Critical Infrastructure Protection

Water

Volume II:
Security Methods and Solution Alternatives

Don Philpott, Walter Presson Jr., and Cynthia Presson

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Government Training Inc. ™
Rights and Contracts Department
5372 Sandhamn Place
Longboat Key, Florida 34228
Don.dickson@GovernmentTrainingInc.com

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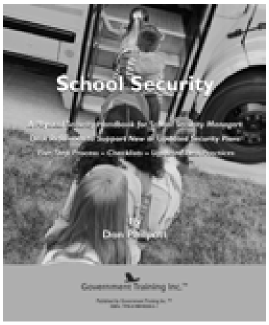

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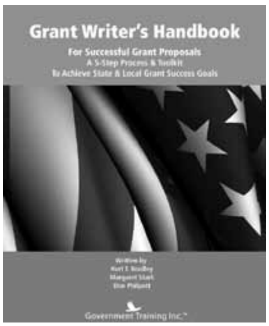

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About the Authors

Don Philpott

Don Philpott is editor of International Homeland Security, a quarterly journal for homeland security professionals, and has been writing, reporting and broadcasting on international events, trouble spots and major news stories for more than 40 years. For 20 years he was a senior correspondent with Press Association -Reuters, the wire service, and traveled the world on assignments including Northern Ireland, Lebanon, Israel, South Africa and Asia.

He writes for magazines and newspapers in the United States and Europe and is a contributor to radio and television programs on security and other issues. He is the author of more than 130 books on a wide range of subjects and has had more than 5,000 articles printed in publications around the world. His most recent books are The Integrated Physical Security Handbook II, Crisis Communications, Special Event Security, Planning & Management, and Personal Safety & Security. All of these books have been published by Government Training Inc.

He is a member of the National Press Club.

Walter "Butch" Presson Jr.

Walter "Butch" Presson Jr. has been employed at the SC Environmental Training Center at Central Carolina Technical College since 1995, enhancing the credibility of the ETC as the premier water and wastewater training provider in South Carolina. His reputation as an effective, knowledgeable instructor and water professional is known throughout the state with over 40 years of experience in the water/wastewater industry.

Butch holds South Carolina A-level operator licenses in Water Treatment, Biological Wastewater, Physical/ Chemical Wastewater and a B-level license in Water Distribution. He was the Water Environment of South Carolina's (WEASC) Swamp Fox District and Association Wastewater Operator of the Year in 1982, and was the first Chair of the WEASC Swamp Fox District in 1980. He served on the Water Environment Association Board of Directors (1986-87) and currently serves on the SC Environmental Certification Board's Continuing Education Committee. He is a member of the American Water Works Association, Water Environment Association of South Carolina and the Water Environment Federation.

Cynthia Presson

Cynthia Presson, Executive Director of the SC Section of American Water Works Association and the Water Environment Association of South Carolina, has been working in the environmental field for more than 20 years.

With a BS degree in Agronomy from LSU and a Masters in Business Management with emphasis on Non-Profit Leadership from New England College, Cindy has worked in various environmental areas during her career, including genetic, tissue culture and disease research on small fruit plants, wet chemistry lab analyses, hazardous waste treatment, storage, disposal and transportation, water & wastewater treatment & operations, environmental training & development, and association management. She holds SC A-level operator licenses in Physical/Chemical & Biological Wastewater treatment and a B-level in Water Treatment. Cindy is a Certified Environmental Trainer, including water/wastewater operations and facility vulnerability assessment and security.

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This manual has drawn heavily upon the authoritative materials published by the Federal Emergency Management Agency (FEMA), Department of Homeland Security (DHS), Government Accountability Office (GAO), General Services Administration (GSA), Environmental Protection Agency (EPA) and many other state and federal agencies. These materials are in the public domain and accreditation has been given both in the text and in the reference section. In some instances, when official reports are being mentioned in this book, opinions are stated. These are the opinions of expert witnesses and members of the report's panel, not the opinions of the authors. They are included, however, because they do contribute to the debate on protecting the nation's water infrastructure.

This book is based on the unique five step process developed for the Integrated Physical Security Handbook (Government Training, Inc.) for protecting the nation's critical infrastructure.

Introduction

This volume discusses methods for protecting your facility, equipment and services. It should be read in conjunction with volume one which discusses facility vulnerabilities and threats, how to develop an emergency response plan and how to implement it.

