube trigger breaks, releasing the stopper and allowing water to hit the diffuser, spraying water throughout the area

Figure 9-3 Water sprinkler system

Fire Detection and Response (cont'd.)

- Gaseous emission systems
 - Until recently, two types of systems: carbon dioxide and Halon
 - Carbon dioxide robs a fire of oxygen supply
 - Halon is clean but has been classified as an ozone-depleting substance; new installations are prohibited
 - Alternative clean agents include FM-200, Inergen, carbon dioxide, FE-13 (trifluoromethane)

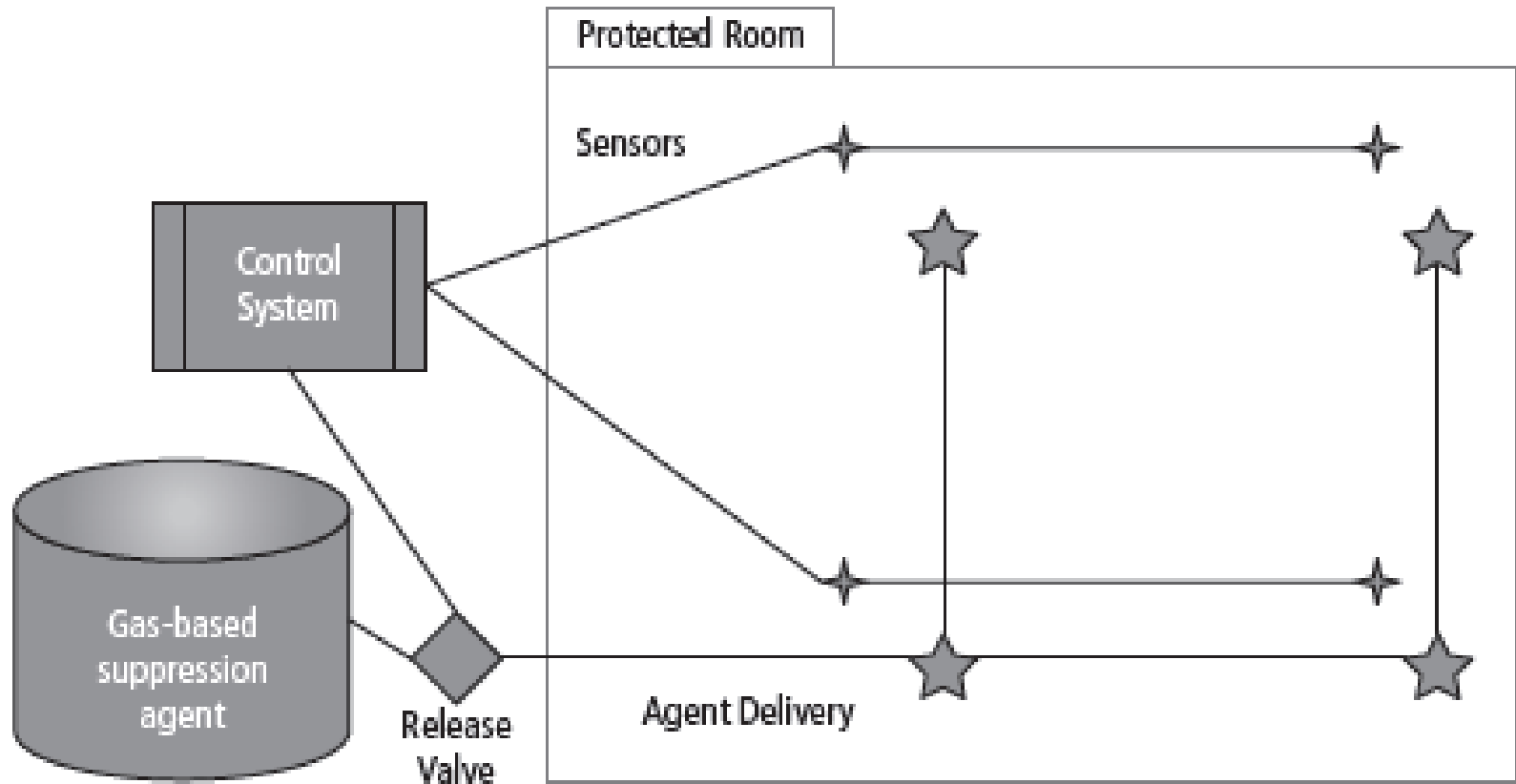


Figure 9-4 Gaseous fire suppression system

Failure of Supporting Utilities and Structural Collapse

- Supporting utilities (heating, ventilation, and air conditioning; power; water; and others) have significant impact on continued safe operation of a facility
- Each utility must be properly managed to prevent potential damage to information and information systems

Heating, Ventilation, and Air Conditioning

- Areas within heating, ventilation, and air conditioning (HVAC) systems that can cause damage to information systems include:
 - Temperature
 - Filtration
 - Humidity
 - Static electricity

Heating, Ventilation, and Air Conditioning (cont'd.)

