

CHECKLIST FOR DOOR HARDWARE

HINGES:

- Except for residential and light commercial use all hinges should be ball-bearing/oil impregnated type
- Hinges on exterior doors should be non-ferrous with non-removable stainless steel pins.

LOCKSETS:

- Except for residential and light commercial use all locksets shall be heavy-duty type with lever handle trim.
- Levers shall be solid cast or forged brass, bronze or stainless steel. Hollow or filled levers are not acceptable.

CYLINDERS:

- Cylinders shall be 6 pin.
- Furnish temporary construction cylinders (as required by the scope of the project).
- Cylinders to be by same manufacturer as the locksets.

DOOR CLOSERS:

- Verify what kind of closer is being specified.
 - What angle of door opening is allowed with the particular closer?
 - Is it for an interior or exterior door?
- Multi-size type closers shall be considered the standard.
- Closers shall have individual adjustment valves for door speed, latching speed, and backcheck control. Closers with spring power adjustment are required for interior doors subject to ADA requirements.
- Use closers with high impact, non-corrosive covers which completely conceal all valves – discouraging tampering.
- Supplier shall be responsible for providing all necessary mounting brackets, drop plates, parallel arm brackets, adjustable arms, etc. to permit complete installation of door closers.
- Typically this type of closer is finished with aluminum paint. Take this into consideration when using with aluminum doors – the finish seldom matches well.
- This type of closer requires a minimum 6” top rail to mount on aluminum doors – so it will not fit on the narrow or medium stile door typically. In this case, consider specifying that the closer be supplied by the door supplier to match the finish on the door.

DOOR STOPS:

- Verify that a door stop is required
 - If the door can conceivably open 180 degrees but the closer restricts the opening to 160 degrees then you must verify that the closer has a back-check adjustment or use a floor stop
 - Use wall stops when possible. In planning try to locate the doors near a perpendicular wall if possible rather than out in the middle of the room.
 - Floor stops are “trippers” and create barriers to proper cleaning of floor surfaces.
 - Overhead stops are useful when you can’t use a wall stop and you don’t want to use a floor stop – but they don’t work well in conjunction with closers.
- a door stop is requiredUse wall stops wherever

THRESHOLDS AND GASKETING

by Charles F Smith Jr. & Neal Frazier, AHC

WEATHERSTRIPPING

Once thought of solely as spring bronze around a residential door, weatherstripping 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 weatherstripping, 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 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 in mill or as extruded finish. 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.

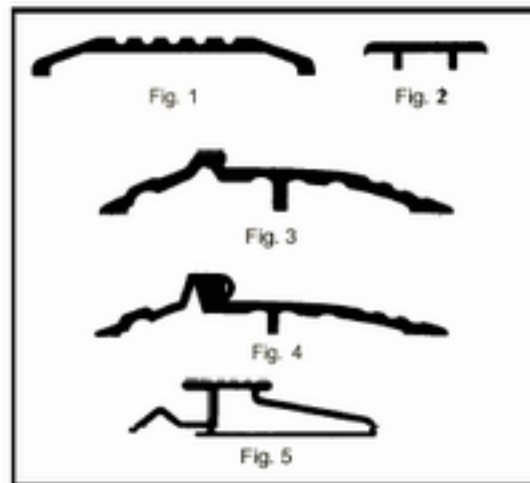
The saddle type threshold (Figure 1) is the most common and a simple and straightforward application that generally is effective. When used with a door sweep, it becomes even more effective in dealing with heat or cold as well as protecting from wind, water and dust. You should select a saddle of a height to close the gap between the floor and the bottom of the door to within 1/8th of an inch. Standard widths are available up to 7" depending on specific conditions, and with the use of threshold assembly parts, any width requirement can be met.

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 air space between the corridor carpet and the guest room carpet to keep fire from spreading (Figure 2). 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.

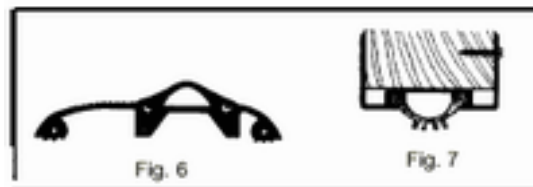
The panic type threshold (Figure 3) normally is used for out-swinging doors. Many public buildings are required, either by code or security, to have some sort of panic-exit device. This type of threshold is designed for the vertical rod of the device to engage. It also provides weatherproofing protection at the bottom of the door. For added protection, a seal can be incorporated into the stop strip (Figure 4).

