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# Specifying for efficient installation and door performance

Installation is literally the last consideration in specifying and sourcing door gasketing and other door hardware. Commonly delegated to whatever trades happen to be nearby, haphazard installation inevitably leads to problems that can compromise door operation and add costs to all building team members.

We have all seen binding hinges or gasketing that prevent doors from operating properly—and mistakes like these become immediate punch list items. Other problems, such as gaps, cause performance deficiencies that defeat the purpose of specialized doors and can invalidate required door and assembly labels. Specifications that anticipate field and operating challenges go a long way toward ensuring both successful installation and expected door function over time. By understanding those challenges upfront, architects can minimize, correct or avoid installation and performance problems by application of appropriate gasketing and door hardware.

## Some guiding principles

Successful installation and door function both depend on carefully coordinating gasketing and hardware at both specification and installation. It is important to understand how gasketing works with other hardware, and to specify together as a system. Precision is necessary because most gasketing is specified for specific purposes, and must be installed and function as a system. Components in engineered systems are designed to work together to create an efficient seal around the entire perimeter of the door. For example, properly installing the right gasket accomplishes little if the door bottom is wrong or installed incorrectly.

Life safety systems designed to block smoke and fire are highly specialized gasketing that can fail with disastrous results if not properly installed (See Figure 1). There is no margin for error for preserving sound ratings when installing high-end acoustical sealing systems. For example, a gap as small as 1/16-inch anywhere in the perimeter seals virtually guarantees failure for Sound Transmission Class (STC) field tests. Life safety codes subject fire and smoke assemblies to similarly stringent limitations. Even conventional climate-control systems will not achieve their purpose if gaps in the seals allow water or air infiltration.

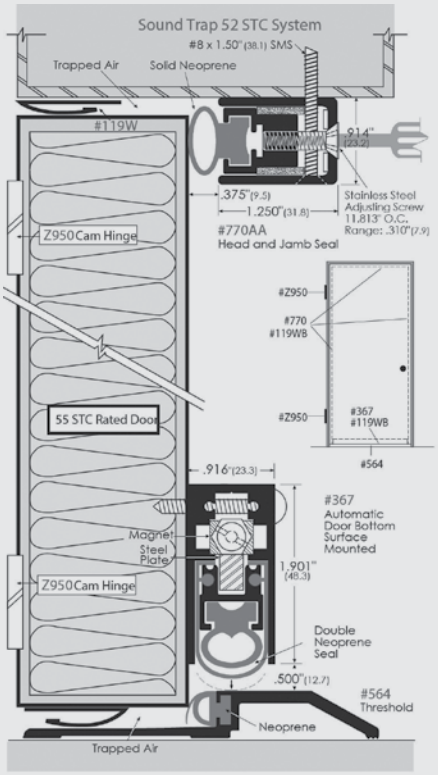


**Figure 1**
Successful field tests for rated gasketing, such as this high-end acoustical control system, depend on a continuous, uninterrupted seal around door perimeters. Gaps in clearances caused by door alignment problems or installation mistakes can be prevented or easily corrected by specifying adjustable gasketing. The adjusting screws in this system can be tightened to close any gaps in clearances and restore sound-tight seals.

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A couple of tales from the front might help to underscore what happens in real life when site crews, and their supervisors, neglect the basics:

- One high school experienced unwelcome sound pouring into its halls from its band practice room in spite of an insert used to patch a one-inch gap in the gasketing—loud proof that gaps matter, along with measuring and cutting precisely to avoid breaks in the first place. (Remember the old adage: measure twice, cut once!)
- Failure of an exterior saddle for a New York City penthouse apartment door resulted in a very expensive claim for refinishing wood floors—all because caulking was omitted!

Because proper installation is essential for delivering promised performance for rated door assemblies, specifiers should be advised to include in their specs requirements for installation per manufacturer guidelines for all gasketing and door hardware, and for hiring expert installers. As a rule, installation instructions should be included with hardware submittal packages.

## Solid footing for heavy traffic

Even perfectly installed door saddles will soon start to wobble or collapse if they are not heavy enough to stand up to high-volume or other high-abuse traffic in places such as schools and sports arenas. Consider the case of a thin-walled saddle installed in an area hospital to ease a transition to quarry tile that was crushed under the weight of heavy food carts, creating a serious tripping hazard at its upturned ends.

Lighter-gauge saddles can also buckle when secured to the floor and often become loose because screws cannot be tightened fully. Specifying heavy-duty, thick-gauge door saddles for these openings, together with installation using appropriate flat-head screws with metal or plastic expansion anchors, usually eliminates these problems. Heavy-duty saddles will also be needed to accommodate the strikes for automatic flush bolts.

Under similar conditions, mortised automatic door bottoms offer better protection from heavy traffic and abuse than surface-mounted models. For hospitals concerned about access to mortised door bottoms for routine cleanliness inspections, the answer is specifying easy-access end plates that allow the door bottom to be removed from either end while the door remains on its frame.

Installation of automatic door bottoms is straightforward for most available products, but many installers are unfamiliar 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. Carefully following manufacturer instructions is advised to prevent these problems.

ADA compliance adds a different challenge for door-closer hardware used in high-traffic openings. Electromechanical automatic operators meet ADA opening requirements and are well suited for hospitals, senior residences and other facilities. However, manually opening doors equipped with these operators back-drives and wears out their motors. Motor box replacements were necessary within months of installing automatic operators at a New Jersey college where traffic through main entrances averaged 40 students per hour. The higher force required for manual opening is an additional problem for automatic operators installed in elementary schools.

Electrohydraulic operators are the better solution for environments where primary use is manual (See Figure 2). When activated, a motor/clutch system drives a manual closer to automatically open the door. The optimal design allows the clutch to slip when abused to reduce damage to the operator. User-friendly digital programming interfaces are also available with simple installation similar to mechanical door closers.

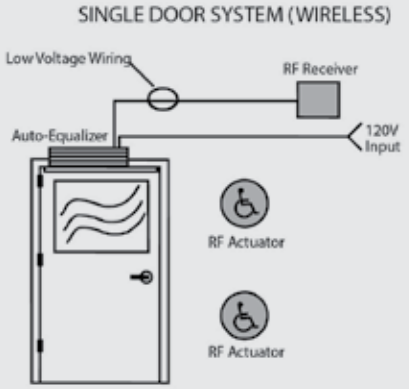


**Figure 2**
Designed for automatic door operation when actuators are touched, electrohydraulic door operators function as full-featured door closers for primary manual use, preventing premature failure from back-driving motors. Using wireless radio-frequency actuators and receivers powered by the operator also simplifies installation.

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## Site conditions: The big unknown

Experienced gasketing installers know to expect the unexpected. Uneven concrete pours, adjacent floor surfaces of varying thickness, twisted frames, warped doors, openings that are not square, high humidity and temperature extremes—this list goes on.

Good installers survey the site ahead of time, extend cautions and advice to other installers, order supplemental supplies in advance and know how to deal with whatever site conditions they find.

Of course, some site challenges are easier than others to address. Thresholds should be specified to bridge transitions between varying floor surfaces—such as carpet, tile and concrete—where flat saddles will not work. Thresholds with neoprene compression seals are designed to help compensate for other field conditions such as concrete floors and doors that are out of tolerance at the bottom. Some models are available with an extra flap of neoprene acting as a second seal for better results.

Uneven floor conditions can also impede the operation of automatic door bottoms with rubber that slides into place, resulting in gaps. Models that drop the seal in a scissor-like motion—adjusting to the floor from a center pivoting point—generally perform best and have the longest service life. Holding the strike end of the door bottom in upward position until released by an activating plunger, an integral magnet is an additional useful feature for ensuring an efficient drop that eliminates all drag.

Light-duty, surface-mounted gaskets applied with pressure-sensitive adhesive are sometimes used for economy and, mistakenly, for ease of installation. In practice, field conditions must be closely controlled, as these gaskets require application to dirt-free surfaces within specific temperature ranges for proper adhesion. While specifying top-quality self-adhesive tape can improve performance, extra time and effort are often needed to obtain the desired results, and the consequences of anything less include seals that peel off, rip or tear.

Damages were claimed for a substantial amount of inventory when temperature controls for a private home's wine cellar failed due to partial delamination of a self-adhesive head and jamb gasket. The probable direct cause was applying the gasket at out-of-spec temperatures. More fundamentally, a stick-on seal was most likely the wrong choice for this temperature-sensitive application. As a rule, mechanically fastened gaskets are preferred when field conditions are less than perfect, and especially when the application dictates a better seal.

The ultimate challenge for installers—and for specifiers charged with designing door assemblies that perform to expectations—is alignment problems. Gaps from imperfect alignment are a very common problem in newly installed gasketing and can also surface as buildings settle and doors cycle through changes in temperature and humidity.

## Adjustability: The saving grace for installer and specifier

Adjusting screws where available is invaluable for enabling this critical process at installation, and also for restoring a sound-tight seal when clearances increase for any reason. Forethought in specifying adjustable hardware can make an enormous difference here. Recommended head and jamb gasketing provides compression seals that can be tightened variably along the length of the gasket using adjusting screws to compensate for gaps. It can also provide elongated holes for useful east/west latitude and simple in-place adjustment using a screwdriver for improving alignment.

Where compatible with aesthetics and door function, continuous hinges can also help support proper door alignment. Evenly distributing stress along the full length of the door and frame, these hinges provide smooth, effortless door swing while keeping the door in constant alignment and eliminating door sag. However, out-of-square door frames or doors also complicate hinge installation. To counter alignment difficulties, look for continuous hinges that also provide adjustability using elongated holes positioned for separate X/Y axis adjustment (See Figure 3A). Backing out the screws incrementally allows installers to easily shift hanging doors back in square.

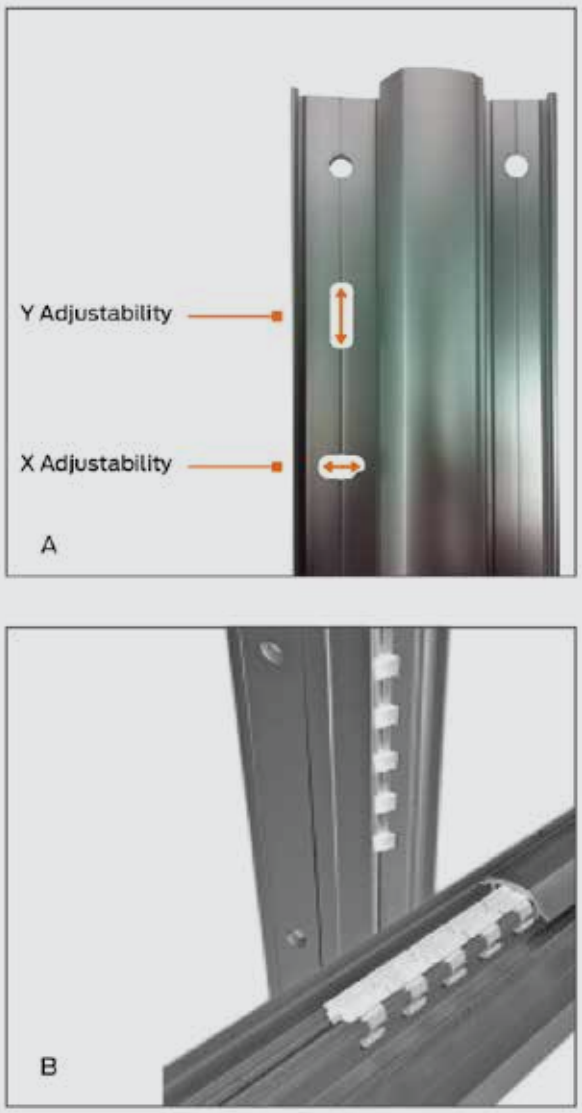


**Figure 3**
Continuous hinges with elongated screw holes for horizontal and vertical adjustment (A) make life easier for installers dealing with misaligned doors or frames. A centered bearing system (B) where available better accommodates a wide variety of door applications and simplifies on-site trimming without cutting off bearings.

Another desirable feature for easy adjustment of continuous hinges is a centralized bearing system. Where bearings typically run the full length of conventional bearing systems, centering them at the mid-height of the door enables easy on-site trimming without cutting bearings off and compromising load-carrying capacity (See Figure 3B). As additional benefits, this design eliminates the internal flexing and grinding that can occur in high-abuse applications, and delivers maximum lateral strength at the top and bottom of the door where it is most needed.

Specifying a concealed vertical cable (CVC) latching system provides easy maintenance, as well as efficient installation. The difficulties of adjusting traditional vertical rods are legend among installers, and the drudgery of removing doors repeatedly for iterative adjustments is compounded for openings subject to heavy traffic or abuse.

Such was the case with two openings at a university in Indiana—a pair of aluminum and glass doors and a single hollow metal door. Daily traffic exceeded 150 uses through each of those openings in separate science facilities housing both classrooms and research facilities. Ongoing complaints by installers charged with constant latch adjustments led to a decision by the university's project manager to replace the old rods with CVC systems because of greatly improved adjustability.

Flexible CVC systems that install as one assembly (See Figure 4) allow adjustment of the exit device centerline even if it is not aligned with top and bottom latches. Attachment of the center slide to the exit device at a single point with a set screw completely eliminates the micro-adjustments required to thread rods into the device and latches, along with tedious and time-consuming door hangings at each pass.

Bottom latch adjustability with the door hanging is a particularly useful feature where available. In addition to initial adjustments at installation, maintenance is often needed when latch bolts begin dragging on the floor as a result of door sag and settling over many cycles of operation. To avoid repeated door removals and imprecise adjustments, look for side-access spring pins to lock latches in place after adjusting up or down to restore proper clearances, while the door remains hanging.

## High-performance demands

Service life is always an important consideration for specifying gasketing and door hardware that will reduce costs by meeting the tests of time. Specifying neoprene or silicone, for example, will typically yield better long-term performance than can be expected from vinyl seals.

Gasketing systems and door assemblies rated for smoke, fire, acoustical control and/or, most recently, energy efficiency deserve full attention from designers and specifiers to installers and their supervisors. When faulty installation compromises tested ratings, repairing or replacing gasketing and other door hardware to restore ratings after installation can be very expensive for all parties. Specifying proactively to minimize possibilities for costly installation mistakes is the smart thing to do.

As building industry professionals, we should also recognize the benefits to applying the same "standard of care" to every door opening we specify and supply, rated or not. Delivering on site what we promise on paper, and getting it right the first time, saves everyone time and money and helps keep our customers happy.

Contact an Allegion spec writer (or call 877-929-4350) today for assistance on your building projects.

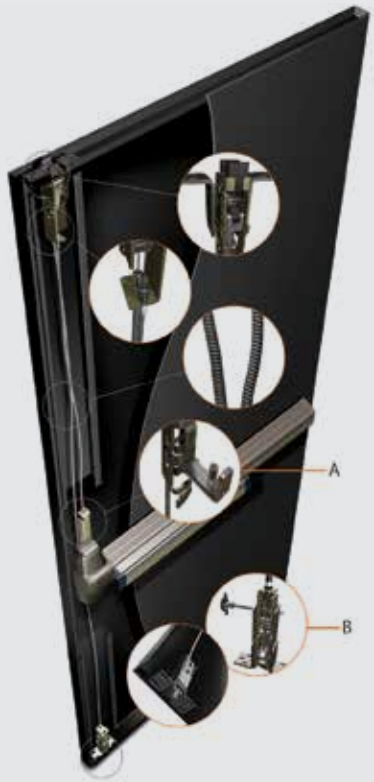


**Figure 4**
Concealed vertical cable latching systems offer substantial installation and adjustment advantages over traditional vertical rods, including center slide attachment to the exit device at a single point (A), easily accomplished with the door in place. Some systems also provide easy side bottom-latch access (B) with the door hanging when maintenance and latch bolt adjustments are needed.

## About Allegion

Allegion (NYSE: ALLE) is a global pioneer in safety and security, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion produces a range of solutions for homes, businesses, schools and other institutions. Allegion is a $2 billion company, with products sold in almost 130 countries. For more, visit **www.allegion.com.**

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