1

Hanging Devices

As discussed in the Introduction, the first type of device addressed in the Door and Hardware Institute's Sequence and Format for the Hardware Schedule is the hanging device. Although not typically a highlight of the door opening, the hanging device is one of the most important components. Supporting the entire weight of the door from the top, bottom, side, or a combination, the hanging device is relied on for its precise and consistent pivot point swing or slide, and is probably the most actively used door opening component.

Depending on the type of door, its function, and application, doors can be hung onto a door frame, onto a framed opening, or directly on a wall. A swinging door can be hung on hinges, continuous hinges, pivots, or floor closers, while a sliding door can be hung on tracks and hangers suspended from the top underneath the head of a framed opening, on the face of the wall, or supported by the floor from underneath the door. The most efficient and effective way to hang a door would be any means supported by the floor rather than the frame or wall. This creates less or no tension on the frame or wall where the door by nature is pulling away, whereas a door supported by the floor is resting on top and has no tension at all.

Although a swinging door is the most common type, sliding door options and use have increased over recent years because of their functionality, space-saving ability, and aesthetics.

HINGES

Also Known As: Butts, Butt Hinges, Standard Hinges

DESCRIPTION

Hinges are manufactured to accommodate various door sizes, thicknesses, weights, new and existing conditions, and fire ratings. Special hinge applications are available for specific situations, which include healthcare and those that have particular aesthetic needs, sound requirements, or door and frame applied materials.

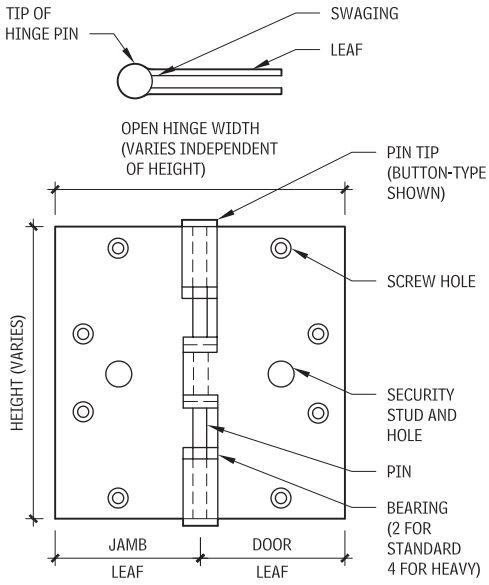


FIGURE 1.1 Elements of a Hinge

(Source: The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

PROPERTIES

Hinges are typically manufactured with two leaves that have alternating knuckles, which meet to form a barrel, and a hinge pin holds the leaves together as one. This gives a hinge the ability to rotate or swing a door into the open or closed position.

A hinge pin typically has a flat tipped end so that it rests against the top of the hinge barrel so that the pin does not fall through. With that said, although most commercial hinges are manufactured with pins that are "nonrising," they still have the ability to rise if nothing is holding them in place as a nonremovable pin option (see Nonremovable Pin in the hinge options section of this chapter). Other pin options are what are known as fast pins, which are more difficult to remove in the field as they are either riveted or threaded into the barrel, similar to the way a screw is with threads. This type of pin might be most desirable on out-swinging, or reverse bevel, doors so that the pins cannot be easily removed, the door taken off its hinges, and the opening left unsecure.

Although the majority of barrels are round, some manufacturers offer square barrel hinges for a different aesthetic. Screw holes are typically countersunk, unless one is using a special hinge type such as the slip-in hinge (see Slip-In under Types in this section).

Bearings

Also known as anti-friction bearings, these are hinges that are manufactured with bearings separate the metal of the knuckles, keeping them from directly touching and pivoting on each other. The inserts, which can be plastic, ball bearings or oil-impregnated bearings, create a barrier between the metal parts, eliminating metal friction, which causes less wear on the knuckles than a nonbearing hinge would.

BALL BEARING

Ball bearing hinges are manufactured with a metal ring inserted in between each knuckle of the barrel with ball bearings inside each ring, very similar to the wheels of roller skates, which help them roll more smoothly and with less friction. Most commonly, the ball bearing rings are visible, creating additional shear lines in the appearance.

FIGURE 1.2 Heavyweight Ball Bearing Full Mortise Butt Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.3 Nonbearing Full Mortise Butt Hinge
(Source: Courtesy of Scott J. Tobias)

Available as an option from some manufacturers are concealed bearing hinges, where the bearings are concealed in larger knuckles, which are visually similar to nonbearing butt hinges.

Standard weight hinges typically have two rings of ball bearings on the barrel whereas heavy weight hinges typically have four. Per building codes and standards, fire rated doors must be installed with butt hinges that have a minimum of two ball bearings.

NONBEARING

Nonbearing hinges allow the knuckles of the barrel to directly meet, pivoting on each other with nothing to prevent the metal from wearing excessively. This is more likely on frequently used door openings than on infrequently used ones, such as a closet or bedroom door in a home.

OIL-IMPREGNATED BEARING

Oil-impregnated bearing hinges are manufactured with a metal ring insert in between each pair of knuckle of the barrel with oil inside each ring instead of ball bearings. These rings of oil act similarly to ball bearings and protect the knuckles of the hinge barrel from touching each other directly, helping to reduce excessive wear.

Corners

ROUND CORNER

Some hinges are available with rounded corners as an option; these are typically used for residential doors and frames, although you may come across them on a commercial project or two. The round corner can either be a specific model number or an option to a model number allowing you to change the square edge to round.

SQUARE CORNER

Most hinges are manufactured standard with square edges with 90-degree corners. Be cautious when handling the hinge, the corner can be sharp at the point.

FIGURE 1.4 Round Corner Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.5 Square Corner Hinge
(Source: Courtesy of McKinney® Products Company)

Finishes

Depending on the manufacturer's availability, hinges are typically available in all architectural hardware finishes. Depending on the aesthetic and cost choices made, sometimes hinges are specified with plated or solid metal finishes to match the locking and/or other hardware on the opening. Prime-coated hinges are also available, which are less expensive than a plated finish and are typically painted the same color and at the same time as the door, frame, and surrounding areas.

Painting hinges or anything on site is not recommended as it will contribute to poor air quality for those currently and eventually working in the space. Using a manufacturer's factory finish might even help contribute to credits toward a current or future green building standard, code, or certification.

Grades

Although hinges are typically referred to in weights, ANSI/BHMA A156.1 American National Standard for Butts and Hinges have minimum standards and hinges are graded with various tests. Cycle testing, hinge pin rise, hinge play to test the movement of a fixed hinge, vertical and lateral wear, an electrical hinge test, and finish tests are the main tests. Cycle testing shows the following as minimum grade requirements for cycle testing:

- Grade 1: 2,500,000 cycles
- Grade 2: 1,500,000 cycles
- Grade 3: 350,000 cycles

Imagine getting a grade 3 product when specifying a grade 1 due to poor substitution practices. Be sure to check each item delivered against the approved specifications and submittals for compliance of quality.

Hole Preparations

NONTEMPLATED

Nontemplated hinges are manufactured without standard fastener hole locations and the holes can be at any location on the hinge leaves. These hinges tend to be less expensive and are typically used for residential applications.

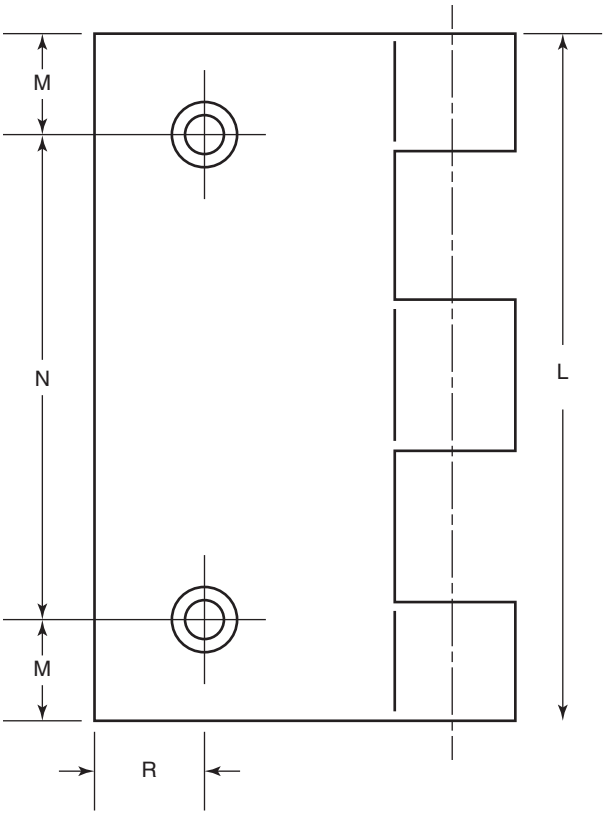


FIGURE 1.6 Template Hinge Pattern
(Source: ANSI/BHMA A156.7 American National Standard for Templated Hinge Dimensions, 2009, Builder's Hardware Manufacturer's Association)

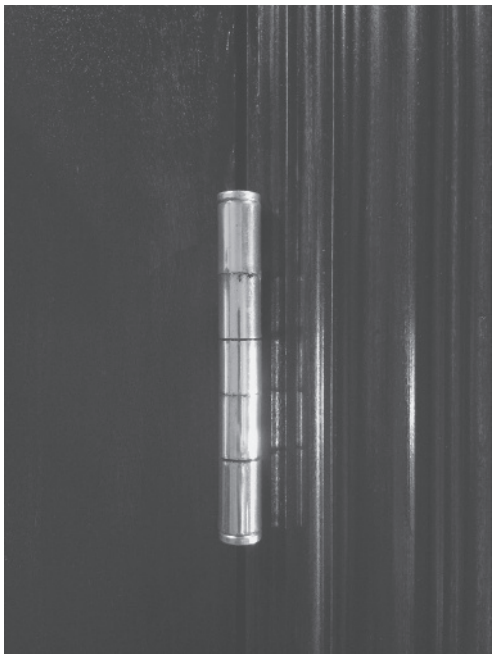


FIGURE 1.7 Five-Knuckle Hinge Barrel
(Source: Courtesy of Scott J. Tobias)

TEMPLATED

Templated hinges are manufactured with standard fastener hole locations on the hinge leaves. These standard locations are detailed in the ANSI/BHMA Standard A156.7–2003 for Template Hinge Dimensions. This standard is typically referenced in commercial construction projects specifications (see the Introduction of this book for more information on ANSI/BHMA).

Knuckles

Hinges can be manufactured with different knuckle quantities. The different knuckle quantities that form the barrel give the barrel different appearances.

FIVE-KNUCKLE HINGES

A hinge with five knuckles is typically the most widely used type of butt hinge. One leaf of the hinge has three knuckles and the other leaf has two, which fit together to form a barrel. The hinge barrel is held together by inserting a hinge pin down the center of the barrel from one end to the other.

THREE-KNUCKLE HINGES

Three-knuckle hinges are another widely used option, where one leaf has two knuckles, one each at the top and bottom ends of the leaf. The other leaf has one large knuckle in the center and, when pieced together with the other half, a three-knuckle hinge barrel is formed. The hinge barrel is held together by inserting a hinge pin down the center of the barrel from one end to the other.

TWO-KNUCKLE HINGES

Two-knuckle hinges are also referred to as Paumelle Hinges (see Paumelle Hinges in this section). A two-knuckle hinge with a conventional barrel will have a very streamlined clean look where there are

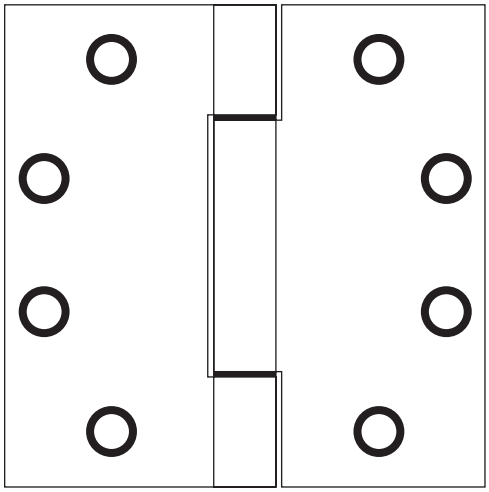


FIGURE 1.8 Three-Knuckle Hinge Diagram
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.9 Two-Knuckle Hinge
(Source: Courtesy of Scott J. Tobias)

only two long "knuckles" forming the barrel. Typically, rather than a pin being inserted into the barrel, the bottom half of the leaf of the barrel has a pin attached to it protruding out of the barrel on one side. The top hinge leaf barrel is hollow and, with the help of gravity keeping the two leaves together to form the full barrel, the top leaf slips onto the pin of the bottom leaf.

Unlike five- and three-knuckle hinges, which can be used on any handed opening, left hand or right hand, two-knuckle hinges are handed and have to be specific to the door swing. It would be impossible to install a left-hand hinge on a right-hand door, as the pin would be sticking down instead of up with nothing to support the bottom leaf.

Materials

Hinges are manufactured from various materials including steel, brass, bronze, or stainless steel. The material type specified and installed can depend on the door opening application and fire rating requirements.

If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire for a certain period of time, depending on the surrounding wall rating. If anything other than a steel base hinge is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other prematurely.

When choosing a base metal, one should also take into account rusting. Brass and bronze base metal hinges will not rust at all, whereas steel hinges are prone to rust, and although stainless steel can rust, it is more resistant than steel.

Although you might see aluminum hinges on some light-duty doors, it is not optimal for door openings due to the softness of the metal. Aluminum does not rust as steel does, but it does oxidize and corrode, which gives the appearance of rusting without the rust color. Aluminum hinges are typically clear coated to help prevent the oxidation.

Ratings

NONFIRE RATED

Nonfire rated hinges can only be used on doors and frames that are not fire rated openings. These hinges can be manufactured from brass or bronze base metals.

FIRE RATED

Fire rated hinges can be applied to both fire rated or nonfire rated doors and frames. These hinges can only be manufactured from steel or stainless steel base metals.

Sizes

The hinge size typically follows the model number, so once you have decided on the manufacturer, type, knuckle configuration, and bearing type, and the door size, material, and frequency; it is time to determine the proper hinge size.

The first number in the size of a hinge typically refers to the hinge height, while the second number refers to the hinge width. For a typical 1 3/4-inch-thick door, the hinge size would typically be 4 1/2 inches by 4 1/2 inches, which means the hinge leaves are 4 1/2 inches high and 4 1/2 inches wide with the hinge leaves in the open position.

For thicker doors and doors and/or frames with plant-on materials on the faces such as panels, thicker hinges might be required to clear the added materials. The calculation for figuring out the optimal hinge width is to deduct the backset (dimension between the edge of the door and the edge of the hinge leaf) of the hinge on the door from the door thickness, multiply the balance by 2, and add any additional clearances such as the thickness of an applied panel. The dimension might end up in the middle of a standard hinge size offering; if you come across this situation, round up to the next available size.

Swaging

Hinge leaves are typically swaged. Swaging is a slight offset of the hinge leaf at the barrel. The offset accounts for the door edge, which is typically beveled. A beveled door edge is typically required for swinging doors so that the door edge does not bind with the square edge of the frame. If both edges were square, the door would not fit into the frame.

Recommened Size of Hinges per Door, Either Wood or Metal

Door		Hinge	
Thickness In. (mm)	**Width In. (mm)**	**Height In. (mm)**	**Gauge**
1 3/8" (35)	up to 36" (914)	3 1/2" (89)	.123
1 3/8" (35)	over 36" (914)	4" (102)	.130
1 3/4" (44)	up to 36" (914)	4 1/2" (114)	.134
1 3/4" (44)	36 – 48" (914–1219)	5" (127)	.146
1 3/4" (44)	over 48" (1219)	6" (152)	.160
2" 2 1/2" (51–64)	up to 42" (1067)	5" (127)	.190
2" 2 1/2" (51–64)	over 42" (1067)	6" (152) HW	.203

FIGURE 1.10 Butt Hinge Size Chart
(Source: Courtesy of McKinney® Products Company)

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Hollow Metal Door Weights by Gauge

	Lbs. per Square Foot
20 Gauge	4
18 Gauge	5
16 Gauge	6
14 Gauge	7

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Wood Door Weights by Door Thickness

	Lbs. per Square Foot	
	1 3/8" door	1 3/4" door
Particle/Mineral Core	4.75	5.25
Stave Core Wood	3.75	4.25
Hollow Core Wood	1.3	1.5

Door Weight Chart Butt Hinges

FIGURE 1.11 Door Weight per Square Foot Chart
(Source: Courtesy of McKinney® Products Company)

When in the parallel position, most hinge swaging provides a 1/16-inch clearance between the hinge leaves to accommodate for the door and frame clearance, which allows the door to swing in and out of the door frame without binding.

Weights

Although hinges are categorized in grades by ANSI/BHMA A156.1 American National Standard for Butts and Hinges, they are also referred to as weights—standard and heavy. The optimal hinge weight depends on the door's width, weight, and frequency of use, and there are industry, code, manufacturers' and standards charts to help guide us to the correct choice. In addition to weights, a hinge can be manufactured with different quality levels, depending on its source, factory, and sometimes the standards of the country in which it is manufactured.

Some manufacturers still manufacture hinges in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports. Imports are available for the most typical and widely used sizes, namely, for 3-foot-wide, 7-foot-high, and 1 3/4-inch-thick wood or metal swinging doors. The hinges are less expensive than those still made in the United States and the lower quality can sometimes be noticed with ragged edges, poor finishes, and less than optimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell similar hinges in quality and cost in order to compete on projects.

STANDARD WEIGHT

Standard weight hinges are manufactured with 0.134-inches-thick material and are typically specified and installed on the majority of commercial wood and metal doors and frames.

HEAVYWEIGHT

Heavyweight hinges are similar to standard-weight hinges in the manufacturing process and design, except they are manufactured at 0.180 inches in a thicker gauge metal and are more substantial than standard-weight hinges.

Heavyweight hinges are recommended for specification and installation on wider, thicker, and more frequently used door openings to help the door withstand the higher use and abuse it might encounter in its extensive use.

Expected Frequency of Door Operation

Door	Expected Daily Cycles	Frequency Yearly	
Commercial			
Commercial Store Entrance	5,000	1,500,000	High
Office Building Entrance	4,000	1,200,000	
Theatre Entrance	1,000	450,000	
School Entrance	1,250	225,000	
School Restroom Door	1,250	225,000	
Store or Bank Entrance	500	150,000	
Office Building Restroom Door	400	118,000	
School Corridor Door	80	15,000	Average
Office Building Corridor Door	75	22,000	
Store Restroom Door	60	18,000	
Residential			
Entrance	40	15,000	Low
Restroom Door	25	9,000	
Corridor Door	10	3,600	
Closet Door	6	2,200	

FIGURE 1.12 Door Frequency of Use Chart
(Source: Courtesy of McKinney® Products Company)

TYPES

Anchor

Typically fully mortised and furnished in sets of three, an anchor hinge is manufactured similarly to a standard mortise hinge. The difference is that the top hinge of the set is manufactured with two flat metal plates with screw holes that rest flat on top of the door and against the head of the frame. The plates are screwed down and up in place, in a sense anchoring the hinge to the door and frame where the most tension, or pulling away from the frame, typically occurs.

Although not commonly used and a unique aesthetic where the hinge is installed at the very top of the edge of the door (instead of 5–1/2 inches to 7 inches down from the top of the door as with most standard hinges), the use of an anchor hinge could possibly help sustain an opening's lifespan by supporting some of the weight of the top of the door by being attached to the head of the frame instead of the top of the hinge jamb.

Blank Plate

Hinge blank plates are available to fit the preparation for a templated mortised hinge leaf, which might not be used anymore. A preparation might need to be filled with a blank if a door is removed from the opening altogether and no door will hang in the opening anymore or if the existing mortise preparation has weakened and is not sufficient to hold the weight of a door hung on the mortise hinge it was intended to. In this case, a hinge blank would fill the preparation and a surface-mounted hinge could hang the door instead.

FIGURE 1.13 Anchor Hinge
(Source: Courtesy of McKinney® Products Company)

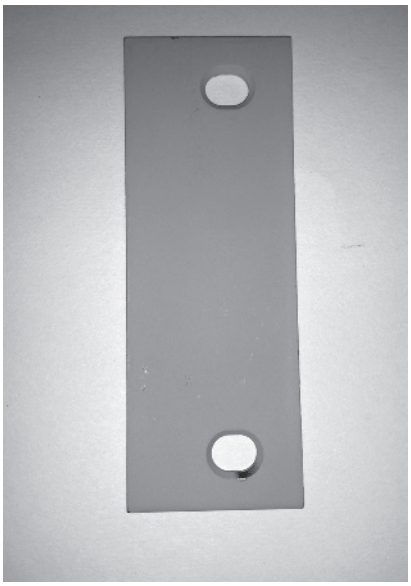


FIGURE 1.14 Hinge Blank Plate
(Source: Courtesy of Maddalena Messina)

Detention Hinge

Typically used on prison cell doors or very high security metal pass-through doors used in courthouses or other types of detention facilities. One would think that this would be the perfect place for a high-security fastener, when in fact these hinges are typically welded onto the surface or faces of the metal door and frame.

