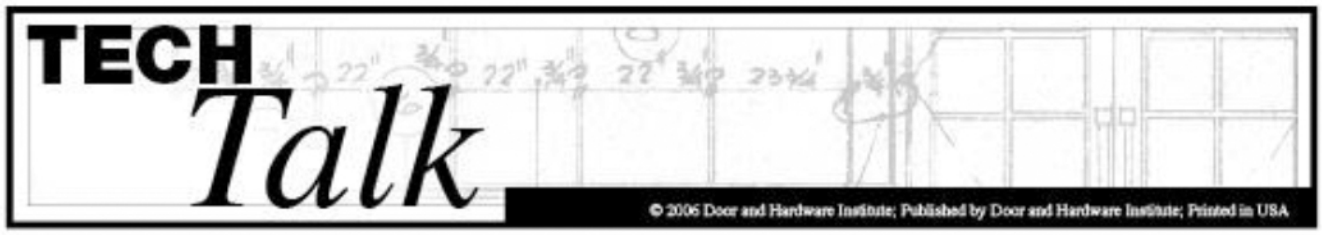


Thresholds and Gasketing

Weatherstripping, once thought of solely as spring bronze around a residential door, has acquired more significance in today's commercial market. In addition to performing the standard function of energy conservation, weatherstripping and thresholds now are used to retard sound transmission as well as smoke infiltration around and under doors. Handicapped persons also have had an impact on thresholds with the design and implementation of products specifically designed for that group. In fact, with the many different functions of today's weather-stripping, a more accurate term is gasketing. This broad classification includes all types, such as smoke gasketing, sound gasketing and weatherstripping. This document will be broken down to two product types: thresholds and gasketing. Within each general group, of course, many variations will be discussed and illustrated in detail.

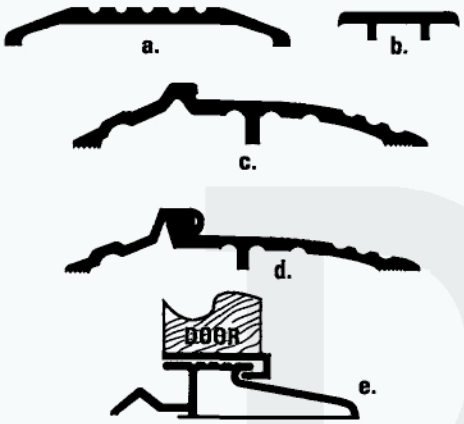
Thresholds

Thresholds are, in many ways, the largest and most diverse category. The more popular types are made by an extrusion process and they normally are furnished in either aluminum or bronze. Cast thresholds are available for iron, aluminum and bronze. Extruded aluminum thresholds normally are supplied with finishes of either milled or extruded. The reason for this is they will be placed on the floor and walked on, so any applied finish or anodizing will become scratched and eventually wear off in a high traffic area. However, architects do occasionally call for anodized aluminum thresholds, particularly in a dark bronze finish, and they are available. The major reason is that they are less expensive than solid bronze. Of course, solid bronze lasts longer and the finish will not wear off. Solid bronze thresholds are available in a polished brass finish (ANSI/BHMA 605 or Fed. US3), or an oil-rubbed dark bronze finish (ANSI/BHMA 612 or Fed. US10B).

All thresholds serve a similar purpose: to provide a seal between the floor and the bottom of the door. While thresholds can be categorized into one of four basic types (saddle, panic, interlocking and vinyl top), within each type are many variations to fill specific job requirements.

The saddle type threshold (Figure 1a) is the most common. It is a simple and straightforward application that generally is effective. When used with a door sweep, the saddle threshold becomes even more effective, limiting the flow of heat or cold as well as protecting from wind, water and dust. You should select a saddle of a height to close the gap between the floor and the bottom of the door to within Ya". Standard widths are available up to 7" depending on specific conditions, and with the use of threshold assembly parts, any width requirements can be met.

