

# Norfield

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## FUNDAMENTALS OF DOOR PREHANGING PRODUCTION

2016

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## INTRODUCTION

This document is designed to provide information regarding pre-hung door production.

Components, terminology, and processes used in the pre-hung door industry are explained. Our hope is that this information can be used to standardize the language of a door shop, and may be particularly valuable to new employees.

The concepts and information presented in this document is provided to enable you to benefit from Norfield's many years of experience in the pre-hung door industry.

We encourage sharing, and of course any feedback for improvement.

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# Glossary of Prehanging Terms

## Section one

**Active:** In paired or double doors, the hinged door leaf which is primarily operable.

**Affidavit Label:** A label that is placed on a fire-rated door in that a manufacturer states that the door meets certain test criteria.

**Air Infiltration:** Air passing through a door unit when the door is under pressure, usually from wind.

**Annealed Glass:** Glass, which has been heat strengthened or tempered.

**Astragal:** A wood or aluminum 'post' attached on the latch-side edge of one of a set of paired or double doors, which covers the space between doors when they are closed. Which acts like a stop for the active door.

**Backset:** Recess, or spacing, for locating a machined hole. The distance from an edge or surface to the center or edge of the recess, hole or mortise.

**Ball-bearing Hinge:** A heavier-duty hinge than the standard hinge, with bearings supporting the pivots. Ball-bearing hinges are usually used for heavy doors that will be in commercial or industrial use.

**Ball Catch:** A spring loaded ball mechanism that is inserted into the top edge of doors that have dummy locks. The ball engages a plate on the header that has a dimple to receive the ball, which in turn keeps the door closed.

**Boot:** A term used for the rubber part at the bottom or top end of an astragal, which beds the astragal end and seals between the end and the door frame or sill.

**Boss, Screw Boss:** A part that enables the fastening of a screw into the feature, thereby allowing assembly of the part with another. Screw bosses are common features of molded plastic lite frames and extruded aluminum doorsills.

**Box-Framed:** In door and sidelite assemblies, a term used to differentiate door and sidelite units which are first framed as separate units, with heads and sills separate and the width of the door or sidelite panels. Box-framed doors are joined to box-framed sidelites.

**Brad:** A small nail with a small head, usually used to fasten small trim and moldings, also known as a finish nail.

**Brickmold:** A molding, usually 1-1/4" x 2", used to trim the outside edge of a exterior door frame.

**Buck:** A term usually used in masonry construction to describe a door frame or a sub-frame in a masonry opening, around which a steel door frame wraps and is fastened.

**Butt:** A type of hinge commonly used to assemble doors. Butt hinges are often referred to simply as butts.

**Carpet Shim:** A spacer block used under a doorsill to raise the sill an appropriate amount, if carpet is used, so the door clears the carpet when opened.

**Casing:** A horizontal or vertical molding, which accents or trims edges of doors and windows to the surrounding walls.

**Caulking:** Sealant, which is usually extruded or trowled into a recess or joint, to seal against air and water leakage through the joint.

**Clad:** Provided with a facing or jacket which works as a protection against weather, and provides a finished appearance. Cladding may be painted metal, plastic, or a heavy coating applied by the manufacturer.

**Clear Jambs:** Natural wood door frames, without paint or primer applied, and which appears to be made of full-length pieces of stock, without joints or knots.

**Closed-Cell Foam:** Sponge-like material, usually used in gaskets and weather-stripping, which compresses into joints, but absorbs little water.

**Closer Block:** An inside reinforcement, usually placed across the top edge of a door, to enable firm fastening of self-closing hardware to the door.

**Continuous Sill:** A sill used for a type of door and sidelite unit in which the unit has full-width top and bottom frame parts, and an internal post or posts separating sidelites from the door panel.

**Core:** The center section of a door.

- Corner Plug, Corner Seal Pad:** A small part, usually made of resilient material. It is used to seal water, which gets beyond the bottom ends of weather-stripping in doors, from getting between the door edge and the jambs, adjacent to the bottom gasket.
- Cove Molding:** A small molded wood lineal piece, usually formed with a scooped face, used to trim and fasten a panel of some type into a frame.
- Cross-bore:** A large through-hole, near the edge of a door panel, usually 2-1/8" inch in diameter, which houses a cylinder lockset or deadbolt latch.
- Cylinder Lock, Cylindrical Lock:** Lock hardware that mounts into a door which has been prepared with a bored hole or holes through the face, and into the edge.
- Dado:** A machined or sawn groove, across the width of a part. Rectangular groove cut into a board or part so that a matching piece can be fitted into it to form a joint.
- Deadbolt:** A latch used to secure a door closed, the latch being driven from the door into a receiver in the jamb or frame.
- Deadbolt Spacing:** The distance between the cylinder lock to the bore for the deadbolt lock.
- Door Hand:** The door hand is the description of which side of the door the lockset is on and consequently, which side of the door has the hinge pins visible.
- Doorlite:** An assembly of frame and glass panel, which when fitted to a door in a formed or cut-out hole, creates a door with a glass opening.
- Double-Glazed:** Outfitted with two panes of glass with a sealed airspace between.
- Drip Strip:** In exterior doors, a fitting used across the outside face of the door adjacent to the bottom edge. It is used to divert cascading rain away from the door bottom edge and away from the door/sill joint.
- Drywall Opening:** A rectangular opening in a wall, usually an interior wall, prepared to the size necessary to receive a pre-hung door assembly.
- Dummy Cylinder:** A lock without a latch, typically used for the passive door panel of a double door unit, so that the hardware appears equal to that used on the active panel.
- Edge Bore:** The hole bored through the edge of a door to allow the latch hardware to pass through, into the jamb strike prep.
- Electric Strike:** A mechanism, which allows a switch to open the latch of a door.
- End Seal Pad:** A closed-cell foam piece, about 1/16-inch thick, in the shape of a sill profile, fastened between the sill and the jamb to seal the joint.
- Escutcheon:** A stamped decorative plate, usually circular. It is used to trim the shaft of a door knob or deadbolt latch or to trim the opening where the shaft or latch adjoins the face of a door.
- Etched Glass:** Glass used for doorlites on which a decorative pattern is engraved by means of chemical action or mechanical sandblasting.
- Faceplate:** The plated or solid metal trim piece, usually about 1 x 2-1/4 inches, that is housed flush into the edge of a door, which projects the latch of a passage lock or deadbolt.
- Faceplate Mortise:** The pocket in the edge of the door that is mortised to receive the Faceplate.
- Finger Joint:** A way of joining short sections of board stock together, end to end to make longer stock. Door and frame parts are often made using finger-jointed pine stock.
- Fire Door:** A door of a construction type, which has been tested to contain the spread of fire from one room or occupancy area to another. Fire doors are listed and labeled to show their ratings in terms of time, i.e., 1/2 hour, 1-1/2 hour, etc.
- Flush-Glazed:** A type of glazed door which has its glass perimeter moldings flush with or set down from the face of the surrounding door.
- Foam:** Rigid or flexible plastic, light in weight and cellular in structure, used in door construction. Rigid foam is used as the insulating and binding core for doors. Flexible foam is sometimes used as a gasket around door open-

ings.

**Foot Bolt:** A steel pin housed in a door bottom edge or astragal, with a latch mechanism, which can be driven down into a receiver socket or hole in the floor or threshold. It allows the door to be better secured when closed.

**Frame:** In door assemblies, the perimeter members at the top and sides, to which the door is hinged and latched. See jamb.

**Glazing:** The elastic material used to seal glass to a surrounding frame.

**Grille:** For doors with glass lites or inserts, a removable face-mounted assembly of thin wood or plastic pieces, which when in place, gives the lite or insert a patterned multi-pane look. **Grooved Glass:** Glass, which has been decorated with abrasively routed recesses. Grooving can give a single piece of glass a multi-paned look.

**Handing:** A term, which describes or determines the direction of swing of a door when opening.

**Head Bolt:** A steel pin housed in a door top edge or astragal. See foot bolt.

**Head, Head Jamb:** The horizontal top frame member of a door assembly.

**Header Clearance:** The clearance between the top edge of the door and the head jamb.

**Hinge:** An assembly of metal plates and a cylindrical metal pin, which when fastened to a door edge and to a doorframe, allow the door to swing or rotate in its frame.

**Hinge Pattern:** The dimensions that locate the hinges on the door edge.

**Hinge Sizes:** The distance across the hinge, measured parallel to the hinge pin.

**Hinge Stile:** The full-length vertical pane of a door, at the side or edge of the door, which fastens to its frame with hinges.

**Inactive:** A term for a door panel fixed in its frame. Inactive door panels are not hinged and are not operable.

**Insulated Glass, Insulating Glass:** A glass assembly of multiple full-lite pieces, separated by a perimeter spacer and sealed as a unit. Insulated glass in residential doors is usually made with two thicknesses of 1/8-inch glass, separated by an airspace up to 3/4-inch thick.

**Inswing:** A term used to describe an exterior entry door unit for which, when the hinged door panel is opened, the panel swings into the building.

**Jamb:** A vertical perimeter frame part of a door unit.

**Jamb Jack:** A fastener device for fixing a door frame to a wall structure, which allows the space or margin between the frame and the structure opening, to be varied by turning the fastener screw.

**Jamb Stop:** In interior door frames the stop is the material attached to the jamb to which the door closes against. In exterior doorframes, the molded-in rebate surface of the jamb against which door panels close and seal.

**Kerf:** A thin slot cut into the mitered end of casing to attach and align the pieces using a kerfing nail, a specialty fastener. A thin slot cut into an exterior jamb, that weather-stripping can be inserted.

**King Stud:** In a wood-framed rough opening, the stud which runs full height from floor plate to ceiling plate, against which trimmer stud attaches.

**Knuckle:** The feature of a hinge where the hinge leaf is cut for two or three projections which wrap and form a barrel or socket for the hinge pin.

**Laminate:** A thin sheet of wood or plastic that is bonded with adhesive to a core or substrate, which creates a decorative and usable surface.

**Latch:** A moveable, usually spring-loaded pin or bolt, which is part of a lock mechanism, and engages a socket or clip on a door jamb, retaining the door closed.

**Latch Bore:** The hole drilled into the edge of a door to accept the door latch portion of the lock hardware.

**Leaf:** A term which can apply to a door or hinge and which defines a part of the assembly which can swing on a pivot. Butt hinges have two leaves.

**Lite:** An assembly of glass and a surrounding frame, which is assembled to a door, or is integrally built into the door at the factory.



- Lock Block:** A rectangular block of wood or other solid material, placed inside a door assembly at the lock side edge, which reinforces the assembly when the lock hardware is installed.
- Lock Bore:** For cylindrical locksets, the large through hole, usually 2-1/8-inches in diameter, bored near the door panel's lock edge, into which the lock mechanism is placed and installed.
- Lock Height:** The dimension from the top of the door to the center line of the lock bore.
- Lock Stile:** In insulated door assemblies, the full-length part, usually wood, which makes up the lock edge of the door panel. In wood stile and rail doors, the full length wood piece, 4 to 6-inches wide, at the lock edge of the door.
- Low-E Glass:** Glass which has been factory coated with a thin layer of material, nearly clear, which acts to absorb and reflect heat and UV rays.
- Miter:** An angled cut across the end of a lineal part, usually done to join with a similarly cut part at a corner. Most typically used in casing.
- Mortise:** A recess cut into the surface or edge of a part, usually for the purpose of housing hardware such as hinges, latch plates etc.
- Mortise-Type Lock:** A lockset which usually has a rectangular-shaped mechanism, which is housed into a deep recess cut into the edge of a door.
- Mull:** A short term for mullion. Used occasionally as a verb to describe the joining of two door units together, or the joining of a door to a sidelite unit.
- Mulled:** An adjective describing a door and sidelite unit which has been made up by edge-joining two framed units together.
- Mullion:** A post or divider which runs from sill to frame top in a multi-panel door, or door and sidelite assembly. In stile and rail doors, the vertical wood parts which separate panels.
- Multiple Extension Unit:** In patio door assemblies, a fixed door panel in a separate frame, edge-joined to a patio door unit to add another glass panel to the installation.
- Muntins:** In glazed lite assemblies, thin vertical and horizontal divider bars, which give the lite a multi-paned look. Muntins may be part of lite frames, and on the outside surface of the glass, or assembled between glass in insulated glass units.
- NRP Hinge:** An abbreviation for a hinge with a non-removable pivot pin. NRP hinges are used when exterior doors swing out, as a security feature. The fixed pins make it impossible to remove a door by driving out pivot pins.
- Open-Cell Foam:** A foam material which has passageways between cells. Open-cell foam will absorb and retain water, because the water will penetrate deeply inside the foam.
- Outswing:** An exterior door assembly in which the door panel swings outside the building.
- Panic-proof Lock:** A lock and latch device, which permits a door to be, opened outward by pressure being applied to a horizontal bar mounted across the inside face of the door.
- Passage Lock:** A lock-set, which will retain a door, closed, but which cannot be locked.
- Passive:** In a double or two-panel door assembly, the door, which usually remains, closed and fixed by bolts at top and bottom. The other door panel is used for regular passage.
- Plant:** A decorative molding applied to the surface of a flush door, to give the appearance of a raised-molding design.
- PVC:** Abbreviation for polyvinyl chloride, a plastic material used to make molded or extruded parts.
- R-Value:** A number which describes in relative terms the ability of a material or assembly to resist the flow or transmittance of heat. Assemblies or materials with high R-values are better insulators than those with lower R-values.
- Rabbit, Rebate:** A groove or step cut along the length of the edge of a piece of wood that is to be joined to another with a corresponding tongue or ledge cut into it.

- Rail:** In stile and rail doors, horizontal pieces at the top and bottom edges, and at intermediate points, connecting the stiles together.
- Rebate:** See rabbet.
- Reveal:** The offset or space between edges of parts.
- Riser:** A term which describes the part of an adjustable sill which can be moved up or down by turning adjusting screws.
- Rough Opening:** A structurally-framed opening in a wall which receives a door unit or window.
- Safety Glass:** Glass which when broken, shatters into small pieces without sharp edges.
- Sealant:** Elastic material pumped or trowled into a joint to prevent water penetration.
- Shim:** A thin piece of material used between parts of an assembly, to change and fix the distance between parts, when they are fastened.
- Sidelite:** A fixed narrow panel, installed next to a door panel, for decorative purposes. Sidelites almost always contain glass.
- Slide Bolt:** The part of an astragal assembly which, by means of moving latches at the tops and bottoms of astragals, places bolts into frame heads and sills. It is for fixing passive doors closed.
- Stile:** In stile and rail doors, the vertical pieces on both sides that connect the rails together, enabling lock, latch and hinge mortising to be done.
- Strike:** A metal part with a hole or recess for receiving a door latch. It has a curved or ramped face so that a spring-loaded latch contacts it when closing. Strikes are fit into mortises in doorjambes or mullions, and screw-fastened.
- Stile and Rail Doors:** A type of door constructed without a door skin, so that the vertical and horizontal members are visible and panels are held in place between both stile and rail.
- Substrate:** The base or core material in an assembly of parts. The full-length wood or composite part of the sill.
- Tempered Glass:** A glass sheet, which has been strengthened by heat processing.
- Template:** A pattern or jig used to machine-cut a precise hole or recess into a door or frame part.
- Thermal Break:** A feature of a door or frame assembly which separates metal or glass exposed to outside temperatures from coming into contact and transmitting heat to or from inside-exposed parts.
- Threshold:** Another term for sill. The horizontal part of a door assembly, fixed under the door panel and bearing on the floor.
- Transom:** A framed glass assembly mounted atop a door assembly. Transoms are rectangular curved or arched tops. One design of a curved top transom has the shape of a half-ellipse.
- Trimmer Stud:** In a wood-framed rough opening, the stud or framing member which runs vertically from the sub-floor to and supporting the structural header member, into which a door frame is fastened.
- Triple-Glazed:** An insulated glass assembly made of three thicknesses of glass, with air spaces between the outer and inner thicknesses.
- Veneer:** A thin film or facing, adhesively bonded to a core or substrate, which makes up the exposed and decorative face of an assembly.
- Warp:** A permanent curvature or deviation from straightness, which can be induced in a part or assembly by a load or force, or by exposure to heat or moisture.
- Wired Glass:** Glass made for use in fire doors, which has embedded wires which bind the glass, and permit the glass to remain solid when exposed to fire.

# Components of a Pre-hung Door Unit

## Section two

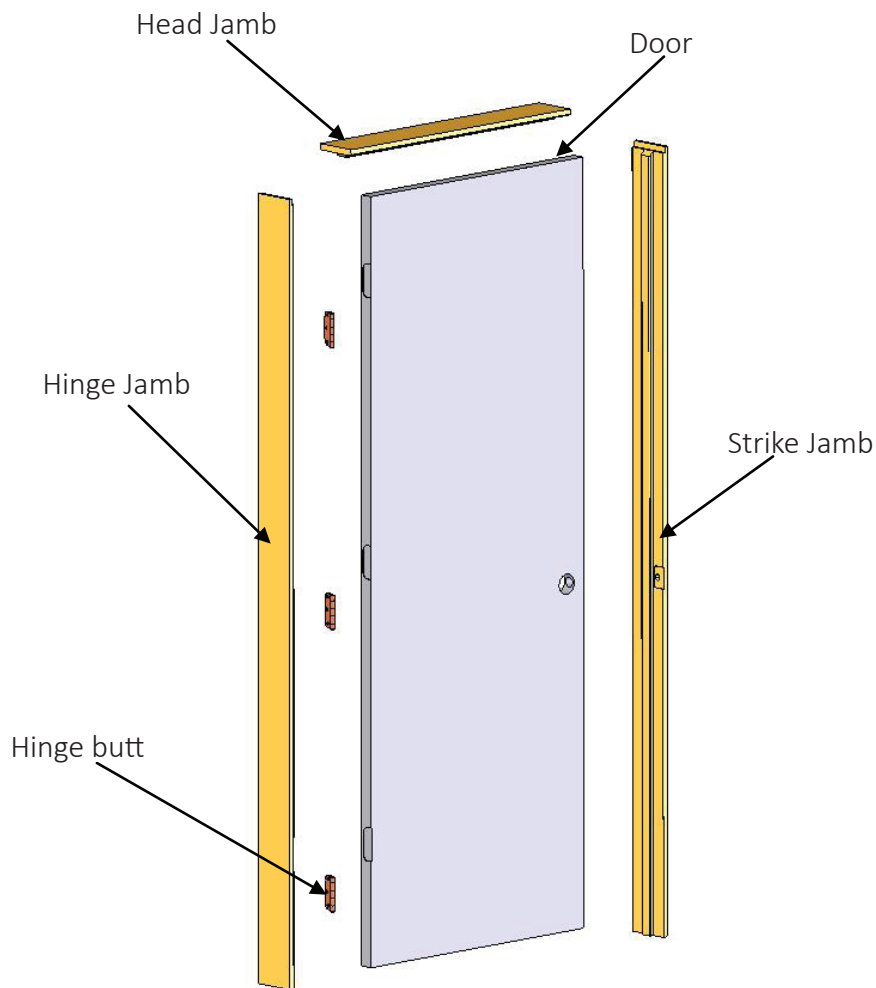
### COMPONENTS OF A TYPICAL PRE-HUNG DOOR

The drawing on the following page illustrates the components of a typical pre-hung door. All pre-hung door units, whether interior or exterior, consist of at least these basic components:

- Door
- Head jamb (header)
- Hinge jamb
- Strike jamb
- Hinge butts

The door is attached to the hinge jamb with hinges. Lock and latch hardware is not generally considered part of the pre-hung door as it is installed after the unit has been installed in the opening. In addition to these components, some units will include casing on one or both sides and exterior units can have a sill installed.

In general terms, if a door unit is assembled when it is shipped from the manufacturer to its destination, it is referred to as a “pre-hung door.” If the components are machined but not assembled when shipped, it is known as a K.D. (“knock-down”) unit.



## DOOR HAND

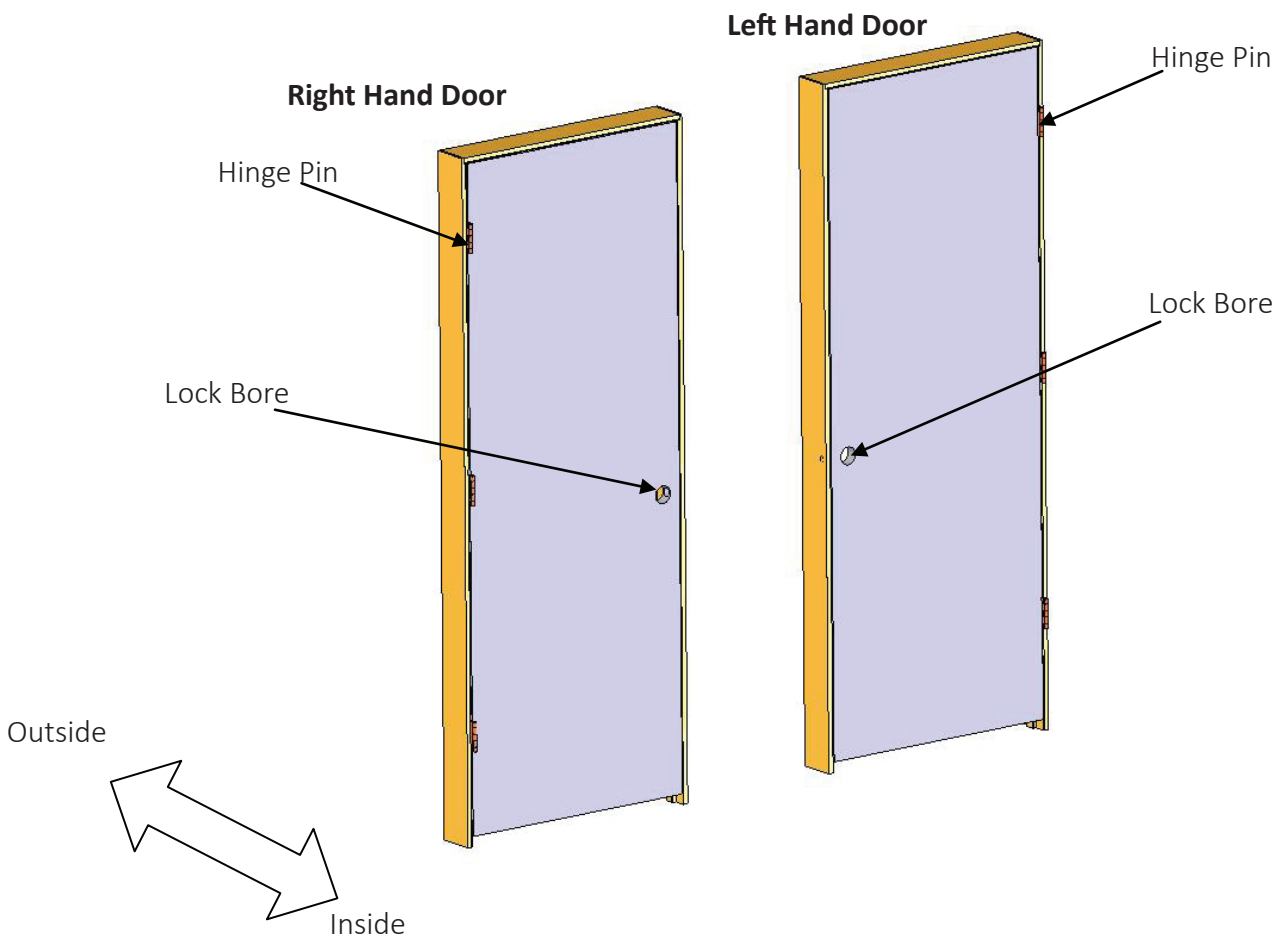
All doors are denoted by the direction of their swing, or their “hand.” Before a door can be hung, its swing must be known.

Currently, there are two methods used to determine the hand of a door. The first method, the one most straightforward and commonly used, designates the door simply as Right Hand (RH) or Left Hand (LH). To determine the swing of the door, simply face the hinge pin side of the door and note the location of the door knob. If the knob is to the left, it is a Left Hand door. If the knob is to the right, it is a Right Hand door.

The other method currently in use designates the door as either Right Hand Reverse (RHR) or Left Hand Reverse (LHR). To determine the swing of the door in this method, face the outside of the door. The outside is the street side of an entrance door, the corridor (hall) side of a room door, or the side opposite the hinge pins on a communicating door (a door that connects two rooms). If the door opens toward you and the hinges are on the left, it is a Left Hand Reverse. If the hinges are on the right, it is a Right Hand Reverse.

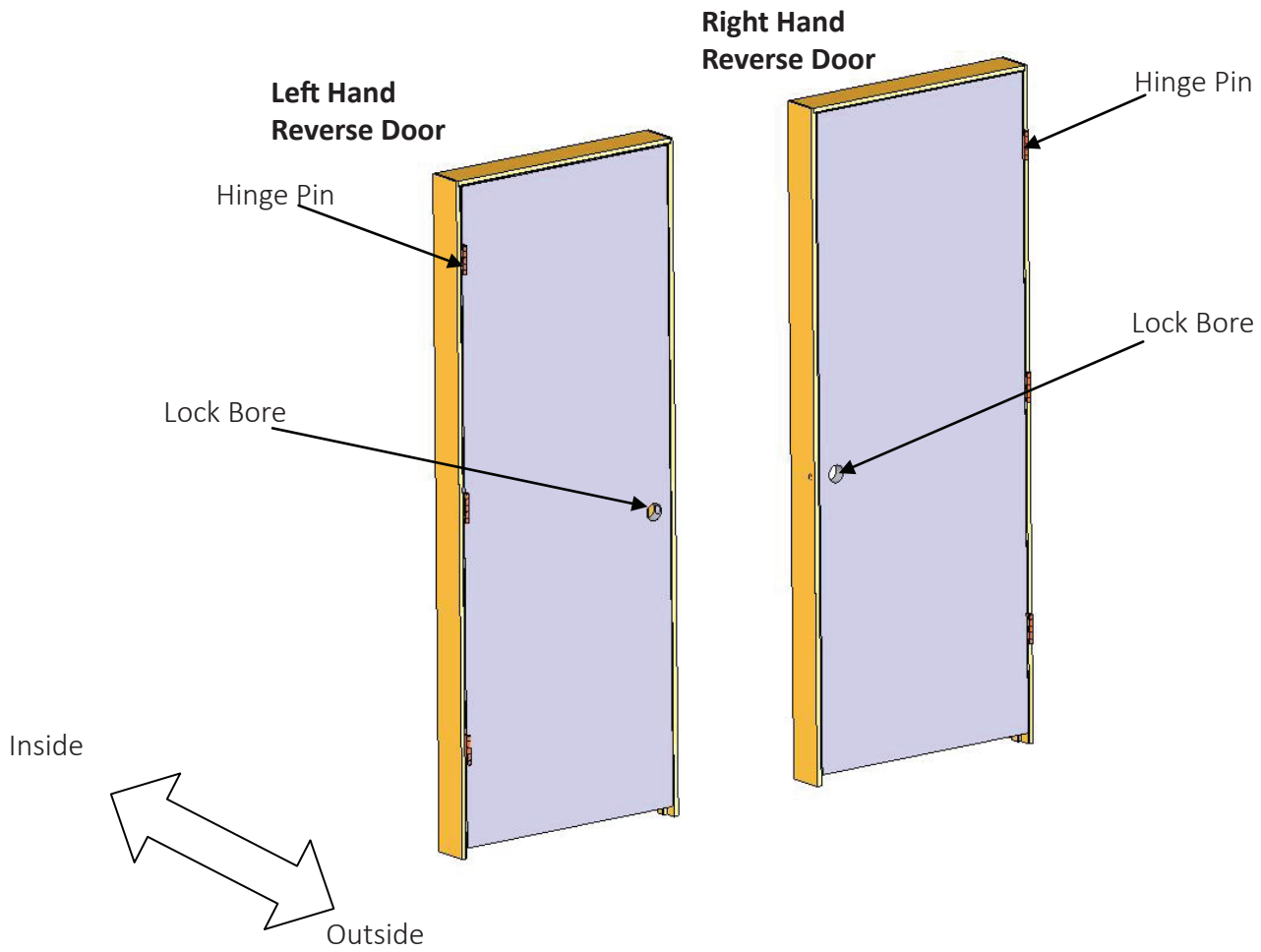
Although both methods are equally accurate and achieve the required results, the first system is preferred. Before hanging a door, make sure that all concerned agree on the method that will be used. This will prevent confusion down the line when the pre-hung doors are actually being installed.

### Standard Door Swings



### Standard Door Swings for “Out Swing” Doors

By Switching inside to outside orientation of door, swinging out rather than in, the hand is called reversed.

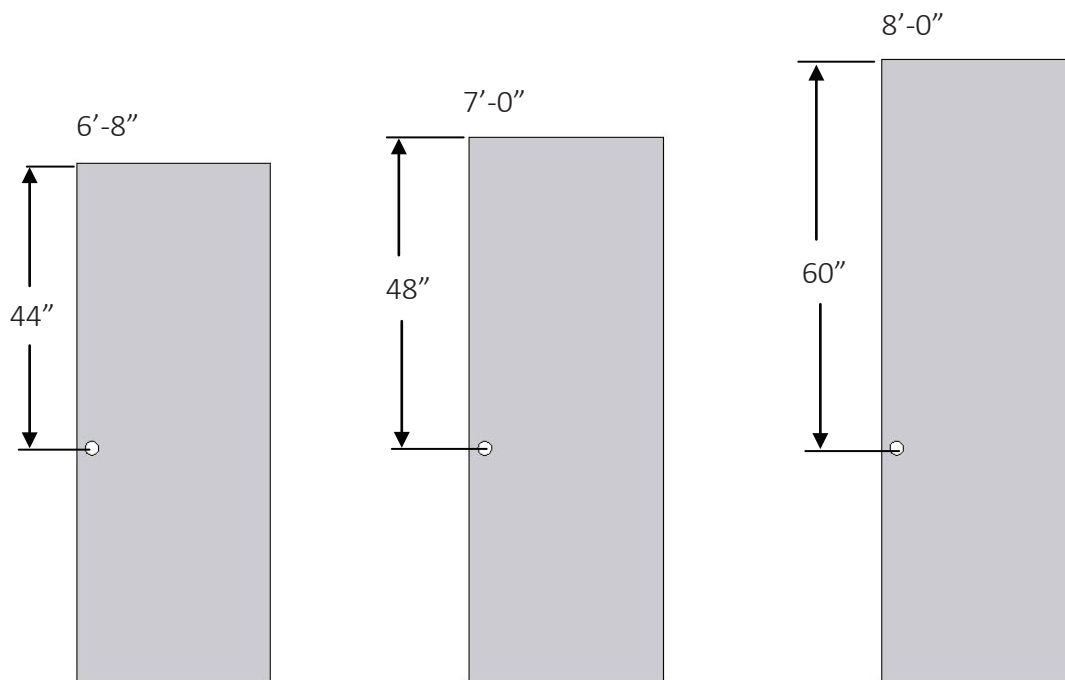


## LOCK HEIGHT

Lock height is the distance from the top of the door to the center of the lock bore. Normal lock heights are 44" and 40" on 6'8" doors and 48" on 7'0" doors, 60" on 8'0" doors.

Because of variation in door length (i.e., doors are not necessarily the precise length their labeling would indicate), lock height is always measured from the top of the door. This insures that proper header clearance is maintained and that the lock hardware aligns with the machining and hardware in the strike jamb.

### Typical Lock Heights

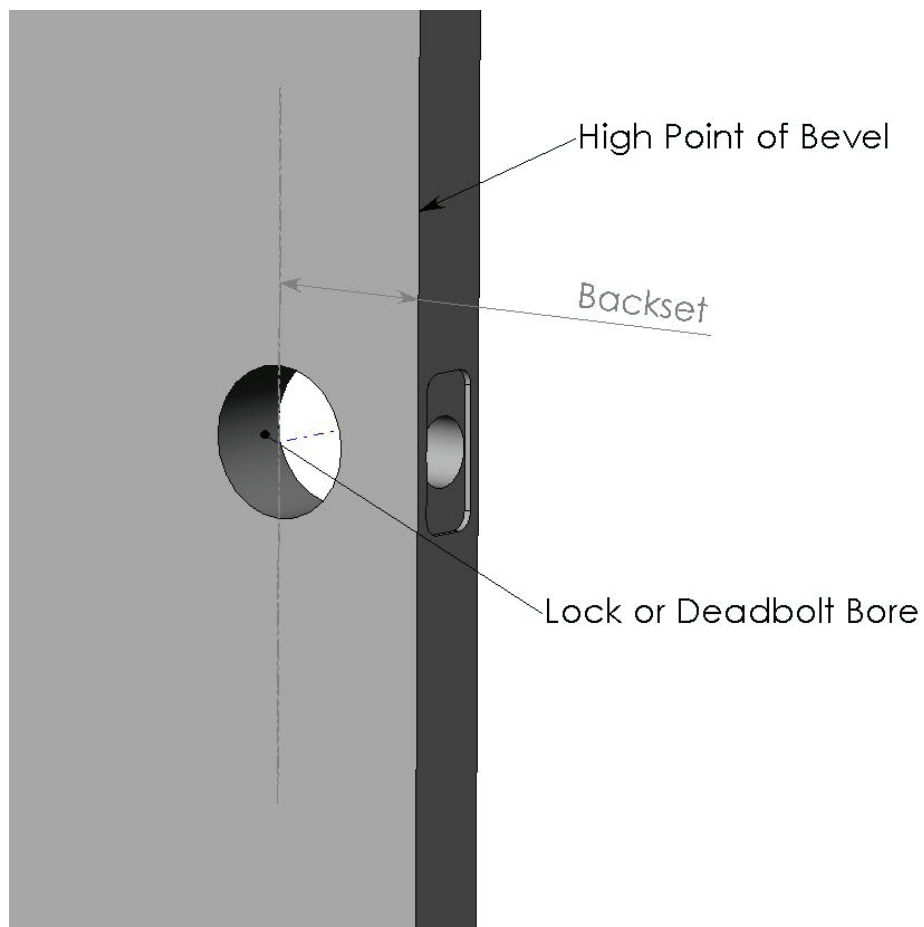


## BACKSET

Backset is the distance a lock is centered from the front edge of the door.

For residential applications the backset is 2-3/8" (most common) or 2-3/4". For the commercial market backsets are usually, 2-3/4" or 5". Correct backset is necessary to insure that lock hardware fits the machined door properly.

One method of defining backset is measuring from the centerline of the door's edge to the center of the lock bore.





## LOCK BORE

The lock bore (or cross bore) is a hole drilled through the face of the door at a specific “backset.” The lock bore must be of sufficient diameter to accommodate the lock hardware. Lock bore diameters range in size from 1-3/8” to 2-1/8,” with 2-1/8” being the most common. The dead bolt bore is the same as the lock bore and must be the right diameter and backset to accommodate dead bolt hardware.

Some lock hardware does not require a through-lock bore (i.e. “pulls” for pocket doors or certain dead bolt locks). In this case, care must be taken to drill the proper face of the door relative to the beveled edge.

## LATCH BORE

The latch bore (or edge bore) is a hole drilled into the edge of the door for the latch bolt. It is drilled on the centerline of the lock bore and is centered in the edge of the door. Latch bore sizes run from 7/8” diameter to 1” diameter, with 1” being the most common.

The latch bore and dead bolt edge bore are always drilled into the lock bore. However, some dead bolts require that the edge bore be drilled deeper than the back edge of the lock bore.

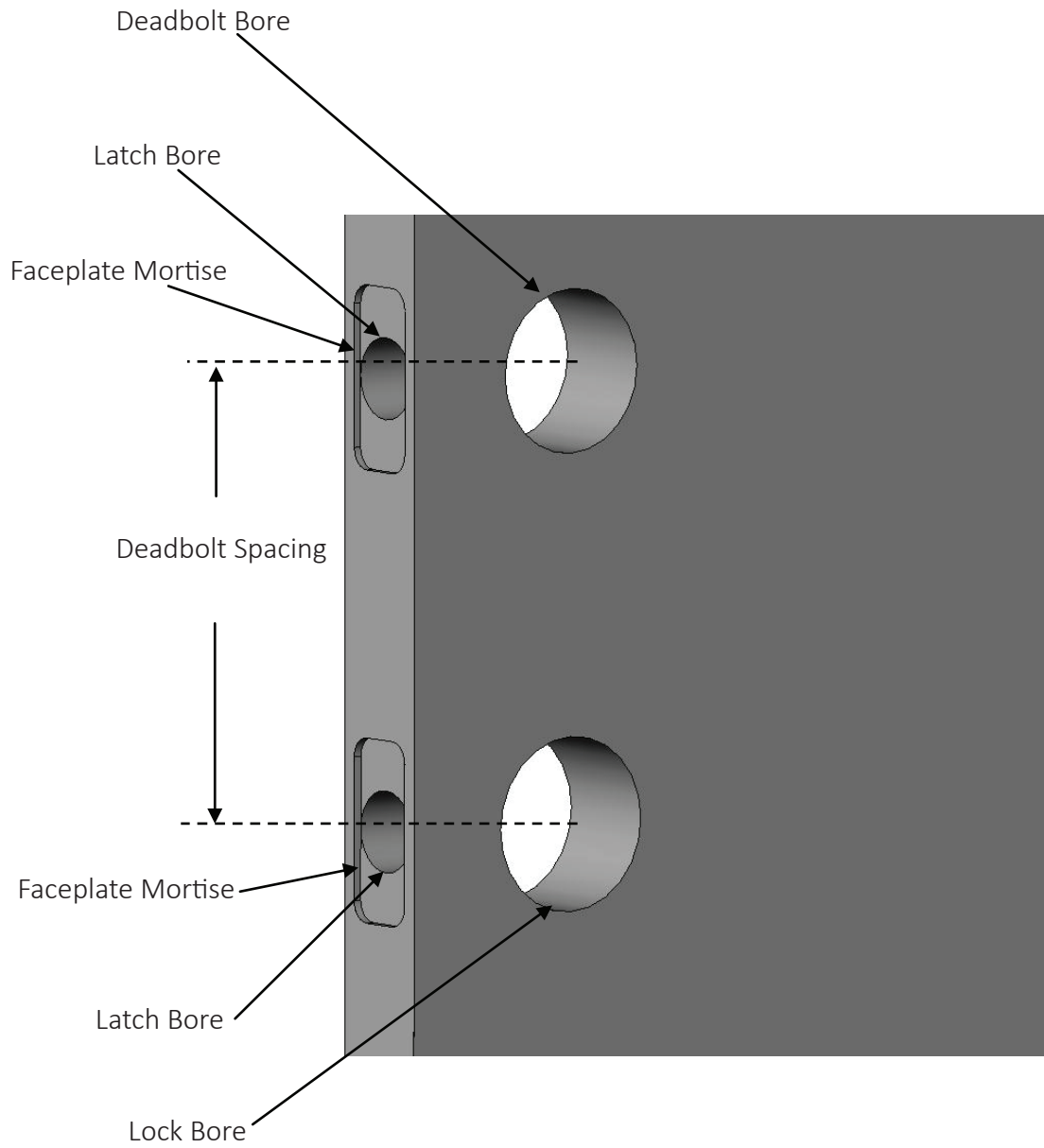
## FACEPLATE MORTISE

The faceplate mortise is a relief on the edge of the door for the latch faceplate. Its width and length will vary with the specific lock hardware being used. The most common width and length is 1” x 2-1/4”. The mortise depth matches the thickness of the faceplate. If a “drive-in” bolt is used, the faceplate mortise is omitted and a cleaner cut is usually wanted.

## DEADBOLT SPACING

Deadbolt spacing is the dimension from the center of the lock bore “up” to the center of the deadbolt cross bore. This dimension varies with the hardware used and the specifications for various door units.

### Lock and Deadbolt Machining



## HINGE PATTERN

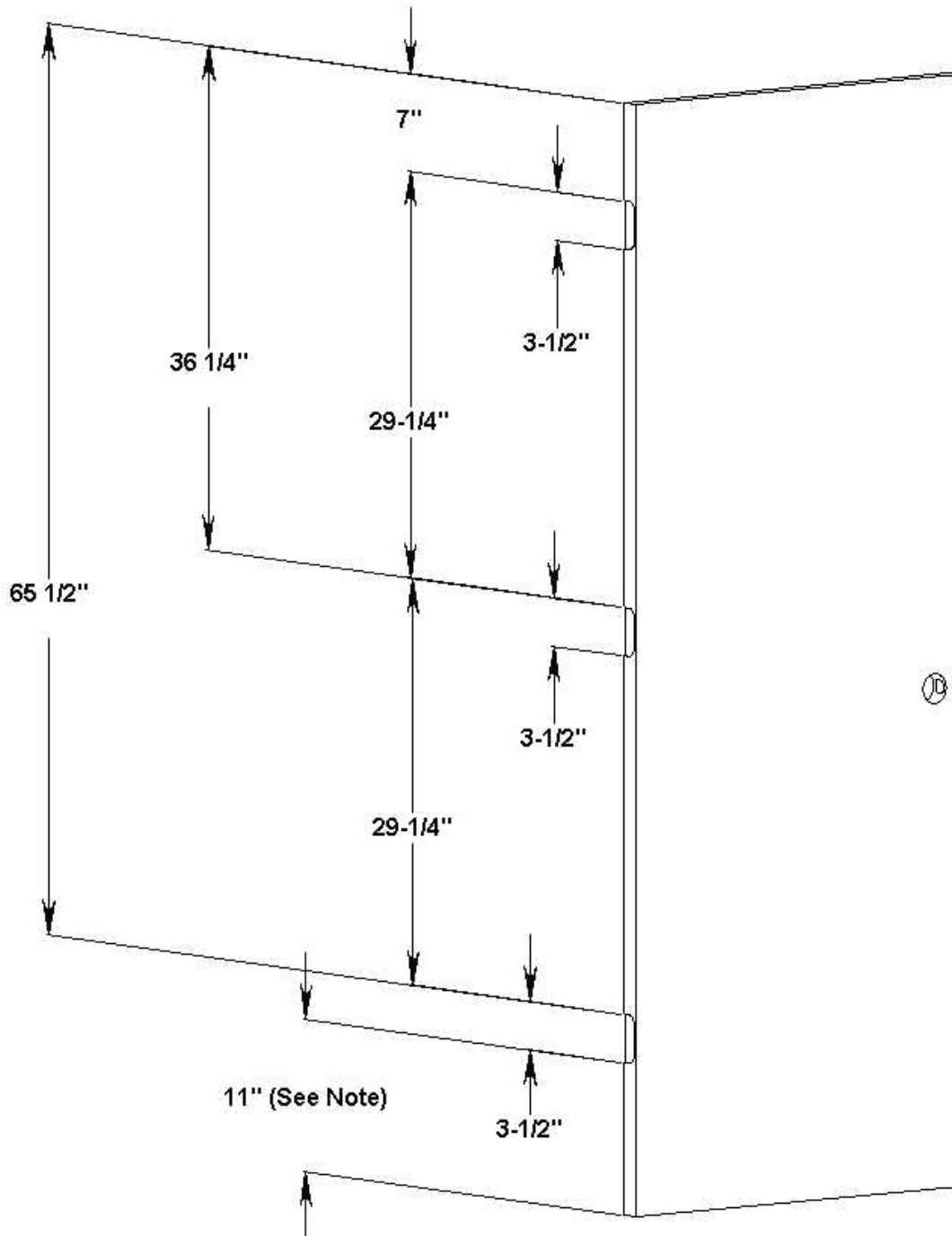
Hinge pattern, or butt spacing, is usually described as a dimension in inches from the top of the door to the top of the top hinge and from the bottom of the door to the bottom of the bottom hinge. Examples of this are “7-11”, “8-8”, and “9-9”.

The more common and accurate method is to measure from the top of the door to the centerline of the top hinge then from this centerline to the center of the middle hinge (if applicable) then to the centerline of the bottom hinge.

If the centerline is used, it is always centered exactly between the top and bottom hinges. If the door has four hinges, the two center hinges are equally spaced between the top and bottom hinges.

The location of the top and bottom hinge remains constant in relation to the door stile, regardless of the door height. For example, if a 6’8” door with a 7-11 hinge pattern has been cut down to 6’7” for floor covering clearance, the dimension from the bottom of the door to the bottom hinge would be 10”.

### Hinge Pattern



## HINGE SIZES

Common hinge sizes are either 3-1/2" x 3-1/2" or 4" x 4". 3-1/2" hinges are used primarily on interior hollow core doors or on fire-resistant doors that connect two rooms. 4" hinges are used primarily on exterior entrance doors.

3" x 3", 4-1/2" x 4-1/2" and 5" x 5" hinges are available but are not commonly used. 3" hinges are found on inexpensive interior door units. 4-1/2" and 5" hinges are found on more elaborate exterior entrance systems or on special commercial applications.

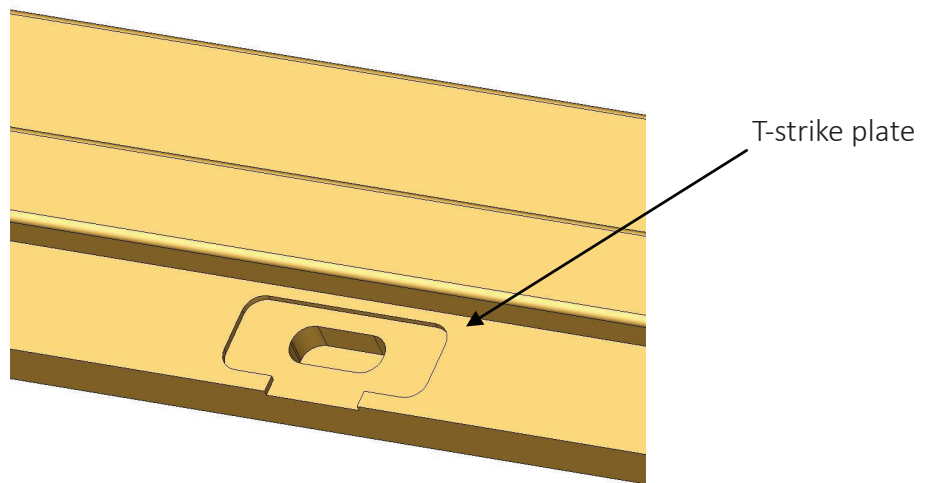
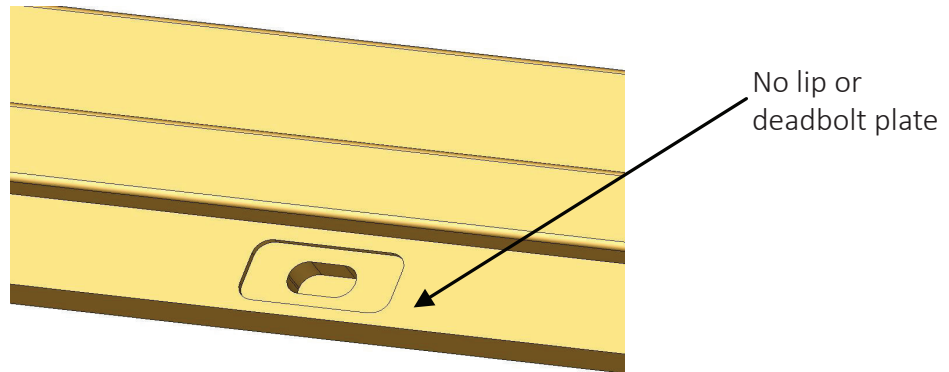
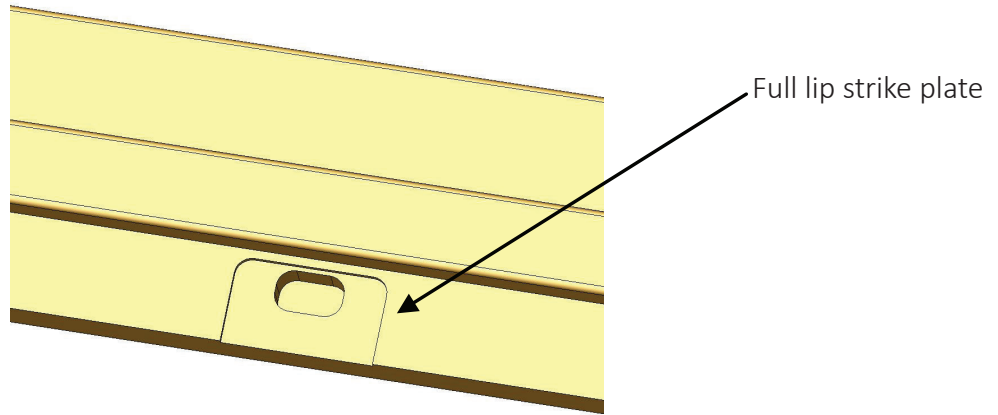
## JAMB MACHINING

Both the hinge jamb and strike jamb are machined to accept door hardware. The hinge jamb is mortised the same as the door to receive the hinges. The mortises are measured from the top of the jamb (dado) with an allowance for header clearance. Refer to the paragraphs on "header clearance" (page 24) and "hinge backset" (page 26) in the next section for details.

The strike jamb is machined to accept the strike plate. This is a specially shaped piece of metal that is attached to the strike jamb to accept the latch bolt when the door is closed. There are three basic types of strike plates: "full-lip", "T-strike" and "no-lip". The type used for any particular application depends solely on the type of lock hardware used. There are many types and shapes of plates within the three groups but the most common of each type is shown in the illustration.

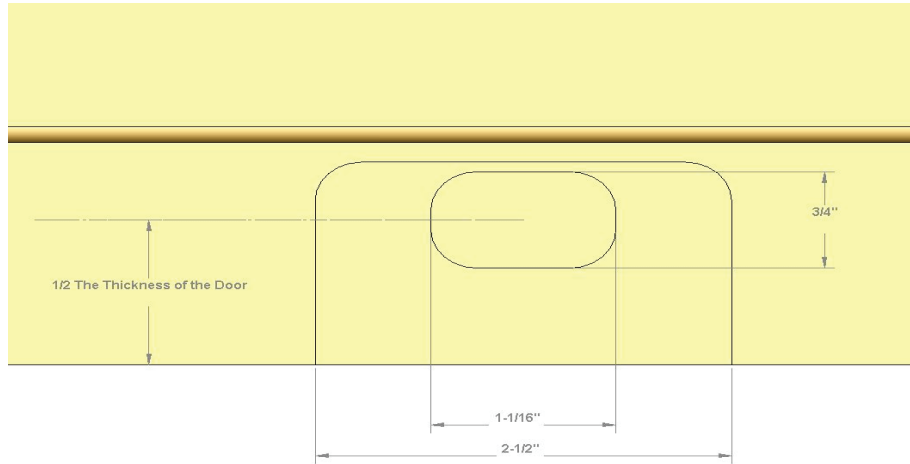
The location for the strike plate mortise is dependent on the lock height. The distance from the dado on the top of the jamb, to the center of the strike plate mortise is equal to the lock height plus the header clearance. The distance from the edge of the jamb to the center of the deep pocket is 1/2" the thickness of the door being used.

