Tech Talk
With Bob Dolph

Broken Windows and the "3 Bears"?

Bob Dolph has served in various technical management and advisory positions in the security industry for 25 years. Bob currently is a training and products consultant for the security industry. He lives in Orlando, Fla.

BOB'S TIPS

Here are 4 tips for acoustical glass break detectors:

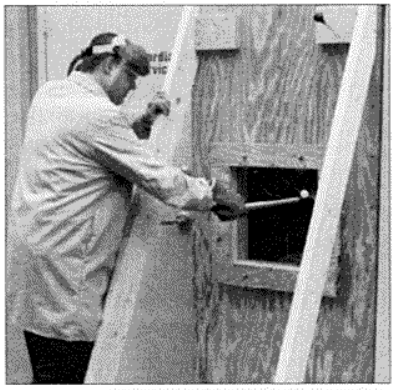
- Mount the detector on a wall or ceiling only.
- Make sure the detector has a direct line-of-sightt to the glass.
- Use a string to measure the distance from the detector to the window.
- Tap the glass with the edge of a quarter to test for false alarms.

It is late at night and burglars have just smashed a window. An acoustical glass break detector only a few feet away from the window fails to activate. How could this happen? It tested fine when it was installed. What could have been done different to avoid this "miss"? What does this have to do with the "Three Bears" fairy tale?

A few years ago I had the unique opportunity to travel around the security industry and test a variety of acoustical glassbreak detectors at different manufacturing facilities. As a result, I would like to share with you some tips and an extra appreciation for the "real world" performance of the acoustical glassbreak detector (AGBD). All of us, in an effort to reduce false alarms and eliminate alarm "misses,' need to take a closer look at the proper installation and servicing of this alarm sensor.

Start With a Sound Foundation in Acoustics

To start down the road of being an AGBD expert, let's take a moment and review some basic acoustic theory and terminology. This understanding will help us better appreciate the performance of the AGBD in its dynamic sound environment.



"Tech Talk" columnist Bob Dolph tests AGBDs by smashing different kinds of glass in a specially constructed frame.

Sound is created when a vibrating object, such as a window and frame, causes a rapid change in air pressure. The rate of this pressure change is Hertz (Hz). Humans notice sound in the frequency range of 20Hz to 20KHz. Most of the breaking glass sound we hear is in the 3KHz to 5KHz range. An AGBD will digitally analyze this audible range and, typically, the "infrasonic" sound range, which is less than 20Hz. Proper identification of both sound patterns by the AGBD will generate an alarm.

At the moment of breakage, this *infrasonic* shock wave is emitted when the glass and frame are flexed. It is an important sound signature for AGBD detection. Have you ever noticed how well low frequency sounds travel when someone slams a car door in front of your house? Care should be taken when testing to identify other sources of infrasonic sound, such as machinery, traffic noise and slamming doors. Some detectors have an adjustment for shock sounds.

Sound Pressure Level (SPL) is the loudness of the sound. SPL, due to its very large range of measurements, is measured in a logarithmic unit called the decibel (dB). This measurement range can be confusing since it is not a typical linear measurement. A few SPL facts will help us better understand SPL measurements. For every 8dB to 10dB change, the human ear *perceives* either a doubling or halving of the sound.

Doubling the distance from a sound source (breaking window) will typically reduce the SPL by 6dB. This is known as the *inverse square* law and applies to sound measurements in open space or the "direct sound field" (less than 15 feet) in a room. As detection distance increases in a room, the SPL may actually increase in a very reflective room (hard room) or decrease in a furnished absorbent room (soft room).

Accumulative sounds are logarithmically added. For example, a 55dB fan sound and a 60dB motor sound would equal a 61.2dB sound level.

The important thing with all this sound theory is that sound levels needed to activate an AGBD can be severely influenced by variables such as distance, room acoustics and ambient noise. Even with today's high-speed microprocessor-based detectors, there must be enough glass-breaking sound for the AGBD to process an alarm.

Rule of Thumb: Location, Location, Location!

