

# Guidelines for the Physical Security of Water Utilities

ANSI/ASCE/EWRI 56-10

# Guidelines for the Physical Security of Wastewater/ Stormwater Utilities

ANSI/ASCE/EWRI 57-10

This document uses both the  
International System of Units (SI)  
and customary units

ASCE STANDARD

ANSI/ASCE/EWRI 56-10

ANSI/ASCE/EWRI 57-10

**American Society of Civil Engineers**

# **Guidelines for the Physical Security of Water Utilities**

**ANSI/ASCE/EWRI 56-10**

# **Guidelines for the Physical Security of Wastewater/ Stormwater Utilities**

**ANSI/ASCE/EWRI 57-10**

This document uses both the International System of Units (SI)  
and customary units.



**ENVIRONMENTAL &  
WATER RESOURCES  
INSTITUTE**

**Published by the American Society of Civil Engineers**

[This is a preview. Click here to purchase the full publication.](#)

## Library of Congress Cataloging-in-Publication Data

Guidelines for the physical security of water utilities, ASCE/EWRI 56-10. Guidelines for the physical security of wastewater-stormwater utilities ASCE/EWRI 57-10.

p. cm.

Includes bibliographical references and index.

ISBN 978-0-7844-1126-1 (alk. paper)

1. Water treatment plants—Security measures—Standards. 2. Storm sewers—Security measures—Standards. I. American Society of Civil Engineers. II. Environmental and Water Resources Institute (U.S.) III. Guidelines for the physical security of wastewater-stormwater utilities ASCE/EWRI 57-10

TD434.G85 2010

363.6'10684—dc22

2010047168

Published by American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, Virginia 20191  
[www.pubs.asce.org](http://www.pubs.asce.org)

This standard was developed by a consensus standards development process which has been accredited by the American National Standards Institute (ANSI). Accreditation by ANSI, a voluntary accreditation body representing public and private sector standards development organizations in the U.S. and abroad, signifies that the standards development process used by ASCE has met the ANSI requirements for openness, balance, consensus, and due process.

While ASCE's process is designed to promote standards that reflect a fair and reasoned consensus among all interested participants, while preserving the public health, safety, and welfare that is paramount to its mission, it has not made an independent assessment of and does not warrant the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed herein. ASCE does not intend, nor should anyone interpret, ASCE's standards to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this standard.

ASCE has no authority to enforce compliance with its standards and does not undertake to certify products for compliance or to render any professional services to any person or entity.

ASCE disclaims any and all liability for any personal injury, property damage, financial loss or other damages of any nature whatsoever, including without limitation any direct, indirect, special, exemplary, or consequential damages, resulting from any person's use of, or reliance on, this standard. Any individual who relies on this standard assumes full responsibility for such use.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

*Photocopies and reprints.* You can obtain instant permission to photocopy ASCE publications by using ASCE's online permission service (<http://pubs.asce.org/permissions/requests/>). Requests for 100 copies or more should be submitted to the Reprints Department, Publications Division, ASCE (address above); e-mail: [permissions@asce.org](mailto:permissions@asce.org). A reprint order form can be found at <http://pubs.asce.org/support/reprints/>.

Copyright © 2011 by the American Society of Civil Engineers.

All Rights Reserved.

ISBN 978-0-7844-1126-1

Manufactured in the United States of America.

18 17 16 15 14 13 12 11      1 2 3 4 5

## STANDARDS

In 2006, the Board of Direction approved the revision to the ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Society's Codes and Standards Committee (CSC). The consensus process includes balloting by a balanced standards committee made up of Society members and nonmembers, balloting by the membership of the Society as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding five years.