Friction

Friction hinges are used to hold a door open at any angle of the door swing. The friction is caused by bearings or discs manufactured into the knuckles, which that can be adjusted to create different friction levels.

Invisible Hinge

Unlike any conventional hinge and available from a limited number of manufacturers, invisible hinges are named just as they appear on the door and frame in the closed position, invisible. This gives the

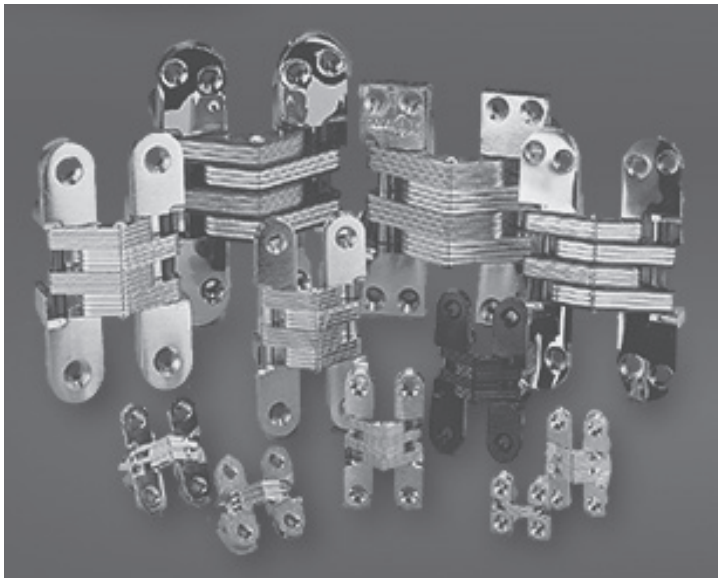


FIGURE 1.15 Various Invisible Hinges
(Source: Soss Door Hardware)

FIGURE 1.16 Invisible Hinge Open
(Source: Soss Door Hardware)

FIGURE 1.17 Invisible Hinge and Door Application
(Source: Soss Door Hardware)

appearance that there is no hinge installed at all and the hinge cannot be seen unless the door is in the open position. When in the open position, on the edge of the door and frame you can see the face of the hinge and the screws.

As with conventional hinges, there are various options available, depending on the door size and frequency of use, including spring and electric transfer hinge options. Although only visible when the door is in the open position and depending on the manufacturer, invisible hinges are available in most standard architectural hardware finishes.

Lightweight

Lightweight hinges are typically used for residential or very light-duty and frequently used door opening applications. Most lightweight hinges are not template are plain bearing, and have rounded corners.

Olive Knuckle

Typically fully mortised, olive knuckle hinges have a similar appearance to intermediate pivots with one knuckle in the center of the device. Oval in shape, resembling an olive, the knuckle joins the two leaves of the hinge together, and they are typically rated grade 2 by their manufacturers and are intended to be used on low-frequency, decorative, residential door openings such as interior French doors. The hinge leaves are typically narrow and might be able to carry less door weight than standard hinges with limited door size varieties.

FIGURE 1.18 Olive Knuckle Hinge
(Source: Courtesy of McKinney® Products Company)

Paumelle Knuckle

Paumelle hinges are hinges that have one knuckle—whether round, rectangular, or olive in shape—where one center knuckle joins the two leaves of the hinge together with a pin sticking out of the bottom half. The top half rests on top of the bottom, with gravity keeping the two halves together. Paumelle knuckle hinges are typically used on low-frequency, decorative, residential door openings such as interior French doors, and the hinge leaves are typically narrow and able to carry less door weight and door size varieties than standard butt hinges.

Pivot Reinforced

Similar to an anchor hinge, a pivot reinforced hinge has two flat metal plates with screw holes that rest flat on top of the door and against the head of the frame. The plates are screwed down and up in place, in a sense anchoring the hinge to the door and frame where the most tension, or pulling away from the frame, typically occurs.

Raised Barrel

Typically, a full mortise hinge and used when a door is recessed in a reveal in a frame, the hinge barrel is offset to allow a door to swing on an offset pivot point. When a door is recessed in a frame, a standard full mortise hinge barrel would not sit flush against the frame and door leaving a gap and an incorrect, inefficient butt hinge installation causing the door and frame to bind. By offsetting the hinge barrel, the hinge barrel sits away from the frame edge, creating a new pivot point for the door, which prevents binding and results in a smooth, free-swinging door.

Slip-In

Unlike a typical hinge, slip-in hinges are manufactured without countersunk screw holes on the hinge leaves because they literally slip into a pocket behind either the hinge edge of the door, the frame, or both. Typically used with aluminum doors and frames, slip-in hinges might provide additional

FIGURE 1.19 Pivot Reinforced Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.20 Raised Barrel Butt Hinge
(Source: Courtesy of McKinney® Products Company)

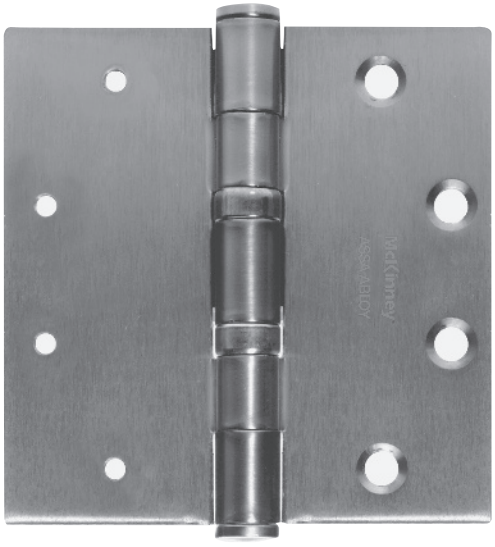


FIGURE 1.21 Slip-In Hinge
(Source: Courtesy of McKinney® Products Company)

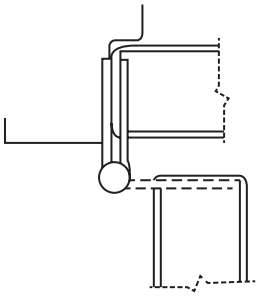


FIGURE 1.22 Slip-In Hinge Diagram
(Source: Courtesy of McKinney® Products Company)

reinforcement for both sides of the hinge leaf. The faces of the pockets on the door and frame would typically be drilled and tapped with countersunk screw holes at the time of manufacturing.

Spring

Spring hinges are manufactured most commonly 4–1/2-inches high by 4–1/2-inches wide for commercial applications. Instead of a conventional pin in the barrel, a spring in tension inside the solid barrel of the hinge keeps the hinge leaves pulling together toward the closed position. This allows the tension to force the hinge leaves together when pulled apart as the door swings away from the frame, essentially closing the leaves of the hinge and the door into the frame when let go.

The disadvantage of a spring hinge is the lack of door control due to the spring hinge having only one adjustment, which either tightens or loosens the spring tension and closing force. When spring hinges are used on doors, it is not uncommon for the doors to either not close all of the way all of the time or slam shut harder than desired. In addition to only having one adjustment available, the surrounding

FIGURE 1.23 Spring Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.24 Large Barrel Spring Hinge
(Source: Bommer Industries, Inc.)

FIGURE 1.25 Double-Acting Spring Hinge
(Source: Courtesy of Scott J. Tobias)

conditions such as air pressure, air conditioning, and heating at different times of the day and year will affect the closing force.

If you have spring hinges, especially in commercial applications, be prepared to adjust them frequently, depending on the frequency of use. It is recommended that a door closer be used in lieu of a spring hinge when possible due to the typical various valves that offer stages of closing. This assists with controlling the closing force to ensure proper closing and latching of the door into the frame as desired or required by code.

Per NFPA 80, if spring hinges are used on 3-foot by 7-foot by 1 3/4-inch fire rated doors, at least two of the three hinges provided must be spring type.

In addition to standard-sized spring hinges, there are other types including, a large single-barrel spring hinge, sometimes referred to as a "Bommer hinge." Although there are numerous manufacturers, Bommer is one of the oldest and most well-known manufacturers of large single-barrel spring hinges. These hinges can typically be seen on older city apartment doors.

Another type of spring hinge is a double-acting spring hinge, which is typically installed on double-acting doors. A double-acting door is typically used in restaurant kitchens for easy in and out access for the staff, and if specified and installed correctly, will return the door to the closed position every time.

Strap Hinge

Strap hinges are used for oversized doors such as barn doors. One leaf is typically installed as a standard hinge, and the other is not really a leaf, but a strap that is installed across the face of the door.

Some screen or storm doors appear to have strap hinges installed on them, but typically they are a decorative plate that is installed on the face while another hinge is actually hanging the door, typically a continuous hinge.

FIGURE 1.26 Swing-Clear Hinge
(Source: Courtesy of McKinney® Products Company)

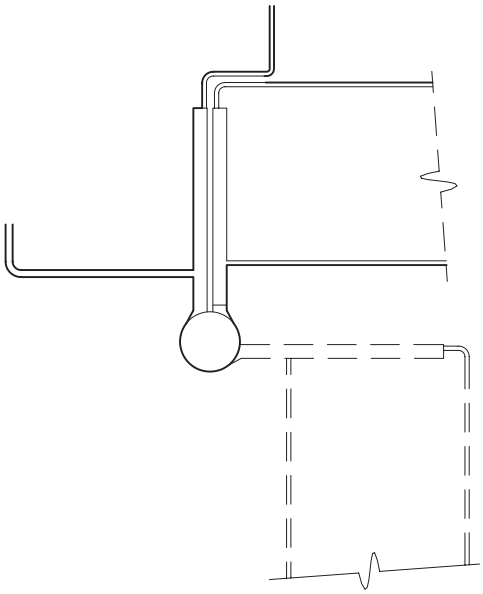


FIGURE 1.27 Standard Swing Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

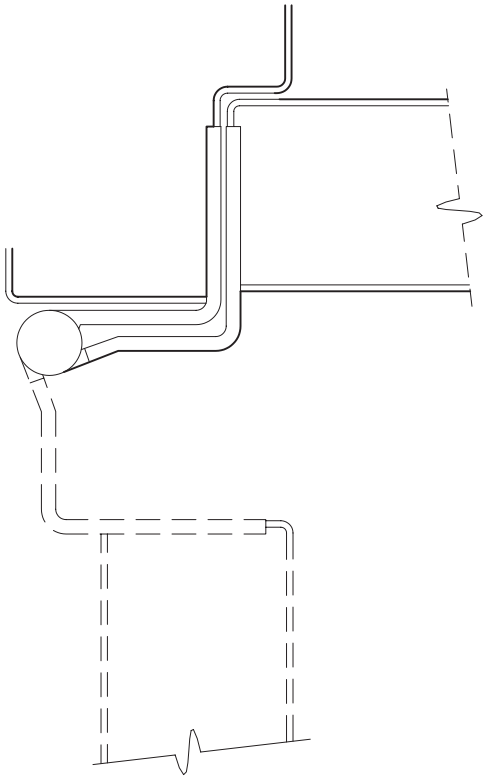


FIGURE 1.28 Swing-Clear Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

Swing Clear

A swing-clear butt hinge is typically used to swing a door out of the opening in order to increase the clear width opening of a doorway or corridor. The clear width of the opening is typically increased by the same dimension as the thickness of the door. For example, if a door is 1 3/4-inches thick and

a swing-clear butt hinge is used, the clear width of the opening is increased by 1 3/4-inches to allow for more room to travel through the opening. This application is typically seen in cross-corridor door openings both voluntarily and by code to allow for stretchers, carts, wheelchairs, and people to travel through the opening. This allows for extra room without having to navigate a standard width, possibly getting caught up on or hitting the edge of the door while in the open position.

The swing-clear hinge is different from a typical butt hinge, which remains in the path of the door opening when in the open position (see Figures 1.27 and 1.28). Building codes and accessibility standards state that the clear width opening of a doorway must be a minimum of 32 inches. You might now ask, what defines a clear width opening? Good question; a clear width opening is the clear open space to pass through the door opening when measuring with the door open at 90 degrees, measured between the face of the door and the opposite stop face of the frame.

Tee Hinge

Tee hinges are manufactured in the shape of a tee, and are typically used for light-duty doors such as a screen door of a home. The top part of the tee is sideways and gets mounted to the frame like a butt hinge, and the longer portion lays across the front of the door similar to a strap hinge.

Wide Throw

A wide throw butt hinge has hinge leaves that are wider than standard sizes and typically wider than the height. A standard butt hinge for a 1 3/4-inch-thick door is 4 1/2-inches high by 4 1/2-inches wide, and if the door were to have an applied panel to the face, the width of the hinge would have to be the same dimension wider than 4 1/2 inches to clear the applied panel, or the butt hinge barrel would bind. For example, if the panel were 1/2-inch thick, then the hinge would be specified 1/2 inch wider to accommodate and allow the barrel of the hinge to clear the panel for proper operation without binding.

FIGURE 1.29 Tee Hinge
(Source: Scott J. Tobias)

OPTIONS

Air Transfer

This option is available for the transfer of air for pneumatic devices, although by far it is not a common application and there is a lack of availability of devices. Locking and exit devices that are operated by the use of pneumatic air might be used in rooms that do not allow electricity due to the presence of explosive materials.

A more common use for pneumatic air is for automatic operators (see Chapter 5, Closing and Control Devices), but the air transfer required is typically much higher than an air transfer hinge would allow and is typically done directly to the device with wider tubing.

Decorative Tip

Decorative tips are available as an option to give the plain flat ends of a hinge some aesthetic appeal. The tips are typically installed at both ends of the hinge barrel and may require special pins with screws that protrude out of the tip. Some tips have threaded pins attached and are screwed into the flat end of the barrel. Although various manufacturers offer other types of decorative tips, the following are some of the more popular:

- Acorn tips: Shaped like an acorn, these tips have a rounded body with a soft pointed top.
- Ball tips: Shaped just like they sound, round like a ball
- Linear tips: With decorative grooves, some manufacturers offer unique aesthetics.
- Round tips: A rounded end that looks like the shape of a dome
- Steeple tips: Tall and shaped like the steeple of a church or temple, these tips resemble the same.
- Urn tips: Similar to a steeple tip near the top, an urn tip is wider and more rounded in the center.

Electric Transfer

Hinges are available with wires running through them, and electric transfer hinges are available for electric locking or release devices. An electrified lockset on a single door or a pair of doors or an electric

FIGURE 1.30 Acorn Tip
(Source: Courtesy of Scott J. Tobias)

FIGURE 1.31 Steeple Tip
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.32 Ball Tip
(Source: Courtesy of Scott J. Tobias)

strike on a pair of doors would require a device, which would transfer the power from the wall into the hinge leaf on the frame, through the barrel of the hinge and leaf on the door, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer hinges are available with various wire quantities. A simple system would only require four wires, while a more complex system or added options such as a signal switch might require as many as twelve.

Also, electric transfer hinges are intended to operate with low-voltage and amperage devices. If they are too high, there is a danger of overheating and damaging the devices that they operate, and this creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

Some manufacturers furnish electrified transfer hinges with nonproprietary Molex® connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex® connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.

FIGURE 1.33 Flat Tip
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.34 Round Tip
(Source: Courtesy of McKinney® Products Company)

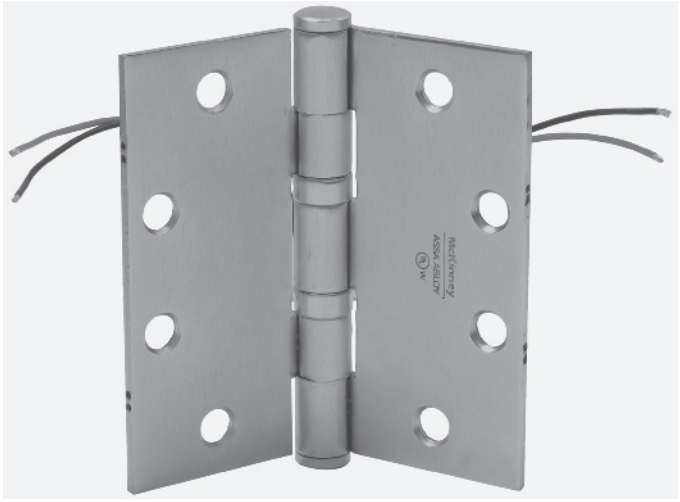


FIGURE 1.35 Electric Transfer Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.36 Electric Transfer Wired to Door
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

FIGURE 1.37 Molex® Connector Hinge
(Source: Courtesy of McKinney® Products Company)

FIGURE 1.38 Molex® Connector Wired to Door
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

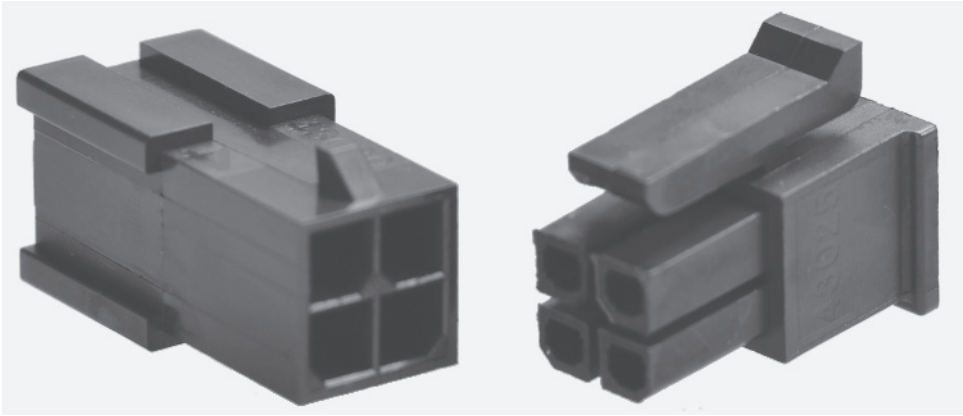


FIGURE 1.39 Four-Pin Molex® Connector
(Source: Courtesy of McKinney® Products Company)

Hospital Tip

Hospital tips on butt hinges are an available option to create a smooth, flush, and sloped tip of the hinge barrel. This option is typically used in mental health facilities to reduce the gaps or spaces of the hinge. This helps to minimize an object having the ability to be tied or wedged in between the barrel and hinge leaf, creating a hanging situation.

Nonremovable Pin

Nonremovable pins (NRPs) are an option recommended for hinges used on secure doors that are reversed bevel, doors that swing and are pulled toward the user in lieu of pushing them away. The keyword here is "option"; hinge barrel pins are standard as removable and NRPs must be specified.

A nonremovable pin is a very inexpensive option—approximately $2 per hinge—and consists of a set screw on the inside of the hinge barrel, which is only visible and accessible while the door is open. NRPs prevent the possibility of the pin being popped out of the barrel with a hammer and screwdriver. Once the pin is out of the barrel, the door can essentially be pulled out of the frame from the hinge side, even if the door latch or deadbolt is in the locked position. An expensive mistake can be avoided for such a small cost if a nonremoveable pin hinge is used as necessary.

FIGURE 1.40 Nonremovable Pin Full Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

Nonrising Pin

Nonrising hinge pins are most typically used on commercial hinges, which means the pin will resist rising up out of the barrel with each rotation of the door and hinge leaves. This will help to reduce the hinge pin "rising" up out of the hinge barrel after frequent use of the door. Keep in mind that a pin that has risen out of the barrel can affect the performance of the hinge and level swing on the door.

Rising Pin

Rising pins are typically seen on residential doors and are less expensive than commercial hinges. You might typically notice the hinge pin "rising" up out of the hinge barrel after frequent use of the door. Keep in mind that a pin that has risen out of the barrel can affect the performance of the hinge and level swing on the door.

Security Stud

Security stud hinges prevent the hinges from being separated while in the closed position, where the pins are removable and can be popped out of the barrel. One leaf has a physical metal stud sticking out of it, while the matching position on the other leaf has a hole to accept it; this way, if someone tries to cut off the barrels of the hinge and pull the leaves apart, in essence pulling the door out of the frame, the security stud will not allow the leaves to separate.

Signal Switch

Sometimes referred to as a door position switch, each hinge leaf has a magnetic switch installed on the back side, which meets when the door and hinge are in the closed position. When the leaves split apart as the door swings open, the switch sends a signal to the security system, alerting one that the door is in the open position. This does not indicate, however, whether or not the lockset latch is in the latched or locked position, but there are other devices available for that function.

FIGURE 1.41 Rising Pin on Full Mortise Hinge
(Source: Courtesy of Scott J. Tobias)

FIGURE 1.42 Rising Pin on Full Mortise Hinge Close Up
(Source: Courtesy of Scott J. Tobias)

FIGURE 1.43 Signal Switch Full Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

QUANTITIES

Hinges are typically installed in consistent quantities; two hinges per leaf for openings through 60 inches to door height. One additional hinge per leaf for each additional 30 inches in height or fraction thereof, and four hinges for Dutch doors up to 90 inches in height. You might ask why four hinges for a Dutch door. A Dutch door is a split-leaf door that has a top half and bottom half that swing independently from each other. In order for the doors to swing at all, they need at least two hinges each to do so. There is no such thing as a split hinge.

