Smart Installation:

Preventing Noisy Fallout from STC* Performance Failures

*Sound Transmission Class

By Jerry Heid, AHC

IN TANDEM WITH THE EXPLODING NOISE AND DIN OF MODERN LIFE, our industry continues to face rising expectations for door and hardware solutions that effectively block or contain sound. Meeting the full scope of customer needs for quiet and privacy requires operable door assemblies designed to achieve specific and appropriate levels of sound control—quantified by sound transmission class (STC) ratings. It also requires those assemblies to actually deliver what their STC ratings promise.

In practice, opening performance in the field depends as much on expert installation as it does on the quality of the acoustical gasketing components of STC-rated assemblies. Sound systems that don't measure up to their STC promises are at best a waste of money and carry risks of even costlier liabilities.

This article focuses on practical tips for installing STC gasketing to ensure expected performance—over time as well as on day one.

Market Needs and Expectations

Here's a brief recap and update of trends and challenges in sound control that are being seen in commercial and high-end residential markets and which represent revenue opportunities for educated door and hardware professionals.

No Noise Allowed. Concert halls and theaters, broadcasting and recording studios—these are arguably the most familiar performance-driven facilities, requiring in turn flawless performance from the highest STC-rated systems for blocking outside noise. A substantially larger potential market continues to grow around the need for comparable systems and ratings to contain noise in locations ranging from HVAC plants and other heavy-equipment rooms in corporate and healthcare facilities to music and band rooms in schools.

Code-Mandated Noise Mitigation. We continue tracking—and door consultants need to follow—emerging noise standards that are increasing demand for sound control systems in major building sectors as they are incorporated into local building codes. Hospitals and schools are among the facilities impacted by privacy rules under the Health Insurance Portability and Accountability Act (HIPAA) for ensuring the confidentiality of communications with individuals.

Among recent developments, patient complaints about noise are now among quality measurements being used to determine hospital reimbursements by Medicare. And strategies for improving indoor environmental quality under the Leadership in Energy and Environmental Design (LEED) initiative of the U.S. Green Building Council are also prompting measures to improve noise control in building design for both of these sectors.

In addition, new ANSI acoustical performance standards are being incorporated into designs for learning spaces (minimum STC 30-35 rating required for classrooms), as well as into accessibility guidelines under the ADA (Americans with Disabilities Act) for accommodating those hard of hearing (refer to ANSI S12.60-2002, *Acoustical Performance Criteria, Design Requirements and Guidelines for Schools*).

Privacy and Security Needs and Expectations. Industry consultants should be vigilant in advising designers and owners regarding potential liabilities for failing to provide effective sound control, even beyond code requirements. Anecdotal reports, along with evidence from our own case files, show trends toward litigation and costly remediation in circumstances where acoustical systems, or their absence, lead to breaches of privacy and confidentiality. These risks should be considered in specifying and installing acoustical gasketing for settings as varied as churches, doctors' and therapists' offices, corporate HR quarters, and even hotel accommodations.

Additional risks and opportunities come with recognizing and addressing urgent security needs for effective sound control—for government, the military and embassies, as well as corporations and other private entities. As one example, we are seeing increasing numbers of military SCIF (Secure Compartmentalized Information Facilities) applications, which require the highest STC ratings.

Sound Principles and Practices

While the science of acoustics is complex, successfully installing sound door assemblies comes down to understanding a few essential facts. As noted previously, sound-control needs for these applications are translated by acoustical engineers or consultants into a specific STC rating required for each door opening. Door and hardware manufacturers design sound-blocking components, and systems are configured and tested to deliver the required ratings.

Sound door assemblies for less-demanding applications typically provide STC ratings in the range of STC-30 to STC-40, and systems with ratings as high as STC-52 or above are available for high-performance sound control. While each 10-unit increment in these ratings requires 10 times as much sound-blocking performance as the one before, equal precision is required during installation of every acoustical gasketing system to achieve its rated STC performance.

For acoustical door assemblies to be effective at blocking sound, gasketing systems must provide complete, uninterrupted and airtight seals around head, jamb and sill.

To understand the importance of gasketing in these systems, consider the fact that a tiny hole transmits almost as much sound as a much larger gap. In the simplified physics of sound transmission, gaps guarantee noise. In practice, this means that successful sound control depends on preventing and sealing any and all gaps around door perimeters.