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 (Figure 5) is often the solution. An "L" or "J" hook on the bottom of the door interlocks with the threshold itself, thus the name. Some 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 6). 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 (Figure 7) will prolong the life of the vinyl and hold replacement to a minimum.



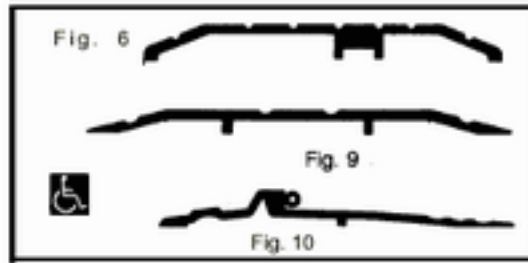
The aluminum that is used in these thresholds is an excellent conductor of heat and cold. During extremely cold weather, aluminum thresholds actually can "sweat" on the interior. A solution to this problem is the thermal barrier threshold (Figure 8). By using a rigid piece of vinyl as an insulator, this type of threshold breaks the path the cold travels. The thermal barrier feature is available on all four types of thresholds.

In public high traffic areas, it is desirable for safety to have a threshold with an abrasive, non-skid surface 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. While there are several codes in effect today, most of the codes state the maximum height for a threshold on an exterior opening cannot exceed 1/2", while the maximum height for interior thresholds cannot exceed 1/4".

There are code regulations which govern the slope, bevel and vertical rise of thresholds, which would be most applicable to wheel chair needs. As a result of these codes, specifically designed saddles are available today as handicapped accessible thresholds (Figure 9).

There also are latch track sections available for exterior openings that satisfy the 1/2" maximum height requirement (Figure 10), 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.



SWEEPS

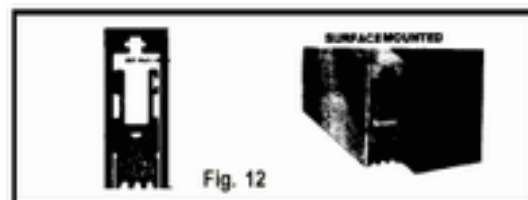
Generally a 1/8" clearance is left between the threshold and bottom of the door when a saddle type threshold is used. This gap is sealed by the use of a sweep. The sweep generally has an aluminum housing and sealing material of neoprene, vinyl, pile, brush, etc. (Figure 11).

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.



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 12) 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 even 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.

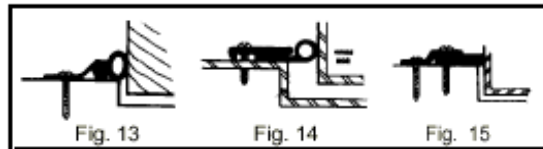


GASKETING

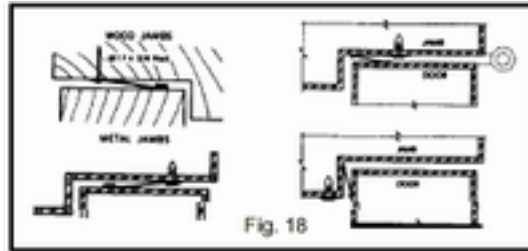
Most perimeter seals used today on the head and side jambs of doors operate on the same basic principle and are installed in the same way. An extruded aluminum section containing a strip of vinyl, pile, neoprene, silicone, polyurethane, polyprene or nylon brush is attached to the door stop. When the door is closed, the gasketing makes contact with the face of the door, creating a seal (Figure 13). There is a wide range of materials and shapes available for these applications. The simplest uses mill finish aluminum housings 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 weather sealing properties. In cooler climates vinyl will not last as long over the years as higher quality material.

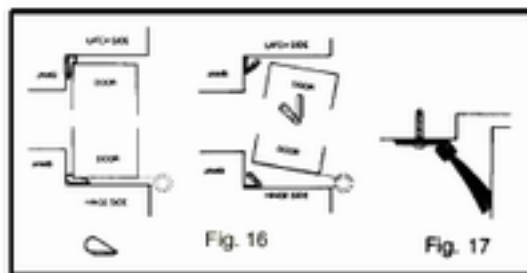
You will find greater durability in a gasketing made from an anodized aluminum section fitted with an extruded neoprene, polyurethane or silicon bulb or blade (Figure 14). These materials wear well in low temperatures and maintain weather sealing characteristics through years of use in all types of climates. An even better combination is anodized aluminum housings fitted with neoprene sponge sections (Figure 15). 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 -40 degrees Fahrenheit and the best grades, -70 degrees 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.