Table 6.4.3.1 Builders Hardware: Hinges, Spring Hinges, and Pivots

Maximum Door Rating (hr)	Maximum Door Size				Minimum Hinge Size				Hinge Type
	Width		Height		Height		Thickness		
	ft	m	ft	m	in.	mm	in.	mm	
For 1¾ in. (44.5 mm) or Thicker Doors									
3 or less	4	1.22	10	3.05	4½	114.3	0.180	4.57	Steel, mortise or surface
3 or less	4	1.22	8	2.44	4½	114.3	0.134	3.40	Steel, mortise or surface
1½ or less	3⅛	0.96	8	2.44	6	152.4	0.225	5.72	Steel, olive knuckle or paumelle
3 or less	4	1.22	10	3.05	4	101.6	0.225	5.72	Steel pivots (including top, bottom, and intermediate)
1½ or less	3	0.91	5	1.52	4	101.6	0.130	3.30	Steel, mortise or surface
1½ or less	2	0.61	3	0.91	3	76.2	0.092	2.34	Steel, mortise or surface
3 or less	3	0.91	7	2.13	4½	114.3	0.134	3.40	Steel, mortise or surface (labeled, self-closing, spring type)
3 or less	3	0.91	7	2.13	4	101.6	0.105	2.67	Steel, mortise or surface (labeled, self-closing, spring type)
For 1⅜ in. (34.93 mm) Doors									
3 or less	3	0.91	7	2.13	3½	88.9	0.123	3.12	Steel, mortise or surface
3 or less	2⅔	0.81	7	2.13	3½	88.9	0.105	2.67	Steel, mortise or surface (labeled, self-closing, spring type)

Note: Table 6.4.3.1 lists the most common applications of hinges, spring hinges, and pivots. Consult the door and hardware manufacturer's specific listings for applications not addressed in this table.

FIGURE 1.44 Hinge Quantity Chart

(Source: Reproduced with permission from NFPA 80–2013, Fire Doors and Other Openings Protectives, Copyright © 2012, National Fire Protection Association. This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented by the standard in its entirety.)

APPLICATIONS

Full Mortise

Full mortise butt hinges are the most commonly installed type of butt hinge in new and most renovation type construction projects. Both of the hinge leaves are swaged and fully mortised into the edge of the door and frame allowing the hinge to sit flush with the edge of the door and frame.

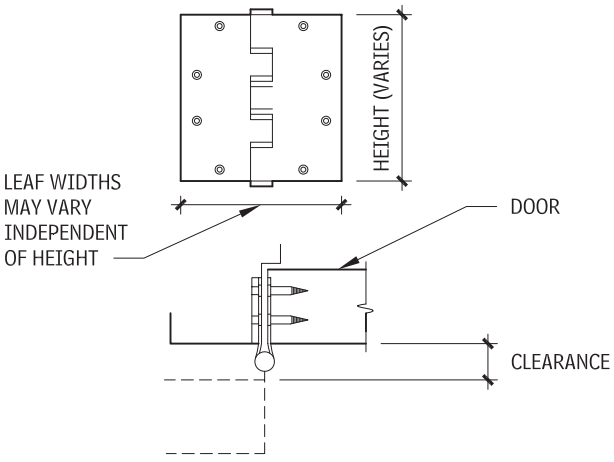
Full Surface

Full surface butt hinges do not have swaged leaves and are surface-mounted onto the face of the door and frame, and there are two typical reasons why a full surface butt hinge would be installed. The first would be the use of a channel iron door and frame, which are so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a surface-mounted butt hinge might be used is in lieu of replacing a door or frame, which can be costly. Full surface butt hinges are used on an existing opening whose door and or frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a surface-mounted butt hinge would be applied to a new location of the door and frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

Keep in mind, however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual leaves of the hinge spread across the face of the door or frame instead of just the barrel at the edge. The frame leaf



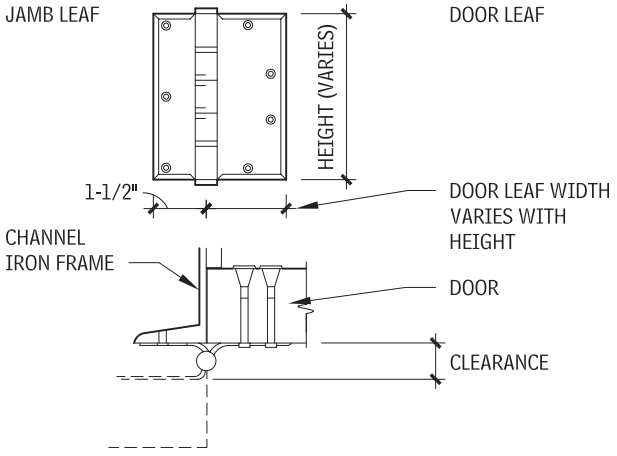
FULL MORTISE

FIGURE 1.45 Full Mortise Hinge Diagram

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

FIGURE 1.46 Full Mortise Hinge

(Source: Courtesy of McKinney® Products Company)



FULL SURFACE

FIGURE 1.47 Full Surface Hinge Diagram

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

is typically shorter than the door leaf, as a frame face is typically 2 inches wide, which is not enough room for a standard 4 1/2-inch-wide hinge leaf.

Half Mortise

"Half" butt hinges always refer to the door portion of the opening. Half mortise butt hinges have a swaged leaf on the door side, and similar to a full mortise hinge, are mortised into the edge of the door. The frame hinge leaf, similar to the full surface hinge, is not swaged and is surface-mounted onto the face of the frame.

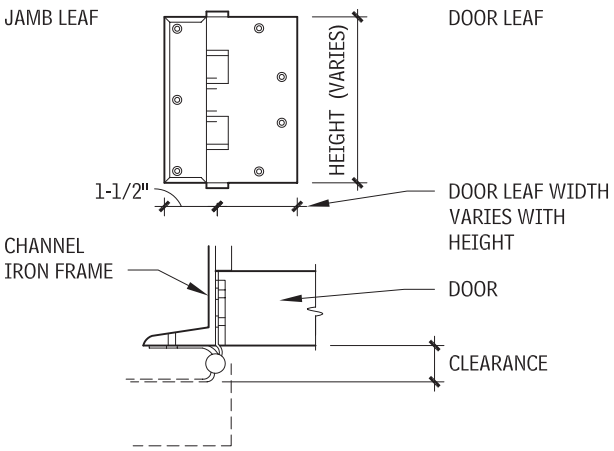


FIGURE 1.48 Half Mortise Hinge Diagram
(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

FIGURE 1.49 Half Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

There are two typical reasons why a half mortise butt hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half mortise butt hinge might be used is in lieu of a frame having to be replaced, which can be costly. They are often used on an existing opening whose frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a half mortise butt hinge would be applied to a new location of the frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

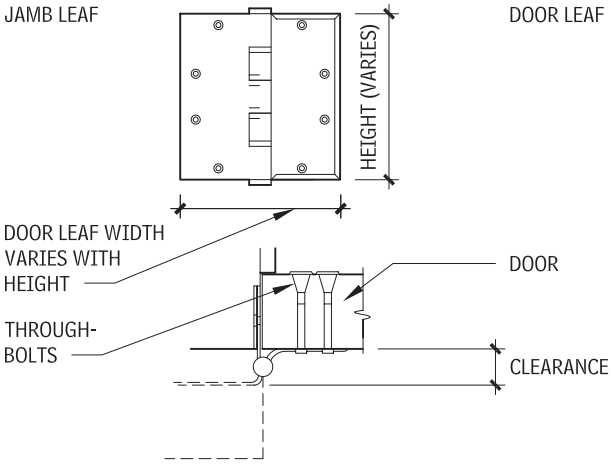
Half Surface

"Half" butt hinges always refer to the door portion of the opening. Half surface butt hinges are similar to the full surface hinge, are not swaged, and are surface-mounted onto the face of the door. The frame leaf is swaged, and similar to a full mortise hinge, is mortised into the edge of the frame.

There are two typical reasons why a half surface butt hinge would be installed. The first would be with the use of a channel iron door, which is so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half surface butt hinge might be used is in lieu of a door having to be replaced, which can be costly. They are typically used on an existing opening whose door preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a half surface butt hinge would be applied to a new location of the door, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)



HALF SURFACE

FIGURE 1.50 Half Surface Hinge Diagram

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

FIGURE 1.51 Half Surface Hinge

(Source: Courtesy of McKinney® Products Company)

Keep in mind, however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual door leaf of the hinge spread across the face of the door rather than just the barrel at the edge.

INSTALLATION

Hinges may require the use of shims during installation to ensure a flush, plum installation. If the door opening is fire rated, there are specific requirements as to the type and installation of the shims.

Although hinges are the most commonly used means of hanging a door, they are also the least expensive and the least efficient. Because they are installed at various points on the frame's jamb and the door's hinge side of a door with nothing supporting the door from the bottom, a door on hinges is always in tension, "pulling" away from the frame. Further, every time a door is swung open or closed, more tension is created, pulling on the screws within the reinforcements of the door and frame that hold the hinges in place.

Depending on the frequency of door swing use, a door may show and operate with signs of early wear, such as separation of the door from the frame starting at the top, and separation of the hinge leaf from the hinge preparation on either the door or frame. Once this happens, the door typically sags, pulling more and more as the tension grows, quickly becoming an issue for swinging, closing, latching, and securing the opening.

Fasteners

Hinges are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

FIGURE 1.52 Machine-Wood Combination Hinge Screw Fastener
(Source: Courtesy of McKinney® Products Company)

Locations

Hinges should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have hinges installed 10 inches above the finished floor with the center hinge equal in distance from the top and bottom hinges (or additional center hinge, depending on the door height), and the top hinge is recommended to be located 5 inches from the top of the door.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the hinges installed anywhere up to 13 inches above the finished floor but, depending on the manufacturer, can be at any location up to that height. The middle hinges are installed equal in distance from the top and bottom hinges (or additional center hinge, depending on the door height), and the top hinge is recommended to be located up to 11 3/4 inches from the top of the door.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have hinges in the same locations as custom steel doors and frames, with the bottom hinge installed 10 inches above the finished floor and the center hinge equal in distance from the top and bottom hinges (or additional center hinge,

depending on the door height). The top hinge is also recommended to be located 5 inches from the top of the door.

Preparations

Hinge preparations are typically machined at the factory, including the drilling and tapping of screw holes. With metal doors and frames, the preparation is typically a cutout in the location where a hinge will go, and then a reinforcement plate is welded in place, which is where the hinge and screws will actually be secured.

When using a heavyweight hinge, the thicker gauge metal means that the materials to be mortised into a door are thicker, which means that the door and frame preparations have to be deeper than a standard hanging device to accommodate the thicker metal.

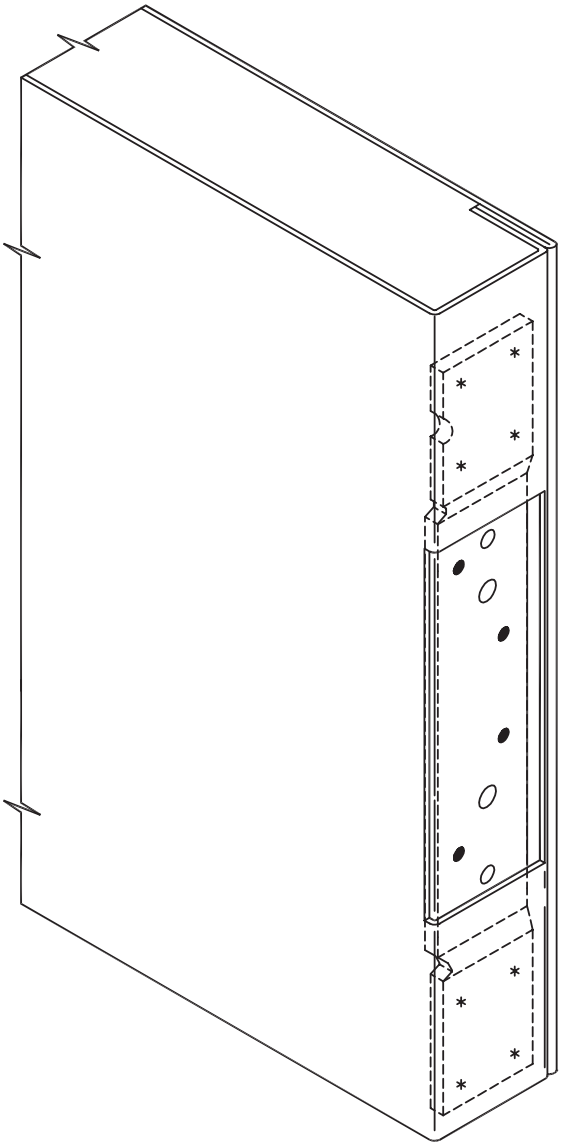


FIGURE 1.53 Hinge Preparations on Door
(Source: Courtesy of Ceco Door)

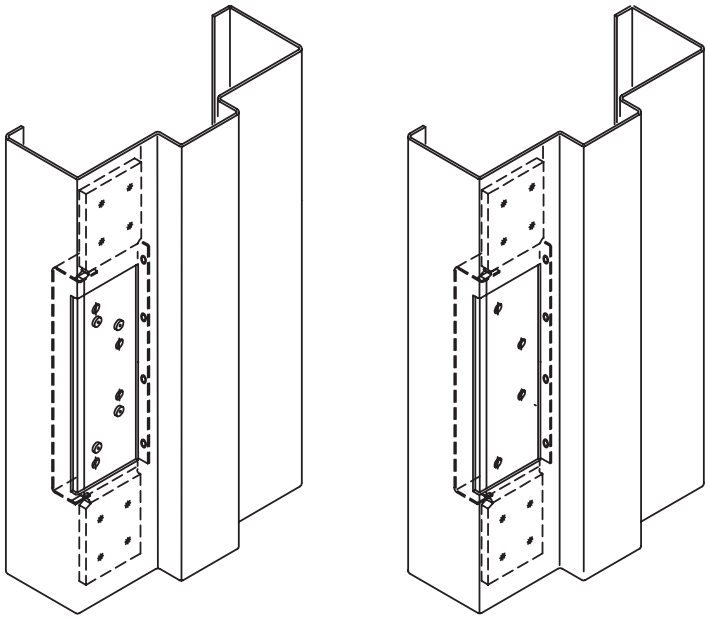


FIGURE 1.54 Hinge Preparations on Frame
(Source: Courtesy of Ceco Door)

CONTINUOUS HINGES

Also Known As: Piano Hinges

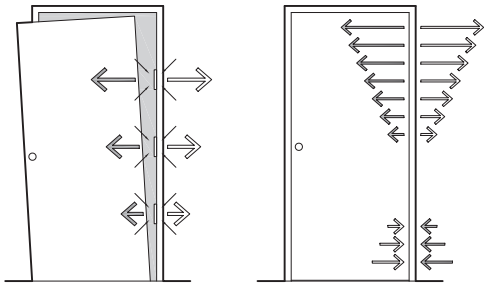


FIGURE 1.55 Standard vs Continuous Hinge Installation
(Source: Courtesy of Markar Architectural Products)

DESCRIPTION

Sometimes referred to as piano hinges, continuous hinges are a more efficient means of hanging a door than a standard hinge. This is true because the continuous hinge's length covers the entire height of the door and frame, which, unlike a hinge, supports the door's full height. Along with having many more fasteners on a continuous hinge, this helps prevent sagging from the top where most of the tension of the opening exists with the screws always trying to pull away from the edge of the door and frame.

Continuous hinges are also typically more secure than standard hinges because of the full door and frame height installation. This makes it much more difficult to pry apart the door and frame on the hinge side. It is true that air flow might be more restricted on the continuous hinge side of a door, but without proper weatherstripping or gasketing, there would not be much energy efficiency advantage to using a continuous hinge.

PROPERTIES

Similar to standard hinges, continuous hinges are manufactured with two leaves, except they are typically the same size in length as the door and frame height instead of small points on the door as with standard hinges. Continuous hinges are available as two types, geared or pin and barrel.

Bearings

Bearings separate the metal of the knuckles from directly touching and pivoting on each other. The inserts create a barrier between the metal parts, eliminating metal friction, which causes less wear on the knuckles than would a nonbearing hinge.

NONBEARING

Nonbearing hinges allow the knuckles of the barrel to directly meet, pivoting on each other with nothing to prevent the metal from wearing excessively. This is more likely on frequently used door openings rather than infrequently used ones, such as a closet or bedroom door in a home.

MEDICAL BEARING

Medical bearing continuous hinges are manufactured as barrel type hinge with a plastic insert separating the metal knuckles keeping them from directly touching. Not only do these inserts help with preventing

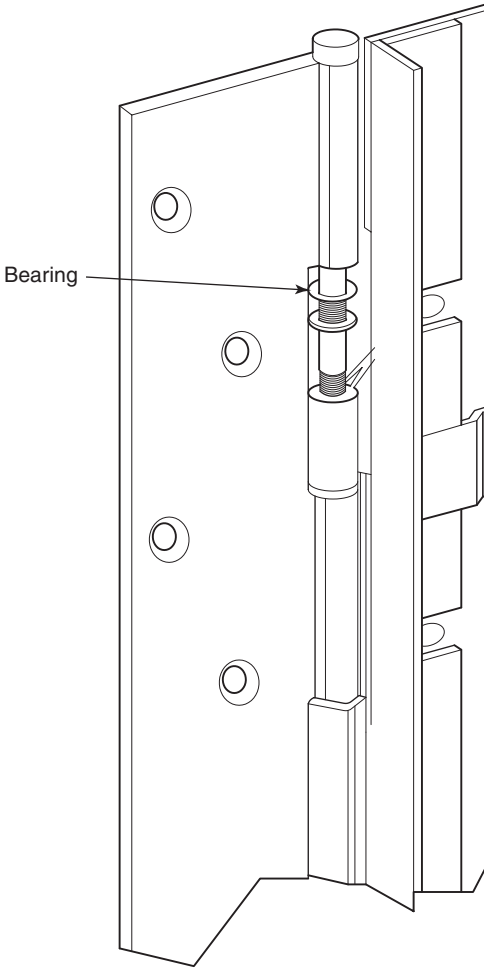


FIGURE 1.56 Medical Bearing for Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

wear of the knuckles from the metal touching metal, but these inserts also assist with the resistance to air flow between the hinge knuckles, which can transfer air particles from one room to another.

Corners

SQUARE CORNER

Continuous hinges are manufactured "standard" with square edges with 90-degree corners. Be cautious when handling the hinge, as the corner can be sharp at the point.

Finishes

Continuous hinges are typically available in fewer finishes than standard hinges and the choices are limited, depending on the base metal of the hinge. Painting continuous hinges (or anything else for that matter) on a project site is not recommended, as it will contribute to poor air quality for those working and in the space. Using a manufacturer's factory finish might even help contribute to credits toward a green building certification or code now or in the future.

ALUMINUM BASE METAL

Although some manufacturers offer additional finish options, aluminum continuous hinges are typically available from the factory with a clear anodized finish (US 628), dark bronze anodized

(US 313), light bronze anodized (US 311), black anodized (US 315), and various powder-coated paint finishes, which are typically more durable than a conventional architectural finish and can be scratch resistant.

STEEL BASE METAL

Steel-based hinges are typically manufactured with a prime gray powder-coated finish, which is typically more durable than a conventional architectural finish, can be scratch resistant, and is intended to be painted in the field to match the door or surrounding conditions.

STAINLESS STEEL BASE METAL

Stainless steel hinges are typically available from the factory with a polished stainless steel finish (US 629) or satin stainless steel finish (US 630). With surface-mounted continuous hinges, although the hinge itself, which is connected to the door, is stainless steel, the housing, or the metal that covers the screws to give the hinge a cleaner appearance, might be manufactured with aluminum material with a brushed aluminum or clear-coated anodized aluminum finish (US 628).

Some manufacturers also offer various powder-coated paint finishes, which are typically more durable than a conventional architectural finish and can be scratch resistant.

Geared

Geared hinges have two leaves with alternating gears on each leaf that fit together to form the rotating portion of the hinge, which is typically covered by rectangular full-length housing. Geared hinges are typically manufactured with aluminum material and have the ability to carry lighter, less frequently used door weights than a pin and barrel type continuous hinge (see Grades in this chapter).