Once you have identified your facility's vulnerabilities and determined what level of threat they pose, you can develop a plan to eliminate the threat or at least, mitigate its impact. The sections in this volume explain what system hardening options are available to you, how and where they can be implemented and what you should know about them.

The key challenge in implementing IPS is to do the maximum necessary to ensure the safety and security of the facility and the critical assets within, without impacting on the day to day operational procedures.

The key elements that must always be considered are:

- **People** – the people that work in and visit the facility, those working and living nearby and those who rely on your products and services.
- **Operations** – the day to day running of the facility covering everything from shifts and deliveries to maintenance and utilities.
- **Information** – information/data sources and protection, communications internally and externally.
- **Assets** – other than people cover anything that is key to your mission that can be destroyed, damaged or stolen, and

- **Inter-dependence** – how what happens at your facility may impact on the wider community and how incidents at neighboring facilities might impact on you. You have to be aware of what is happening upstream and downstream of your facility.

A model security facility is one where all necessary systems are in place, tried and tested, to protect people, operations, inter-dependence and information without impacting on day to day operations. It is one where everyone knows why the systems are in place and what they have to do. It is a facility where confidence levels are high and people feel safe and secure.

You must take into account the following crucial elements – deterrence, detection, delay and response and then recovery and re-assessment – all are mitigation measures. These are the foundations on which any integrated physical security plan must be built.

- **Deterrence** - provides countermeasures such as policies, procedures, and technical devices and controls to defend against attacks on the assets being protected.
- **Detection** - monitors for potential breakdowns in protective mechanisms that could result in security breaches.
- **Delay** – provides measures that in the event of a breach, delays intruders long enough to allow a security team to apprehend them before they achieve their objective.
- **Response** - procedures and actions for responding to a breach. ***Note***: Because total protection is almost impossible to achieve, a security program that does not also incorporate detection, delay and response is incomplete. To be effective, all three concepts must be elements of a cycle that work together continuously.
- **Recovery** - your plan to continue business and operations as normally as possible following an incident. Mitigation planning is part of your response and recovery with the aim of minimizing the effects of any incident.
- **Re-assessment** - crucial and an ongoing process. Before implementing any changes, you need to revisit your strategic plan to ensure that goals and objectives will be met. Whenever there are changed circumstances or when new threats are identified, revisit your strategic plan and conduct a re-assessment to see what additional measures, if any, are needed.

Deter	Detection	Delay	Response
Discourage access	Intrusion sensing	Barriers	Interruption
	Alarm Communication	Dispensable barriers	Communication to response force
	Entry Control	Deployment of response force	Neutralization

Deter

- Barriers, sensors, fences, access controls
- Signage
- Visible cameras
- Guard stations
- Dogs
- Patrols

Detection

- Sensor Activated - Alarm Signal Initiated - Alarm Reported - Alarm Assessed
- Performance Measures
  - Probability of detection
  - Time for communication and assessment
  - Frequency of nuisance alarms
  - Alarm without assessment is not detection

Delay

- Protective force/guards/security
- Barriers

Response

Communicate to response force - Deploy Response Force - Neutralize adversary

- Performance measures:
  - Probability of communication to response force
  - Time to communicate
  - Probability of deployment to adversary location
  - Time to deploy
  - Response force effectiveness

When implementing facility hardening always bear in mind DDDR. What systems are you putting in place that will deter or delay an unwanted visitor, allow you to detect their presence in a timely manner and respond accordingly. Successful DDDR means you have a security facility.

CHAPTER 1

Systems Hardening

Aboveground, Outdoor Equipment Enclosures

Objective

Enclosures are installed on aboveground distribution and collection system appurtenances to prevent or delay unauthorized access to this equipment.

Application

Equipment enclosures can be installed over backflow prevention devices, valves, pumps, motors, and other critical equipment located outdoors and aboveground at water or wastewater treatment plants, at remote facilities (pumping stations, etc.), or within water distribution and other piping systems, to prevent tampering with, or altering of, the equipment's normal operation. Enclosures may be particularly useful in areas with public access.

Location Used

These enclosures are physically placed over the appurtenances to be protected.

Description

Water and wastewater systems consist of multiple components spread over a wide area, and typically include a centralized treatment plant, as well as distribution or collection system components that are typically distributed at multiple locations throughout the community. Utilities protect these components in many ways. Some of these components can be located below-ground in locked vaults, while others can be located inside locked buildings. However, in recent years, distribution and collection system designers have favored placing critical equipment - especially assets that require regular use and maintenance - aboveground. One of the primary reasons for doing so is that locating this equipment aboveground eliminates the safety risks associated with confined space entry, which is often required for the maintenance of equipment located below-ground. In addition, space restrictions often limit the amount of equipment that can be located inside, and there are concerns that some types of equipment (such as backflow prevention devices) can, under certain circumstances, discharge water that could flood pits, vaults, or equipment rooms. Therefore, many pieces of critical equipment are located outdoors and aboveground.