- Ventilation shafts
 - While ductwork is small in residential buildings, in large commercial buildings it can be large enough for an individual to climb though
 - If vents are large, security can install wire mesh grids at various points to compartmentalize the runs

Heating, Ventilation, and Air Conditioning (cont'd.)

- Power management and conditioning
 - Electrical quantity (voltage level, amperage rating) and quality of power (cleanliness, proper installation) are concerns
 - Noise that interferes with the normal 60 Hertz cycle can result in inaccurate time clocks or unreliable internal clocks inside CPU

Heating, Ventilation, and Air Conditioning (cont'd.)

- Grounding and amperage
 - Grounding ensures that returning flow of current is properly discharged to ground
 - Overloading a circuit causes problems with circuit tripping and can overload electrical cable, increasing risk of fire
 - GFCI: capable of quickly identifying and interrupting a ground fault

Heating, Ventilation, and Air Conditioning (cont'd.)

- Uninterruptible power supply (UPS)
 - In case of power outage, UPS is backup power source for major computer systems
 - Four basic UPS configurations:
 - Standby
 - Ferroresonant standby
 - Line-interactive
 - True online (double conversion online)

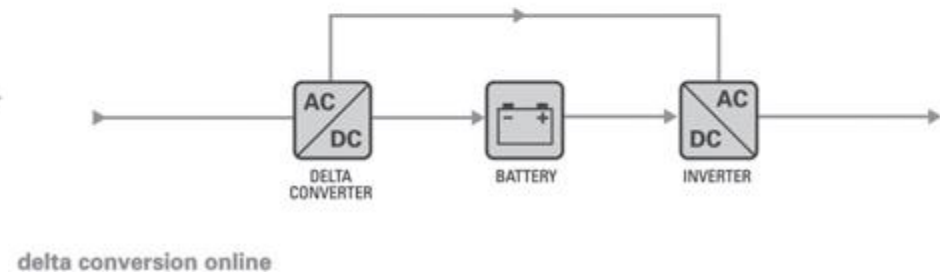
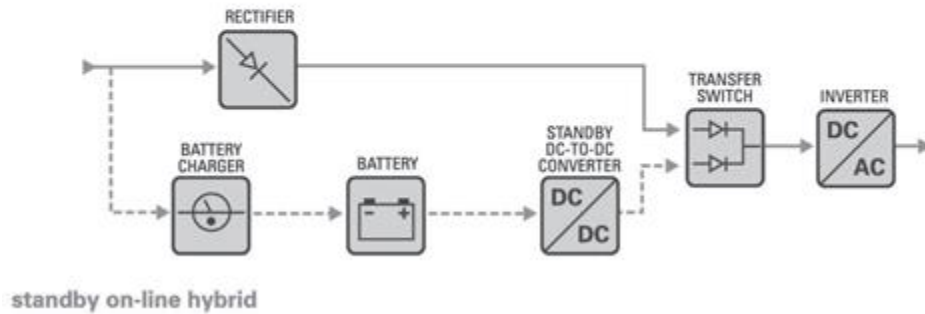
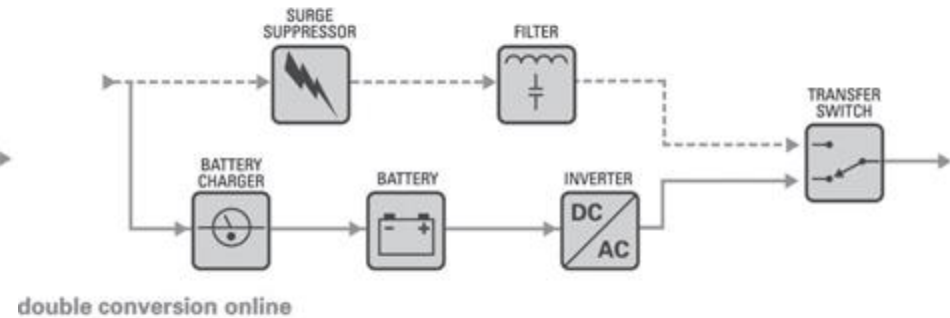
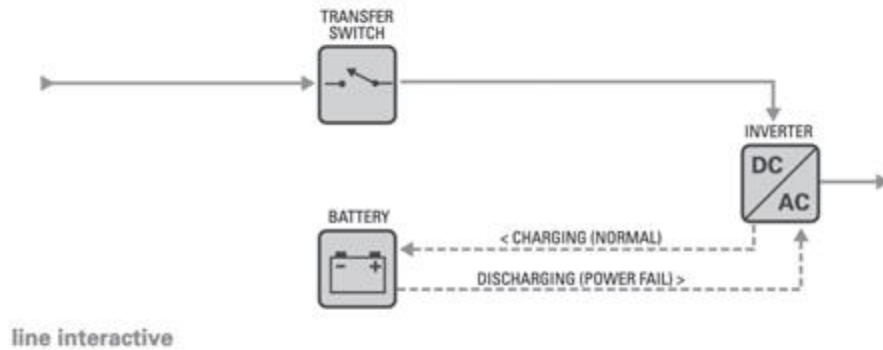
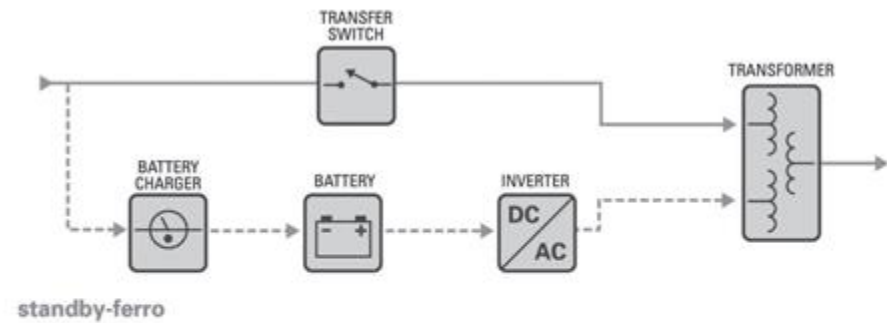
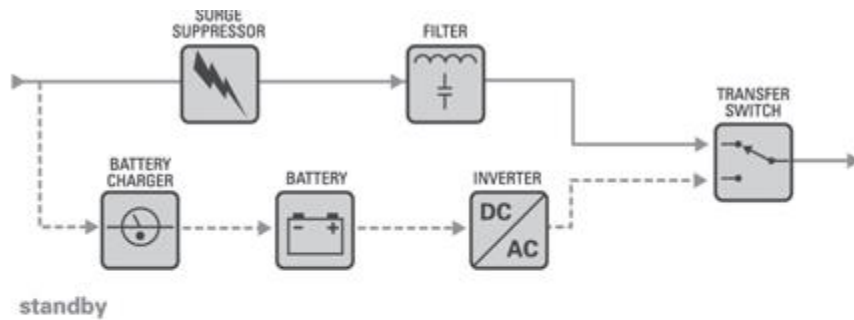
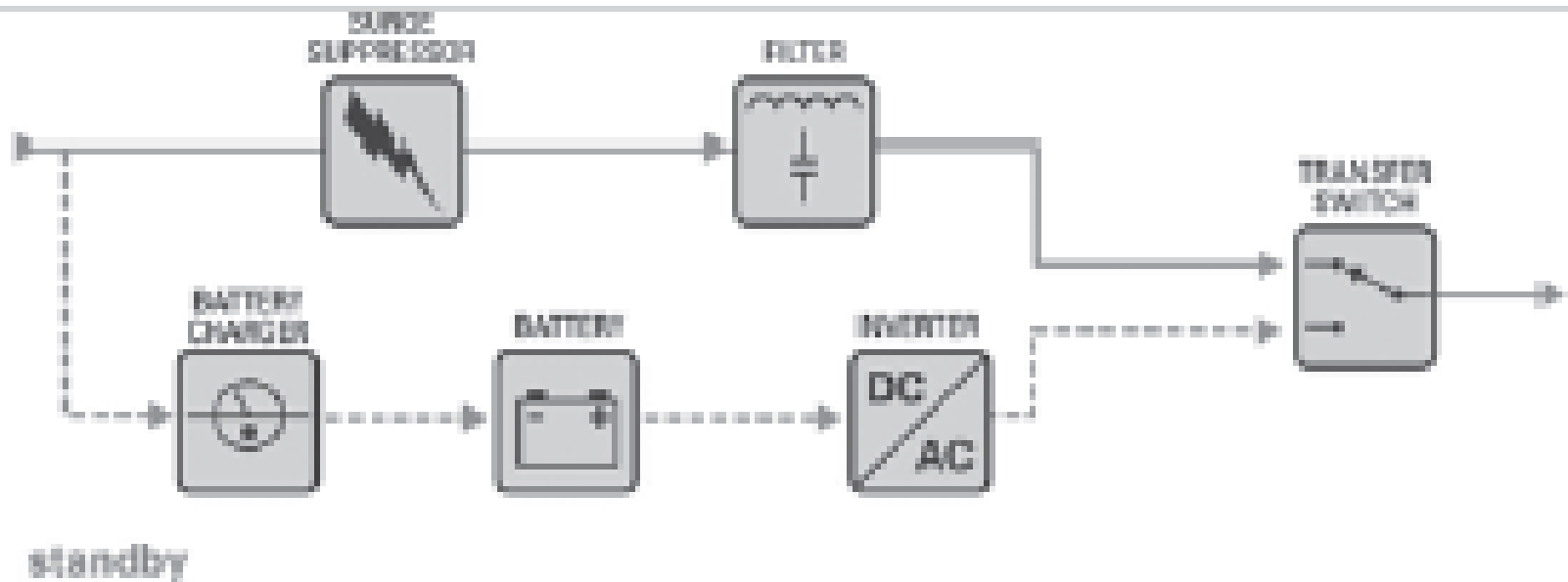