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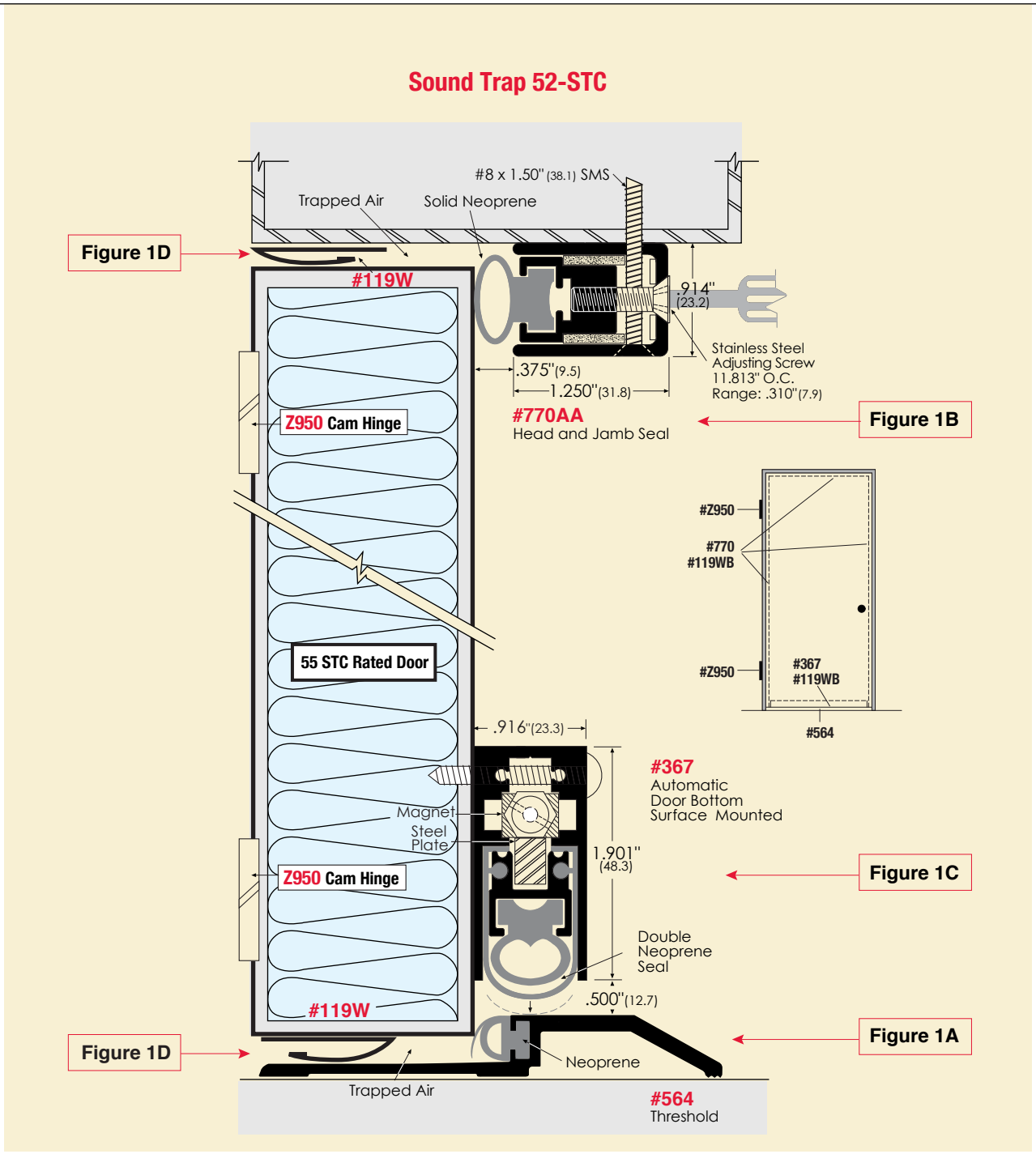

Figure 1 **Sound Trap 52-STC**

Engineered systems are developed and tested to deliver a specific STC rating. Zero's SOUND TRAP 52-STC rated gasketing systems as shown here are designed for use with sound-rated single metal doors with cased-opening frames. They provide an STC 52 rating when properly fitted with STC 55 or higher acoustical doors.

General Observations

For industry consultants advising designers and owners, engineered door assemblies with gasketing tested as a unit should be recommended for best results in the filed. Manufacturers' installation instructions for these assemblies are developed to ensure that all gasketing components function together properly to deliver the tested rating.

For the purposes of this discussion, we refer to systems using mechanically attached gasketing, which are often found in higher STC-rated assemblies. A major benefit of these systems is the availability

Illustrations courtesy of Zero International

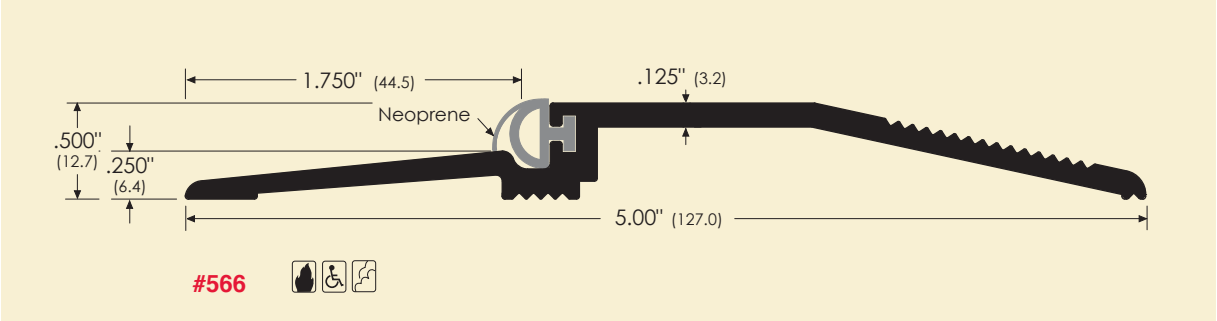

Figure 2 **#566 saddle**

While the 0.250" rise of this modified saddle complies with proposed ADA standards for threshold height, the reduced sealing surface against the lip may impact sound-blocking performance.

of adjusting features for correcting common problems that cause sound leaks and reduced STC performance. Chief among these problems is imperfect alignment, which can cause gaps even in newly installed gasketing but which also can happen later as buildings shift and settle and doors cycle through changes in temperature and humidity.

Figure 1 shows an example of an STC-52 door gasketing system used in engineered sound door assemblies, which includes adjustable gasketing. We will primarily reference this figure in calling out steps and guidelines for installing STC gasketing systems.

Start with the Fundamentals

Because proper installation is essential for delivering promised sound ratings, specifiers should be advised to include in their specs requirements for installation per manufacturer guidelines. In addition, installation instructions should as a rule be included with hardware submittal packages.

Procedures for installers begin with measuring the size of openings precisely to ensure proper fit for efficient sealing. One-eighth-inch perimeter tolerances are critical for sound applications to accommodate the applied gaskets without leaving gaps. Undercut will vary depending on floor conditions and the type of threshold being used.

Even the most sophisticated gasketing systems require caulking. Caulk the entire perimeter—caulk behind the gasketing, and caulk the saddle or threshold. Note also that finish coating or paint must be completely cured before installing any seals to avoid gasketing damage when seals pull away from drying paint.

Following are tips and precautions to help minimize costly mistakes when installing each component of sound gasketing. Saddles or thresholds should be installed first after hanging the door.

Anchoring the System

- Caulk underneath on the front and inside legs of the saddle, especially around the notch cut for the stop. Another bead of caulk should be applied where the saddle meets the frames after the saddle is anchored down.
- Be certain the screws and anchors used to attach saddles to concrete floors will hold up to anticipated traffic. Typical installations use #10 flat-head screws with metal or plastic expansion anchors.
- The best solution for uneven concrete floors and doors that are out of tolerance at the bottom is to specify thresholds with neoprene compression seals designed to help compensate for those conditions in the field. Some models are available with an extra flap of neoprene acting as a second seal for better results.

Rabbeted thresholds that close against a raised lip on the threshold, as shown in Figure 1A and Figure 2, provide optimal blocking against sound. As a side note, door and hardware consultants should be aware of the current debate around ADA compliance concerning replacement of lipped thresholds with flat saddles, and of trade-offs in sound performance that may result.

Head and Jamb Protection

Installing the head gasket to the top edge of the stop is the next step, followed by running jamb gaskets along the full length of the frame between the head seal and the top of the saddle. Hinge-side gasketing should be installed first to ensure that there is no binding, and then the lock side gasketing is installed.

- It is always advisable to first confirm that the gasketing supplied with the door assembly

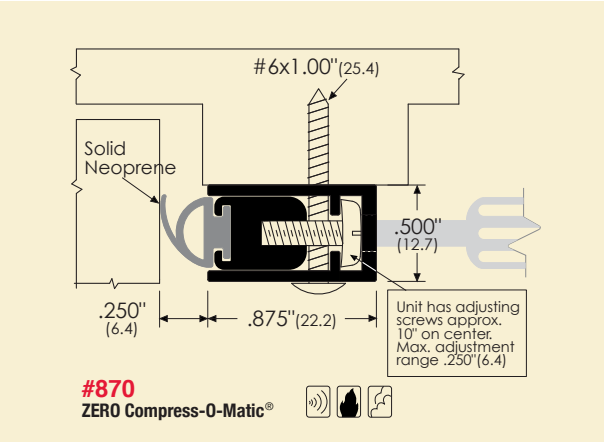

Figure 3 #870

This adjustable head and jamb gasketing is intended for use with standard-profile, hollow-metal frames with a stop, while the gasketing shown in Figure 1B should be installed only on cased- opening frames. Both units feature adjusting screws that can be tightened to close any gaps in clearances and restore sound-tight seals.

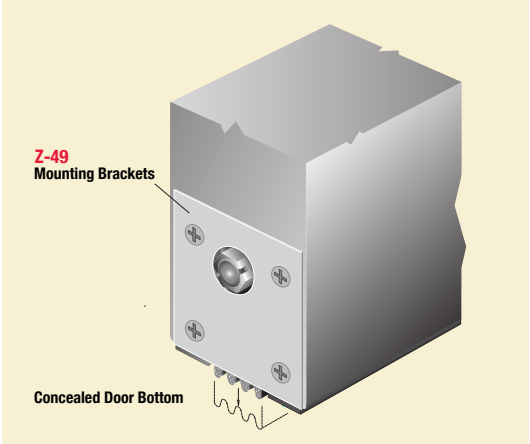

Figure 4 Z49

Easy-access mounting brackets allow removal of the drop mechanism in automatic door bottoms without taking doors off their frames. They are likely to specified for doors in hospitals and other facilities subject to higher standards and routine inspections for cleanliness.

Is correct and appropriate for the hollow metal frame in use—with or without stop (Figure 1B and Figure 3).

- Measure and cut precisely to avoid gaps. It is essential to avoid cutting the gasketing to install closers and other rim exit devices. Use the mounting brackets that come with the gasketing!
- To prevent mounting screws from wandering, pilot holes should be punched or pre-drilled. Hold the gasket up, align it, mark and start the holes. Elongated holes, available on some gaskets, allow useful east/west latitude to adjust for improved alignment.
- Special care is needed when installing gaskets to grout-filled frames. To avoid the expense and time of replacing drill bits after every hole, it is advisable to specify polystyrene in the stop.

Back to the Bottom Line

Automatic door bottoms (Figure 1C) are installed after perimeter seals are in place. Although installation is straightforward for most available products, many installers are not familiar with the procedures.

When automatic door bottoms are not installed correctly, the rubber seal does not retract sufficiently when the door is opened. When the door is closed, the rubber activates too soon and drags, which causes abrasion and premature wear and weakens the door. Following these basic procedures will avoid these problems in most cases:

- Surface-mounted and semi-mortised models are mounted on the push side of the door, where the door stop is. If the door bottom is properly machined, mortised units are easy to insert and attach with screws.
- Most models are equipped with an adjusting nut that regulates the drop of the seal. This nut must be on the hinge side and should not be adjusted until the unit has been mounted.
- The door bottom must be cut to ensure a very close fit between the jamb gaskets, leaving clearances as specified by the manufacturer.
- Door bottoms are cut from the lock side, making sure to push the gasket insert as far as possible toward that end of the housing before trimming.
- To ensure the right drop for optimum clearance, the housing of the door bottom unit should be placed on top of a shim of appropriate height (per manufacturer specifications) set on the door saddle. After closing the door to mark position, the unit can be fastened down.
- The last step is to turn the adjusting screw in or out as needed until the closing door pushes the rubber seal down to make contact with the saddle.
- Easy-access mounting brackets can be used to secure mortised automatic door bottoms to doors. These brackets allow easy removal of the drop mechanism for cleaning or other purposes (Figure 4).