Securing equipment that is located outdoors and aboveground can be difficult. Erecting a fence or wall around the exposed components may provide some security, but this may be impractical for some components. For example, installing a fence or wall around a centralized treatment facility may be more practical than fencing every backflow preventer located within the community (particularly if these are located adjacent to private property). This Product Guide focuses on other types of security devices that can be used to secure aboveground, outdoor equipment.

Many different system components can be installed outdoors and aboveground. Examples of these types of components could include:

- Backflow prevention devices;
- Air release and control valves;
- Pressure vacuum breakers;
- Pumps and motors;
- Chemical storage and feed equipment;
- Meters;
- Sampling equipment; and
- Instrumentation.

Much of this equipment is installed in remote locations and/or in areas where the public can access it. For example, the accompanying graphic shows a backflow preventer located in the open near a private residence.

As described above, one of the most effective security measures for protecting aboveground equipment is to place it inside a building. When/where this is not possible, enclosing the equipment or parts of the equipment using some sort of commercial or homemade add-on structure may help to prevent tampering with the equipment. These types of add-on structures or enclosures, which are designed to protect the equipment both from the elements and from unauthorized access or tampering, typically consist of a box-like structure that is placed over the entire component, or over critical parts of the component (i.e., valves, etc.), and is then secured to delay or prevent intruders from tampering with the equipment. The enclosures are typically locked or otherwise anchored to a solid foundation, which makes it difficult to for unauthorized personnel to remove the enclosure and access the equipment.

Standard aboveground enclosures are available in a wide variety of materials, sizes, and configurations. Many options and security features are also available for each type of enclosure, and this allows system operators the flexibility to customize an enclosure for a specific application and/or price range. In addition, most manufacturers can custom-design enclosures if standard, off-the-shelf enclosures do not meet a user's needs.

Many of these enclosures are designed to meet certain standards. For example, the American Society of Sanitary Engineers (ASSE) has developed Standard #1060, Performance Requirements for Outdoor Enclosures for Backflow Prevention Assemblies. If an enclosure will be used to house a backflow preventer, this standard specifies the acceptable construction materials for the enclosure, as well as the performance requirements that the enclosure should meet, including specifications for freeze protection, drainage, air inlets, access for maintenance, and hinge requirements. ASSE #1060 also states that the enclosure should be lockable to enhance security.

Enclosure Configuration

Equipment enclosures can generally be categorized into one of four main configurations, which include:

- One piece, drop over enclosures;
- Hinged or removable top enclosures;
- Sectional enclosures; and
- Shelters with access doors.

Each of these enclosure types is discussed in more detail below.

A one piece, drop-over enclosure is typically used for small applications, such as housing a water meter. This enclosure is shaped like a doghouse, and has four sides with an integrated top or roof, and an open bottom (no floor). These enclosures are typically rectangular in shape, with interior lengths ranging from 20 to 62 inches and interior widths ranging from 22 to 50 inches. This type of enclosure is easy to install because it is simply placed over the desired piece of equipment and secured to some sort of foundation. Options for setting foundations are similar for each enclosure configuration, and are discussed in the following section.

Both standard and decorative enclosures are available. A standard enclosure has flat walls on all sides, whereas a decorative enclosure is designed to resemble some natural feature, such as a rock or a tree stump. Decorative enclosures may help to disguise system components that are located within a landscaped area or in a noticeable location in the community.

Hinged or removable top enclosures are similar in size and shape to one piece, drop-over enclosures, are installed in a similar fashion, and are used for the same types of applications. The difference between the two enclosure types is the means of access to the equipment housed inside. As discussed above, a one piece, drop-over enclosure has an integral top, and in order to reach the equipment enclosed by this device, the entire enclosure needs to be removed. The advantage of the hinged or removable top enclosure is that only the top needs to be taken off, or opened, to access the enclosed equipment.

The hinges on a hinged top enclosure are designed to hold the top in an upright position once it is opened, and the top will not close until the operator places it back down. The hinges are typically located inside of the enclosure to prevent vandalism and unauthorized access.