Figure 1



A special type saddle has been developed as a result of a fire regulation which prohibits combustible floor coverings (carpet) from running continuously under a door, in a hotel guest room for example. This saddle provides a dead airspace between the corridor carpet and the guest room carpet to keep fire from spreading (b). This section can be particularly useful also for sound and smoke protection by providing a rigid surface on which an automatic door bottom can operate.

The panic type threshold (c) normally is used for out-swinging doors. Many public buildings are required, either by code or security, to have some sort of panic-exit device. This type of threshold is designed for the vertical rod of the device to engage. It also provides weather-proofing protection at the bottom of the door. For added protection, a seal can be incorporated into the stop strip (d).

Some buildings, such as motels and apartments, have fairly specific requirements concerning in-swinging doors which are exposed to the elements. The interlocking type threshold (e) is often the solution. An "L" or "J" hook on the bottom of the door interlocks with the threshold itself, thus the name. Some interlocking thresholds offer further protection when weepholes are provided at 12" intervals to make a waterproof threshold. The pitfall in using an Interlocking threshold is that mud, ice, rocks and such can become lodged in the hook, causing the seal to lose effectiveness, Interlocking thresholds are suitable for exterior, out-swing doors flush with the building's face and no overhang protection.

The last type of threshold is the vinyl top (Figure 2a). It is similar to the saddle type except across the top of the saddle a strip of vinyl is inserted to make a more effective seal. Vinyl tops are fine for residential use, but not recommended for commercial use since the vinyl wears out when exposed to high traffic situations. In those cases, putting the vinyl on the bottom of the door instead (b) will prolong the life of the vinyl and hold replacement to a minimum.

Figure 2

The aluminum that is used in these thresholds is an excellent conductor of heat and cold. During extremely cold weather, aluminum thresholds actually can "sweat" on the interior. A solution to this problem is the thermal barrier threshold (Figure 3a). By using a rigid piece of vinyl as an insulator, this type of threshold breaks the path the cold travels. The thermal barrier feature is available on all fourtypes of thresholds.

In public high traffic areas, it is desirable to have a threshold with an abrasive, non-skid surface. This ensures safety beyond that provided by the regular fluting. Such finishes may be applied to any aluminum or bronze threshold, to make any opening sill non-skid coated. Abrasive finish should be considered for wide or unfluted thresholds.

The needs of the handicapped have influenced all phases of the hardware industry, including the gasketing and threshold industry. ICC/ANSI A117.1 *Accessible and Useable Buildings and Facilities 1998 Edition* states: The maximum height for a threshold on an opening cannot exceed ½".

There are some code regulations that govern the slope, bevel and vertical rise of thresholds for wheelchair traffic. As a result of these codes, specifically designed saddles are available today as handicapped accessible thresholds (b).

There also are latch track sections available for exterior openings that satisfy the '/2[1]' maximum height requirement (c), and any handicap section. Whenever you encounter situations where handicapped needs are involved, there are thresholds available that meet the codes, and still perform the basic task of sealing the gap between the floor and the bottom of the door.

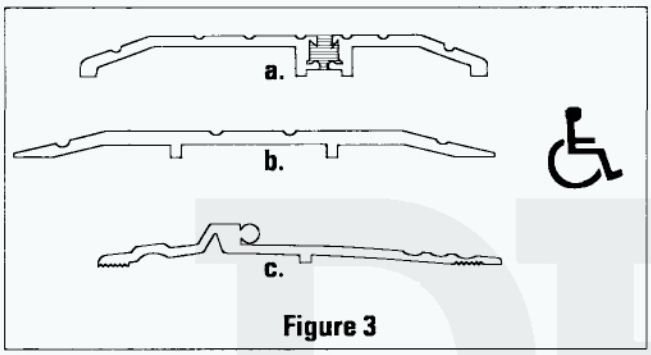


Figure 3

Sweeps

Generally a Vs" clearance is left between the threshold and bottom of the door when a saddle type threshold is used. This gap is sealed by the use of a sweep. The sweep generally is formed by an aluminum housing holding a sealing material of neoprene, vinyl, pile, brush, etc. (Figure 4). The sweep should contact the bevel of the threshold at a height great enough to allow the sweep to swing clear of the floor or carpet when the door is operated. Since one does not walk on the neoprene, brush or vinyl it does not sustain the wear that it would on the threshold.