Figure 9-5 Types of uninterruptible power supplies⁹
 Source: Courtesy of American Power Conversion Corporation



Heating, Ventilation, and Air Conditioning (cont'd.)

- Emergency shutoff
 - Important aspect of power management is the need to be able to stop power immediately should a current represent a risk to human or machine safety
 - Most computer rooms and wiring closets are equipped with an emergency power shutoff

Water Problems

- Lack of water poses problem to systems, including functionality of fire suppression systems and ability of water chillers to provide air-conditioning
- Surplus of water, or water pressure, poses a real threat (flooding, leaks)
- Very important to integrate water detection systems into alarm systems that regulate overall facilities operations

Structural Collapse

- Unavoidable forces can cause failures of structures that house organization
- Structures designed and constructed with specific load limits; overloading these limits results in structural failure and potential injury or loss of life
- Periodic inspections by qualified civil engineers assist in identifying potentially dangerous structural conditions

Maintenance of Facility Systems

- Physical security must be constantly documented, evaluated, and tested
- Documentation of facility's configuration, operation, and function should be integrated into disaster recovery plans and operating procedures
- Testing helps improve the facility's physical security and identify weak points

Interception of Data

- Three methods of data interception:
 - Direct observation
 - Interception of data transmission
 - Electromagnetic interception
- U.S. government developed TEMPEST program to reduce risk of electromagnetic radiation (EMR) monitoring

Mobile and Portable Systems

- With the increased threat to information security for laptops, handhelds, and PDAs, mobile computing requires more security than average in-house system
- Many mobile computing systems
 - Have corporate information stored within them
 - Some are configured to facilitate user's access into organization's secure computing facilities

Mobile and Portable Systems (continued)

- Controls support security and retrieval of lost or stolen laptops
 - CompuTrace software, stored on laptop; reports to a central monitoring center
 - Burglar alarms made up of a PC card that contains a motion detector

Laptop loaded with
trace software



Central monitoring
station verifies
ownership



Stolen computer
information passed
to law enforcement

Figure 9-6 Laptop theft deterrence

Remote Computing Security

- Remote site computing: away from organizational facility
- Telecommuting: computing using telecommunications including Internet, dial-up, or leased point-to-point links
- Employees may need to access networks on business trips; telecommuters need access from home systems or satellite offices
- To provide secure extension of organization's internal networks, all external connections and systems must be secured

Special Considerations for Physical Security Threats

- Develop physical security in-house or outsource?
 - Many qualified and professional agencies
 - Benefit of outsourcing includes gaining experience and knowledge of agencies
 - Downside includes high expense, loss of control over individual components, and level of trust that must be placed in another company
- Social engineering: use of people skills to obtain information from employees that should not be released

Inventory Management

- Computing equipment should be inventoried and inspected on a regular basis
- Classified information should also be inventoried and managed
- Physical security of computing equipment, data storage media, and classified documents varies for each organization

Summary

- Threats to information security that are unique to physical security
- Key physical security considerations in a facility site
- Physical security monitoring components
- Essential elements of access control
- Fire safety, fire detection, and response
- Importance of supporting utilities, especially use of uninterruptible power supplies
- Countermeasures to physical theft of computing devices