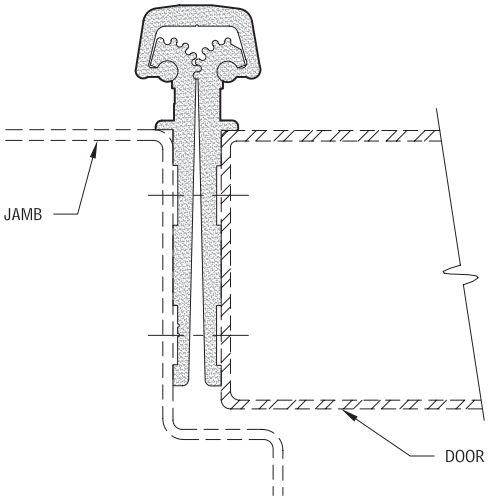


FIGURE 1.57 Geared Continuous Hinge Diagram
(Source: Courtesy of Pemko Manufacturing Company)

FIGURE 1.58 Geared Continuous Hinge
(Source: Courtesy of Pemko Manufacturing Company)

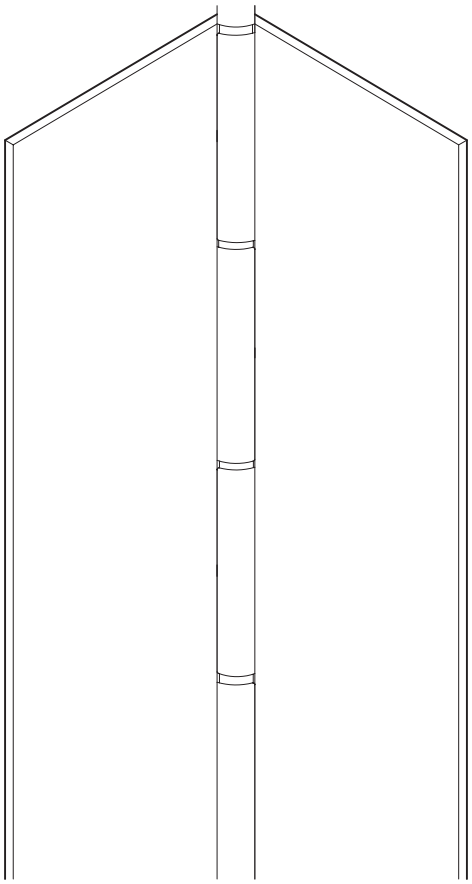


FIGURE 1.59 Blank Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Hole Preparations

BLANK

Blank plates are available, which are continuous hinges without holes. They would typically be used in a hinge perimeter welded installation instead of securing the hinge to the door and frame with screw fasteners.

CUSTOM HOLE PATTERN

If for some reason a custom hole pattern is desired or required, some manufacturers offer that option for an additional cost due to the custom setup that will have to take place to create the custom hole pattern.

NONTEMPLATED

Nontemplated hinges are manufactured without standard fastener hole locations and holes can be placed at any location on the hinge leaves. These hinges tend to be less expensive and are typically used for residential applications.

PLUG WELD

In addition to the perimeter welding with a blank hole preparation, plug weld holes allow welding to take place within the body of the hinge in addition to the perimeter. Holes are drilled into the surface of the hinge leaves and the welds are made through the hole to the door surface, further bonding the two together.

SYMMETRY TEMPLATED

Symmetry templated hinges are manufactured with equally patterned hole locations on the hinge leaves. Since door manufacturers typically do not drill and tap holes on the doors and frames for continuous hinges, there are no standard locations required as with standard hinges, as described in the ANSI/BHMA standards.

Materials

Continuous hinges can be manufactured from aluminum, brass, bronze, steel, or stainless steel, depending on their type, application, and fire rated door-opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire for a certain period of time, depending on the surrounding wall rating.

If anything other than a steel-based continuous hinge is installed on a fire rated door opening and a fire occurs, the continuous hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

Pin and Barrel

Pin and barrel hinge leaves form the barrel of the hinge, similarly to a standard hinge, giving the door edge a more conventional hinge look than a gear-type hinge. Pin and barrel hinges typically hold more weight and withstand higher use and frequency than a geared continuous hinge.

Sizes

Continuous hinges are typically available for standard door heights such as 6 feet 8 inches, 7 feet, 7 feet 2 inches, 7 feet 6 inches, 8 feet, and so on, up to 10 feet. The hinges are typically manufactured 1 inch shorter in length than the actual door height to allow the door to close into the frame without any

FIGURE 1.60 Pin and Barrel Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

FIGURE 1.61 Pin and Barrel Continuous Hinge
(Source: Courtesy of Scott J. Tobias)

FIGURE 1.62 Pin and Barrel Continuous Hinge
(Source: Courtesy of Scott J. Tobias)

binding. If the hinge were the full height of the door, the hinge metal would bind behind the stop of the frame. Frame stops protrude into the door opening and, if the hinge is closed into the frame at full height, the hinge metal thickness would interfere with the door closing fully.

Continuous hinge leaves are various in widths depending on the type. A full mortised or flush edge mount would be enough to extend the thickness of the door, less the inset dimension (typically 1/8 inch), which is the distance between the edge of the door and back and of the hinge leaf.

Swaging

Continuous hinge leaves are typically swaged. Swaging is a slight offset of the hinge leaf at the barrel. The offset accounts for the door edge, which is typically beveled. A beveled door edge is typically required for swinging doors so that the door edge does not bind with the square edge of the frame. If both edges were square, the door would not fit into the frame.

When in the parallel position, most hinge swaging provides a 1/16-inch clearance between the hinge leaves to accommodate for the door and frame clearance, which allows the door to swing in and out of the door frame without binding.

Weights

Continuous hinges are not categorized in grades as with most architectural hardware. They are available in different gauges, which is the thickness of the metal. They could also be considered light, medium, and heavyweight, depending on the thickness and amount of door weight they can hold.

With that said, continuous hinges can be manufactured with different quality levels, depending on the source and factory and possibly country standards.

Some manufacturers still manufacture continuous hinges in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports.

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Hollow Metal Door Weights by Gauge

	Lbs. per Square Foot
20 Gauge	4
18 Gauge	5
16 Gauge	6
14 Gauge	7

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Wood Door Weights by Door Thickness

	Lbs. per Square Foot	
	1 3/8" door	1 3/4" door
Particle/Mineral Core	4.75	5.25
Stave Core Wood	3.75	4.25
Hollow Core Wood	1.3	1.5

FIGURE 1.63 Door Weight per Square Foot Chart
(Source: Courtesy of McKinney® Products Company)

Imports are available for the most common and widely used sizes, typically for 3-feet-wide, 7-feet-high, and 1 3/4-inch-thick wood or metal swinging doors. The continuous hinges are less expensive than those still made in the United States and the low quality can sometimes be noticed with ragged edges, poor finishes, and suboptimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell at the same level and price point of these continuous hinges to compete on projects through the distribution marketplace.

LIGHTWEIGHT

Lightweight continuous hinges would not typically be used on a commercial application but more likely on a residential or an infrequently used door or cabinet, or on a piano door (continuous hinges are also known as piano hinges). A lightweight continuous hinge is typically manufactured from aluminum, brass, or steel but can be of a thinner gauge than a medium or heavyweight continuous hinge for commercial applications.

MEDIUM/STANDARD WEIGHT

Medium-weight continuous hinges would typically be manufactured with 14-gauge material (.075 inch) with the ability to carry standard door weights up to 400 pounds with certain applications with restrictions allowing 600 to 1,000-pound infrequently used lead-lined doors.

HEAVYWEIGHT

Heavyweight continuous hinges would typically be manufactured with 12-gauge material (.105 inch) with the ability to carry heavy door weights up to 900 pounds.

Welded End Pins

This option is to tack weld the pins so that they become nonremovable to secure the opening when the door is out-swinging and the barrel is visible and able to be tampered with. The pins are attached to the fixed end knuckles of the hinge leaves so that the welding does not interfere with the rotation of the hinge barrel.

TYPES

Adjustable

An adjustable continuous hinge is a solution for those not-so-perfect installations, or existing situations where the surrounding conditions may have been altered since the original construction. These hinges do just what their name says: adjust to meet not-so-perfect conditions. If you have a frame or a door that is not flush, is out of alignment or is sagging, or the clearances have been altered over time, an

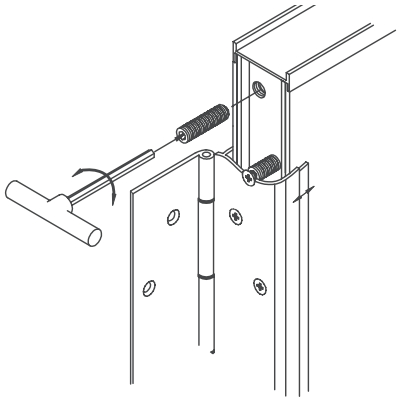


FIGURE 1.64 Adjustable Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

adjustable hinge will allow you to close the uneven gaps at the edge of the door and frame as required to get a flush installation. Keep in mind that the adjustments are limited and vary, depending on the manufacturer.

Edge Mount Safety Guard

Edge mount safety guard continuous hinges are available to protect the edge of a door in addition to hanging it. The hinge has additional metal, which wraps the edge of the door slightly to the face, protecting the edge from carts or stretchers as they go through the door opening. These hinges are also available as adjustable to meet not-so-perfect conditions. If you have a frame or a door that is not flush, is out of alignment or sagging, or the clearances have been altered over time, an adjustable hinge will allow you to close the uneven gaps at the edge of the door and frame as required to get a flush installation.

Raised Barrel

Typically a full mortise hinge and used when a door is recessed in a reveal in a frame; the hinge barrel is offset to allow a door to swing on the offset pivot point. When a door is recessed in a frame, a standard full mortise hinge barrel would not sit flush against the frame and door, leaving a gap and an incorrect, inefficient butt hinge installation, causing the door and frame to bind. By offsetting the hinge barrel, the hinge barrel sits away from the frame edge, creating a new pivot point for the door, which prevents binding and a smooth, free-swinging door.

Spring

Spring continuous hinges are manufactured in some of the same sizes as standard continuous hinges, except with a spring in tension inside the barrel of the hinge. This allows the tension to force the hinge leaves together when pulled apart as the door swings away from the frame, essentially closing the leaves of the hinge and the door into the frame when let go.

The disadvantage to a spring hinge is that it only has one adjustment by tightening or loosening the spring tension, and the doors will typically either not close all the way all of the time or slam shut more than desired due to all of the surrounding conditions such as air pressure, air conditioning, and heating levels at different times of the day and year.

If you have spring hinges, especially on commercial applications, be prepared to adjust them often, depending on the frequency of use. It is recommended that a door closer be used in lieu of a spring hinge when

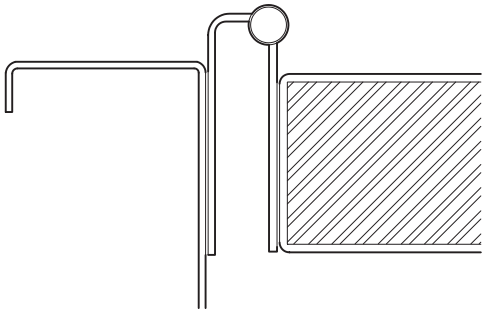


FIGURE 1.65 Edge Mount Safety Guard Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

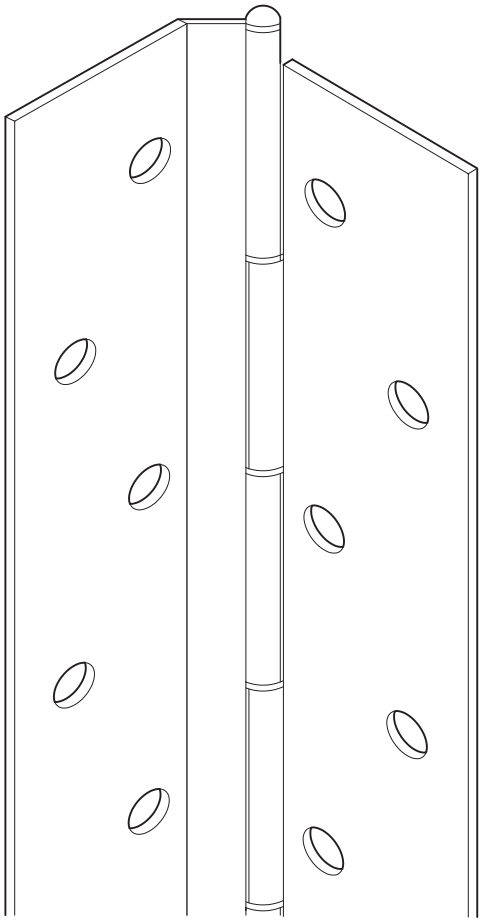


FIGURE 1.66 Raised Barrel Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

possible because of the various valves that offer stages of closing. This assists with controlling the closing force to ensure proper closing and latching of the door into the frame as desired or required by code.

Swing Clear

A swing-clear continuous hinge is typically used to swing a door out of the opening in order to increase the clear width opening of a doorway. The clear width of the opening is typically increased by the same dimension as the thickness of the door. For example, if a door is 1 3/4-inches thick and a swing-clear butt hinge is used, the clear width of the opening is increased by 1 3/4 inches to allow for more room to travel through the opening. This application is typically seen in cross-corridor door openings both voluntarily and by code to allow for stretchers, carts, wheelchairs, and people to travel through the opening. This allows for extra room without having to navigate a standard width opening, possibly getting caught up on or hitting the edge of the door while it is in the open position.

A typical continuous hinge remains in the path of the door opening when in the open position (see Figure 1.68). Building codes and accessibility standards state that the clear width opening of a doorway must be a minimum of 32 inches. You might now ask, what defines a clear width opening? Good question. A clear width opening is the clear open space to pass with the door opening when measuring with the door open at 90 degrees, measured between the face of the door and the opposite stop face of the frame.

To explain further, let's go through an example opening using a 36-inch-wide, 1 3/4-inches-thick hollow metal door and frame swinging on a standard mortise continuous hinge. Using the code to guide us as to where to measure, we come to the clear width dimension by deducting the door thickness, which is 1 3/4 inches, plus the width of both stops of the frame, which is typically 5/8-inch thick each, for a total of 3 inches. Deduct 3 inches from the original door width of 36 inches, and that leaves a 33-inch clear-width opening, which complies with the codes and standards. In addition, there are also restrictions regarding projections of door hardware into the clear width, so that it does not interfere with the clear-width requirement.

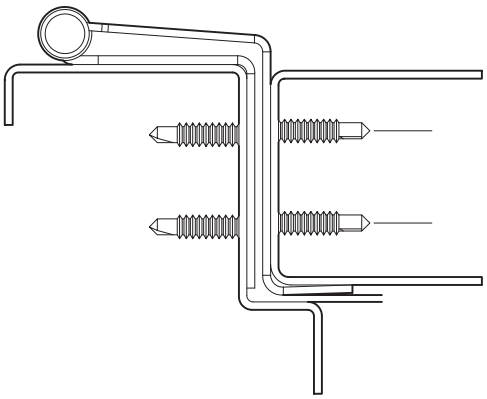


FIGURE 1.67 Swing-Clear Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

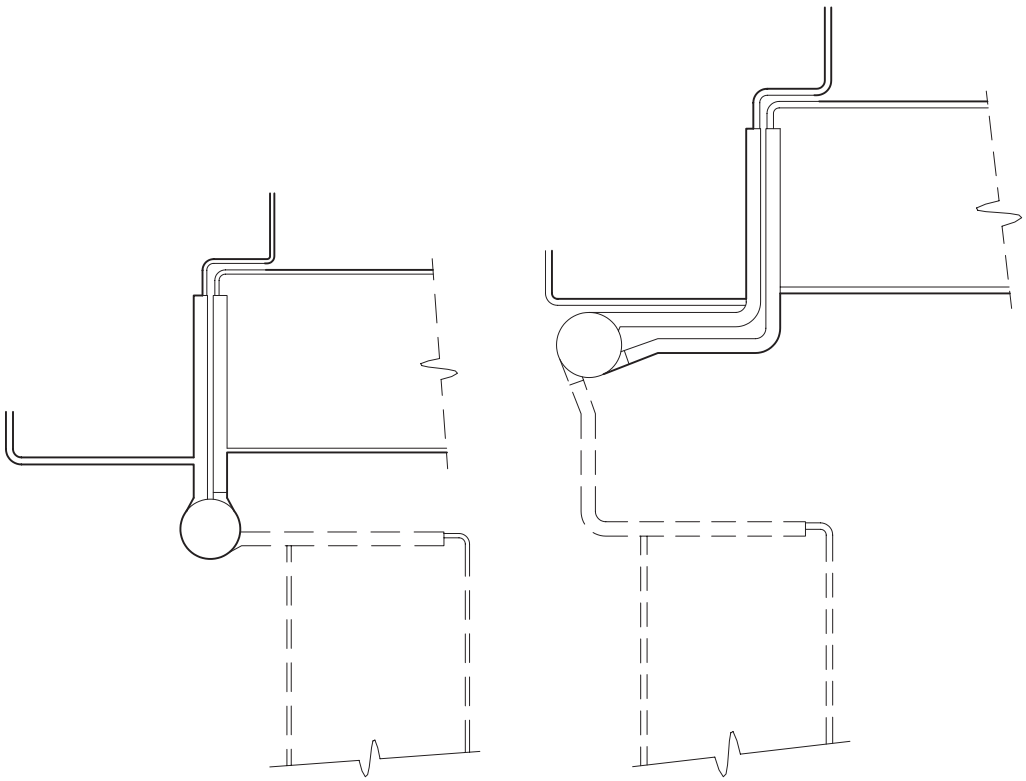


FIGURE 1.68 Standard Continuous (A) vs Swing-Clear (B) Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

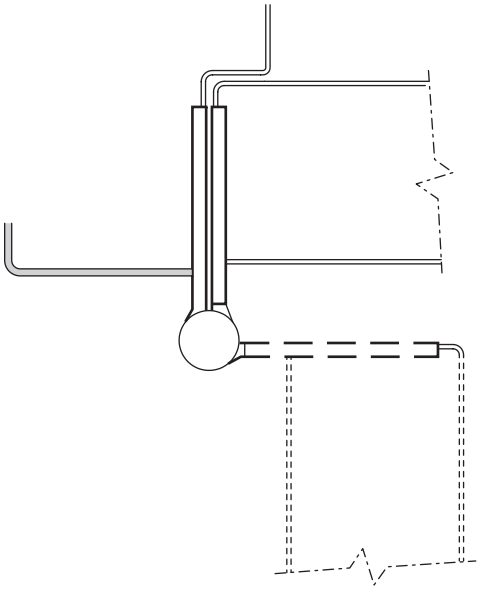


FIGURE 1.69 Standard Swing Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

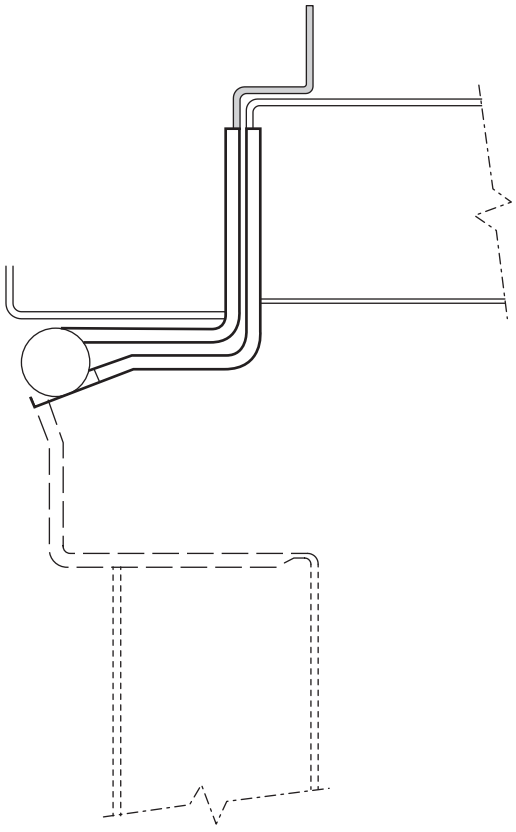


FIGURE 1.70 Swing-Clear Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

Using the same situation as described above, if we were working on a major renovation of an existing building, which was constructed prior to the required minimum clear-width openings of today's codes and had 34-inch-wide openings, we would not meet the minimum clear-width requirements if we replaced the hinges with standard butt hinges using the same formula as above, which only give us a 31-inch clear-width opening. This can be a very costly renovation, having to rip out all of the doors and frames, widen the openings, and install new doors and frames to meet the requirements.

This is how a swing-clear hinge can help save cost and meet the required codes. If we start with the same 34-inch-wide door opening, use the same formula as above, but use swing-clear continuous hinges instead of standard continuous hinges, we can increase the clear width by the door width, which is 1 3/4 inches, increasing our 31 inches to 32 3/4 inches, meeting the required codes.

OPTIONS

Automatic Door Bottom Cut

When using an automatic door bottom, depending on the type and size, special cutouts might be required to accommodate the location of the door bottom so that it does not conflict at the same location on the door.

Current Transfer Preparation

Continuous hinges are available with cutouts to accommodate electric power transfer devices for easy installation and access for maintenance or replacement (see Chapter 2, Securing Devices). Power

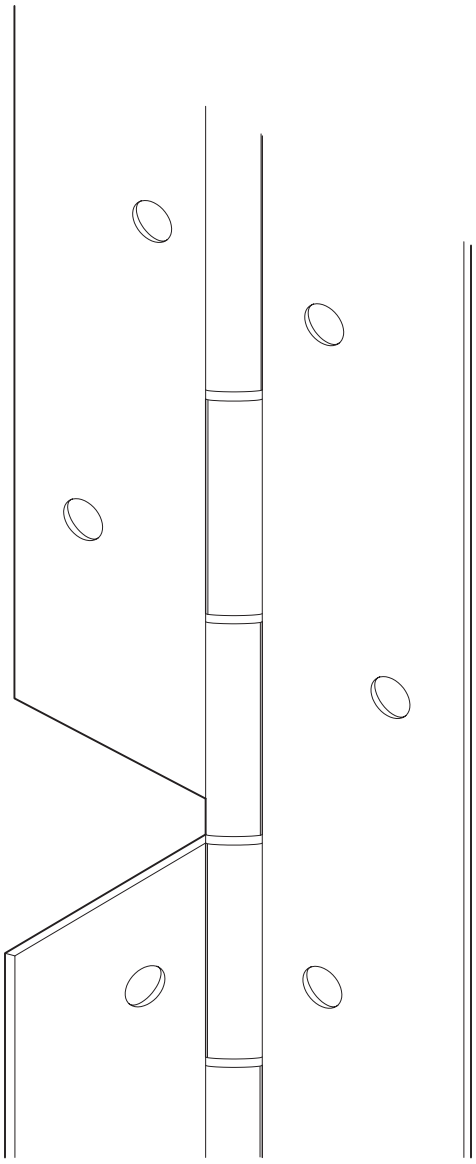


FIGURE 1.71 Dutch Door Continuous Hinge Preparation
(Source: Courtesy of Markar Architectural Products)

transfers are similar in function to an electric transfer hinge but are able to transfer higher voltage and amperage than can an electric transfer hinge.