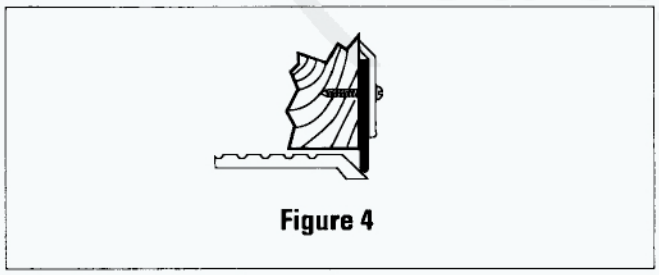


Figure 4

Automatic Door Bottoms

Automatic door bottoms provide an exceptional seal for high quality installations. The three types of automatic door bottoms (surface mounted, semi-, and fully mortised) (Figure 5) operate on the same principle. When the door is closed, the activator rod is depressed against the jamb or stop on the frame. This causes the portion of the door bottom closest to the hinged side to drop. The resulting pressure created when the bar contacts the floor or threshold causes the remaining portion to come down. This gives a complete seal across the bottom of the door. When the door is opened, the process is reversed: the bar is raised allowing the seal to swing clear of the carpet or other obstruction. This equipment may be used for radiation shielding, using a lead insert in the drop bar in lieu of lining the mortise. Naturally this equipment is more expensive. Meeting fire tests may determine the selection of proper door bottoms.

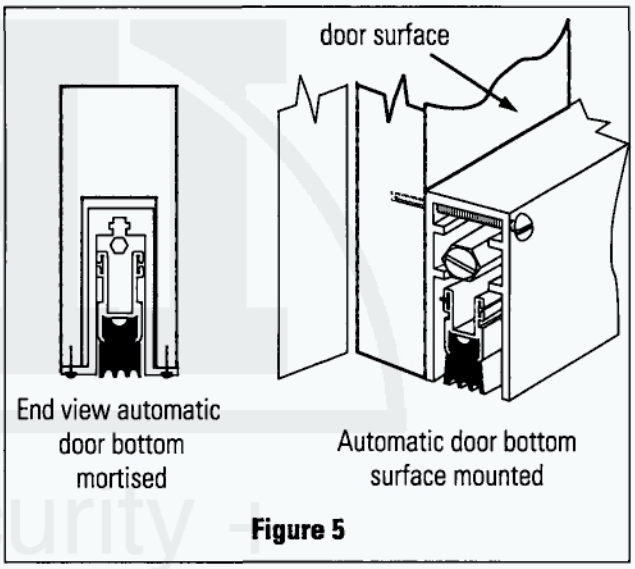


Figure 5

Gasketing

Most perimeter seals used today on the head and side jambs of doors operate and are installed in much the same way. An extruded aluminum section containing a strip of vinyl, pile, neo-prene, silicone, polyurethane, polyprene or nylon brush is attached to the door stop. When the door is closed, the gas-keting makes contact with the face of the door, creating a seal (Figure 6). There is a wide range of materials and shapes available for these applications. The simplest uses a mill finish aluminum housing with a vinyl bulb. This provides good protection when extreme temperatures are not encountered. When the temperatures fall below freezing however, vinyl becomes hard and may crack, losing its

weathersealing properties. In cooler climates vinyl will not last as long over the years as higher quality material.

