BUTT HINGES - Table 2-8A of the National Fire Protection Association (NFPA) handbook No. 80 sets forth the minimum quantity, size and weight (thickness) for swinging fire doors. Table 2-8A also stipulates that "All hinges or pivots, except spring hinges, must be of the BALL BEARING type." As far as quantity is concerned, Table 2-8A requirements correspond exactly with the hardware industry standards (up to 60 inches in height, 2 hinges and an additional hinge for each additional 30 inches or fraction thereof) and should be followed in all cases. Table 2-8A calls for size 4-1/2 inch hinges to be used on full sized doors with mortise or surface type hinge application. Good hardware practice would require 5 inch hinges to be used on doors over 3 feet 6 inch in width. The difference between 5 and 4-1/2 inch hinges, in terms of bearing surfaces, pin sizes, fastenings and weight of leaf metal, is vast, A knowledgeable hardware consultant will insist upon the larger size where wide, heavy doors are being used.

Thickness or gauge of hinge metal, more commonly referred to as weight, varies with the door size. Standard weight hinges in size 4-1/2 inch have leaves of 0.134 thickness, while heavy weight hinges in the same size have leaves of 0.180 thickness. Table 2-8A (below) allows the former to be used on 4'0x8'0x1-3/4" in size, while calling for the heavy on doors up to 4'0x10'0x1-3/4". Since these two requirements overlap, the practical effect is to permit standard weight hinges to be used on all size doors to and including 4'0x8'0x1-3/4", and to call for the heavy weight hinge only on larger doors.

Here again good practice calls for a somewhat different rule. If 4-1/2 inch hinges are being used, heavy weight should be provided on all door widths greater than 3'0. For door size exceeding 3'6x8'0x1-3/4" hinges should be 5 inches high on 0.190 (heavy weight) thick.

Steel hinges of the olive knuckle type may be used on labeled doors when permitted in the door manufacturer's procedure. Observe hinge and door size limitations as listed in Table 2-8A.

NOTE: ALL HINGES OR PIVOTS, EXCEPT SPRING HINGES, MUST BE OF THE BALL BEARING TYPE.

Doors up to 60 inches in height shall be provided with two hinges and an additional hinge for each additional 30 inches of height or fraction thereof.

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Table 2-8A Builders Hardware

Mortise and Surface Hinges, Pivots, or Spring Hinges for Swinging Doors

Doors up to 60 in. (1.52 m) in height shall be provided with two hinges and an additional hinge for each additional 30 in. (0.76m) of door height or fraction thereof. The distance between hinges may exceed 30 in. (0.76 m). When spring hinges are used, at least two shall be provided.

Door Rating, Hr						Maximum Door Size		Minimum Hinge Size		Type Hinge
						Width, Ft (m)	Height Ft (m)	Height In. (mm)	Thickness In. (mm)	
For 1-3/4-In. (44.5-mm) or Thicker Doors										
3	1-1/2	1	3/4	1/2	1/3	4 (1.22)	10 (3.05)	4-1/2 (114.3)	0.180 (4.57)	Steel, Mortise or Surface
3	1-1/2	1	3/4	1/2	1/3	4 (1.22)	8 (2.44)	4-1/2 (114.3)	0.134 (3.40)	Steel, Mortise or Surface
	1-1/2	3/4		1/2	1/3	3 ft. 2 in. (0.96)	8 (2.44)	6 (152.4)	0.225 (5.72)	Steel-Olive Knuckle or Paumelle
3	1-1/2	3/4	3/4	1/2	1/3	4 (1.22)	10 (3.05)	4 (101.6)	0.225 (5.72)	Steel Pivots (including top, bottom and intermediate)
	1-1/2	1	3/4	1/2	1/3	3 (0.91)	5 (1.52)	4 (101.6)	0.130 (3.30)	Steel, Mortise or Surface
	1-1/2	1	3/4	1/2	1/3	2 (0.61)	3 (0.91)	3 (76.2)	0.092 (2.34)	Steel, Mortise or Surface
3	1-1/2	1	3/4	1/2	1/3	3 (0.91)	7 (2.13)	4-1/2 (114.3)	0.134 (3.40)	Steel, Mortise or Surface (labeled self-closing spring type)
3	1-1/2	1	3/4	1/2	1/3	3 (0.91)	7 (2.13)	4 (101.6)	0.105 (2.67)	Steel, Mortise or Surface (labeled self-closing spring type)
For 1-3/8-In. (34.93-mm) Doors										
3	1-1/2		3/4	1/2	1/3	3 (0.91)	7 (2.13)	3-1/2 (88.9)	0.123 (3.12)	Steel, Mortise or Surface
3	1-1/2	1	3/4	1/2	1/3	2 ft. 8 in. (0.81)	7 (2.13)	3-1/2 (88.9)	0.105 (2.67)	Steel, Mortise or Surface (labeled self-closing spring type)

NOTE 1: All hinges or pivot□
permitted if they meet the test requirements of *Standard for Butts and Hinges* (ANSI A156.1). Spring hinges shall be labeled.

NOTE 2: 4-1/2 in. (114-□
frequency use or unusual stress.

NOTE 3: Some manufacturers may provide fire doors with hinges of lighter weight which are not ball bearing when they are part of a listed assembly and meet the test requirements of ANSI A156.1 and have been tested to a minimum of 350,000 cycles.

NOTE 4: Pivot sets made up of components smaller and/or of a lighter gauge than shown in Table 2-8A may be used provided they meet the requirements of ANSI A156.4 *Door Controls (Closers)*, and are in accordance with the manufacturers' labeled service procedures.

APPLICATION DETERMINES KIND OF HINGE

Use Three Hinges To A Door - Use Anti-Friction Bearing Hinges On Doors Equipped With Closers

TO SELECT THE PROPER HINGE
THE FOLLOWING FACTORS SHOULD BE CONSIDERED

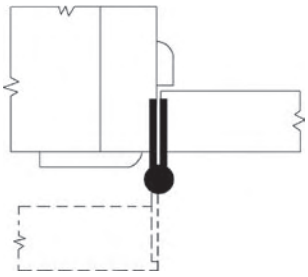
• The material of the door and frame determine method of application, i.e. mortised, surface mounted, half surface mounted, or half mortised.

• The size, thickness and weight of the door - Wider doors, put more strain on hinges, so taller hinges should be used. Thicker doors require wider hinges. Heavy doors require taller, heavier gauge, narrower hinges.

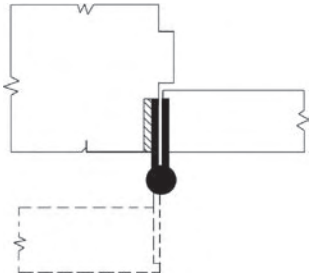
• Clearance of the trim when a door swings 180º effects the width of the hinge.

• The frequency of use and the abuse the door will be subjected to effect hinge choice ... heavy duty ball bearing, average ball bearing or non-ball bearing hinges. It also effects the need for additional hardware such as closers, panic devices, etc.

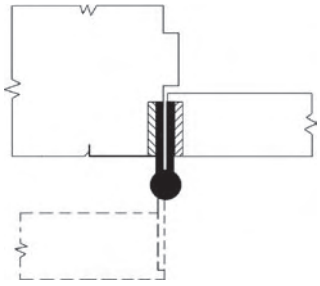
FULL MORTISE
Wood Doors, Wood Frame



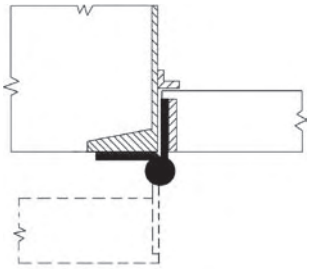
FULL MORTISE
Wood Doors, Hollow Metal Frame



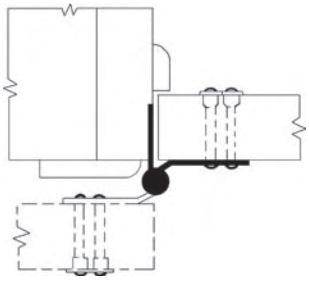
FULL MORTISE
Hollow Metal Doors, Hollow Metal Frame



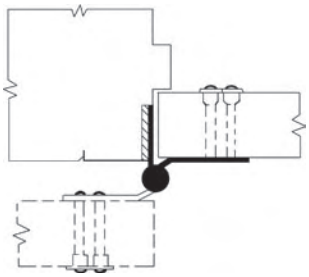
HALF MORTISE
Hollow Metal Doors, Channel Iron Frame



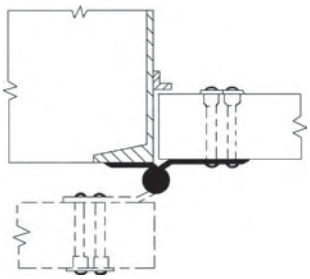
HALF SURFACE
Wood Doors, Wood Frame



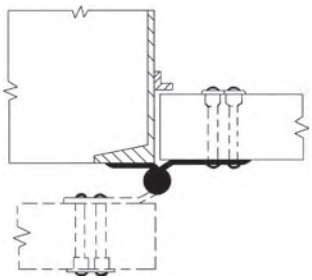
HALF SURFACE
Mineral Core Doors, Hollow Metal Frame



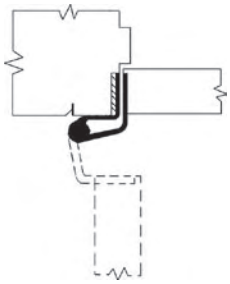
FULL SURFACE
Mineral Core Doors, Channel Iron Frame



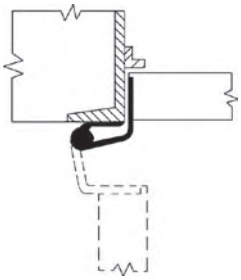
FULL SURFACE
Hollow Metal Doors, Channel Iron Frame



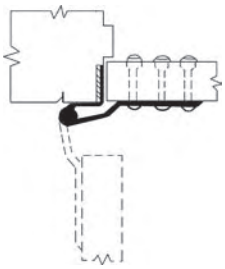
"SWING CLEAR" FULL MORTISE
Wood Doors, Hollow Metal Frame



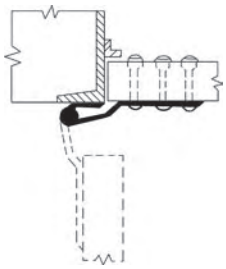
"SWING CLEAR" HALF MORTISE
Wood Doors, Channel Iron Frame



"SWING CLEAR" HALF SURFACE
Mineral Core Doors, Hollow Metal Frame



"SWING CLEAR" FULL SURFACE
Mineral Core Doors, Channel Iron Frame



HOW TO SELECT THE PROPER WEIGHT AND BEARING STRUCTURE

There are three groups of hinges:

Standard Weight - Plain Bearing
Standard Weight - Ball Bearing
Heavy Weight - Ball Bearing

To determine the weight and structure of the hinge you must consider:

1. Frequency of use
2. Weight of door
3. Weight of door hardware

Ball bearing hinges should always be used on doors where door closers are applied and in all fire rated openings. Heavy weight ball bearing hinges should be used on heavy doors and high frequency use doors.

HOW TO DETERMINE THE FREQUENCY OF USE

Frequency Of Use General Guidelines

TYPE OF BUILDING/USE	EXPECTED	FREQUENCY
HIGH FREQUENCY	**DAILY**	**YEARLY**
Large Department Store Entrance	5,000	1,825,000
Large Office Building Entrance	4,000	1,460,000
Hospital Corridor and Surgical Doors	5,000	1,825,000
School Entrance	1,250	356,250
Office Stairwell	500	182,500
MEDIUM FREQUENCY		
Hospital Consultation Rooms	100	36,500
School Corridor	100	36,500
Office Building Corridor	80	29,200
Storage Room	50	18,250
LOW FREQUENCY		
Residential Entrance	30	10,950
Residential Interior	20	7,300

HOW TO DETERMINE THE DOOR WEIGHT

Estimated Door Weights in Pounds Per Sq. Foot

COMMERCIAL FLUSH WOOD DOOR WEIGHTS
Estimated Door Weights in Pounds Per Sq. Foot

DOOR THICKNESS: DOOR MATERIAL:	1-3/8"	1-3/4"	2"	2-1/4"	2-1/2"
Ash	4.5	5.3	6.0	6.8	7.5
Birch	3.8	4.3	5.0	5.6	6.3
Fir	3.0	3.5	4.0	4.5	5.0
Mahogany	4.5	5.3	6.0	6.8	7.5
Oak	6.0	7.3	8.0	9.0	10.0
White Pine	3.0	3.5	4.0	4.0	5.0
Res. Hollow Core	1.7	2.5	-	-	-
Inst. Hollow Core	-	3.2	-	-	-
Staved Core	3.3	4.2	-	5.4	-
Particle Board Core	4.0	5.0	-	-	-
Mineral Core	-	4.0	-	-	-
Acoustic Core	-	8.3	-	10.6	-
Hollow Metal 18 gauge	4.3	4.6	-	-	-
Hollow Metal 16 gauge	5.4	5.8	-	-	-
Hollow Metal 15 gauge	6.2	6.5	-	-	-
Hollow Metal 14 gauge	7.0	7.3	-	-	-
Hollow Metal 13 gauge	8.3	8.7	-	-	-
Hollow Metal 12 gauge	9.9	10.2	-	-	-
Hollow Metal 11 gauge	11.2	11.6	-	-	-
Hollow Metal 10 gauge	12.8	13.0	-	-	-
1-3/4" Wood + 1/16" Lead	-	8.7	-	-	-
1-3/4" Wood + 1/8" Lead	-	12.4	-	-	-
1-3/4" Wood + 3/16" Lead	-	16.1	-	-	-
1-3/4" Wood + 1/4" Lead	-	19.8	-	-	-
1-3/4" Wood + 3/8" Lead	-	27.2	-	-	-
1-3/4" Wood + 1/2" Lead	-	34.6	-	-	-

The above table represents relative weights of most common doors and is intended to be a guide or approximation.

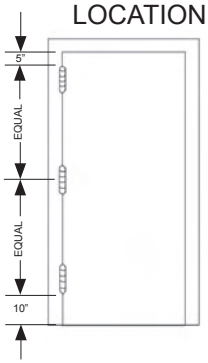
HOW TO SELECT THE PROPER HINGE SIZE

1. Door Height 2. Door Weight 3. Door Width
4. Door Thickness 5. Trim Dimension Required

First find the height of hinge. ***The following chart is only an example.*** Job situation will vary.

THICKNESS OF DOOR IN INCHES	WIDTH OF DOOR IN INCHES	HEIGHT OF HINGE IN INCHES
1-3/8" Door	To 32"	3-1/2"
1-3/8" Door	32" to 36"	4"
1-3/4" Door	To 36"	4-1/2"
1-3/4" Door	36" to 48"	5"
1-3/4" Door	Over 48"	6"
2", 2-1/4", 2-1/2" Door	To 42"	5" Heavy Weight
2", 2-1/4", 2-1/2" Door	Over 42"	6" Heavy Weight

LOCATION OF HINGES ON DOORS



Top hinge 5" from jamb rabbet to top edge of barrel.

Bottom hinge 10" from bottom edge of barrel to finished floor.

Third hinge centered between top and bottom hinges.

The above is U.S. Standards procedure.

* Certain western states use as standard 7" from top and 11" from the bottom.

HOW TO DETERMINE THE NUMBER OF HINGES PER DOOR

As a general rule you will want to use 1 hinge per every 30" of door or fraction thereof.

Referring to door height:

Doors up to 60" - 2 hinges, doors over 60" but not over 90" - 3 hinges, doors over 90" but not over 120" - 4 hinges.

HOW TO DETERMINE THE HINGE WIDTH

You need:

1. Door Thickness 2. Backset 3.Clearance required

Wood Door x Wood Frame: The door would be flush with the casing or face of the frame

Wood or Metal Door x Hollow Metal Frame: The door inset would be 1/8".

Doors up to 2-1/4" Thick: The hinge is set back 1/4" from the back face of the door.

Doors over 2-1/4" Thick: The hinge is set back 3/8" from the back face of the door.

Once these dimensions are known you can apply the following formula:

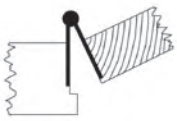
Take the door thickness, minus the backset, times two, plus the clearance required. If the size is not standard move up to the next larger hinge width.

The first dimension of a full Mortise hinge is the hinge height. The second dimension is the hinge width when both leaves are in the open position. It may be necessary to extend the width of the hinge to clear trim or wall conditions.

HAND OF DOORS

All doors are handed - right or left. The following illustration indicated clearly this “handling” as it is understood within the hardware industry.

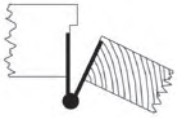
REGULAR DOORS OPENING IN



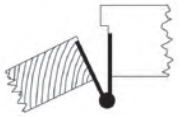
OUTSIDE
Left hand door
takes
left hand hinges

OUTSIDE
Right hand door
takes
right hand hinges

REVERSED DOORS OPENING OUT
Including Bookcase, Closet and Cupboard Doors



OUTSIDE
Left hand reverse door
takes
right hand hinges



OUTSIDE
Right hand reverse door
takes
left hand hinges

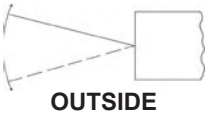
DOUBLE ACTING

Right Side of Hinge

OUTSIDE
Left hand door
takes
left hand hinges

Outside

Left Side of Hinge



OUTSIDE
Left hand door
takes
left hand hinges

(Hand of door is determined from outside)

When standing on outside of door and hinges are on the right, it is right hand. When hinges are on the left, it is left hand.

A double acting door opens from you and toward you, therefore is not called reverse like a single acting door. When specifying two finishes on the same hinge, stand in the doorway facing the jamb to determine the right or left side.

HINGE SWAGING

Swaging is the slight offset in the hinge leaves which permits them to close to parallel position as the door closes.

All hinges for full mortise application are swaged. Normal swaging on standard and heavy gauge hinges provides a clearance of 1/16” when leaves are parallel. Full mortise wide throw hinges have a clearance of 3/32”.

HINGE OPENED

HINGE CLOSED

Hinges for full surface application are not swaged. Blank hinges are for full surface welded application and are always furnished “flat back” unless other wise specified.

HINGE OPENED

HINGE CLOSED

When only on leaf is swaged, the non-swaged leaf is approximately 1/16” shorter. *Exception-on template hinges for metal door and metal frame application both leaves must be the same width, so specify:* **“Leaves must be equal.”** These hinges also require right or left hand specification.

HINGE WITH ONE LEAF SWAGED

When only on leaf is swaged, the non-swaged leaf is approximately 3/32” shorter. *Exception-on template hinges for metal door and metal frame application both leaves must be the same width, so specify:* **“Leaves must be equal.”** These hinges are handed requiring right or left specification.

HINGE WITH ONE LEAF SWAGED FLAT

TEMPLATE HINGES

All PBB template hinges are made to close tolerances and conform to the America National Standard Institutes (ANSI) specifications wherever applicable.

Template hinges will exactly fit the cutout and screw hole location in hollow metal doors and hollow metal frames made to similar template.

Each hinge is carefully inspected and held within close commercial tolerances.

We recommend the use of blueprint templates, which are available on all sizes, when physical sample of a template hinge is not required. These are drawings which show actual measurements, gauge of metal, location, and size. (Note: Some template drawings are not to scale).

Use of physical samples to make cutouts on metal doors or frames is not recommended.

PBB has developed the exclusive Concealed Bearing hinge specifically for those who seek the ultimate in slimline hinges. The Concealed Bearing hinge combines classic simplicity of style with precision-crafted durability.
The three-knuckle hinge, with nested concealed friction free micro smooth brushings was designed for a precise new fitting that eliminates barrel bulge.

CARE IN MAINTENANCE

If a rust-resistant base is desired. PBB hinges are either zinc plated or copper plated prior to the final finishing.

Plated finishes are all well lacquered to retard oxidation of the finish.

For a BHMA specification category, a PBB hinge will meet or exceed BHMA requirements - gauge of metal, hinge size supporting specified door weight, type of finish. We are under constant testing and evaluation with both Warnock Hersey and Underwriters Laboratories.
Refinements are included such as special milling of the knuckles on all bearing hinges for proper seating of the bearing surface.

The streamline design of PBB's five-knuckle and concealed bearing series, meets the demands of todays architectural standards without sacrificing quality, strength, serviceability, or price.

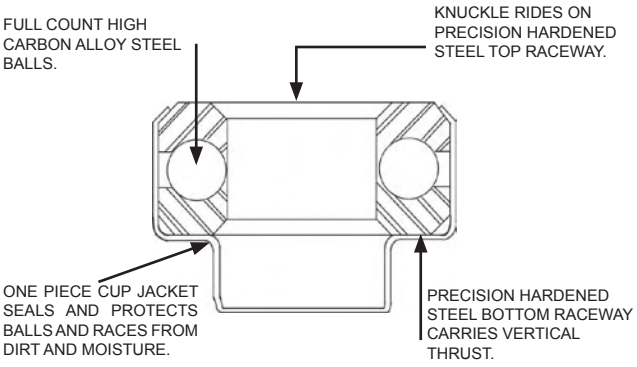
LIFE-TIME BEARINGS

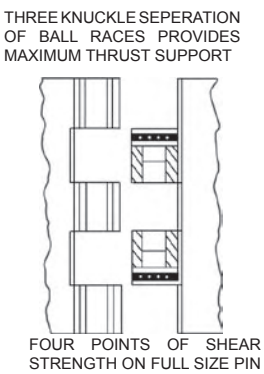
PBB's ball bearing hinges are available with two bearings or four bearings. Half of the Bearing unit supports the vertical load. One bearing of a two-bearing hinge carries the vertical load, and only two bearings of a four bearing hinge carry the load.
Four-bearing hinges are needed to provide continued floating silent service for the heavy doors or doors receiving frequent use.
PBB's complete line of slim, modern hinges is designed to match the needs of contemporary architecture. These fine precision crafted hinges represent our dedication to progress and our pledge to constantly provide the best in quality and style.

PRECISION BALL BEARINGS

BALL BEARING ASSEMBLIES HAVE BEEN:

- Designed to conform to the circumference of the barrel, thus giving a clean, slim appearance to the hinge
- Engineered to dependable, permanent service





PERMANENTLY LUBRICATED WITH NON-FLUID GREASE.

THE COMPLETE LINE OF **PBB'S** PRECISION HINGES IS MANUFACTURED IN COMPLIANCE WITH ALL APPLICABLE FEDERAL AND ANSI SPECIFICATIONS.

ELECTRIC

Gauges available:
.130,.134,.146,.180,.190
Electric hinges allow electrical current and signals to pass from jamb through the hinge into the door in an invisible manner. Available in ball bearing type only. (For options available see below, under extras).

EXTRAS

RC	- 1/4" Radius Corner
RC5	- 5/8" Radius Corner
NRP	- Non Removable Pin
MAX	- Maximum Security Stud w/NRP
HT	- Hospital Tip
Z	- Rust Resistant Base
BP	- Brass Pin
SP	- Stainless Steel Pin
BT	- Ball Tip
ST	- Steeple Tip
UT	- Urn Tip
NH	- No Holes

ELECTRIC HINGES

EL	- Electric Through WIre
EM	- Electric Monitor
EMW	- Electric Monitor w/ Through Wire

BASE MATERIALS

STEEL-
PBB Wrought Steel is *durable yet corrosive.* Best if used on interior applications where temp and humidity are controlled. Steel ball bearing hinges may be used on fire rated openings.

BRASS-
PBB Wrought Brass is *rust resistant and decorative.* Apply brass hinges where appearance is of great concern yet humidity is also a factor. Brass hinges may not be used on fire rated openings.

STAINLESS STEEL-
PBB Stainless Steel AISI Types 302/304. *Rust resistant, durable and decorative.* Apply stainless steel hinges on highly corrosive areas such as chemical storage, seacoast, or industrial areas where acids or atmospheric conditions exist. Stainless steel ball bearing hinges may be used on fire rated openings.