Custom Design

Some manufacturers will custom make a continuous hinge to your design requirements as long as they comply with all required standards and codes. Of course, this would be for an additional cost.

Dutch Door Preparation

Dutch door continuous hinges are manufactured specifically for Dutch doors, which are single doors that are split horizontally. These doors are typically used for some type of pass-through and might have a shelf on the bottom leaf, as with a coat check room. A conventional continuous hinge is just that, continuous and would not allow a split door to open, whereas a Dutch door hinge is split and allows the top and bottom leaves to swing freely and independently.

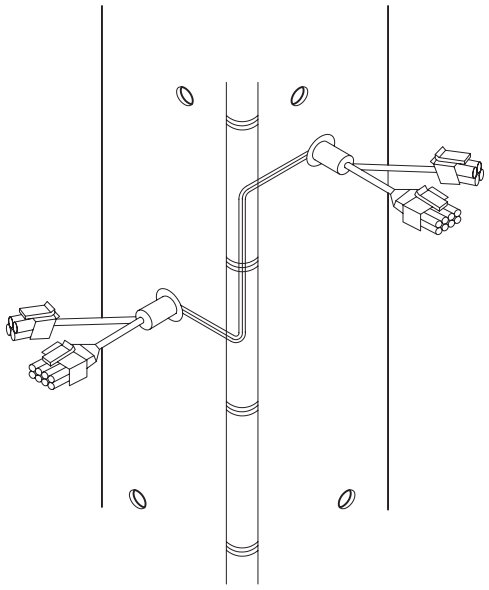


FIGURE 1.72 Electric Transfer Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Edge Guard Cutouts

When using an edge guard continuous hinge to add protection to the door edge, depending on the other hardware installed on the door, additional cutouts might be required.

ACTIVE LEAF CUTOUTS

- Latch cutout for a bored/cylindrical lockset, also known in the industry as a 161 preparation
- Body cutout for a mortise lockset, also known in the industry as an 86 preparation

INACTIVE LEAF CUTOUTS

- Manual flushbolt cutout
- Automatic flushbolt cutout
- Automatic flushbolt strike cutout

Electric Transfer

Continuous electric transfer hinges are available with wires running through them and are an option for transferring power and powering electric locking or release devices on a door. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors would require a device, which would transfer the power from the wall into the continuous hinge leaf on the frame, through the barrel of the continuous hinge and leaf on the door, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer continuous hinges are available with various wire quantities. A simple system would only require four wires, while a more complex system with added options, such as a signal switch, might require as many as twelve wires.

Also, electric transfer continuous hinges are intended to operate with low-voltage and low-amperage devices. If voltage or amperage are too high, there is a danger of overheating and damaging the devices and those that they operate, and it creates the danger of a fire. If the devices do need higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

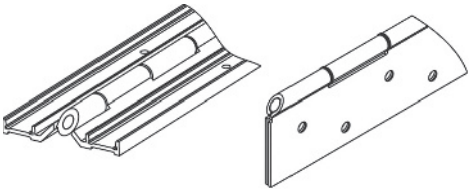


FIGURE 1.73 Hospital Tip Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

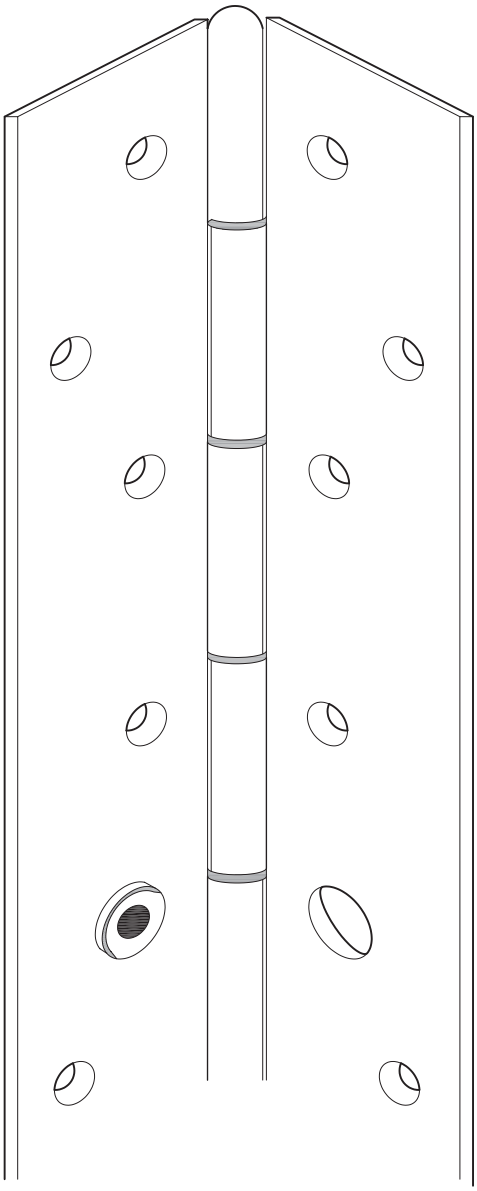


FIGURE 1.74 Security Stud Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Some manufacturers furnish electrified transfer continuous hinges with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.

Hospital Tip

Hospital tip continuous hinges are available to create a smooth, flush, and sloped tip of the hinge barrel without any gaps or spaces that would allow something to be wedged in between the barrel and hinge leaf. These continuous hinges are typically installed on openings in mental health facilities to reduce the possibility of a patient harming him- or herself by tying a string around the hinge barrel to create a hanging situation.

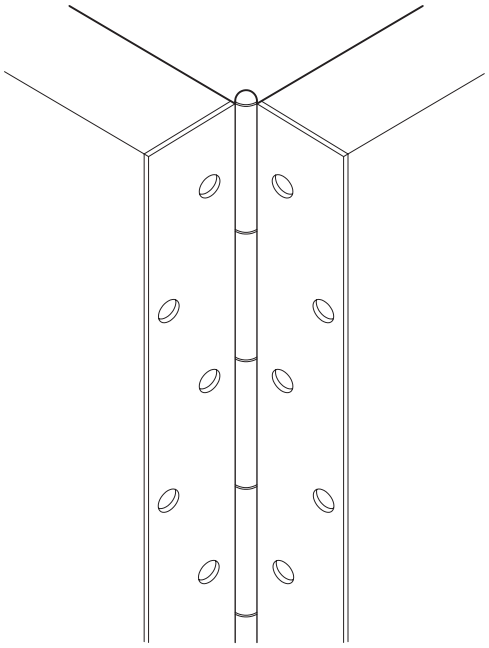


FIGURE 1.75 Sheared Leaf
(Source: Courtesy of Markar Architectural Products)

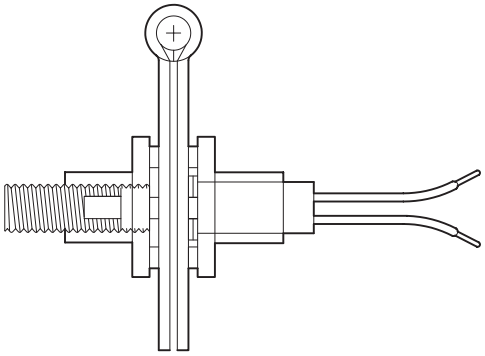


FIGURE 1.76 Signal Switch Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Lead Lined

Continuous hinges are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as not to interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening where the protection for those passing by would be eliminated.

Security Stud

Security studs prevent the hinges from being separated while in the closed position. One leaf has a physical metal stud sticking out of it, while the matching position on the other leaf has a hole to accept it; this way, if someone tries to cut off the barrels of the hinge and pull apart the leaves, in essence pulling the door out of the frame, the security studs will not allow the leaves to separate.

The studs might also extend into the back of the door hinge leaf, which means that the door leaf itself has to be prepared to accept the studs recessed into it.

Sheared Leaf

Sheared leaf continuous hinges are available for narrow door thicknesses or frame rabbets. You must specify the desired dimension so that the factory can shear the leaves of the hinges to suit your special application.

Signal Switch

Sometimes referred to as a door position switch or monitoring switch, each hinge leaf has a magnetic switch installed on the back side, which meet when the door and hinge are in the closed position. When the leaves split apart as the door swings open, the switch sends a signal to the security

system, alerting one that the door is in the open position. This does not indicate, however, whether or not the lockset latch is in the latched or locked position, but there are other devices available for that function.

Special Lengths

Although continuous hinges are typically available in standard lengths to accommodate standard door heights, some manufacturers offer custom lengths for an additional cost.

Wide Throw

A wide throw continuous hinge has hinge leaves that are wider than standard sizes and typically wider than they are high. If the door were to have an applied panel to the face, the width of the hinge would have to be the same dimension wider than a standard hinge leaf to clear the applied panel, or the continuous hinge barrel would bind. For example, if the panel were 1/2 -inch thick, then the hinge would be specified 1/2 -inch wider to accommodate and allow the barrel of the hinge to clear the panel for proper operation without binding.

QUANTITIES

Continuous hinges are typically furnished one per door leaf. There are options for a Dutch door continuous hinge, which is split at the door split. Another option for a Dutch door would be to install two separate continuous hinges, one for the top leaf and one for the bottom.

APPLICATIONS

Full Mortise/Edge Mount

Full mortise continuous hinges are the most commonly installed type of continuous hinge in new and most renovation type construction projects. Both of the hinge leaves are swaged and fully mortised into the edge of the door and frame, allowing the hinge to sit flush with the edge of the door and frame.

Full Surface/Flush Mount

Full surface continuous hinges do not have swaged leaves and are surface-mounted onto the face of the door and frame. There are two typical reasons why a full surface continuous hinge would be installed. The first is the use of a channel iron door and frame, which are so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

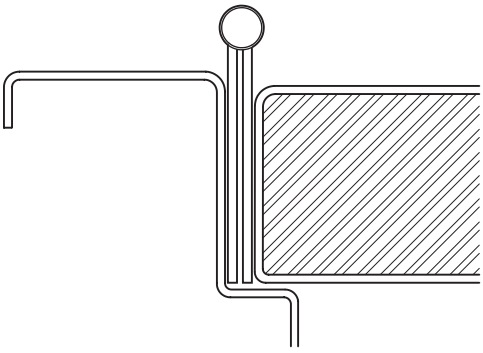


FIGURE 1.77 Full Mortise Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

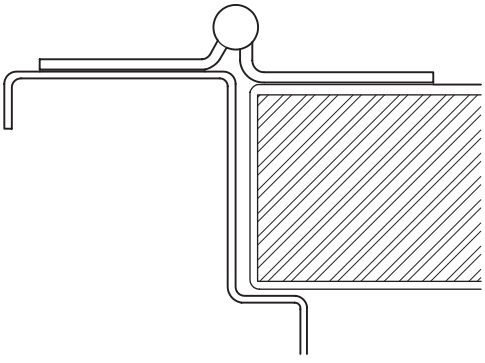


FIGURE 1.78 Full Surface Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

The second reason why a surface-mounted continuous hinge might be used is in lieu of replacing a door or frame, which can be costly. This type of hinge can be used on an existing opening whose door and or frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a surface-mounted continuous hinge would be applied at a new location on the door and frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

Keep in mind however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual leaves of the hinge spread across the face of the door or frame instead of just the barrel at the edge.

Half Mortise

When speaking of half continuous hinges, the "half" always refers to the door portion of the opening. For example, half mortise continuous hinges have a swaged leaf on the door side, and are mortised into the edge of the door. The frame door butt hinge leaf is not swaged and is surface-mounted onto the face of the frame similarly to a full mortise continuous hinge. The frame leaf is usually shorter than the door leaf, as a frame face is typically only 2 inches wide, which is not enough room for a standard 4 1/2-inch-wide hinge leaf. There are two typical reasons why a half mortise continuous hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so, which is why a half continuous butt hinge would be applied. Another reason why a half mortise continuous hinge might be used is for an existing opening whose frame preparation reinforcements have loosened and failed, which would prohibit someone from being able to screw a new hinge into the same preparation. A half mortise continuous butt hinge would be applied to a new location on the frame, on the surface, which would maintain the same pivot point as the existing hinges, both not requiring the existing cutout and preparation for support and saving the frame from having to be replaced, which can be costly. Keep in mind, however, although this is a cost savings, the aesthetics will not be the most pleasing, seeing the entire hinge on the face of the frame instead of just the barrel.

Half Surface

Half continuous hinges always refer to the door portion of the opening. Half surface continuous hinges have a swaged leaf on the door side, and similar to a full surface hinge, are mortised into the edge of the door. The frame hinge leaf, similar to the full surface hinge, is not swaged and is surface-mounted onto the face of the frame.

There are two typical reasons why a half surface continuous hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half surface continuous hinge might be used is in lieu of a replacing frame, which can be costly. Another instance where it would be appropriate to use a half surface continuous hinge might be when an existing opening has frame preparation reinforcements that have loosened, prohibiting a new hinge from being installed into the same preparation.

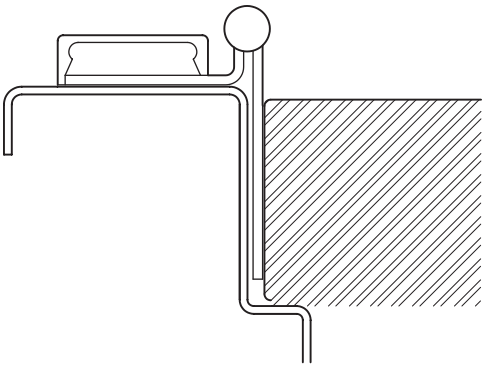


FIGURE 1.79 Half Mortise Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

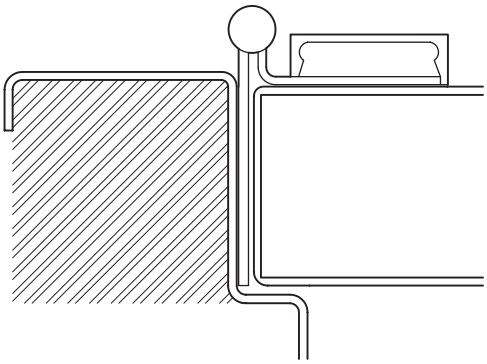


FIGURE 1.80 Half Surface Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Although a half surface continuous hinge would be applied to a new location of the frame, being the surface, the hinge would still be able to maintain the same pivot point as the existing hinges.

Keep in mind, however, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual frame leaf of the hinge spread across the face of the frame instead of just the barrel at the edge.

INSTALLATION

Continuous hinges are the second most commonly used and expensive type of hanging device. Because they are typically installed the same as the full height of the door, unlike standard hinges, the weight of the door is distributed along the entire height instead of various points of the door.

Similar to one with standard hinges, the door still has nothing supporting it from the bottom, so the tension still exists, albeit it is less than with standard hinges.

Although less than with standard hinges, depending on the frequency of door swing use, a door may show and operate with signs of early wear, separation of the door from the frame starting at the top, and separation of the hinge leaf from the hinge preparation on either the door or frame. Once this happens, the door typically sags; pulling more and more as the tension grows, quickly becoming an issue for swinging, closing, latching, and securing the opening.

Fasteners

Continuous hinges are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Continuous hinges are typically placed along the length of the entire door height less 1 inch to avoid binding with the stop on the frame. As with all hardware applications, check to see if there are any conflicts such as a protection plate being installed with a surface-mounted continuous hinge. Adjust

the protection plate width accordingly so the surface continuous hinge has a flat smooth surface upon which to install.

Preparations

Continuous hinges do not require any special preparations at the edge of the door other than reinforcements and the door being manufactured narrower to accommodate for the installation for a full mortise hinge.

Screw holes are not typically drilled and tapped at the factory, especially for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavy weight continuous hinge, thicker gauge metal means that the materials will be thicker and the door width will be narrower than a door with a standard weight continuous hinge.

PIVOTS

Also Known As: Pivot Set, Pivot Hinge

DESCRIPTION

Pivots can be manufactured as various types to accommodate various door sizes, thicknesses, weights, existing conditions, and fire ratings. They can also be manufactured with various bearing types or no bearings at all, which can affect the swinging operation of the door. Specialty pivots are available for various types of special applications such as oversized doors, aesthetic design aspects of an opening, and door- and frame-applied materials.

Conventional pivots do not typically return a door to center, but there are some lighter-duty spring pivots that have that option. For devices that return a door to center, see Hanging Means, Floor Closers in this chapter.

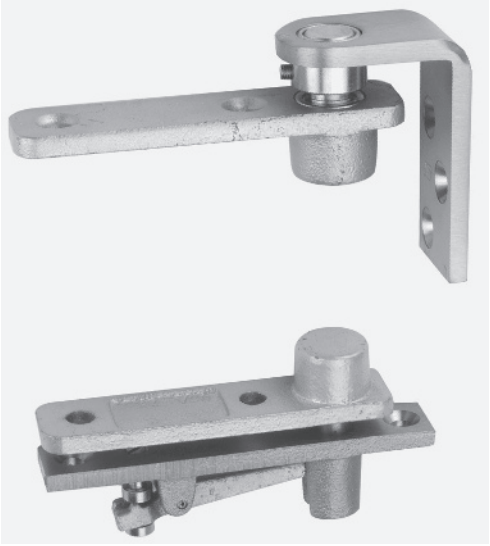


FIGURE 1.81 Standard Duty Center Pivot Set
(Source: Courtesy of Rixson®)

PROPERTIES

Pivots are typically furnished in sets, which are installed at the top and bottom of the door and are connected to the head of the door opening or frame and the floor.

Bearings

Pivots that are manufactured with bearings separate the metal of the knuckles from directly touching and pivoting on each other. The inserts create a barrier between the metal parts eliminating metal friction, which causes less wear on the knuckles than would a nonbearing pivot.

ANTI-FRICTION BEARING

Anti-friction bearings have a material manufactured in between the two leaves of the pivot plates to prevent the metal from wearing on metal to give the device a longer life cycle without defect.

THRUST BEARING

Thrust bearings help support the weight or vertical load of the door, or the weight resting on top of the bottom arm and pivot.

NEEDLE BEARING

Needle bearings help support the lateral force of the opening, or the swinging from side to side on the pivot point.

Bushings

A bushing is a material used typically to separate the two portions of a top or intermediate pivot where they join, similar to bearings of a hinge, continuous hinge, or bottom pivot (see Hanging Means, Hinges, Properties, and Bearings in this chapter).

Materials

Pivots are manufactured from steel, brass, bronze, stainless steel, or aluminum depending on their application and fire rated door opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire.

If anything other than a steel base is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

TYPES

Bottom Pivot

The bottom pivot is typically an arm connected to a floor plate on a spindle and similarly to a top pivot, allowing the arm to rotate on the floor plate and the door to swing open and closed from a frame or door opening. For floor conditions that do not allow conventional fastening, there are some bottom pivots that rest on the floor but attach to the jamb instead (see Figure 1.82). Depending on the manufacturer, the pivot point might be covered by a cap with a screw fastener to cover the knuckle or joining portion of the two arms for aesthetics.

Other applications for bottom pivot arm configurations and fastening are available specifically for concrete and some have vertical adjustments, which move the pivot up and down within limits to accommodate for floors that are not level.

FIGURE 1.82 Offset Top-Mounted Pivot
(Source: Courtesy of Rixson®)

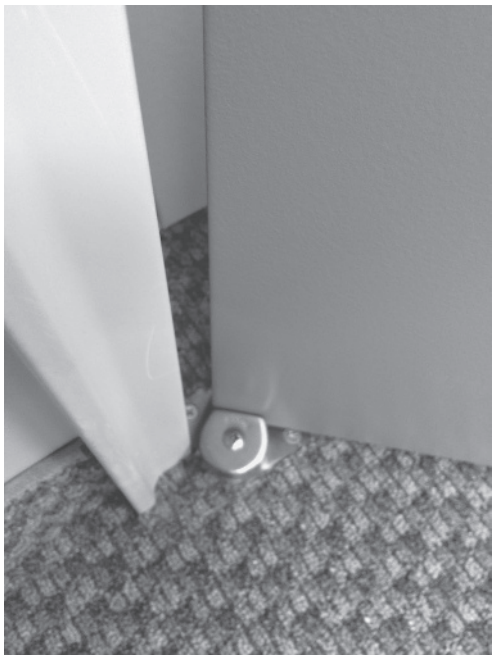


FIGURE 1.83 Floor-Mounted Bottom Offset Pivot
(Source: Courtesy of Scott J. Tobias)

Intermediate Pivot

Offset intermediate pivots are not only recommended to be specified and installed when using a top and bottom offset pivot, they are required by some manufacturers. Offset intermediate pivots have the same standard pivot point as a top and bottom pivot set, which is 3/4 inch, which means the pivot point, or center of the pivoting portion of the pivot, is 3/4 inch from the face of the door and are handed either left hand or right hand. Intermediate offset pivots are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a

FIGURE 1.84 Intermediate Offset Pivot
(Source: Courtesy of Scott J. Tobias)

FIGURE 1.85 Offset Top Pivot Arm
(Source: Courtesy of Rixson®)

panel on the face of the door. If an extended offset is not furnished for a panel on the face of the door, the pivot point would conflict with the panel, and that portion of the panel would have to be cut out to accept the pivot point and arm.

