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FACILITY SECURITY: INTRUSION SYSTEMS -- PART 1

An intruder just entered your facility. Do you know they're there? If so, are you prepared for what might happen next? The best way to combat these legitimate security concerns is to install an intrusion detection system to protect your facility and employees. Why? A properly designed intrusion detection system should identify when and where an intruder first enters your facility as well as pinpoint their present location. But how do you choose a system when there are so many varieties available? Familiarizing yourself with the specifics of the following security solutions will help narrow your search.

Breaking an electrical circuit. You can wire points of entry into buildings or enclosures using electrically sensitized strips of metallic foil or wire. Any action that breaks the foil or wire breaks the electrical circuit and activates an alarm (audible, visual, or silent). You typically install metallic foil on glass surfaces. You can also equip doors and windows with magnetic contact switches, which activate an alarm when the door or window is open, thus creating a break in the electric circuit.

These systems consistently provide the most trouble-free service and cause few (if any) nuisance alarms. You'll find this system adequate in most low-risk applications. However, this system can become costly to install when you're trying to monitor many entry points. You can also compromise the system if you apply it improperly. Another note of caution: An intruder can defeat this system by bridging the circuits.

Interrupting a light beam. This photoelectric detection system derives its name from the use of a light-sensitive cell and a projected-light source. The source transmits invisible light beams at several thousand pulses per second, and the cell receives them. An infrared filter over the light source makes the light beam invisible to intruders. Then, you hardwire the cell to a control station. When an intruder crosses the beam, the light beam breaks contact with the photoelectric cell, which activates an alarm. For the most effective layout, you should crisscross the light beams via hidden mirrors (see Figure, above). A projected beam of invisible light can be effective for approximately 500 ft indoors. The effectiveness of the beam

decreases from 10% to 30% for each mirror used.

Unfortunately, this system is limited to locations where it is not possible to bypass the beam by crawling under or climbing over it. It requires some type of permanent installation. Fog, smoke, dust, and rain in sufficient density will cause interruption of the light beam.

Detecting sound. You can use a sound detection system to safeguard enclosed areas, vaults, warehouses, and similar enclosures. This system uses supersensitive microphone speaker sensors installed on walls, ceilings, and floors to detect any sound caused by attempted forced entry. You adjust the sensitivity of the sensor to fine-tune the system for each installation.

These systems are economical and easy to install. You can use microphone speakers in more expensive sensors to monitor sounds coming from the protected area. However, several disadvantages are associated with these systems. For example, you can only use them in enclosed areas where a minimum of extraneous sound exists. In other words, you shouldn't install this system outdoors.

Detecting vibration. This type of system is similar to the sound detection system. You can use it to safeguard enclosed areas that also employ sound detection systems. You attach vibration-sensitive sensors to walls, ceilings, and floors of the area you want to protect. The sensors pick up any vibration caused by attempted forced entry. Again, you can adjust the sensitivity of the system.

These systems are also economical and easy to install. Unfortunately, you can only use this type of system in areas where there's a minimal amount of vibration from normal activities. It's not satisfactory to use it in areas where high vibrations are encountered, especially in proximity to heavy construction, railroad, or automotive/truck traffic. These systems aren't effective outdoors.

Detecting motion. Ultrasonic or microwave motion sensors are very effective for the protection of interior areas. Ultrasonic systems consist of transceivers (single unit containing a transmitter and receiver or separate transmitters and receivers), an electronic unit (amplifier), and a control unit. The transmitter generates a pattern of acoustic energy that fills the enclosed area. The receiver that connects to the electronic unit picks up the standing sound patterns. If they are of the same frequency as the waves emitted by the transmitter, the system will not alarm. Any motion within the protected area sends back a reflected wave differing in frequency from the original transmission. The system detects the change in frequency, amplifies it, and then activates the alarm. You can operate multiple transceivers or a transmitter and multiple receivers from the same control unit, for more effective coverage of large areas. You should only use this system indoors.

As with the photoelectric system, the protective field is not visible; therefore, it is difficult for the intruder to detect or compromise the system. You may be forced to reduce the sensitivity of the system to overcome possible disturbance factors in the enclosed area (such as telephones, machines, clocks, etc.). The system might even be set off by loud external sounds.

Microwave systems. These systems closely parallel the operation of ultrasonic systems. A transmitter generates a pattern of radio waves into the enclosed space. Then, the waves partially reflect back to an antenna. If all objects within the range of the radio waves are stationary, the reflected waves return at the same frequency. If they strike a moving object, they return at a different frequency. The system activates when it recognizes a difference in the transmitted and received frequency.

These systems can provide good coverage if you properly place and align the antennas. They are also unaffected by air currents, noise, or sound. However, its coverage is not easily confined to a defined area. The radio waves can penetrate thin wood partitions and windows, and therefore may be accidentally activated by persons or vehicles outside the protected area. Fluorescent light bulbs can also activate the sensor.

Detecting capacitance change in an electrostatic field. You can install a capacitance or electrostatic intrusion detection system to protect safes, file cabinets, windows, doors, or partitions. In fact, any unguarded metallic object within maximum tuning range may be protected. This type of system creates an electrostatic field around the object to be protected. You tune this field by creating a balance between the electric capacitance and the electric inductance. Whenever an intruder enters the field, his or her body capacitance creates an imbalance in the electrostatic field, thus activating an alarm.

These systems offer extreme flexibility in design and are simple to install and operate. Another advantage is

that they provide an invisible protective field, which makes it difficult for an intruder to determine when the system triggers. Since the equipment is compact, it may be easily dismantled and reinstalled. Obviously, you can only install this type of system on ungrounded equipment. In addition, accidental alarms can occur if porters or cleaners working at night approach the protected area or object.

Next month, we'll go one step further in our discussion of intrusion systems by examining how the individual components, which make these systems operate, really work.

Types and Application of Intrusion Detection Systems

Legend for Chart:

A - System
B - Principle of activation
C - Application
D - Maintenance supervision problems
E - Nuisance alarms
F - Rating

A

B
C
D
E
F

Audio

Sound

Interior only (for vaults and low sound level areas)

Regular inspection to replace inoperative parts

Frequent (from extraneous sounds)

Not as reliable as ultrasonic

Sonic

Movement

Interior only

Same as above

Few

More reliable than audio

Ultrasonic

Movement

Interior only

Same as above

Few

More reliable for protection of rooms.

Microwave

Movement

Interior only

Same as above

Few

Most reliable within patterns set by antennae

Electromechanical

Breaking of electric circuit

Interior only (doors, windows, skylights)

Same as above

Few (metallic foil may break)

Affords minimum protection for buildings and rooms

Electrostatic (interior)

Movement

Interior only (metal cabinets and safes)

Same as above

Few

Reliable for metal safes and cabinets

Electrostatic (exterior)

Movement

Exterior only (perimeters and can be attached to side of building)

Same as above (also to remove snow, ice, and debris from fence)

Many

Best device developed for fence line security

Closed circuit TV

Visual

Interior and exterior

Regular inspection to replace inoperative parts (also to dry lenses)

None

Very effective for remote surveillance

Photoelectric

Interrupting light beam

Interior and exterior (rooms, halls, gates, and perimeters)

Regular inspection to replace inoperative parts (also to clean transmitter and receiver)

Interior (few), exterior (many--due to fog, rain, birds, etc.)

Interior: reliable when beams are crisscrossed for short distances. Exterior: gates and short distances only

Vibration

Vibration

Interior only

Regular inspection to replace inoperative parts

Few

Not as reliable as ultrasonic

DIAGRAM: This shows a sample of aa photoelectric intrusion detection.

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