The following standards have been issued:

- ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
- ASCE/EWRI 2-06 Measurement of Oxygen Transfer in Clean Water
- ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
- ASCE 4-98 Seismic Analysis of Safety-Related Nuclear Structures
- Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and Specifications for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)
- ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures
- SEI/ASCE 8-02 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
- ANSI/ASCE 9-91 listed with ASCE 3-91
- ASCE 10-97 Design of Latticed Steel Transmission Structures
- SEI/ASCE 11-99 Guideline for Structural Condition Assessment of Existing Buildings
- ASCE/EWRI 12-05 Guideline for the Design of Urban Subsurface Drainage
- ASCE/EWRI 13-05 Standard Guidelines for Installation of Urban Subsurface Drainage
- ASCE/EWRI 14-05 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
- ASCE 15-98 Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
- ASCE 16-95 Standard for Load Resistance Factor Design (LRFD) of Engineered Wood Construction
- ASCE 17-96 Air-Supported Structures
- ASCE 18-96 Standard Guidelines for In-Process Oxygen Transfer Testing
- ASCE/SEI 19-10 Structural Applications of Steel Cables for Buildings
- ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations
- ANSI/ASCE/T&DI 21-05 Automated People Mover Standards—Part 1
- ANSI/ASCE/T&DI 21.2-08 Automated People Mover Standards—Part 2
- ANSI/ASCE/T&DI 21.3-08 Automated People Mover Standards—Part 3
- ANSI/ASCE/T&DI 21.4-08 Automated People Mover Standards—Part 4
- SEI/ASCE 23-97 Specification for Structural Steel Beams with Web Openings
- ASCE/SEI 24-05 Flood Resistant Design and Construction
- ASCE/SEI 25-06 Earthquake-Actuated Automatic Gas Shutoff Devices
- ASCE 26-97 Standard Practice for Design of Buried Precast Concrete Box Sections
- ASCE 27-00 Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
- ASCE 28-00 Standard Practice for Direct Design of Precast Concrete Box Sections for Jacking in Trenchless Construction
- ASCE/SEI/SFPE 29-05 Standard Calculation Methods for Structural Fire Protection
- SEI/ASCE 30-00 Guideline for Condition Assessment of the Building Envelope
- SEI/ASCE 31-03 Seismic Evaluation of Existing Buildings
- SEI/ASCE 32-01 Design and Construction of Frost-Protected Shallow Foundations
- EWRI/ASCE 33-09 Comprehensive Transboundary International Water Quality Management Agreement
- EWRI/ASCE 34-01 Standard Guidelines for Artificial Recharge of Ground Water
- EWRI/ASCE 35-01 Guidelines for Quality Assurance of Installed Fine-Pore Aeration Equipment
- CI/ASCE 36-01 Standard Construction Guidelines for Microtunneling
- SEI/ASCE 37-02 Design Loads on Structures during Construction
- CI/ASCE 38-02 Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data
- EWRI/ASCE 39-03 Standard Practice for the Design and Operation of Hail Suppression Projects
- ASCE/EWRI 40-03 Regulated Riparian Model Water Code
- ASCE/SEI 41-06 Seismic Rehabilitation of Existing Buildings
- ASCE/EWRI 42-04 Standard Practice for the Design and Operation of Precipitation Enhancement Projects
- ASCE/SEI 43-05 Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities
- ASCE/EWRI 44-05 Standard Practice for the Design and Operation of Supercooled Fog Dispersal Projects
- ASCE/EWRI 45-05 Standard Guidelines for the Design of Urban Stormwater Systems
- ASCE/EWRI 46-05 Standard Guidelines for the Installation of Urban Stormwater Systems
- ASCE/EWRI 47-05 Standard Guidelines for the Operation and Maintenance of Urban Stormwater Systems
- ASCE/SEI 48-06 Design of Steel Transmission Pole Structures
- ASCE/EWRI 50-08 Standard Guideline for Fitting Saturated Hydraulic Conductivity Using Probability Density Functions
- ASCE/EWRI 51-08 Standard Guideline for Calculating the Effective Saturated Hydraulic Conductivity
- ASCE/SEI 52-10 Design of Fiberglass-Reinforced Plastic (FRP) Stacks

ASCE/G-I 53-10 Compaction Grouting Consensus Guide  
ASCE/EWRI 54-10 Standard Guideline for the Geostatistical  
Estimation and Block-Averaging of Homogeneous and Isotropic Saturated Hydraulic Conductivity  
ASCE/SEI 55-10 Tensile Membrane Structures  
ANSI/ASCE/EWRI 56-10 Guidelines for the Physical Security  
of Water Utilities