Be careful when specifying extended pivots, as the more the extension, the less weight the pivot will hold due to the balance and placement of the arm underneath the door.

Intermediate offset pivots must adhere to the same codes for hanging doors and butt or continuous hinges and can be used as a set of three or more instead of top and bottom pivots, similar to butt hinge applications.

LIGHTWEIGHT

Lightweight hinges are typically used for very light-duty, low-use door openings that can be mounted in different mountings such as floor to stop, floor to ceiling, and jamb to ceiling.

Top Pivot

OFFSET

An offset top pivot is typically manufactured with two arms that meet at one end and are attached with a pin of sorts, similar to a scissor, which rotates or "pivots" two parts on each other. This allows a door to swing open and closed from a frame or door opening.

CENTER

A center-hung top pivot is also known as a walking-beam pivot and has a retractable pin that allows the door to be installed into the frame. When installing, the pin is retracted until in place and then extended to secure the door into the opening.

FIGURE 1.86 Center Bottom Pivot Arm
(Source: Courtesy of Rixson®)

Spring

Surface-mounted pivots are typically similar to light-duty center-hung pivots, and although they swing the door closed, they cannot be used on fire rated doors. They are installed in the center of the thickness of the door, can hold moderate weight doors, typically swing the door in both directions (similar to a kitchen-type door in a restaurant), and bring the door back to the center of the frame in the closed position. Spring pivots typically come in sets, which include a top and bottom pivot.

They are also installed slightly offset in the thickness of the door, which means that the back end of the door swings into the opening, depending on the pivot and template, approximately 6 inches. This means that the frame cannot have a stop on it, at least not on the pivot side of the door if the door is meant to be single acting.

One thing to be cautious of is the clearance at the edges of the door. Because the pivot is offset in the thickness of the door and the door swings through the frame on the back end, there is a more than normal clearance, which allows for light to shine through the edges. It is recommended in most cases to use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Gate and gravity pivot hinges are also available, specifically manufactured to operate gates and not doors that are not full height in a door opening.

Also known as dwarf or small door spring hinges, screen hinges are small devices used for very light-weight doors, such as an aluminum screen or window panel door.

The torsion door spring hinge typically has two plates and a thick pin of sorts connecting the two, with a heavy-duty spring wrapped around the pin. Tension is created when the plates separate, which are installed on the door and the frame or door opening.

Thrust

Similar to an anchor and pivot reinforced hinge, a thrust pivot hinge has a pivot set at the top of the door that continues to the jamb of the door, so in sense is a top pivot, but requires the use of butt hinges to complete the installation.

OPTIONS

Electric Transfer

Pivots are available with wires running through them, and electric transfer pivots are available for electric locking or release devices. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors requires a device that would transfer the power from the wall into the pivot leaf on the frame, through the pivot point of the pivot and leaf on the door, then across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer pivots are available with various wire quantities. A simple system would only require four wires, while a more complex system or one with added options, such as a signal switch, might require as many as 12 wires.

Also, electric transfer pivots are intended to operate with low-voltage and low-amperage devices. If the voltage or amperage is too high, there is a danger of overheating and damaging the devices and those

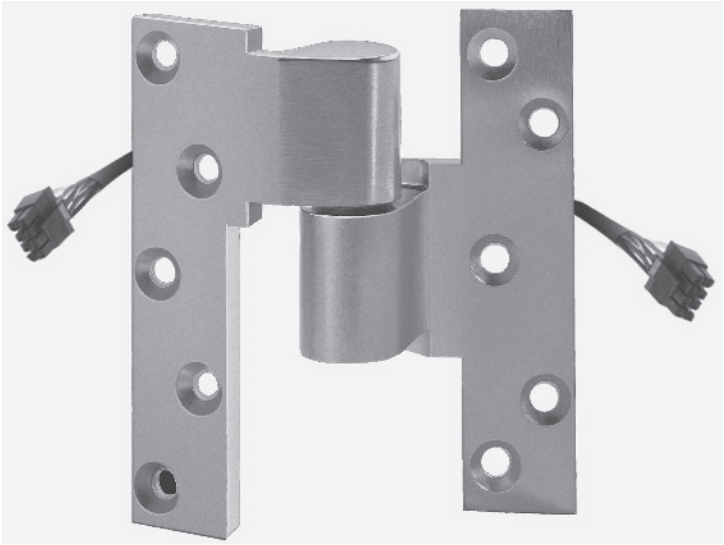


FIGURE 1.87 Electric Transfer Intermediate Pivot
(Source: Courtesy of Rixson®)

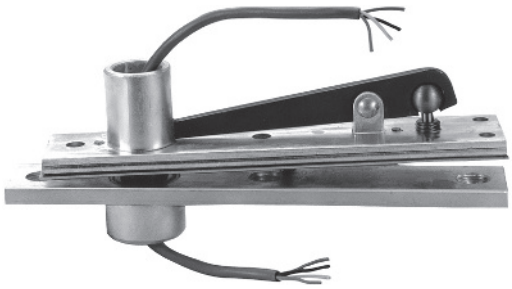


FIGURE 1.88 Electric Transfer Center Top Pivot
(Source: Courtesy of Rixson®)

that they operate, and it creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

Some manufacturers furnish electrified transfer pivots with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together, much like a plug-and-play device on your computer.

Extended Offset

The standard offset pivot point is 3/4 inch, and although available in custom dimensions, the most common extended offset dimension is 1 1/2 inches. The extended offset is typically used to accommodate a panel or plant-on, on the face of the door. If a 3/4-inch panel is installed on a door and an extended offset is not used, the pivot point would conflict with the panel and that portion of the panel would have to be cut out to accept the pivot point and arm.

Be cautious when specifying extended pivots, as the more the extension, the less weight the pivot will hold due to the balance and placement of the arm underneath the door.

Extended Spindle

Extended spindles for the bottom arms and floor plates are available for doors that have large undercuts in order to extend the entire length required. A typical door undercut is 3/4 inch from the finished floor, which is what a standard spindle is manufactured for. Another reason why an extended spindle might be required is a panel or covering on the door or a taller than normal saddle on the floor, which would require the spindle to extend through either.

Fire Rated

Offset pivot sets have the option of being manufactured as fire rated but have to be specified and ordered as such. This means the material is steel or stainless steel and has been tested and passed as fire rated by Underwriters' Laboratories (UL).

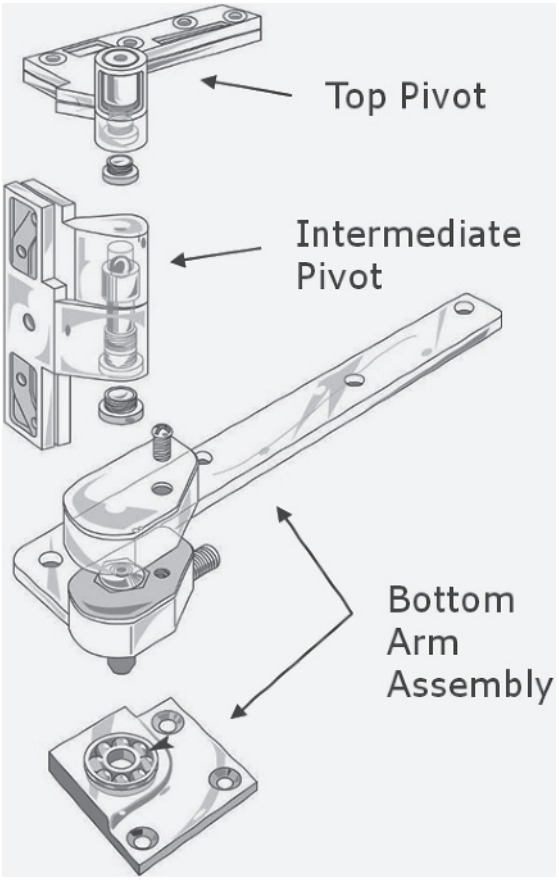


FIGURE 1.89 3/4-Inch Offset Pivot Set
(Source: Courtesy of Rixson®)

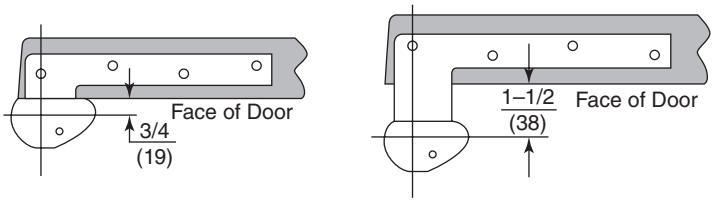


FIGURE 1.90 Various Offsets
(Source: Courtesy of Rixson®)

Institutional Design

Similar to hospital tip hinges (see Hanging Means, Hinges, Options, Hospital Tip in this chapter), institutional design pivots are designed to eliminate the conventional flat portion of the device where the two ends join and pivot. The end is rounded and makes it more difficult to tie or wrap something around the end with the intention to harming oneself.

Lead Lined

Offset pivot sets are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as not to interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening, where the protection for those passing by would be eliminated.

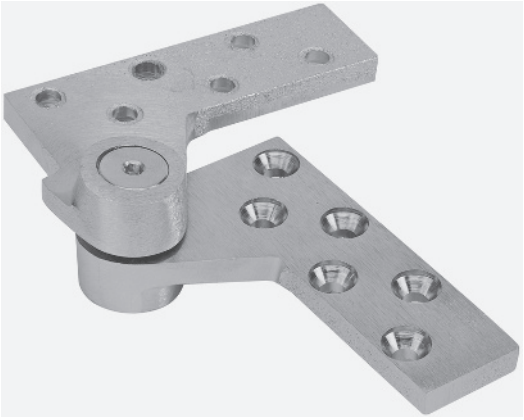


FIGURE 1.91 Lead Lined Top Offset Pivot Arm
(Source: Courtesy of Rixson®)

Less Top Pivot

There are some conditions that might not allow the use of a top offset pivot, although the intermediate and bottom pivots would be optimal for the application. An arched doorway would be one example where a top pivot could not be installed due to the configuration of the top of the door and frame, so the pivot set would be specified "less top pivot."

Special Layouts

Some installations require custom layouts and some manufacturers are willing to work with you to see if they have the ability to customize their tooling to create pivot configurations as required.

Weights

Pivots are not categorized in grades as with most architectural hardware, but in weights such as light, medium, and heavy.

With that said, pivots can be manufactured with different quality levels, depending on the source and factory and possibly country standards.

Some manufacturers still manufacture pivots in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports.

Imports are available in the most typical and widely used sizes, typically for 3-foot-wide, 7-foot-high, and 1 3/4-inch-thick wood or metal swinging doors. The pivots are less expensive than those still made in the United States, and the lower quality can sometimes be noticed with ragged edges, poor finishes, and not optimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell products at the same level and price point of these pivots to compete on projects through the distribution marketplace.

LIGHTWEIGHT

Lightweight pivots would not typically be used on a commercial application but more likely on a residential or an infrequently used door.

MEDIUM/STANDARD WEIGHT

Medium-weight pivots would typically be used on standard-frequency openings with the ability to carry standard door weights from 150 and up to 650 pounds, depending on the manufacturer.

HEAVYWEIGHT

Heavyweight pivots would typically be used on standard-frequency openings with the ability to carry standard door weights from 1,000 and up to 1,750 pounds depending on the manufacturer.

QUANTITIES

Pivots are typically installed in set, depending on their type, although some are available as singles to be combined as necessary for the application.

CENTER

Center pivot sets are typically available with a top and bottom pivot. Because the door is hung balanced in the opening, there is no accommodation nor is there any available type of intermediate center pivot; they are only available for offset pivots. Remember, because of the door and frame configuration for a center pivot, the opening cannot be fire rated.

OFFSET

Offset pivot sets are typically available with a top and bottom, although an intermediate pivot is required by most manufacturers for use with the top and bottom set. Offset pivoted doors have the same requirements as standard hinges—two per leaf for openings through 60 inches to door height. One additional pivot required per leaf for each additional 30 inches in height or fraction thereof, and four pivots for Dutch doors up to 90 inches in height. You might ask why four hinges are used for a Dutch door. A Dutch door is a split-leaf door that has a top half and bottom half that swing independently from each other. In order for the doors to swing at all, they need at least two pivots each.

FIGURE 1.92 Heavyweight Offset Pivot Set
(Source: Courtesy of Rixson®)

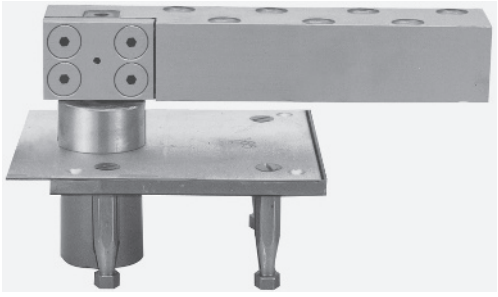


FIGURE 1.93 Heavyweight Center Pivot Set
(Source: Courtesy of Rixson®)

POCKET

A pocket-pivot set typically uses single pivots. Pocket-pivot doors have the same requirements as standard hinges and are installed at the edge of the door, but some manufacturers require more pivots than codes require. The minimum is three pivots per opening, no matter the minimum height, four for 7-feet, 6-inch door heights, and one additional pocket pivot per leaf for each additional 30 inches in height or fraction thereof.

APPLICATIONS

Similar to hinges, some applications will not allow for conventional mortising of the pivot arms on either the door or frame or both. Therefore, other application variations are available to accommodate other necessary mountings.

Center

Center-hung pivots are the next most recommended pivot type after offset pivots, but they cannot be used on fire rated doors. They are installed at the centerline of the thickness and off of the edge of the door and are not handed. Center pivots can be used for single-acting applications, such as one with a conventional door swing, or for double-acting applications, such as you might see in a restaurant on a kitchen door for easy access in either direction. Just as a door edge is beveled for other hanging means so the door edge does not bind with the frame edge, a center-hung door has a bull-nosed, or radius edge, to allow the door to swing through the opening without binding (see Figure 1.94). The radius at the edge of the door creates a larger than standard clearance, which allows light to shine through the edges. It is recommended in most cases to use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Because center pivots are installed at the centerline of the thickness and off of the edge of the door, the back end of the door swings into the opening and to the other side (see Figure 1.94). If being used on a

FIGURE 1.94 Double Lipped Strike with Built-In Emergency Stop
(Source: Courtesy of Scott J. Tobias)

single-swing application, due to the fact that the door needs to swing through the opening on the back end, the frame cannot have a full-stop across the top to stop the door in the closed position. The stop on the frame can either be manufactured to end where the pivot starts or an applied angle stop can be used instead (see Chapter 7, Stops and Holders).

Center pivots can hold the weight of very large and oversized doors and, if installed correctly, they can swing the door freely and make it appear as if it were quite light weight when swinging open or closed. Light-duty center pivots are also available, although they do not have the same strength and durability as conventional commercial types.

RESCUE HARDWARE

Typically used on a healthcare restroom, center pivots are often part of a rescue hardware set, which includes a center pivot that swings both ways through an opening. Other parts of the rescue hardware set include a double-lipped strike plate, which extends the entire width of the frame jamb. An emergency release stop is another part of the rescue hardware set, which is used to stop the door in the closed position in the frame or door opening. When a patient is in the restroom and happens to get injured, falls, or is unable to get out by themselves but are resting against the in-swinging door, the emergency stop can be depressed and the door can be swung toward the rescuers you and away from the patient, who can then be assisted.

Full Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door and frame portions of the pivot are surface-mounted on the faces of the door and frame.

Half Mortise

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is mortised as a conventional top pivot would be, while the frame portion is surface-mounted on the face of the frame.

Half Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is surface-mounted on the face of the door while the frame portion is mortised as a conventional top pivot would be.

Offset

Offset hung pivots are the number one recommended pivot configuration due to their application availability, strength, durability, and longevity; however, they do tend to be the most expensive conventional hanging means other than offset floor closers. Offset pivots are handed, which means they need to be specific to the handing of the door, right or left.

Offset pivots have a standard pivot point of 3/4 inch, which means the pivot point, or center of the pivoting portion of the arm, is 3/4 inch from the face of the door. This pivot point or spindle is typically covered by a cap that is held onto the spindle with a screw. Offset pivots are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a panel on the face of the door, similar to a wide throw hinge (see Pivots, Options, Extended Offset and Hinges, Types, Wide Throw in this chapter).

Offset pivots must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges, and it is not only recommended but required that an intermediate pivot be used when

installing top and bottom offset pivots (see Pivots, Intermediate in this chapter). Light-duty offset pivots are also available, although they do not have the same strength and durability as conventional commercial types.

Patch Fittings

Typically available for both top and bottom pivots, patch fittings are available for glass doors without top and or bottom rails to accommodate conventional pivot arms. Patch fittings are attached to both sides of the glass, sandwiching it in between. Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly or at all.

Pocket

Similar to swing clear standard and continuous hinges, pocket pivots are used for swinging a door away from the clear width opening. A typical application for a pocket-pivot hinge is to swing the door into a pocket in the wall so that the door appears flush with the surrounding wall, appearing to become part of the wall, which some might find more aesthetically pleasing. This application is typically used

FIGURE 1.95 Patch Fitting Bottom Pivot
(Source: Courtesy of Rixson®)

(a)

FIGURE 1.96a Open Pocket Pivot
(Source: Courtesy of Scott J. Tobias)

(b)

FIGURE 1.96b Closed Pocket Pivot
(Source: Courtesy of Scott J. Tobias)

in cross-corridor fire rated doors, which are held open on electromagnetic holders and tied into a fire alarm system (see Chapter 7, Stops and Holders).

Pocket pivots must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges.

INSTALLATION

The most efficient type of hanging device is the pivot. This hardware allows the door's weight to be borne by the floor and not on the frame. The result is virtually no stress on the frame.

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the pivot set. Pivot sets are available offset or center hung.

Fasteners

Pivots are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Pivots are installed on different points of the door, frame, and floor, depending on the type and application (see Hanging Means, Pivots, Quantities in this chapter).

Preparations

Pivot preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw holding force.

Screw holes are typically drilled and tapped at the factory for metal doors, but not for wood doors unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavyweight pivot, thicker gauge metal means that the materials will be thicker and the door and frame preparations need to be coordinated.

FLOOR CLOSERS

Also Known As: Floor Check, Concealed Closer

Equal to pivots as the most efficient type of hanging device is the floor closer, and some may even consider it even more efficient with the addition of the self-closing ability. This hardware allows the door's weight to be borne by the floor and not on the frame. The result is virtually no stress on the frame.

Floor closers can be manufactured as various types to accommodate different door sizes, thicknesses, weights, existing floor conditions, and fire ratings and are available for various types of special applications such as oversized doors and or door and frame applied materials.

FIGURE 1.97 Shallow Floor Closer
(Source: Courtesy of Rixson®)

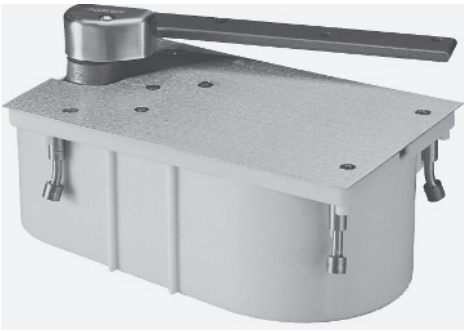


FIGURE 1.98 Heavy-Duty Floor Closer
(Source: Courtesy of Rixson®)

PROPERTIES

Floor closers are typically furnished in sets with a top pivot and floor closer body, which are installed at the top and bottom of the door and connected to the head of the door opening or frame and in the floor directly beneath.

Bearings

Floor closers that are manufactured with bearings help support the weight and operation of the device. They also keep the arm of the floor closer and the spindle from directly touching and pivoting on each other. This creates a supportive barrier between the metal parts, reducing metal friction, which causes less wear and a smoother operation.

THRUST BEARING

Thrust bearings help support the weight or vertical load of the door, or the weight resting on top of the bottom arm and floor closer arm. The thrust bearing level of duty will match that of the floor closer; for example, a heavy-duty floor closer will have a heavy-duty thrust bearing.

NEEDLE BEARING

Needle bearings help support the lateral force of the opening, or the swinging from side to side on the pivot point.

OIL-IMPREGNATED BEARING

Oil-impregnated bearings help support the movement of the walking beam pivot when it is being installed and uninstalled.

Finishes

Floor closer bodies do not have finishes, as they are covered beneath the ground. They are typically furnished with cover plates that are available in most architectural hardware finishes to match the other hardware installed on the door such as the locking device.