A type of seal that is gaining popularity is the press-on type (Figure 16). 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. Its 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.

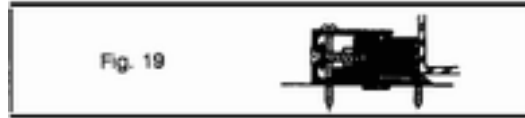


A new type of seal also gaining popularity is the brush type (Figure 17). It is available in many styles, sizes and brush material. Some of these shapes are new to the industry and offer another product from which to select. Check each manufacturer's catalog and specifications for application requirements. Spring bronze and stainless steel still are available and can be found in most manufacturers' catalogs. Once commonly used they now are used mostly on wood frame and door applications (Figure 18).

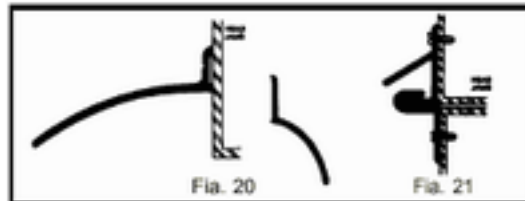


Another category of head and side jamb gasket is more sophisticated. It utilizes an extruded neoprene section with an adjustable feature (Figure 19) to compensate for unevenness or warping of a door. This heavy duty material also provides the most complete sound and light seal. Because of its greater thickness: it is important to check the frame detail when detailing and using

this type of seal. If mounted on a 1/2 " or 5/8 " frame stop, the resulting condition on the push side of the opening (with a 2-3/4" backset lock) is commonly known as a knuckle-buster. 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.



Drip Caps (drip or rain drip) also may be considered part of weatherstripping (Figure 20). 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. Also, they may be of a configuration which interlocks with a piece across the door (Figure 21). When used at the head of the frame the drip piece should extend the full width of the frame.

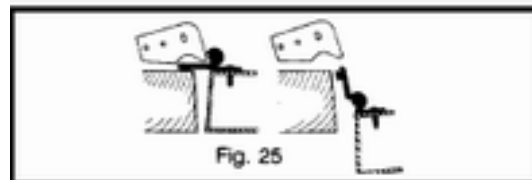


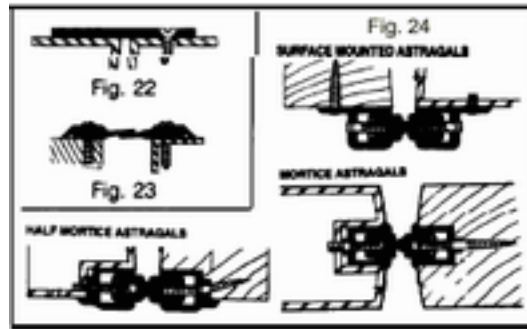
ASTRAGALS

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 22). With both doors active, however, this requires the use of a coordinator to assure that the doors close in proper sequence.

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 (Figure 23). 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 (Figure 24).

Another type is the cam operated astragal (Figure 25). 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.





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 in STC or Sound Transmission Class. The higher the STC rating the more sound that has been absorbed by the door assembly and therefore, the better 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 quality of the door. 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. This information is usually 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.

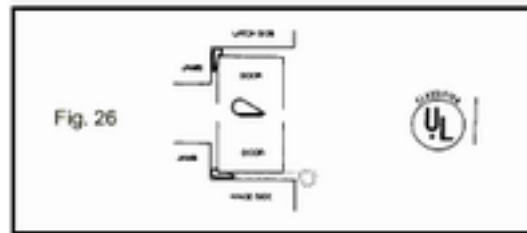
SMOKE GASKETING

There recently has been a great deal of interest in using weatherstripping as smoke gasketing (Figure 26). 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 insure 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 NFPA-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.



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 door frames at the manufacturer's 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 is the Standard for Fire Tests of Door Assemblies, UL-10B. 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 insure it will self-close and latch. Also, this test should be repeated at regular intervals to determine if the gasketing or door has come out of adjustment so it does not self-close and latch. 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 also.

CONCLUSION

The industry has met the challenge, by providing products that protect each opening. These products serve to control air flow, 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.