ANSI/ASCE/EWRI 57-10 Guidelines for the Physical Security  
of Wastewater/Stormwater Utilities  
ASCE/T&DI/ICPI 58-10 Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

# CONTENTS

FOREWORD . . . . .	Page ix
ACKNOWLEDGMENTS . . . . .	xi
<b>GUIDELINES FOR THE PHYSICAL SECURITY OF WATER UTILITIES</b>	
1 Application of Guidelines . . . . .	1
1.1 Introduction . . . . .	1
1.1.1 Elements of a Physical Protection System . . . . .	1
1.1.1.1 Deterrence . . . . .	1
1.1.1.2 Detection . . . . .	1
1.1.1.3 Delay . . . . .	1
1.1.1.4 Response . . . . .	1
1.1.2 Design Basis Threat . . . . .	1
1.1.2.1 Vandal . . . . .	1
1.1.2.2 Criminal . . . . .	1
1.1.2.3 Saboteur . . . . .	2
1.1.2.4 Insider . . . . .	2
1.2 Methodology for Applying These Guidelines . . . . .	4
1.2.1 Instructions for Applying These Guidelines . . . . .	4
1.2.1.1 Step 1: Vulnerability Assessment . . . . .	4
1.2.1.2 Step 2: Characterize Design Basis Threat . . . . .	5
1.2.1.3 Step 3: Identify Security Measures . . . . .	5
1.2.1.4 Step 4: Consider Consequence Mitigation . . . . .	5
1.2.2 Additional Information to Assist in Applying . . . . .	6
1.2.2.1 New and Existing Facilities . . . . .	6
1.2.2.2 Local Codes and Required Aesthetics . . . . .	6
1.2.2.3 Assets Not Under Utility Control . . . . .	6
1.2.2.4 Balance of the System . . . . .	6
1.2.2.5 Value of the Asset . . . . .	6
1.2.2.6 Levels of Security Measures . . . . .	6
1.2.2.7 Response Time and Capabilities . . . . .	6
2 Raw Water Facilities . . . . .	7
2.1 Scope . . . . .	7
2.2 Facility Mission . . . . .	7
2.3 Philosophy of Security Approach . . . . .	7
2.4 Benchmark Security Measures . . . . .	7
3 Wells and Pumping Stations . . . . .	13
3.1 Scope . . . . .	13
3.2 Facility Mission . . . . .	13
3.3 Philosophy of Security Approach . . . . .	13
3.4 Benchmark Security Measures . . . . .	13
4 Water Treatment Plants . . . . .	19
4.1 Scope . . . . .	19
4.2 Facility Mission . . . . .	19
4.3 Philosophy of Security Approach . . . . .	19
4.4 Benchmark Security Measures . . . . .	19
5 Finished Water Storage Facilities . . . . .	25
5.1 Scope . . . . .	25
5.2 Facility Mission . . . . .	25