The top from a removable top enclosure can be unfastened and set aside to access the system component, and can be replaced when the inspection or work is complete. This type of enclosure is also available with access doors built into the sides.

Sectional enclosures and shelters are typically used for larger applications, such as for housing a pump or a backflow prevention device. These units consist of individual sections, one of which contains an access door. They can range from 53 to 172 inches in length, and from 33 to 87 inches in width. Standard units consist of two, four, or six modular sections that fit together with a "tongue and groove" connection. To assemble an enclosure, each section is pushed together around the piece of equipment to be protected, ensuring a tight connection. The enclosure is then fastened to a concrete or other type of anchored foundation. Sectional enclosures are equipped with a minimum of one sliding door to access the component inside. The enclosure can be easily disassembled, providing an additional means of accessing the equipment inside.

Shelters with access doors are house-like structures that can be erected either by installing them over a piece of equipment that is already in place, or by putting them in place first and then assembling the equipment inside them. Standard shelter units typically range from four to sixteen feet in width, and from six to twenty-four feet in length. These enclosures can have flat or pitched roofs, and eve heights of seven, eight, or twelve feet are commonly available. At a minimum, these shelters are equipped with a standard hinged door for accessing the component inside. Shelters can also be fabricated with rolling "garage" doors, and are available with or without an integral floor.

Attributes and Features

Foundations

All enclosures, including those with integral floors, must be secured to a foundation to prevent them from being moved or removed. Un- or poorly-anchored enclosures may be blown off the equipment being protected, or may be defeated by intruders. In either case, this may result in the equipment beneath the enclosure becoming exposed and damaged. Therefore, ensuring that the enclosure is securely anchored will increase the security of the protected equipment.

The three basic types of foundations that can be used to anchor the aboveground equipment enclosure are concrete footers, concrete slabs-on-grade, or manufactured fiberglass pads. The most common types of foundations utilized for equipment enclosures are standard or slab-on-grade footers; however, local climate and soil conditions may dictate whether either of these types of foundations can be used. These foundations can be either precast or poured in place at the installation site. Once the foundation is installed and properly cured, the equipment enclosure is bolted or anchored to the foundation to secure it in place. A concrete foundation is shown in the photograph of the sectional enclosure above.

An alternative foundation, specifically for use with smaller Hot Box enclosures, is a manufactured fiberglass pad known as the Glass Pad™. The Glass Pad™ has the center cut out so that it can be dropped directly over the piece of equipment being enclosed. Once the pad is set level on the ground, it is backfilled over a two-inch flange located around its base. The enclosure is then placed on top of the foundation, and is locked in place with either a staple- or a slotted-anchor, depending on the enclosure configuration.

Construction Materials

One of the primary attributes of a security enclosure is its strength and resistance to breaking and penetration. Accordingly, the materials from which the enclosure is constructed will be important in determining the strength of the enclosure, and thus its usefulness for security applications. Enclosures are typically manufactured from either fiberglass or aluminum. With the exception of the one piece, drop-over enclosure, which is typically fabricated from fiberglass, each configuration described above can be constructed from either material. In addition, enclosures can be custom-manufactured from polyurethane, galvanized steel, or stainless steel. Galvanized or stainless steel is often offered as an exterior layer, or "skin," for an aluminum enclosure. Although they are typically utilized in underground applications, precast concrete structures can also be used as aboveground equipment enclosures. However, precast structures are much heavier and more difficult to maneuver than are their fiberglass and aluminum counterparts. Concrete is also brittle, and that can be a security concern; however, products can be applied to concrete structures to add strength and minimize security risks (i.e., epoxy coating). Because precast concrete structures can be purchased from many concrete producers, this document does not identify specific vendors for these types of products.

In addition to the construction materials, enclosure walls can be configured or reinforced to give them added strength. Adding insulation is one option that can strengthen the structural characteristics of an enclosure; however, some manufacturers offer additional features to add strength to exterior walls. For example, while most enclosures are fabricated with a flat wall construction, some vendors manufacture fiberglass shelters with ribbed exterior walls. These ribs increase the structural integrity of the wall and allow the fabrication of standard shelters up to twenty feet in length. Another vendor has developed a proprietary process that uses a series of integrated fiberglass beams that are placed throughout a foam inner core to tie together the interior and exterior walls and roof. Yet another vendor constructs aluminum enclosures with horizontal and vertical redwood beams for structural support.

Security Features

Other security features that can be implemented on aboveground, outdoor equipment enclosures are discussed below.