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Industry insights

Sealing and healing: Door gasketing for hospitals: Challenges expectations and innovations

Hospitals operate at a delicate intersection between patient comfort and sensibilities and the noisy, bustling realities of an endless institutional “rush hour.” Propelled by increasing competition for patients, along with rising patient expectations, design trends in hospitals are also fostering something of a “resort” image—encouraging their perception as something like “hostels,” offering hospitality features or even a hotel-like environment.

In the mix of hospital needs and desires, there are constraints and opportunities aplenty for door and hardware professionals advising building teams and supplying door gasketing and other hardware to these facilities.

Our research for this article revealed considerable variation among regional building codes pertaining to hospitals and the standards and guidelines they reference. Readers are advised to consult Allegion specification consultants, AHJs and other enforcement agencies regarding any specific gasketing requirements for their projects. We have chosen to limit our discussion of such code requirements to those that appear to us to be, or are likely to become, uniform and universal.

The previous observation regarding the image of hospitals as hostels comes from a consultant with an architectural hardware consulting firm who has extensive experience writing and consulting on door and hardware specifications for hospitals, and who generously contributed to this article. His purpose in doing so is to encourage the specification of good products that last. At the same time, he prefers to remain an unnamed source in deference to his firm’s commitment to independence in the arena of consulting in our industry. We refer to this primary contributor alternatively as our “expert source” or “hospital specifier.” As he happens to be based in California, we do include some references to the current California Building Code (CBC), which reflects elements of the 2009 International Building Code (IBC).

Bumps and glides: Thresholds and door bottoms

In the refined world of hospitals as hostels, patient comfort is paramount. Yet in these venues of constant traffic, thresholds at door openings become obstacles that jostle patients being transported on wheels and can trip up those unsteady on their feet. In our contributor’s experience, thresholds are generally to be avoided at doorways with regular gurney traffic. And consider minimizing threshold height to perhaps 1/4 inch at exterior doors for easier patient access, even if that entails sacrificing some degree of protection against weather and moisture. (Of course, it is important to that remember that thicker thresholds are especially important to withstand the crush of heavy-traffic applications.)

For doorways without thresholds requiring completely sealed perimeters, such as pressurized stairwell doors required to meet fire codes, automatic door bottoms (ADB) are essential. (Other requirements for fully sealed doors are discussed in sections that follow.) To ensure an effective seal when ADBs are used for openings without thresholds, the finished floor must be a smooth surface, such as marble or a flat sill. Trying to seal a door bottom on carpet or uneven concrete is like trying to block air and sound with a sieve!

Our expert also points to specialized ADB and other door bottom features that he has specified to help solve problems that particularly concern hospital clients:

- Removable end plates for mortised door bottoms** (Figure 1): Designed to secure mortised door bottoms to doors, while allowing door bottoms to be removed for cleaning or other purposes without taking the door off the frame. They are especially suitable for use at openings where traffic is heavy and cleanliness standards are high, including patient room and corridor doors, as well as surgical and other “clean” areas. This practical option facilitates the use of mortised door bottoms to meet regional accessibility code requirements, as applicable, for keeping lower door bottom sections clear of obstructions. And it enhances the common use of mortised door bottoms preferred for wood doors.
- Sill protection sweeps with snap-on covers for storefront entry doors** (Figure 2): The hospital specifier cautioned that aluminum storefront manufacturers, when asked to supply the entire opening as a package, typically add door bottoms that do not match the finish. He now specifies separately good-quality, durable sweeps to effectively block water and infiltration—including snap-on covers to conceal attachment screws. He also specifies custom powder-coating for matching other components, which is available from some manufacturers for large-quantity orders.

In addition, door hardware consultants and their hospital clients may find value in these recent innovations that address other common problems in thresholds used in healthcare facilities:

- Wheelchair-accessible shower thresholds** (Figure 3): Intended to eliminate the need for curbs or other dividers that might impede wheelchair access, shower stalls with tiled floors sloping toward a center drain in reality do not work very well at containing water. A better solution is a pliable neoprene threshold that compresses easily under the chair wheels but is sturdy enough to block the water.
- Antibacterial rubber:** Available as an option for shower thresholds, specifying antibacterial rubber provides obvious benefits for assisting hospitals in the ongoing battle against harmful microbes. It can also be used to add antimicrobial properties to special-purpose gasketing commonly used in hospitals, including smoke protection and acoustical control systems.

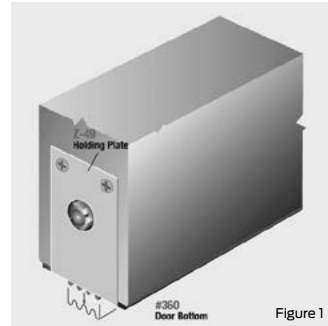


Figure 1

Figure 1: Easy-access holding plates are ideal for healthcare facilities subject to higher standards and routine inspections for cleanliness. Designed to secure mortised door bottoms to doors, while allowing door bottoms to be removed without removing door from the frame.

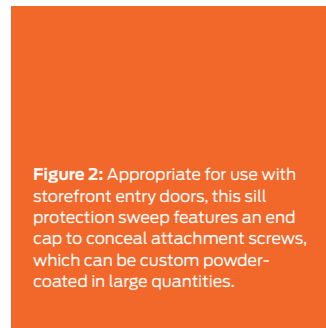


Figure 2: Appropriate for use with storefront entry doors, this sill protection sweep features an end cap to conceal attachment screws, which can be custom powder-coated in large quantities.

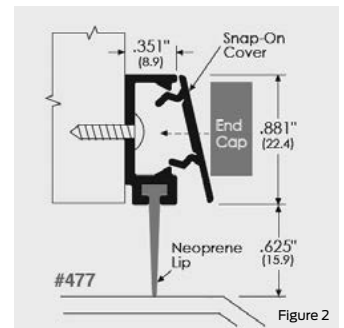


Figure 2

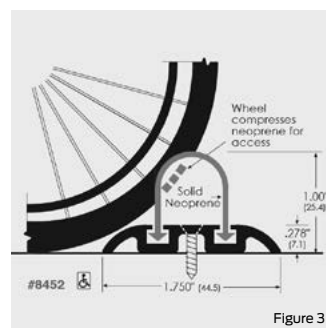


Figure 3

Figure 3: The neoprene gasket in this shower threshold keeps water in while allowing wheelchair wheels to pass over easily.



Aesthetics and function in the balance: Head and jamb gasketing

Perimeter gasketing should do what it is meant to do: seal the opening. In spite of open door practices in many hospitals, this means that patient room doors, when closed, should provide seals that work, blocking light, smoke and noise and providing speech privacy.

It is all too common to see closed doors with visible light around the edges, which means that air, smoke and sound can penetrate as well. The gaps in leaky gasketing are often the simple result of normal operation as buildings cycle through seasons of heat and cold and doors swell and contract over time due to changes in humidity and moisture—even in relatively climate-controlled hospital interiors. Sometimes they occur due to alignment problems at installation.

Mechanically attached gasketing is the surest remedy to these variables. We recommend its use for optimal sealing, to ensure code compliance under all climatic conditions, and whenever installation conditions are less than perfect. And adjustable gasketing provides easy means to restore tight seals when gaps do occur, needing only a few turns of a screwdriver to tighten adjusting screws along the length of the gasket (see Figure 4).

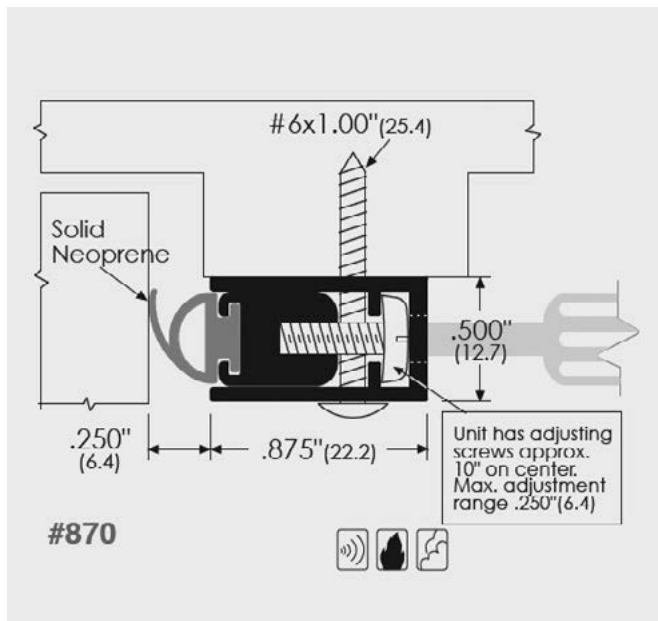


Figure 4: This jamb-applied adjustable sealing system features adjusting screws along its length, which can easily be tightened using a screwdriver to close any gaps in the gasketing.

Our expert source reports that “hostel” aesthetics trump performance measures among his hospital clientele. To avoid the “institutional” look of fastener-applied gaskets, his hospital specifications typically call instead for one or two rows of self-adhesive perimeter seals on all interior doors. He also reminds manufacturers that hospitals (like universities) are proud of their color schemes, noting, “It’s nice to let designers select seal colors to match their frames.”

Fortunately, in addition to a range of standard colors for adhesive seals, some manufacturers are able to customize colors for large projects. In addition, high-end 3M adhesive is available as an option to address concerns about service life and adhesion performance regarding stick-on systems, especially in hospitals, which are more frequently inspected by building officials than other types of buildings.

Specialized gasketing systems: Always a four-sided solution

Whether supplied as a tested assembly or specified as individual components, door gasketing systems require a complete, uninterrupted and air-tight seal around head, jamb and sill to perform effectively at blocking air, fire and smoke or sound. Hospital needs for airtight door openings are driven by practical considerations such as patient comfort, as well as by building and safety codes and standards.

Airborne infection isolation rooms

Our expert source cites the California Building Code (2010, Chapter 12) and the International Building Code among those requiring sealed-tight rooms for maintaining negative pressure to fully contain germs in I-2 occupancy buildings. To satisfy this requirement for airborne-isolation patient rooms, he specifies frame seals, astragals for pairs, and automatic door bottoms with no thresholds.

Fire and smoke protection

Not surprisingly, hospitals are subject to myriad requirements for fire doors at many openings, including cross-corridor doors and stairwells, with specifics determined by design variables and local jurisdictions. Included are recent requirements for fire door assemblies to also meet the air leakage requirements (per UL 1784) for smoke and draft control assemblies—see IBC 2009, Section 715.4.3.1, “Smoke and Draft Control,” referencing UL 1784 for testing and NFPA 105 (2007) for installation. In effect, the Section 715 requirements now mandate smoke-rated perimeter seals for all corridor doors, as well as additional



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smoke-rated seals at door bottoms for all fire doors used in smoke-pressurization systems. In addition to many stairwell doors, this includes corridor doors and other doorways that are integral to “smoke control systems” used in many hospitals. (These systems use HVAC controls to create low pressure in fire areas.)

It is also important to keep in mind that recommended guidelines are minimum standards. For healthcare and other facilities facing the bigger challenges involved in protecting the life safety of vulnerable occupants, it is worthwhile for owners and designers to consider additional measures exceeding those minimum standards, especially in view of variables that might impact what happens in an actual fire.

Keep in mind that hospitals are designed with the idea of keeping people in their rooms in case of fire, and consider whether air leakage minimum standards are adequate for that purpose. For example, in a room that measures 10' x 10' x 9' with a 3' x 7' door, the room will be 100% filled with smoke from smoke-filled corridors in 15 minutes if the door complies with the UL 1784/NFPA 105 maximum leakage of three cubic feet per minute per square foot of door opening. Tested smoke control systems are available providing leakage rates as low as 0.2 cubic feet per minute, which means it will now take 37 hours for smoke to fill that same room.

In addition, approved smoke gasketing and astragals for pairs are required for S-labeled doors used throughout hospitals.

Sound control and privacy

The harmful effects of noise on health and well-being have been well-documented and by now are familiar to most in our industry. Consider then the amplified impact of noise damage on healing bodies that are ill, injured or otherwise impaired, not to mention already stressed from hospital confinement. Yet there are notably few requirements for STC-rated door openings to meet noise standards for hospitals.

We learned in our research that one influential acoustical advisory body has concluded that STC-rated door seals can be eliminated from its recommended guidelines for patient room to corridor doors, while STC wall partition requirements remain for those spaces. One of the acoustical experts we consulted explained that some hospitals object to STC-door recommendations due to preferences to avoid door bottom seals because of difficulties in maintaining and cleaning them.

From our perspective as a manufacturer—and our considerable experience in solving complex noise control challenges involving door openings—we believe that effective STC-rated doors and sealing systems are crucial to maintaining the STC ratings of surrounding partitions. Gaps represent a major problem for sound barriers because sound travels through any size opening with very little loss. While the amount of air flowing through a gap increases with the size of the opening, the size of the gap in a sound barrier does not matter. A small hole transmits almost as much sound as a much larger gap, and unsealed door bottoms represent a major gap.

In reply to hospital concerns about maintaining and keeping door bottoms clean, we mention again the availability of easy-access end caps for mortised door bottoms, discussed previously, to facilitate removal of the gaskets for cleaning. And good-quality door bottoms have been proven durable through millions of cycles of heavy-use testing.

Noting that its architectural clients for hospitals seldom stipulate STC values, the California specifier who contributed to this article uses double rows of adhesive seals and automatic door bottoms, maybe with a threshold, for his specifications for door openings where sound control is important. Those locations include conference rooms, staff lounges and locker rooms, consultation or treatment rooms, and (perhaps especially) pediatric injection rooms, as well as doors to electrical, IT and telecom closets.

For those latter, high-noise spaces—which have to place high on any patient discomfort index—we would almost always recommend heavier-duty sound solutions, including adjustable head and jamb gasketing and heavy-duty automatic door bottoms. While these acoustical sealing systems may sacrifice a bit on aesthetics, a persuasive case can be made in favor of patient comfort. And in many cases, mechanical rooms and other high-noise spaces are typically fitted with outswinging doors, with mechanically fastened door gasketing hidden anyway on the inside of the door.

Door consultants advising hospitals should keep Health Insurance Portability and Accountability Act (HIPAA) in mind. Various standards and regulations are anticipated, or are already in development, which will likely impact the specification of sound-rated components or assemblies to ensure speech privacy in hospital counseling rooms, treatment rooms, and doctors' private offices on hospital premises.



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A “silent door” challenge to our industry

In closing, we share interesting observations from Gary Madaras, Ph.D./Assoc. AIA, director of the Chicago-based Making Hospitals Quiet program, who also consulted with our research on this article. The Making Hospitals Quiet program consults with healthcare providers and designers to improve overall sound quality in hospitals.

Madaras offers a unique perspective reflecting his work with existing hospitals to reduce noise, as well as many nights spent in operating hospitals conducting noise audits. He notes that because few nurse managers are comfortable with closed doors, the noise emanating from hallways can cause a lot of discomfort to patients. The incessant operation of supply closet doors, often located in the heart of patient care areas, is a major source of noise. Frequently lacking adequate gasketing and equipped with noisy latches and handles, these doors rattle and reverberate with each open-and-close cycle. He also notes that corridor doors with “hands-free” automatic opening devices, located throughout patient wings, are also very noisy, with “false opens” due to sensor malfunctions all too common.

To improve patient comfort, Madaras encourages the industry to place more priority on silencing operating doors, building on a principle of “no audible noise” as the base for meeting other performance requirements. Solutions must also retrofit easily into existing buildings to be of value to the many patients using those facilities.

A complete solution to Madaras’s “silent door challenge” will likely require a collaboration of door, frame, hardware and gasketing manufacturers. It is certain that door gasketing—and solid attachment to door frames, best accomplished through screw-adjustable features—is a good start and necessary to making openings quiet.

Madaras also finds that annual door inspections at hospitals typically include only functionality and fire code compliance. He strongly encourages adding an acoustics section to the annual inspection checklist for hospitals. On behalf of hospital patients’ needs and well-being, we fully support that recommendation—and the opportunity that it represents for door and hardware professionals to add value to their hospital consulting services.

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About the author: Jerry Heid, AHC is the National Sales Manager - Zero Brand Allegion. He can be reached at jerry.heid@allegion.com.

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