Grades

Door closers, including floor closers, are graded with grades 1, 2, or 3, depending on ANSI/BHMA test procedures. Such tests include cycle and various valve testing to meet minimum levels. Minimum levels, for example, for a surface or concealed in door cycle testing for a grade 1 closer are 1 million cycles and 100,000 cycles with the backcheck valve control functional.

Materials

The internal parts and decorative cover plates of floor closers are manufactured from various metals, depending on the manufacturer. The arms are manufactured from brass, bronze, stainless steel, or steel, depending on their application and fire rated door opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire.

If anything other than a steel base is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

Springs

CAM

A cam action closer operates by a twisting motion, which pushes and pulls the springs that operate with the closer opening and closing cycles. A cam action closer is different from a standard closer where a standard closer does not have a twisting part, but rather hydraulic fluid that flows back and forth through the device, pushing and pulling the parts that are required to move the closer through the cycles.

TORSION

A torsion spring is a wound spring, where the tension is in the wind rather than in compressing or squeezing. The spring is wound and has tension in the same direction as the door swing, which helps with efficiency and operation of the door.

COMPRESSION

A compression spring is compressed or squeezed and released to create the movement necessary to close a door and is not as efficient as a torsion spring (see Hanging Means, Floor Closers, Options, Springs in this chapter).

Stops

Some floor closers have built-in stops, which hard-stop the door at a set degree of opening. The opening degree is typically limited and depends on the manufacturer's availability.

Valves

Floor closers are manufactured with various valves to assist with optimizing the closing and latching speeds and forces. These valves act in cycles of the door opening and closing.

BACKCHECK

Backcheck valves allow for adjustment to the opening force past about 65 degrees of the door in the open position to give the door less resistance, making it easier to push open.

CLOSING SPEED

Closing speed valves allow for adjustment of the closing speed cycle. This is the speed once initially released if the device has no delayed action option (see Hanging Means, Floor Closers, Options in this chapter) or once the delayed action has completed, and affects the closing up until about 15 degrees of the closed position.

LATCH SPEED

Latch speed valves allow for adjustment to the latching speed cycle. This is the speed once past the closing speed cycle and gives the door enough force and power to clear any of the locking device

latches, or other surrounding elements that might affect the closing such as gaskets around the perimeter of the door.

TYPES

The bodies of a floor closer typically come in two depths. In addition to the floor closer body sizes and depths required for installation, there are many feature differences.

Heavy Duty

Heavy-duty applications require a preparation in the floor of more than 4 inches deep and can carry standard weights up to approximately 450 pounds with extra-heavy-duty applications, carrying weights up to 1,500 pounds.

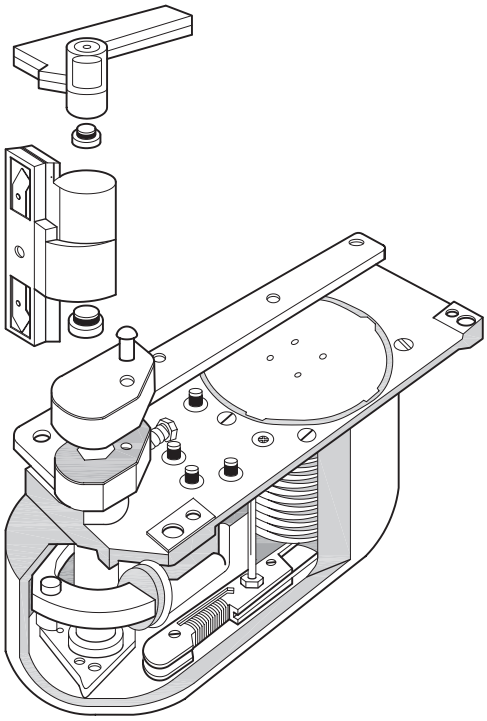


FIGURE 1.99 Heavy Duty Floor Closer
(Source: Courtesy of Rixson®)

Shallow Depth

The body of a floor closer can be standard duty and requires a preparation in the floor of about 2 inches deep, carrying weight up to approximately 250 pounds.

OPTIONS

Cold Weather Fluid

Cold weather fluid is available in lieu of standard oil and fluids used to operate the floor closer. This fluid would be specified and used in areas where extreme cold weather exists so that the fluids do not thicken or freeze, which would affect the operation of the closer.

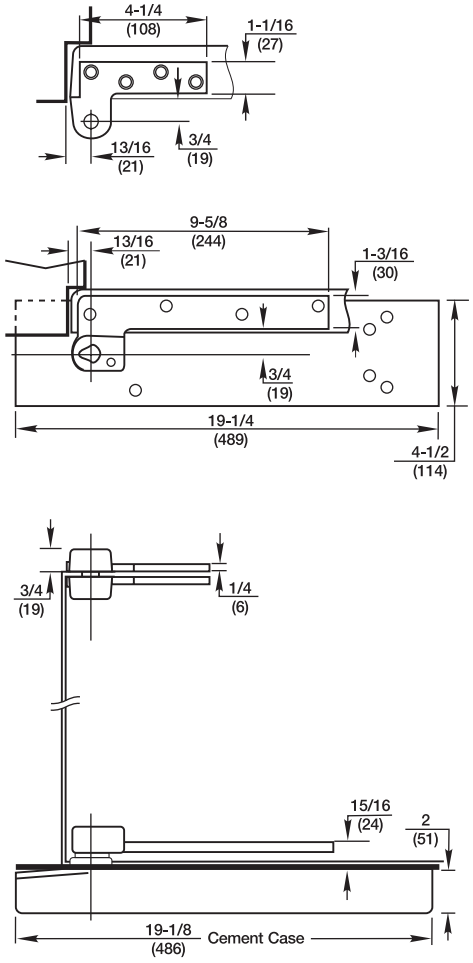


FIGURE 1.100 Shallow Depth Floor Closer
(Source: Courtesy of Rixson®)

Cover Pan

Floor closers are available with cover pans to be installed where the standard decorative cover plate would be. A cover pan would likely be used for the installation of terrazzo or some type of floor

FIGURE 1.101 Floor Closer Cover Pan
(Source: Courtesy of Rixson®)

covering, which would be installed into the pan, then the pan would be installed into the floor. The materials would match the surrounding patterns with the exception of a narrow metal lip of the pan, which can be removed from the floor for access to the floor closer. Access might be required for spring or tension adjustments or for other types of required repairs or replacement. Depending on the pan and material dimensions, an extended spindle might be necessary (see Hanging Means, Floor Closers, Options, and Extended Spindles in this chapter).

Delayed Action

A delayed-action option delays, or slows, the door and sometimes even hold it for a short period of time at a certain degree. This option allows time for someone or something to pass through the doorway without rushing or getting hit by the door while moving through the opening, without the need for a hold-open feature (see Hanging Means, Floor Closers, Options, Hold Open in this chapter).

Electric Transfer

Floor closers are available with wires running through them, and electric transfer pivots are available for electric locking or release devices. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors would require a device, which would transfer the power from the wall into the floor closer body, through the spindle, up the hanging side of the door to the raceway, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer pivots are available with various wire quantities. A simple system would only require four wires, while a more complex system or added options, such as a signal switch, might require twelve wires.

In addition, electric transfer pivots are intended to operate with low-voltage and low-amperage devices. If the voltage or amperage is too high, there is a danger of overheating and damaging the devices and those that they operate, and this creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

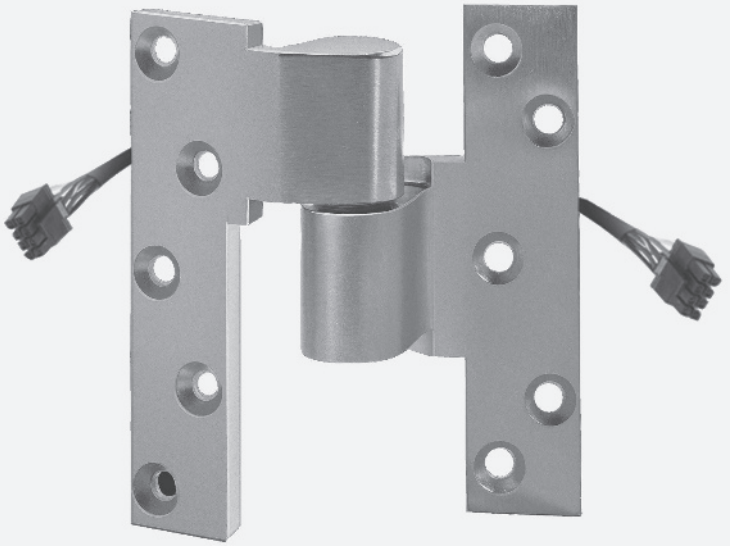


FIGURE 1.102 Electric Transfer Intermediate Pivot
(Source: Courtesy of Rixson®)

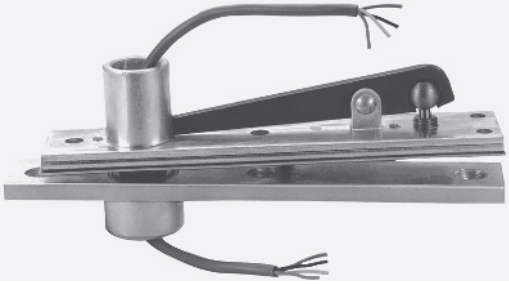


FIGURE 1.103 Electric Transfer Center Top Pivot
(Source: Courtesy of Rixson®)

Some manufacturers furnish electrified transfer pivots with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.

Extended Offset

The standard offset floor closer pivot point is 3/4 inch, and although available in custom dimensions, the most common extended offset dimension is 1 1/2 inches. The extended offset is typically used to accommodate a panel or plant-on, on the face of the door. If a 3/4-inch panel is installed on a door and an extended offset is not used, the pivot point will conflict with the panel and that portion of the panel will have to be cut out to accept the pivot point and arm.

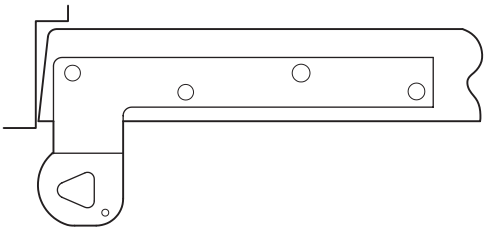


FIGURE 1.104 Extended Floor Closer Arm
(Source: Courtesy of Rixson®)

Be cautious when specifying extended floor closer pivot points, as the more the extension, the less weight the floor closer will hold due to the balance and placement of the arm underneath the door.

Extended Pivot Pin

Center floor closers using top-center pivots sometimes require longer pivot pins in order to engage the door more than a standard pivot pin. This option is recommended when doors are taller than a certain height, but as with all door hardware, check with the manufacturer's recommendations.

Extended Spindle

Extended spindles for the bottom arms and floor plates are available for doors that have large undercuts in order to extend the entire length required. A typical door undercut is 3/4 inch from the finished floor, which is what a standard spindle is manufactured for. Another reason why an extended spindle might be required would be a panel or covering on the door or a taller than normal saddle on the floor, which would require the spindle to extend through either.

Fire Rated

Offset floor closers have the option of being manufactured as fire rated, but have to be specified and ordered as such. This means the material is steel or stainless steel and has been tested and passed by the UL as fire rated and might require additional intermediate pivots to comply.

Hold Open

The hold open option is available to hold the floor closer and door in the open position, which is a fixed degree of opening. The hold open positions can vary depending on availability and cannot be used on fire rated doors, as they are mechanical hold open devices.

Lead Lined

Offset floor closers are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as to not interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening, where the protection for those passing by would be eliminated.

Fewer Parts

Floor closers typically have the option to be specified as fewer of certain parts such as the floor plate, top pivot, or possibly all parts except for the body alone. This might be desired if you wanted to order and install a replacement part of the closer or the closer body itself without having to pay for or waste the other parts of the closer.

Non-Hold Open

The non-hold open option is available so that the door is not held open and closes each time. It is typically used on fire rated doors.

Physically Handicapped

This option indicates the opening force complies with ICC/ANSI A117.1 (International Code Council/ American National Standards Institute) Accessible and Usable Buildings and Facilities, 2009 and the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG). These standards require that any accessible opening have a 5-pound maximum opening force. This option cannot be used on fire rated or exterior door openings, whose requirements override accessible codes and standards. Be aware that this option reduces the opening force, which in turn reduces the closing force, and might prevent the door from closing and latching properly or at all (see Hanging Means, Floor Closers, and References in this chapter).

Sealed Closer

For door openings that have exposure to water or liquids, such as cleaning products, sealing a closer protects the inside of the closer body and all of the working parts of the floor closer. In order to seal the floor closer, it is typically placed in a cement case and a gasket is placed in between it and the secured cover plate, which is fastened to the cement case containing the floor closer body.

Selective Hold Open

The selective hold open option is available to hold the floor closer and door in the open position, which can be selected to achieve different degrees of opening. The hold open positions can vary depending on availability and cannot be used on fire rated doors, as they are mechanical hold open devices.

Special Layouts

Some installations require custom layouts and some manufacturers are willing to work with you to see if they have the ability to customize their tooling to create pivot configurations as required.

Threshold

Some manufacturers offer thresholds to cover the floor closer in lieu of the standard decorative cover plate and or cover plate for terrazzo or other floor coverings. Thresholds might be required by some

codes for floor type transitions and when using a floor closer in those opening types, having the threshold furnished by the same manufacturer as the floor closer would be the best option.

QUANTITIES

Floor closers are typically installed in sets, depending on their type, although some are available as parts as necessary for the application.

Center

Center floor closers are typically available with a floor closer body, arm, top pivot, and decorative plates. Because the door is hung from the top and bottom, there is no such thing as a center hung intermediate pivot. With its operation and configuration, there is no physical way for the door to attach to the frame or framed opening hardware at the middle edge of the door. Also remember, center hung openings are typically not fire rated.

Independently Hung

Independently hung floor closers can be sold as just a floor closer body to work with another hanging means to be specified such as hinges or pocket pivots. These floor closers can also sometimes be sold in sets, depending on the manufacturer, such as a floor closer body with two standard hinges.

Offset

Offset floor closers are typically available with a floor closer body, arm, top pivot, and decorative plates. Although an intermediate pivot is required by most manufacturers for use with the offset floor closer

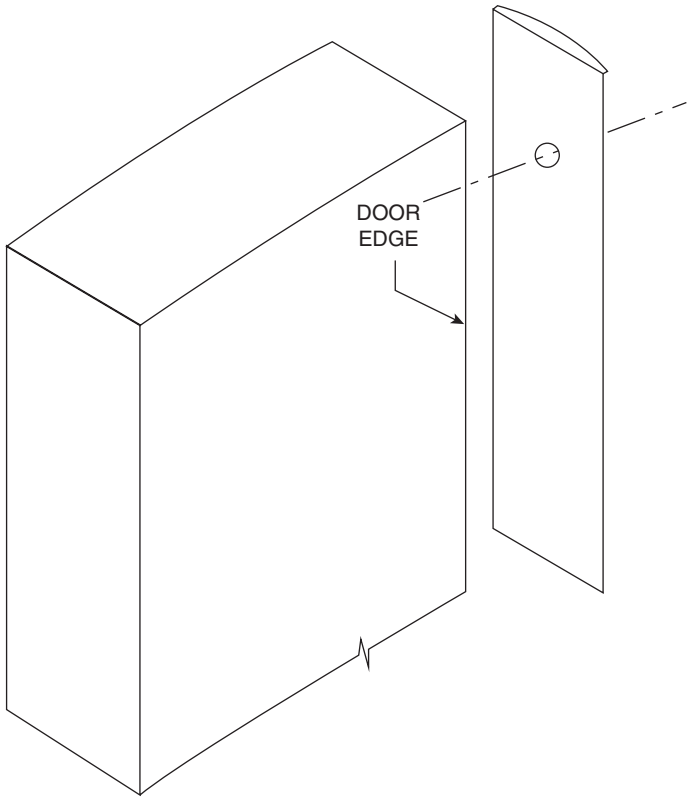


FIGURE 1.105 Radius Edge Door
(Source: Courtesy of Ceco Door)

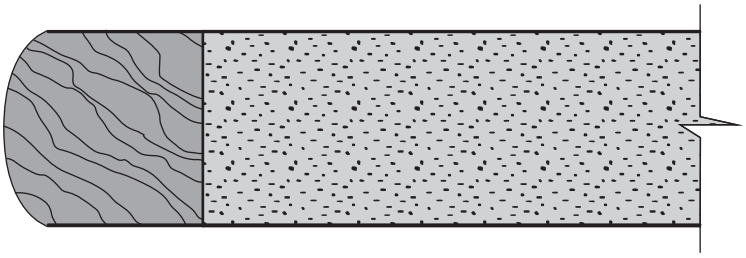


FIGURE 1.106 Center Pivot Point
(Source: Courtesy of Rixson®)

FIGURE 1.107 Independently Hung Floor Closer
(Source: Courtesy of Rixson®)

and top pivot, it does not typically come with the set and needs to be specified or ordered separately. Offset pivoted doors have the same requirements as standard hinges—two per leaf for openings through 60 inches to door height. One additional pivot is required per leaf for each additional 30 inches in height or fraction thereof.

APPLICATIONS

Similar to hinges, some applications will not allow for conventional mortising of the pivot arms on either the door or frame or both. As such, other application variations are available to accommodate other necessary mountings.

Center

Center hung floor closers are the next most recommended hanging means after offset floor closers (see Hanging Means, Floor Closers, Properties, and Offset in this chapter). Center floor closers cannot be used on fire rated doors, as they are installed at the centerline of the thickness and off of the edge of the door. Center hung floor closers can be used for single-acting applications, such as a conventional door swing or double-acting applications such as you might see in a restaurant on a kitchen door for easy access in either direction. Just as a door edge is beveled for other hanging means so the door edge does not bind with the frame edge, a center hung door has a bull-nosed, or radius, edge to allow the door to swing through the opening without binding (see Figure 1.135). The radius at the edge of the door creates a larger than standard clearance, which allows light to shine through the edges. It is recommended in most cases that you use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Because center floor closers are installed at the centerline of the thickness and off of the edge of the door, the back end of the door swings into the opening and to the other side (see Figure 1.105). If being used on a single-swing application and due to the fact that the door needs to swing through the opening on the back end, the frame cannot have a full stop across the top to stop the door in the closed position. The stop on the frame can either be manufactured to end where the center pivot starts or an applied angle stop can be used instead (see Chapter 7, Stops and Holders).

Full Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door and frame portions of the pivot are surface-mounted on the faces of the door and frame.

Half Mortise

Typically available for top pivots, the designation in the device's title refers to the door portion of the opening. The door portion of the pivot is mortised as a conventional top pivot would be, while the frame portion is surface-mounted on the face of the frame.

Half Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is surface-mounted on the face of the door while the frame portion is mortised as a conventional top pivot would be.

Independently Hung

Typically handed left or right, an independently hung floor closer is a closer concealed in the floor and only functions as a door closer and not to carry the weight of the door. This closer requires the use of hinges, continuous hinges, or pocket pivots to hang and carry the weight of the door. The type of hanging devices will have to be specified when ordering the floor closers so that the installation is templated properly.

Offset

Offset floor closers are the number one recommended pivot configuration due to their application availability, strength, durability, and longevity; however, they do tend to be the most expensive conventional hanging method. Offset floor closers are handed, which means they need to be specific to the handing of the door, right or left.

Offset floor closers have a standard pivot point of 3/4 inch, which means the pivot point, or center of the pivoting portion of the arm, is 3/4 inch from the face of the door. This pivot point, or spindle, is typically covered by a cap that is held onto the spindle with a screw. Offset floor closers are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a panel on the face of the door, similar to a wide throw hinge (see Hanging Means, Floor Closers, Options, Extended Offset and Hinges, Types, Wide Throw in this chapter).

Offset floor closers must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges. It is not only recommended, but required, that an intermediate pivot is used when installing top and bottom offset pivots (see Hanging Means, Pivots, Intermediate in this chapter).

Patch Fittings

Typically available for a floor closer set, including a floor closer body and top pivot, patch fittings are available for glass doors without top and or bottom rails to accommodate conventional floor closers

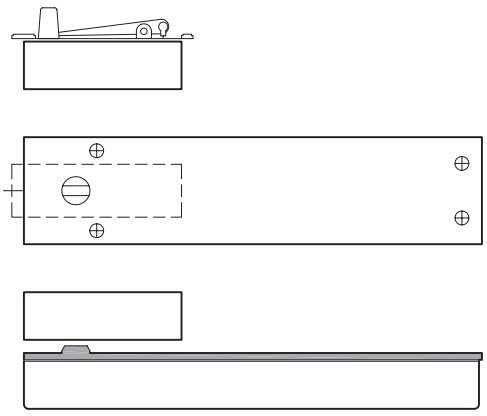


FIGURE 1.108 Patch Fitting Floor Closer
(Source: Courtesy of Rixson®)

and pivot arms. Patch fittings are attached to both sides of the glass, sandwiching it in between. Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly.

INSTALLATION

Equal to if not more efficient than a pivot, a floor closer is the ideal hanging and controlling device. This hardware allows the door's weight to be borne by the floor and not on the frame, resulting in virtually no stress on the frame.