You will find greater durability in a gasketing made from an anodized aluminum section fitted with an extruded neoprene, polyurethane or silicon bulb or blade (Figure 6a, 6b). These materials wear well in low temperatures and maintain weathersealing characteristics through years of use in all types of climates. An even better combination is an anodized aluminum housing fitted with neoprene sponge sections (c). This is a closed cell sponge that will not absorb moisture. It is given a rating that corresponds to the lowest temperature at which it still will remain flexible. The most common grades are rated for -40° Fahrenheit and the best grades -70° Fahrenheit. Of course, extreme temperatures like these are unlikely to be encountered very often, but this system of grading does give you an idea how long a section will retain ideal weatherstripping properties. Verify the grade of neoprene sponge you require.

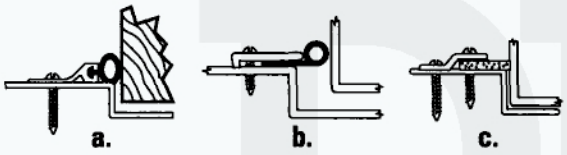


Figure 6

A type of seal that is gaining popularity is the press-on type (Figure 7a, b). Press-on gasketing has been available for some time, and new adhesives and configurations have made them more reliable than in the past. Today, press-on materials usually are made with various rubber compounds including neoprene and silicon. Press-on gasketing's advantage is its ease of installation. There are no holes to drill or fasteners to apply. Caution must be taken during installation, however. The surface of the frame must be clean, and the room temperature within the range recommended by the manufacturer. The adhesive may not adhere if the installation instructions are not followed.

A new type of seal also gaining popularity is the brush type (c). It is available in many styles, sizes and brush material. Some of these shapes are new to the industry and offer another product from which to select. Check each manufacturer's catalog and specifications for application requirements.

Spring bronze and stainless steel are still available and can be found in most manufacturers' catalogs. Once commonly used they now are used mostly on wood frame and door applications (Figure 8).

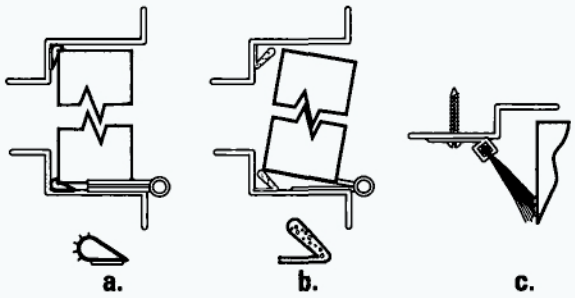


Figure 7

Another category of head and side jamb gasket is more sophisticated. It utilizes an extruded neoprene section with an adjustable feature (Figure 9) to compensate for unevenness or warping of a door. This heavy duty material also provides the most complete sound and light seal. Because of its greater thickness, it is important to check the frame detail when detailing and using this type of seal. If mounted on a ½" or 5/8" frame stop, the resulting condition on the push side of the opening (with a 2 ¾" backset lock) is commonly known as a "knucklebuster". One solution is to specify a longer backset for the lockset. A more ideal solution is to have the frame furnished without a stop (cased opening) with this equipment acting as the frame stop. When you have a requirement for a high quality seal, and the building could have settled, this is an ideal application. One should be aware of potential conflicts with exit device strikes and fire rating problems.

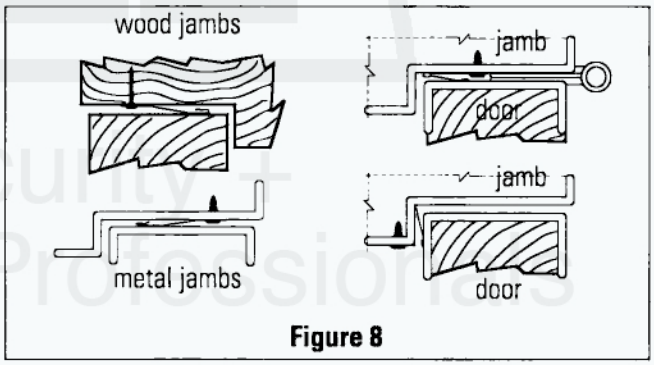


Figure 8

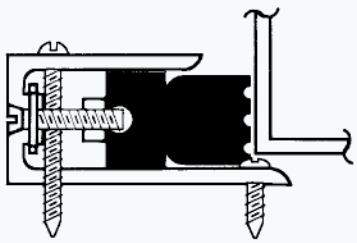


Figure 9

Drip Caps (drip or rain drip) also may be considered part of weatherstripping (Figure 10a). When used on the outside bottom of a door they deflect the rain toward the outside of the threshold. They also prevent water running down the face of the door from collecting and penetrating the bottom. Drip caps also can be used on the outside frame head to protect the area between the top of the door and the rabbeted head of the frame. Those used at the frame head generally will have a greater projection than the type used at the bottom of the door. They also may be of a configuration which Interlocks with a piece across the door (b). When used at the head of the frame the drip piece should extend the full width of the frame.

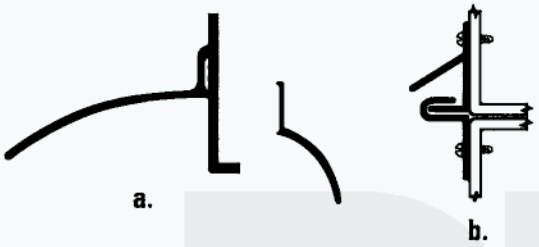


Figure 10

Astragals

Gasketing for meeting stiles of pairs of doors usually is referred to as *astragals.* This is a difficult opening to seal properly for sound, light or air. There are several options. Where only one door is active, overlapping metal astragals such as flat metal sections of aluminum, steel or stainless steel may be used (Figure 11a). With both doors active, however, this requires the use of a coordinator to assure that the doors close in proper sequence.

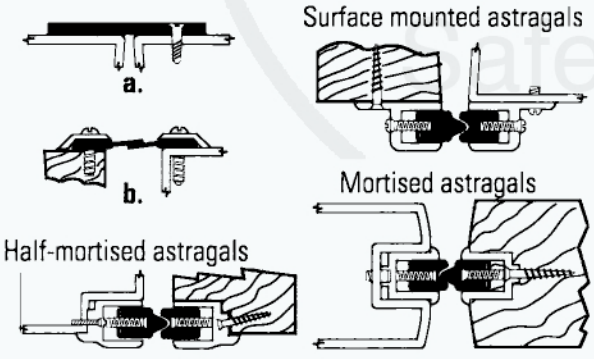


Figure 11

A second group of astragals mounts one piece on the edge of each door with a neoprene or vinyl extrusion overlapping between the two doors (b). Known as *compensating astragals,* this type allows the operation of either door without the use of a coordinator. A similar application using more sophisticated spring loaded adjustable or magnetic units on each door makes an even tighter seal. These units may be mortised or semi-mortised to be less noticeable.

Another type is the cam operated astragal (Figure 12). This offers the security of an overlapping astragal, but due to the spring loaded feature, does not require a coordinator. This unit is operated by a cam mounted overhead and is always installed on the inside of out-swinging doors

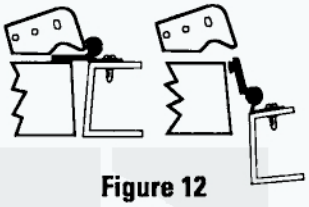


Figure 12

Sound Transmission

It does little good to have a sound control wall or barrier if the door in the wall permits noise to pass through easily. Sound transmission is measured by STC or Sound Transmission Class. The higher the STC rating, the more sound is absorbed by the door assembly, and therefore, the more quite is the assembly. The key here is the word "assembly". If you put high quality sound gasketing on a standard door you will not improve the overall STC of the opening. The door assembly, including gasketing, is only going to be as good as the door itself. To determine the STC of a sound gasketing assembly, you must know what the rating of the door is in a totally sealed condition, information that usually is available from the door manufacturer. A totally sealed condition here means the door actually is part of the wall. It is inoperable and sealed closed with a heavy mastic caulking compound. The sound test is run first in this manner to determine what the perfect STC rating is of the door itself.