As with the other components of the gasketing system, the trickiest

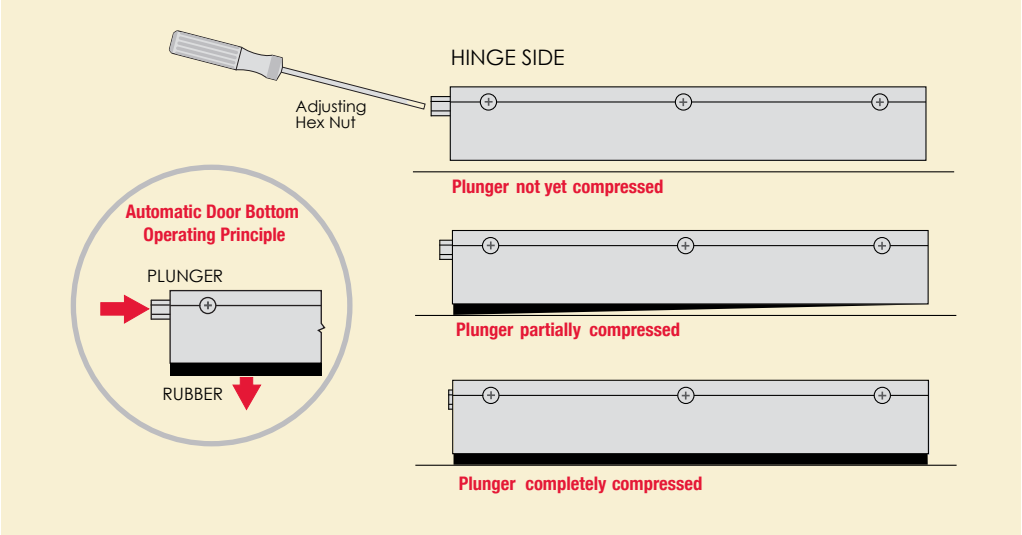

Figure 5 **ADB Operating Principle from catalog p.17**

In high-end automatic door bottoms, the adjusting nut regulates the drop of the seal. Adjusted after the unit has been mounted, it governs a concealed spring mechanism that activates the drop of the seal from the hinge side first, preventing drag or door hang-up during operation that can cause gaps and sound leaks.

Installation issues have to do with imperfect site conditions, which are all too common. Automatic door bottoms with rubber that slides into place may operate poorly and leave gaps when uneven floor conditions interrupt the slide. More reliable seals and operation are generally available with units that drop the gasket into place (Figure 1C and Figure 5).

Final Steps, Checks and Adjustments

Supplemental seals (Figure 1D) are the final components to be installed–first on the head jamb rabbet, then on both jamb rabbets. These seals are critical elements for achieving the highest STC ratings and performance, not only as additional points of interference with sound waves, but also because their materials (typically bronze or stainless steel) extend the range of frequency interruption provided by the neoprene seals in the rest of the assembly. At the same time, precise tolerances are crucial to prevent these seals from impeding door operation.

The dollar bill test is a tried-and-true installer trick to check gasketing in its final position for gaps that require further adjustment. After the door is operated several times to check for smooth opening and latching, a bill or credit card inserted between the door and seals should not fall out under its own weight at any point along the perimeter. Final adjustments must be made carefully to avoid further gaps and sound leaks. Adjusting screws where available is invaluable for facilitating this critical process.

Experience Matters in Preventing Installation Problems

Installation problems are extremely common because of a tendency to rely on untrained or inexperienced installers. Using the wrong gaskets, cutting a gasket too short, extending a door bottom too far into the perimeter seal, or edges that do not line up—these are typical mistakes that compromise system performance and can destroy an STC rating.

Repairing or replacing STC gasketing to restore ratings after installation can be expensive for everyone involved. t o minimize costs and potential liabilities, door and hardware professionals advising designers and owners should emphasize the need for reference to manufacturer instructions and for hiring expert installers. And when vested with direct responsibility for overseeing installation, make sure it is done right. dh

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