Proper positioning and testing of the AGBD is very important for a successful installation. Manufacturers provide very detailed instructions for AGBD installations. It is very important to understand and follow these instructions. Here are some overall AGBD installation tips and guidelines:

First, in order to select the best location, temporarily mount the AGBD

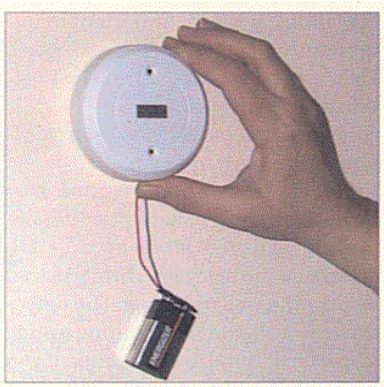
and test. Temporarily power the detector by attaching a good 9V battery with snap-on wire leads *(see photo below)*. Make sure the detector is firmly placed against the wall or ceiling. The detector's cover should be on during testing if specified by the manufacturer. If you are temporarily holding the unit, don't obstruct the microphone opening's line of sight with your hand. When selling a system, sales personnel should be cautious of committing to an exact location before testing and installation.

Mount on walls and ceilings only, no partitions. Use only the specified tester. Consider the option of selling a tester to the customer, especially if the alarm contract states that the customer must periodically test the alarm system. Offer frequent testing services.

A *direct line-of-sight* to the glass is very important. Avoid any blockage by furniture, drapes or partitions. Notify the customer of this and recommend retesting if the room is rearranged.

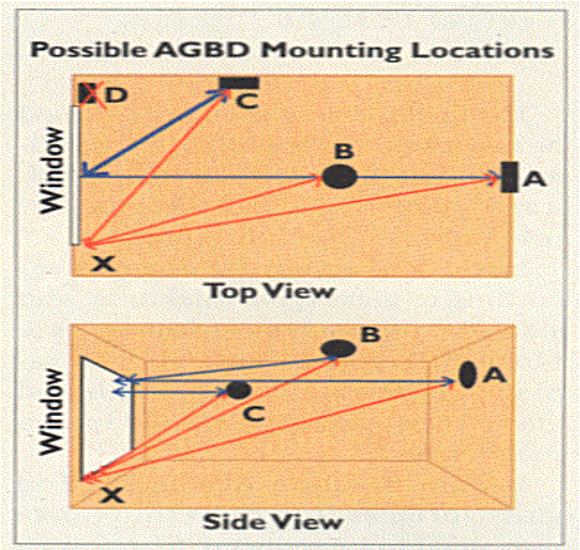
Select the best location as follows *(see diagram at right):* (A) opposite wall is best, (B) ceiling is good; (C) adjacent wall is OK. Be careful of maximum distances (X) to glass (red arrows), which may exceed specified detection distances. H lint: use a string cut to specified maximum distance and check from the detector to all points on the window.

Minimum detection distances should be around four feet to five feet.



This is a good example of how an installer can temporarily test an AGBD with a 9V battery. The installer is holding it against the wall in a recommended location, while testing with the detector.

Installing a detector too close may cause no activation and create an increase in false alarms.



The distance from a detector to a window can vary considerably between the direct distance (blue arrows) and the distance to the furthest point a break can occur on the glass (red arrows). The second distance might exceed the manufacturer's specified distances. This also shows the best, average, and OK locations for mounting an AGBD, and are designated as A, B and C. Installers should avoid mounting an AGBD in the D location.

Several manufacturers caution mounting the detector on the same wall as the glass. The directional nature of many AGBD microphones relies too much on reflected sound rather than direct sound (D).

The final test and installation should be in a room that has all of its furnishings in place. Sound levels can be significantly reduced depending on the carpets, wall coverings and furniture.

Install and adjust the detector according to glass type, thickness, and size. Record the types of glass used. Most broken tempered glass is replaced in the field with laminated glass. Tempered glass should have a marking on it.

Beware of security film installed on glass surfaces. The detection range may need to be reduced. Check with the AGBD manufacturer.

Make Sure the Installation Is Tested for False Alarms

Some tips for this are:

- Position the detector far enough from the window (two-thirds of the maximum range) to minimize potential false alarms coming from the window area. The most effective false alarm sound I have found is striking the glass with the edge of a quarter.
- Avoid close proximity to sound sources such as AC/heating vents or loud machinery. Test with these systems on. Sound and air movement can interfere with detection or cause false alarms by overwhelming sound sampling of some detectors.
- Avoid using the detector on 24-hour alarm loops. If a 24-hour loop is specified, consider a motion / glassbreak combination unit. Use *follower* alarm loops in exit/entry areas.
- Consider a directional sound discriminating detector for difficult false alarm noise applications.

Let me know of any interesting experiences you have had with these sensors. I am just a mouse click away at bobdolph@bobit.com