In general, if a sealed door has an STC of 30 or less, it still will rate 30 when made operable and a quality gasket is used. It is essential that the opening be sealed with gasketing on all four sides to achieve no STC loss in the operable opening. If the STC of a door in a sealed inoperable test is over 30, it becomes harder (and eventually impossible) to achieve an operable STC equal to the door's inactive rating. Extra care should be taken to make sure the proper combination of gasketing

is used to keep the STC of the active assembly as high as possible. The higher the STC of the door, the more critical this becomes.

Certified (sound rated) acoustical openings usually come from the frame and door manufacturer complete with gasketing. These have been tested as a unit and must be supplied accordingly to meet certain STC ratings or class. When faced with fire rated acoustical openings once again the gasketing is provided with the frame and door.

Smoke Gasketing

There has recently been a great deal of interest in using weath-erstripping as smoke gasketing (Figure 13). Smoke is the primary source of deaths in over 90% of fire related deaths. People do not burn to death in fires, they succumb to smoke inhalation. As hardware specifiers and consultants, you should do everything you can to ensure smoke gasketing is provided around fire and smoke barrier doors to reduce smoke infiltration.

Independent infiltration tests show that an opening with no gasketing transmits approximately ten times the amount of air and smoke as the identical opening equipped with smoke protection. A controversy existed as to whether or not gasketing used as smoke infiltration protection could be used on a labeled opening. This now has been addressed by National Fire Protection Association pamphlet IMFPA-80.

NFPA-80, titled *Fire Doors and Windows* states: "no equipment can be used on a labeled opening unless the material has been tested and labeled by a testing laboratory." Until a few years ago no material had that label. Now smoke gasketing is available which has been tested by independent laboratories such as Underwriters Laboratories Inc., Warnock-Hersey International, etc.

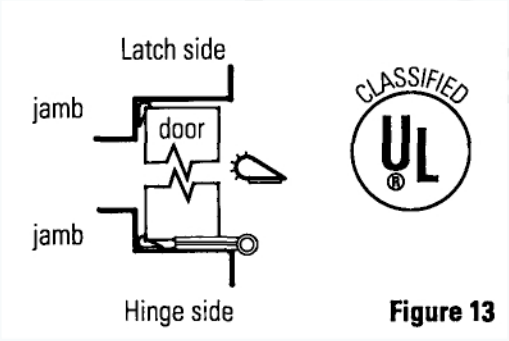


Figure 13

NFPA-105, titled *Smoke and Draft Control Door Assemblies,* has recognized the importance of smoke infiltration and has adopted a recommendation for their use. Gasketing is essential for an assembly intended to control smoke.

Classified gasketing materials are intended to be installed on a labeled door or listed fire doorframes at the manufacturers' plant or in the field in accordance with the installation instructions provided with the product. These gasketing materials are studied to determine that installation of materials does not adversely affect the operation of the door assembly, and to establish that the fire resistance rating is not adversely affected. The basic standard used to investigate gasketing materials for negative pressure testing is the *Standard for Fire Tests of Door Assemblies,* UL-10B. The standard for positive pressure testing is UL-10C. Gasketing materials are investigated and installed on a fire door or frame type designed by the gasket material manufacturer and attached in accordance with the installation instructions provided with the product. The performance of the gasketing is observed during the fire and hose stream test to determine that flaming does not occur on the unexposed surface of the door assemblies and that the gaskets do not adversely affect the fire resistance of the door assembly.

Once gasketing has been installed, the door should be tested several times to ensure it will self-close and latch. Also, this test should be repeated at regular intervals to check for changes in the door adjustment or gasketing seal. With handicap requirements, too tight a seal could cause the latch bolt to become too difficult to operate. Care must be taken on installation to prevent this condition.

Conclusion

The industry has met the challenge by providing products which serve to protect each opening. These products serve to control airflow, sound, light and weather protection, while meeting codes and handicapped access requirements. No single product or material can be properly selected without considering the intended use of each opening. Applicable codes and regulations must also be considered for impact over product selection.