5.3	Philosophy of Security Approach . . . . .	25
5.4	Benchmark Security Measures . . . . .	25
6	Water Distribution Systems . . . . .	31
6.1	Scope. . . . .	31
6.2	System Mission . . . . .	31
6.3	Philosophy of Security Approach . . . . .	31
6.4	Benchmark Security Measures . . . . .	31
7	Water System Support Facilities. . . . .	35
7.1	Scope. . . . .	35
7.2	Facility Mission . . . . .	35
7.3	Philosophy of Security Approach . . . . .	35
7.4	Benchmark Security Measures . . . . .	35
Appendix A	Physical Security Elements . . . . .	41
A.1.0	Fencing and Perimeter Walls . . . . .	41
A.1.1	Chain-Link Fencing . . . . .	41
A.1.2	Anti-Climb/Anti-Cut Fencing. . . . .	41
A.1.3	Ornamental Fencing. . . . .	41
A.1.4	Perimeter Wall. . . . .	42
A.1.5	Fencing Topping. . . . .	42
A.1.6	Perimeter Line. . . . .	42
A.1.7	Fence Foundation Enhancements . . . . .	42
A.2.0	Gates . . . . .	42
A.2.1	Chain-Link Gates . . . . .	42
A.2.2	Electronic Gate Opening . . . . .	42
A.2.3	Electronic Gate Control System . . . . .	43
A.3.0	Site Areas . . . . .	43
A.3.1	Clear Zones . . . . .	43
A.3.2	Site Utilities . . . . .	43
A.4.0	Facility Entrances . . . . .	43
A.4.1	Sallyport Entrances . . . . .	43
A.4.2	Building Entrances . . . . .	44
A.5.0	Bollards and other Vehicle Barriers . . . . .	44
A.6.0	Exterior Surfaces . . . . .	44
A.7.0	Outdoor Security Lighting. . . . .	44
A.8.0	Signage. . . . .	44
A.8.1	Fence Signage . . . . .	44
A.8.2	Primary Site Entrance Signage . . . . .	44
A.8.3	Water Intake Delineation . . . . .	45
A.9.0	Electronic Security Systems. . . . .	45
A.9.1	Intrusion Detection Sensors: General . . . . .	45
A.9.2	Exterior Intrusion Detection. . . . .	45
A.9.2.1	Active Infrared Sensors . . . . .	45
A.9.2.2	Microwave Sensors. . . . .	45
A.9.2.3	Dual-Technology Sensors . . . . .	45
A.9.2.4	Buried Line Sensors . . . . .	45
A.9.2.5	Fence-Mounted Sensors . . . . .	45
A.9.3	Interior Intrusion Detection . . . . .	46
A.9.3.1	Dual-Technology Motion Sensors . . . . .	46
A.9.3.2	Linear Beam Sensors. . . . .	46
A.9.3.3	Glass-Break Sensors . . . . .	46
A.9.4	Door and Hatch Contact Alarm Switches. . . . .	46
A.9.5	Pipeline Vibration Detection . . . . .	46
A.10.0	Access Control Systems. . . . .	46
A.10.1	Access Control Systems: General. . . . .	46
A.10.2	Locks and Padlocks . . . . .	46
A.10.3	Numeric Keypad Locks . . . . .	46
A.10.4	Card Reader Systems . . . . .	46
A.11.0	Closed-Circuit Television (CCTV) Surveillance . . . . .	47
A.11.1	General Considerations . . . . .	47

A.11.2	Field of View . . . . .	47
A.11.3	CCTV Housings and Mounts . . . . .	47
A.11.4	Video Network Servers . . . . .	47
A.11.5	Digital Video Recorders. . . . .	47
A.11.6	CCTV Computer Application Software. . . . .	48
A.12.0	Security, Controls, and SCADA Wiring. . . . .	48
A.12.1	SCADA and Electrical Control Panel Enclosures . . . . .	48
A.13.0	Building Elements . . . . .	48
A.13.1	General . . . . .	48
A.13.2	Doors . . . . .	48
A.13.3	Security Grilles . . . . .	48
A.13.4	Security Cages. . . . .	48
A.14.0	Hatches, Vaults, and Vents . . . . .	48
A.14.1	Hatch, Vault, and Vent Alarms: General . . . . .	48
A.14.2	Roof or Sidewalk Hatches . . . . .	48
A.14.3	Roof Vents. . . . .	49
A.14.4	Vault Hatch with Elevated Curb . . . . .	49
A.14.5	Vault Door Hatch Set Flush with Top of a Structural Slab. . . . .	49
A.15.0	Online Water Quality Monitoring . . . . .	49
A.16.0	Operator Devices . . . . .	49
A.16.1	Man-Down Transmitter . . . . .	49
A.17.0	Chemical Fill-Line Locking Devices . . . . .	49
A.18.0	Hydrants . . . . .	49
A.19.0	Manholes. . . . .	49
GLOSSARY AND ABBREVIATIONS . . . . .		51
REFERENCES . . . . .		55
<b>GUIDELINES FOR THE PHYSICAL SECURITY OF WASTEWATER/STORMWATER UTILITIES. . . . .</b>		<b>67</b>
INDEX . . . . .		111





## FOREWORD

These guidelines were developed as a joint effort between the American Society of Civil Engineers (ASCE) and the American Water Works Association (AWWA) with technical input from the Water Environment Federation (WEF), in accordance with ASCE Rules for Standards Committees, and were published initially as a proposed draft, *Guidelines for the Physical Security of Water Utilities* (ASCE/AWWA/WEF 2006). That consensus process included balloting by a balanced Standards Committee and reviewing during a public comment period. The provisions of this document have been written in permissive language and, as such, offer to the user a series of options or instructions but do not prescribe a specific course of action. Significant judgment is left to the user of these documents.

These guidelines use customary units with the International System of Units (SI) in parentheses. This approach was in the best interest of ASCE, AWWA, and WEF at the time of development of the initial Draft of these guidelines.

### PURPOSE OF THE GUIDELINES

These guidelines apply to physical security for facilities used in potable water source, treatment, and distribution systems.

### BACKGROUND OF THE DEVELOPMENT

Highlights related to the creation of all the Water Infrastructure Security Enhancements (WISE) guidance documents and/or standards in the early years of the twenty-first century are summarized below:

1. Under the U.S. Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (PL 107–188), drinking water utilities serving more than 3,300 customers were required to conduct vulnerability assessments (VAs) of their water systems. The VAs often recommended security improvements to reduce the risk of malevolent acts (such improvements may also reduce the risk associated with natural events). Similar requirements for wastewater utilities have yet to be promulgated, but the protection of wastewater utility facilities using similar approaches has been promoted by the U.S. Environmental Protection Agency (USEPA) and various industry organizations. In addition, ASCE, AWWA, and WEF agreed to work together to develop materials to assist in the implementation of security recommendations and the overall improvement of water and wastewater infrastructure security. The project was funded by USEPA under a cooperative agreement to foster public/private partnership in water and wastewater security. This project was known as the USEPA Water Infrastructure Security Enhancements (WISE) Project.
2. The three organizations each became responsible for a portion of the project: AWWA led the drinking water supply, treatment, and distribution systems effort; WEF led the wastewater and stormwater collection, treatment, and disposal systems effort; and ASCE led the effort concerning the methodology and characteristics pertinent to design of contaminant detection and monitoring systems for both water and wastewater systems.
3. Phase 1 of the USEPA WISE project focused on the creation of Interim Voluntary Security Guidance documents (ASCE/AWWA/WEF 2004a, 2004b, 2004c). The purpose of these documents was to provide a centralized starting point for utilities as they integrate modern security practices into the management, operation, construction, or retrofit of their water, wastewater, and stormwater systems. Training materials were developed in Phase 2 to disseminate the information contained in the Phase 1 guidance documents.
4. Under the direction of USEPA, Phase 3 focused solely on the development of physical security guidelines for water, wastewater, and stormwater facilities. These voluntary consensus guidelines were first developed as the Draft and were published initially as *Guidelines for Physical Security for Water Utilities* (ASCE/AWWA/WEF 2006). The primary reviewers were members of the Water Supply Subcommittee of the ASCE WISE Standards Committee (SC), and the USEPA/ASCE/AWWA/WEF WISE Project Phase 3 Team.
5. The sections compiled in these guidelines are intended to provide direction to water utilities on how to design or retrofit their infrastructure, with consideration given to their unique circumstances and threats. A discussion of the various security threats and incidents that have occurred at water and wastewater utilities is provided in an American Water Works Association Research Foundation report by Welter (2003). This document can provide additional information in the assessment of security measures for utilities.
6. The USEPA Water Security Working Group presented its report *Recommendations of the National Drinking Water Advisory Council to the U.S. Environmental Protection Agency on Water Security Practices, Incentives, and Measures* to the National Drinking Water Advisory Council (NDWAC) on May 18, 2005 (WSWG 2005). Those findings included 18 features of an “active and effective” security program. These guidelines address the following NDWAC recommendations, which discuss physical security:
  - a. Establish physical and procedural controls to restrict access to utility infrastructure to only those conducting authorized, official business and to detect unauthorized physical intrusions.
  - b. Incorporate security considerations into decisions about acquisition, repair, major maintenance, and replacement of physical infrastructure; this should include consideration of opportunities to reduce risk through physical hardening and the adoption of inherently lower-risk design and technology options.
7. These guidelines should be implemented in concert with the other features and approaches described in the NDWAC report (WSWG 2005).