Be aware, however, that although a floor closer will stop a door when the spring reaches full tension, the floor closer will stop working efficiently, as it is not meant to stop the door. Some floor closers actually have stops built into them, but otherwise an additional stop will need to be installed (see Stops and Holders in Chapter 7).

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer.

It is recommended to install overhead stops on out-swinging doors hung on floor closers, especially on exterior heavy duty applications.

Fasteners

Floor closers are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer arm. Floor closers are available in offset or center hung options.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Floor closers are installed on different points of the door, frame, and floor, depending on the type and application (see Hanging Means, Floor Closers, Quantities in this chapter).

Preparations

Floor closer preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw holding force.

Screw holes are typically drilled and tapped at the factory for metal doors, but not for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavyweight floor closer, thicker gauge metal for the pivot arms mean that the materials will be thicker and the door and frame preparations will need to be coordinated.

SLIDING AND FOLDING DOOR HARDWARE

Also Known As: Track and Hardware

DESCRIPTION

Track and hardware is used to hang folding and sliding doors, which are sometimes used for aesthetic purposes, but typically are installed to maximize the space around the opening by not having a swinging door that requires clearance all around so that the door swings freely.

Typical folding and sliding doors are not fire rated, although there are a handful of manufacturers that do manufacture a fire rated heavy duty fire rated sliding door for building separation applications.

When specifying track and hardware, you must also consider any type of pulls, locking devices, or stops that may be required as they are typically not included in the standard track and hardware set.

PROPERTIES

Sliding door track and hanger components are manufactured with different weights, thicknesses, and materials in order to accommodate the various door sizes, materials, and weights.

Bearings

NEEDLE BEARINGS

Some manufacturers incorporate needle bearings into the hangers in order to help with the lateral or side-to-side movement of the hangers with the sliding operation of the door.

Finishes

Tracks have traditionally not been a consideration for aesthetic reasons and were concealed as often as possible. In recent years, sliding doors have become more popular with unique track and hanger designs being developed to add aesthetic appeal to the opening. Finishes include polished steel or stainless steel, polished and satin brass or bronze, and anodized aluminum.

Materials

Tracks are typically available in anodized aluminum, brass, bronze, stainless steel, and steel, depending on the manufacturer and availability.

Tracks

Tracks are available in different configurations, which in turn work with specific hangers, which are the mechanisms with rollers that attach the door with brackets and allow the door to slide across the track.

BOX SHAPE

This track is square where the top attaches to the top jamb of the framed opening or the face of a wall and the wheels suspend the door and slide along the inside of the box. There is an opening at the bottom where the hanger sticks through and attaches to the door. The track can be straight for a single sliding door or a pair of bi-parting doors, can be manufactured curved for a curved wall and opening, or can be installed parallel in multiples to accommodate a bi-passing application. The track also has the option to come manufactured with a fascia, also known as flashing, to cover the track, rollers, and hangers behind it.

GROOVE

This track sits on the floor and rather than suspend the door from the track, the weight of the door is borne on the track and floor. This type of track typically has grooves that accept sheaves, which are metal wheels that glide along the grooves on the track.

TEE SHAPE

This track is shaped like a tee where the rollers grab the vertical portion of the tee on both sides and suspend the door while the horizontal portion of the tee attaches to the top jamb of the framed opening.

ROUND SHAPE

Round tracks typically attach to the top jamb of the framed opening or the face of a wall and the wheels suspend the door and can slide along the inside of the tube. There is an opening at the bottom where the hanger sticks through and attaches to the door. The track can be straight for a single sliding door or a pair of bi-parting doors or can be installed parallel in multiples to accommodate a bi-passing application.

There are tracks that are tubular in shape where the track is installed on the face of the wall and door opening. The hangers rest on top of the tube track and the hangers have their own unique aesthetic with the rollers on top instead of rolling along the inside.

Weights

LIGHT

Lightweight track and hangers are available to carry light door weights up to 25 to 75 pounds and are not recommended for frequently used openings.

MEDIUM/STANDARD

Medium-weight track and hangers are available to carry light door weights up to 150 to 200 pounds and are recommended for medium frequency of use.

HEAVY

Heavyweight track and hangers are available to carry light door weights up to 1,000 pounds and are ideal for frequently used openings but can be expensive.

TYPES

Folding

Folding doors are fixed at one end with a top and bottom pivot and slide at the other. The doors fold together as you open them and extend next to each other when closed. This application helps save space where a swinging door might not have the room to swing all the way open or around due to a narrow corridor or other situation.

Folding doors require additional accessories such as hinges to attach the leaves of the folding doors together and can be installed in various configurations such as with two doors to create a single-fold door, four doors to create a double-fold door, two single-fold doors to create a pair of folding doors, to name a few combinations.

Sliding

Sliding doors can be installed as single doors or pairs of doors with many configurations available. They can be surface-mounted on a wall, bi-passing doors within one opening, single or double in a pocket, and even on the floor with rollers that are called sheaves, which roll along a grooved track on the floor.

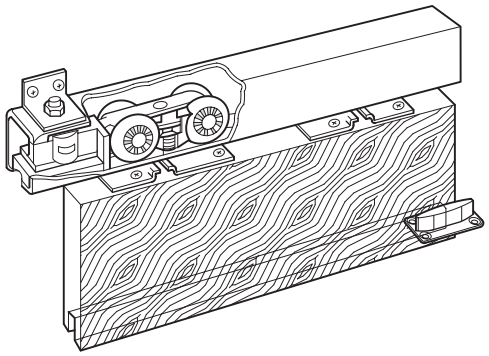


FIGURE 1.109 Sliding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

OPTIONS

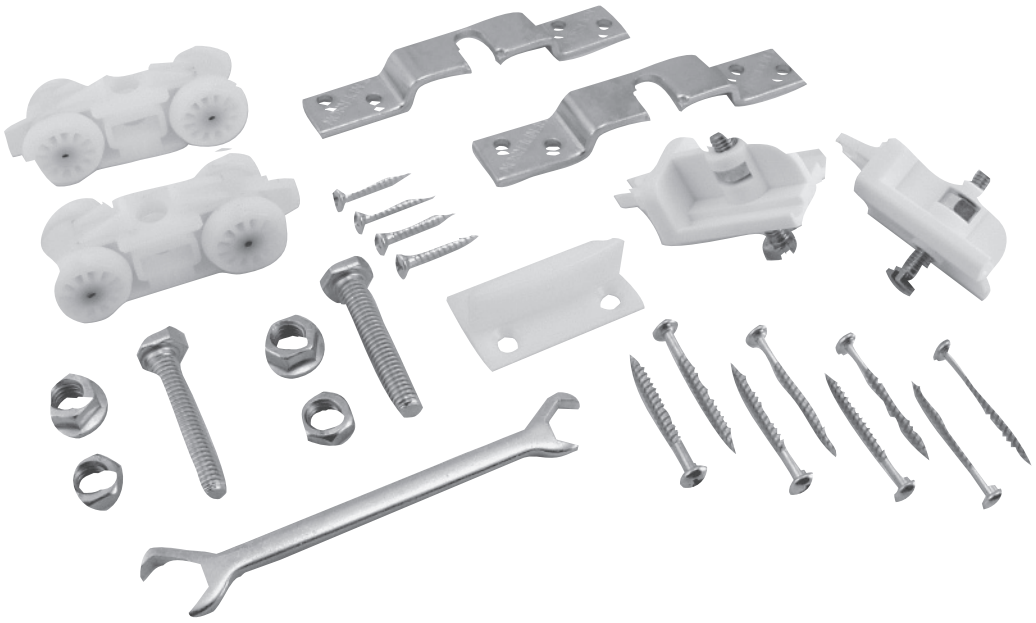


FIGURE 1.110 Sliding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

Side Wall Track

This option is available where the track is mounted on a wall where the ceiling or head of the jamb is not perpendicular but rather at a 45-degree angle. The angle of the top of the track where it mounts is also at 45 degrees, allowing for proper fastening.

Fascia

A fascia is a decorative cover, which is installed over or manufactured as part of the sliding door track. The fascia covers the track and hangers so that they are not visible and only the surface of the covering or fascia is seen. The fascia can be painted or coated with an architectural finish or another type of finish material.

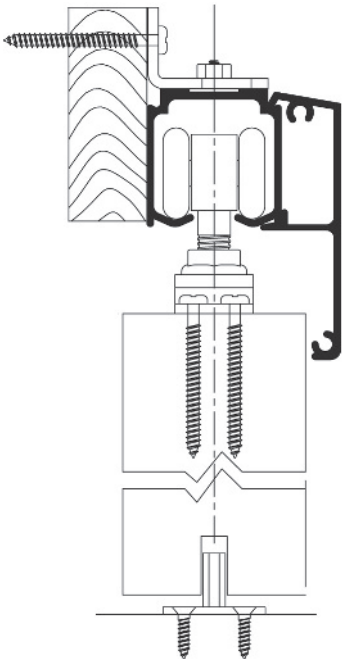


FIGURE 1.111 Sliding Wall Track
(Source: Courtesy of Pemko Manufacturing Company)

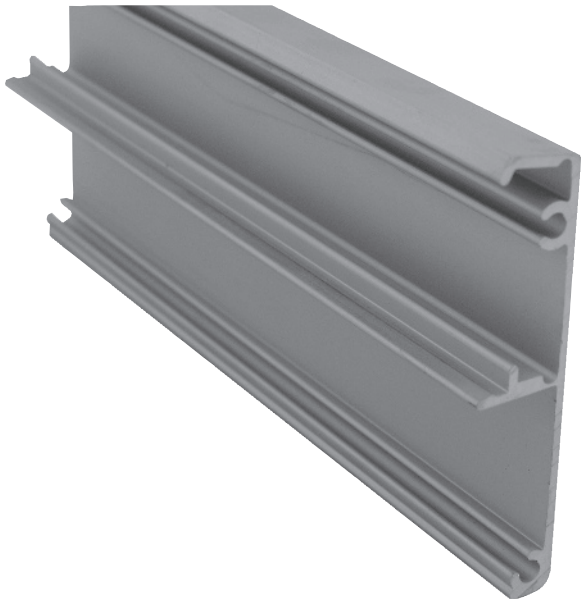


FIGURE 1.112 Track Fascia
(Source: Courtesy of Pemko Manufacturing Company)

FIGURE 1.113 Track Fascia
(Source: Courtesy of Pemko Manufacturing Company)

FIGURE 1.114 Channel Guide
(Source: Courtesy of Pemko Manufacturing Company)

Guides

Floor guides are available to help guide the doors for optimal use and to help avoid any damage to the surrounding conditions.

CHANNEL

The channel is installed along the entire length of the bottom of a folding or sliding door opening and either surface-mounted or recessed in the floor. If surface-mounted, it is more likely in an opening that is not frequently passed through, such as a closet.

CHANNEL ROLLER

The channel roller is typically a fixed pin or caster to the bottom of the door that fits and rolls along the channel guide. This keeps the door straight in the opening and helps prevent the doors from knocking into a wall or each other if against a wall, in a pocket, or bi-passing.

FLOOR

Floor guides are available in different shapes and sizes to accommodate the different types of doors and thicknesses available.

SIDEWALL

A sidewall channel is used when the door is mounted on the face of the wall and helps keep the door from scraping against and along the wall as it slides across the door opening.

THRESHOLD

A threshold guide is similar to a typical threshold (see Accessories, Types, Thresholds in Chapter 7), except the threshold has a groove for a channel roller guide.

Hangers

Hangers are used to hang the door from the track, which typically incorporate rollers, which help the door slide easily across the track. Hangers are available in different sizes and duties, depending on the door size, weight, and frequency of use.

Mounting Brackets

Various mounting brackets are available to accommodate any special installation conditions that might exist or arise during construction. Check with various manufacturers or your local door opening consultant.

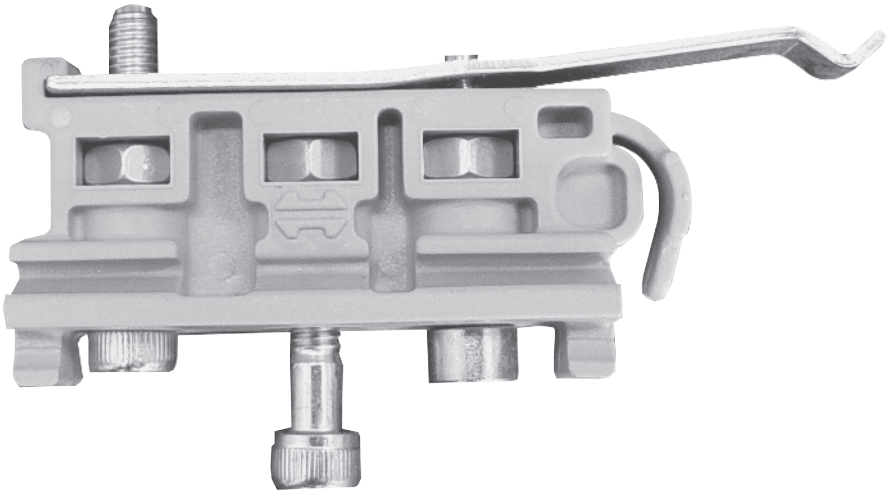


FIGURE 1.115 Hangers
(Source: Courtesy of Pemko Manufacturing Company)

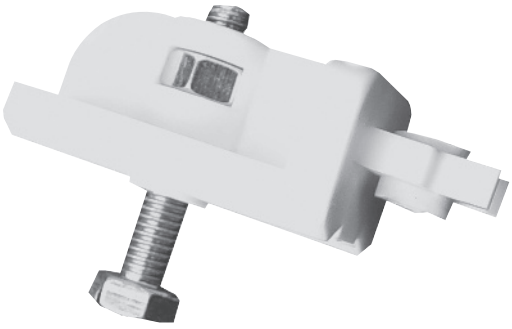


FIGURE 1.116 Hangers
(Source: Courtesy of Pemko Manufacturing Company)

FIGURE 1.117 Track Stop
(Source: Courtesy of Pemko Manufacturing Company)

Stops

Stops are used to stop a door from sliding past the end of the track and possibly into a wall or frame or framed opening side jamb. They can also be installed in a pocket to stop the door in the pocket before hitting the wall.

FLOOR

Floor stops are attached to the floor and can be used to stop the door in the open or closed position.

TRACK

Track stops are attached to the track by screws or a clip, and they create stops for doors to hit up against. The stops can either be a hard stop or have a bumper at the end for a softer stop.

WALL

Wall stops or bumpers are attached to the wall or frame or opening side jamb and can be used to stop the door in the open or closed position.

QUANTITIES

Tracks and hangers are typically furnished in sets for each door opening. Each track that holds a door typically has a set or pair of hangers and rollers. Optional items like stops, pulls, locking devices, and special application hardware need to be specified separately.

FIGURE 1.118 Wall Stop
(Source: Courtesy of Pemko Manufacturing Company)

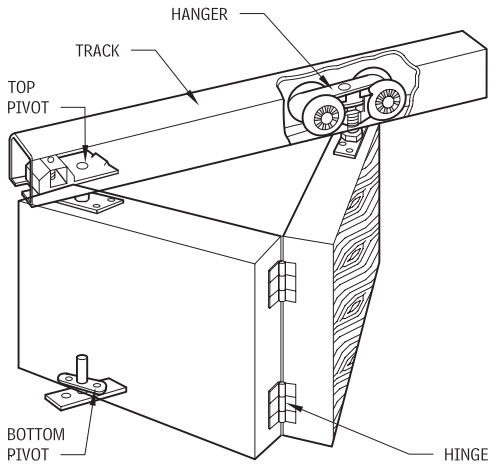


FIGURE 1.119 Bi-Folding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

APPLICATIONS

Bi-Folding

Bi-folding doors are two-panel doors that are fixed at one end with a top and bottom pivot and slide at the other. The doors fold together as you open them and extend next to each other when closed. This application helps save space where a swinging door might not have the room to swing all the way open or around due to a narrow corridor or other situation.

Bi-folding doors require hinges to attach the leaves of the folding doors together and can be installed in various configurations such as with two doors to create a single-fold door.

FIGURE 1.120 Face Mounted Sliding Door
(Source: Courtesy of Rockwood® Manufacturing Company)

FIGURE 1.121 Sliding Door Edge Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Bi-Parting

Like a pair of doors that part from each other and separate to open the door, bi-parting doors can be surface-mounted on the wall or installed in pockets in the walls. Suspended or floor-mounted tracks can be used for this application. Typically, the same track that is used for a single sliding door track can be used; the doors are butted up against each other and part from one another as they open.

Bi-Passing

Bi-passing doors are installed with two doors next to each other on separate tracks, either aligned or on one double track. This allows the doors to pass each other, saving space since there is no need for space to swing doors open. Bi-passing doors are typically opened one at a time, hiding behind one another, which blocks one side of the door opening. Suspended or floor-mounted tracks can be used for this application.

Face-Mounted

Also known as barn door hardware, sliding doors can be installed where the track is surface-mounted to the face of a wall and the door hangs and slides on the front of an opening. When surface-mounted, and depending on aesthetic preference, the track is either exposed or a decorative fascia is installed to hide the track.

Pocket

Pocket sliding doors conceal half of the track in a pocket in a wall, hiding the door in the wall when in the open position. This type of door is the most space-saving type if the wall already exists,

as the door utilizes the existing opening. A suspended track or floor track can be used for this application.

POCKET FRAME KITS

Some manufacturers offer pocket frame kits, which include all of the necessary parts required to install a pocket door; some include framing for door openings that are not already framed.

FIGURE 1.122 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Patch Fittings

Patch-fitting hangers are available for glass doors that do not have top or bottom rails to accept standard track hangers. The fittings are attached to both sides of the glass, sandwiching it in between.

FIGURE 1.123 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

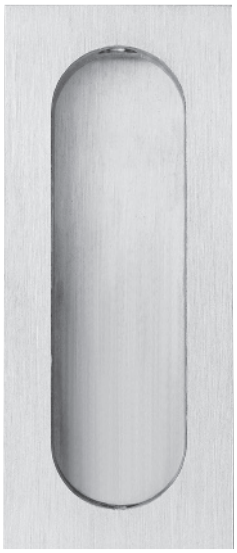


FIGURE 1.124 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly.

Single

Single sliding doors can be installed on a wall and over the door opening, in a pocket, or a folding door.

FIGURE 1.125 Sliding Door Locking Device
(Source: Courtesy of Rockwood® Manufacturing Company)

Floor-Mounted

Aldo known as sheaves and track, this application sits on the floor and rather than suspend the door from the track, the weight of the door is borne on the track and floor. This type of track typically has grooves that accept sheaves, which are metal wheels that glide along the grooves on the track.

Soffit-Mounted

Soffit-mounted tracks, or tracks installed on the top jamb of a frame or door opening, are a typical track installation. The fasteners go up through the track and secure the track to the head, which holds the weight of the folding or sliding door.

INSTALLATION

Sliding door hardware can be installed on the face of the wall over the opening with brackets to suspend the track, underneath the frame head or framed opening on the soffit, or on the floor with sheaves and track rather than hangers and track.

Fasteners

Track and hangers are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Each manufacturer typically recommends installation requirements and locations for fasteners and devices in order for track and hangers or sheaves to operate properly.

Preparations

Doors, frames or framed openings, and floors are typically not prepared for track and hangers prior to installation, as they are surface-mounted for the most part. Sheaves for floor track might be prepared, as they are recessed in the bottom of the door; it is best to coordinate and confirm with your door manufacturer.

Preparations that will likely take place at the door and frame factories along with manufacturing are recessed pulls and locking and strike devices. Whether recessed at the edge or on the face of the door, these pulls and devices require preparation prior to installation.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

Following are chapters of a modified or fully adopted version of the International Building Code that refer to hanging means door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
  - Section 1008: Doors, Gates and Turnstiles
- Chapter 17: Special Inspections and Tests
- Chapter 26: Plastic
  - Section 2603: Foam Plastic Insulation

National Fire Protection Association (NFPA) 101: Life Safety Code

Following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to hanging, means door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Standards for Accessible Design (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, that refers to hanging means door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

Following are technical documents available for reference that refer to hanging means door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders' Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech Talk BH-1 Butts and Hinges
- Tech-Talk CH-1 Continuous Hinges
- Tech-Talk EAH-91 Electrified Architectural Hardware

- Tech-Talk FC-1 Concealed Floor Closers
- Tech-Talk P-1 Pivots
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council (ICC) A117.1 Accessible and Usable Buildings and Facilities

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to hanging means door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, that refer to hanging means door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to hanging means door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to hanging means door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to hanging means door hardware in general:

- ANSI/BHMA A156.1 American National Standard for Butts and Hinges
- ANSI/BHMA A156.7 American National Standard for Template Hinge Dimensions
- ANSI/BHMA A156.14 American National Standard for Sliding and Folding Door Hardware
- ANSI/BHMA A156.17 American National Standard for Self Closing Hinges & Pivots
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.20 American National Standard for Strap and Tee Hinges and Hasps
- ANSI/BHMA A156.26 American National Standard for Continuous Hinges

- ANSI/BHMA A156.32 American National Standard for Integrated Door Openings Assemblies
- ANSI/BHMA A156.115 American National Standard for Hardware Preparation in Steel Doors and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames