

PROTECTING AMERICA'S UTILITIES INFRASTRUCTURE

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ABSTRACT

Acts of terrorism in the United States and around the world have created concern about the possibility of future incidents. Steps have been taken and are continually being taken to assure the safety of all Americans. But do those steps adequately include threats to our nation's utilities? There are many inviting targets, such as nuclear plants, natural gas facilities, water treatment plants, electrical substations and dams, and telecommunications central offices and switching facilities. There are also many thousands of miles of utility lines serving these facilities. In order to resist, respond to, and recover from terrorist attacks, facility owners must know where all utility lines are that serve their facilities and what they are. Identifying and mapping existing utilities is an obvious priority for owners of utilities and major facilities. The American Society of Civil Engineers (ASCE) has developed a national standard, CI/ ASCE 38-02, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*, which addresses such utility identification and mapping procedures. This presentation will discuss existing utility-related dangers and recommended methods for identifying and mapping existing assets.

BACKGROUND

Acts of terrorism in the United States and around the world have created concern about the possibility of future incidents. Steps have been taken and are continually being taken to assure the safety of all Americans. But do those steps adequately include threats to our nation's utilities? There are many inviting utilities targets. In order to resist, respond to, and recover from terrorist attacks, facility owners must know where all utility lines are that serve their facilities.

On December 17, 2003, President George W. Bush signed Homeland Security Presidential Directive-7 (HSPD-7) pertaining to Critical Infrastructure Identification, Prioritization, and Protection. This directive established a national policy directing federal departments and agencies to work with state and local governments and the private sector to identify and prioritize critical infrastructure and to protect it from terrorist attacks.

HSPD-7 cautions that terrorists seek to destroy, incapacitate, or exploit critical infrastructure across the United States in order to threaten national security, cause mass casualties, weaken the economy, and damage public morale and confidence. It points out that this critical infrastructure provides the essential services that underpin American society. It concludes that while it is not possible to protect or eliminate the vulnerability of all critical infrastructure throughout the country, strategic improvements in security can make it more difficult for attacks to succeed and can lessen the impact of attacks that may occur. (1)

Other important homeland security efforts include (a) the National Critical Infrastructure Program that was created to identify America's critical public infrastructure, and (b) the

Protected Critical Infrastructure Information Program that was created to allow the private sector to voluntarily submit information on buildings, energy plants, oil refineries, and other key resources. (2)

To further the efforts of these initiatives, the Department of Homeland Security issued a grant to a group led by the American Society of Mechanical Engineers to develop a methodology for making vulnerability assessments called Risk Analysis and Management for Critical Assets Protection (RAMCAP). The first phase of this project includes nine areas: nuclear reactors and waste storage; chemical plants; refineries; liquefied natural gas tanks; subways; railroads; highways; and power systems. (2)

UTILITY TARGETS

Utilities are among the most critical infrastructure in the United States. Numerous facilities and lines produce, transmit, and distribute communications, electricity, gas, oil, cable television, high-speed internet, crude products, steam, waste, storm water, and other similar commodities.

These utilities serve many utility facilities that may be targeted, including nuclear plants, hydroelectric dams and electrical substations, water treatment facilities, major telecommunications central offices and switching facilities, and petroleum storage tanks.

These major utility facilities are well protected from terrorist attacks. This can be seen from the priorities established above in the RAMCAP program. Plans have been made to safeguard them, and if necessary, to respond to and recover from any attacks that may occur.

More at risk than the facilities themselves are the utilities that serve them. These utilities include:

- Overhead lines transmitting and distributing electricity and communications, including cable television and high-speed internet service.
- Underground conduits containing electrical, fiber optic, and other lines transmitting and distributing electricity and communications.
- Pipelines carrying gas, oil, and other flammable and explosive products.
- Vaults, manholes, pedestals, junction boxes, and other structures for power and communication systems.

Not only do utilities such as these serve major utility facilities, they also serve other critical facilities such as large buildings, airports, subways, military bases, sports stadiums, schools, gas stations, banks, tunnels, and much, much more.

Underground utilities may be the most vulnerable. They create many opportunities for access to otherwise secure facilities. Owners of critical facilities obviously need to know where the utilities are that serve their facilities, and what they are. But, unfortunately many do not. Whereas, major utility facilities are afforded utmost security, utility lines

serving these and other facilities are often ignored. Often they are not even known to exist. Records of these existing utilities are generally poor, incomplete, or difficult to interpret.

Identifying and mapping existing utilities is an obvious priority for owners of utilities and of other major facilities if they expect to be able to resist, respond to, and recover from terrorist attacks. Facility owners, as a minimum, in order to enhance security and to be able to respond to and recover from terrorist attacks, should establish a perimeter zone around their facilities, and should obtain accurate and comprehensive information about all utilities crossing that perimeter.

The American Society of Civil Engineers (ASCE) has developed a national standard, CI/ASCE 38-02, *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data*, which addresses such utility mapping procedures. (3)

COLLECTING AND DEPICTING UTILITIES DATA

The ASCE standard guideline addresses issues such as:

- How utility information can be obtained,
- What technologies are available to obtain that information, and
- How that information can be conveyed to the information users.

The intent of the standard guideline is to present a system of classifying the quality of data associated with existing subsurface utilities. Such a classification will allow facility owners, engineers, and utility owners to develop strategies to reduce risks by improving the reliability of information on existing subsurface utilities in a defined manner.

The ASCE standard guideline recognizes four quality levels of subsurface utility information that should be depicted on mapping documents. These quality levels range from Quality Level D (the lowest level) to Quality Level A (the highest level). The highest level of accuracy and comprehensiveness is generally not needed at every point along a utility's path, only at certain points where it is essential to map the utility line in three dimensions. Hence, lesser levels of information may be appropriate at most points along a utility's path.

The process set forth in the ASCE standard guideline for collecting utility information is as follows:

- Collect and correlate existing utility records. This is Quality Level D (QL-D) information. It may provide an overall "feel" for the existence of certain utilities, but it is often highly limited in terms of comprehensiveness and accuracy.
- Survey visible above-ground utility facilities, such as manholes, valve boxes, posts, etc., and correlate this information with existing utility records. This is Quality Level C (QL-C) information. When using this information, it is not

unusual to find that many underground utilities have been either omitted or erroneously plotted.

- Apply appropriate surface geophysical techniques to determine the existence and horizontal position of underground utilities. This is Quality Level B (QL-B) information. This activity provides two-dimensional mapping information.
- Use nondestructive digging equipment at critical points to expose subsurface utilities in order to determine the precise horizontal and vertical position, as well as the type, size, condition, material, and other characteristics. This is Quality Level A (QL-A) information. This activity provides the highest level of information presently available.
- Survey to facility owner's requirements and map resulting precise plan and profile information.

Utilization of this step-by-step process will allow facility owners not only to map utilities serving their facility, but also to know exactly how reliable the mapped information is.

CONCLUSIONS

Homeland Security Presidential Directive 7 (HSPD-7):

- Directs Federal departments and agencies to work with State and local governments and the private sector to identify and prioritize critical infrastructure and to protect them from terrorist attacks,
- Cautions that terrorists seek to destroy, incapacitate, or exploit critical infrastructure across the United States in order to threaten national security, cause mass casualties, weaken the economy, and damage public morale and confidence,
- Points out that this critical infrastructure provides the essential services that underpin American society, and
- Concludes that while it is not possible to protect or eliminate the vulnerability of all critical infrastructure throughout the country, strategic improvements in security can make it more difficult for attacks to succeed and can lessen the impact of attacks that may occur.

Utilities are among the most critical infrastructure in the United States. Attractive utility facilities that may be targeted include nuclear plants, hydroelectric dams, electrical substations, water treatment facilities, major telecommunications central offices and switching facilities, and petroleum storage tanks.

More at risk than the facilities themselves are the utilities that serve them. These utilities may include overhead and underground lines transmitting and distributing electricity and communications, pipelines carrying gas, oil, and other flammable and explosive products, and numerous vaults, manholes, pedestals, junction boxes, and other structures for power and communication systems. Not only do utilities such as these serve major utility

facilities, they also serve other critical facilities such as large buildings, airports, subways, military bases, sports stadiums, schools, gas stations, banks, tunnels, and much, much more.

Underground utilities may be the most vulnerable. They create many opportunities for access to otherwise secure facilities. Owners of critical facilities obviously need to know where the utility facilities are that serve their facilities, and what they are. But many do not.

Identifying and mapping existing utilities is an obvious priority for utility owners and owners of other major facilities if they expect to be able to resist, respond to, and recover from terrorist attacks. Facility owners, as a minimum, should establish a perimeter zone around their facilities, and should obtain accurate and comprehensive information about all utilities crossing that perimeter.

The ASCE's *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data* addresses issues such as how utility information can be obtained, what technologies are available to obtain that information, and how that information can be conveyed to the information users. It recognizes four quality levels of subsurface utility information that should be depicted on mapping documents and sets forth a systematic process for collecting utility information.

The process set forth in the ASCE standard guideline for collecting utility information basically involves (a) collecting and correlating existing utility records (QL-D); (b) surveying visible above-ground utility facilities and correlating this information with existing utility records (QL-C); (c) applying appropriate surface geophysical techniques to determine the existence and horizontal position of underground utilities (QL-B); (d) using nondestructive digging equipment at critical points to expose subsurface utilities in order to determine the precise horizontal and vertical position, as well as the type, size, condition, material, and other characteristics (QL-A); and (e) surveying utilities information to the facility owner's requirements and mapping resulting precise plan and profile information. Utilization of this step-by-step process will allow facility owners not only to map utilities serving their facility, but also to know exactly the reliability of the mapped information.

By using this step-by-step process, facility owners can be assured that they are aware of all utilities entering their facilities and that they will be able to successfully resist, respond to, and recover from terrorist attacks.

REFERENCES

Homeland Security Presidential Directive 7 (HSPD-7), Critical Infrastructure Identification, Prioritization, and Protection, December 17, 2003.

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