### Strike Plate Types



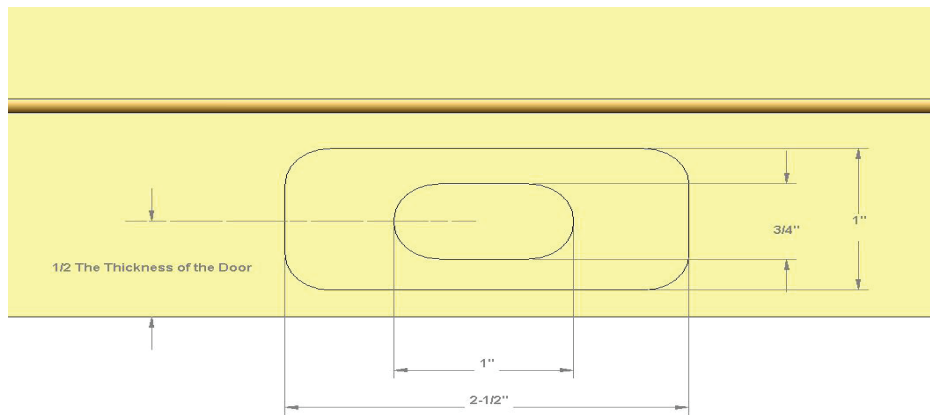
### Template Number 9202-001

The most common size of full lip strike plate



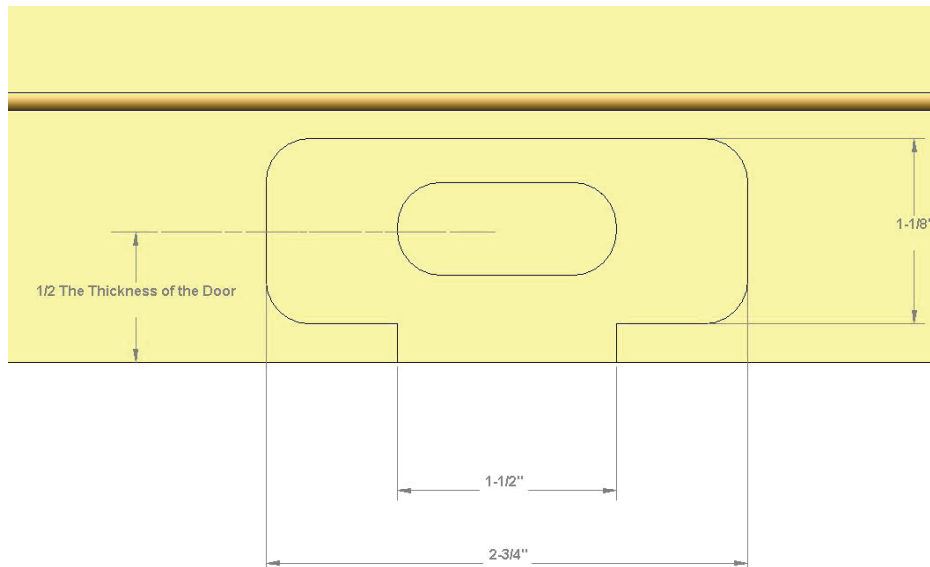
### Template Number 9206-001

The most common size of deadbolt strike plate



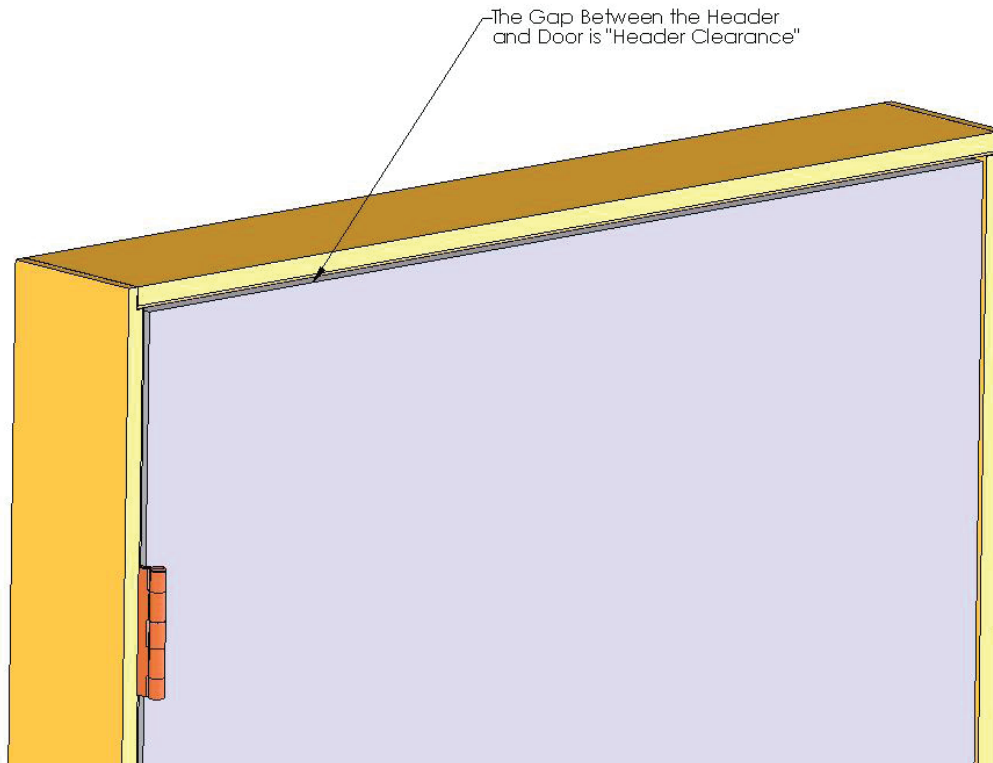
### Template Number 9204-001

The most common size of t-strike plate



## HEADER CLEARANCE

Header clearance (head jamb clearance) is the gap between the top of the door and the head jamb when the door is closed. It is usually between 1/16" and 3/16", with 1/8" being the most common.

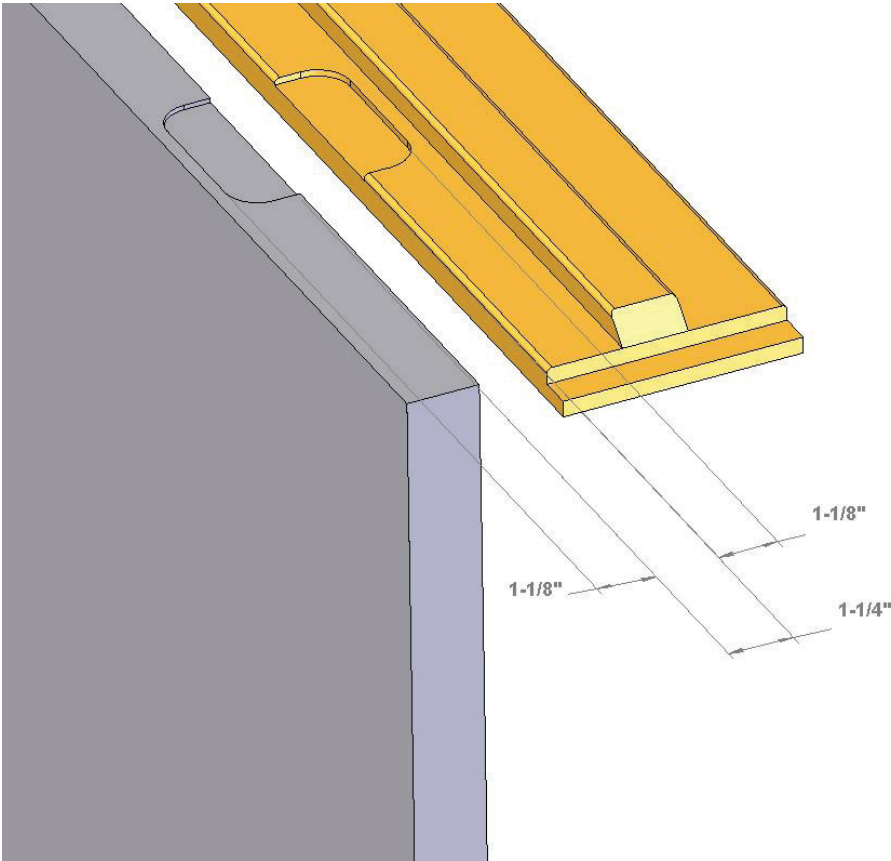




### Hinge Mortise Dimensions

When setting the dimensions of a mortise on a door machine the hinge reveal or hinge dimension is used. As an example a Magnum can be set to control the reveal, and the automated machines are adjusted using the hinge mortise dimensions,

The mortise is set equal distance into the door and jamb and is typically 1-1/8" on a 3-1/2" hinge used on a 1-3/8" thick interior door.



### HINGE BACKSET (REVEAL)

Hinge backset is the distance from the stop on the jamb to the edge of the hinge mortise and from the face of the door to the edge of the mortise. The hinge backset must be correct to insure a clearance (reveal) between the face of the door and the doorstop on the jamb when the door is closed. If weather-stripping is used on the jamb, the hinge backset may have to be adjusted to compensate for the thickness of the weather-stripping.

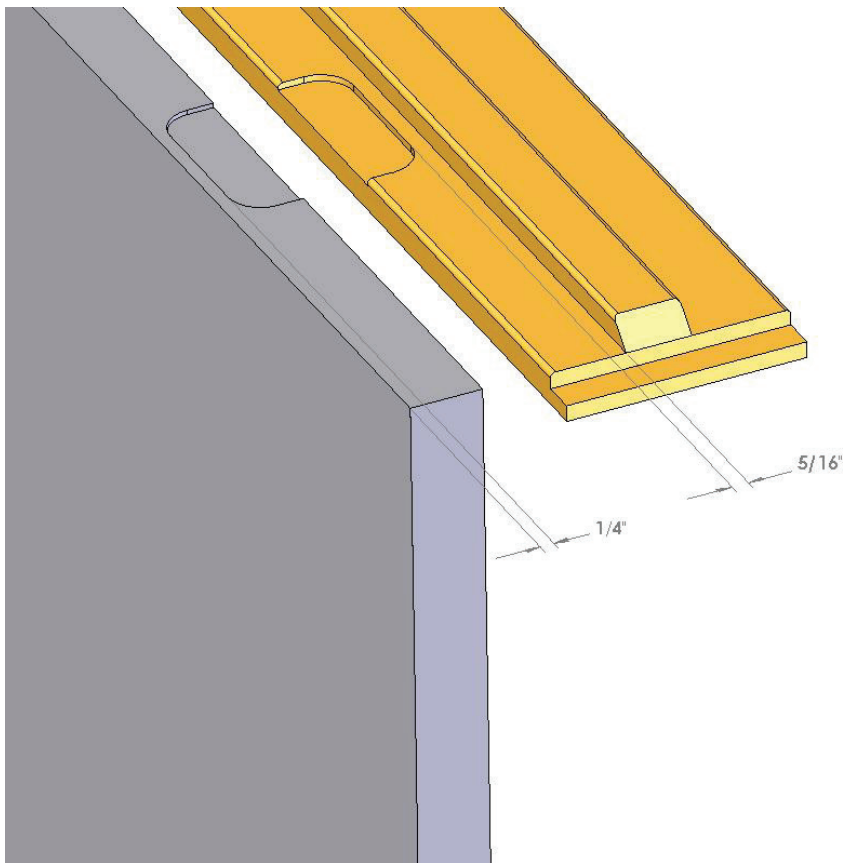
Accepted hinge backsets are:

#### 1-3/8" Doors

1/4" - Door  
5/16" - Jamb

#### 1-3/4" Doors

3/8" - Door  
7/16" - Jamb



## DOOR JAMBS

The term “jamb” refers to the wood members of the frame of a pre-hung door. They can be made from any wood species, particleboard, MDF, plastic or other materials. However a few types of wood are most commonly used. Pine is the most common wood for interior doorjamb and Fir is most often used for exterior jambs. (Philippine Mahogany and Oak are used also, but on a limited basis.) When Pine and Fir are used, it is becoming more and more common to see the jambs made up of short pieces of wood “finger-jointed” together to make up the longer lengths.

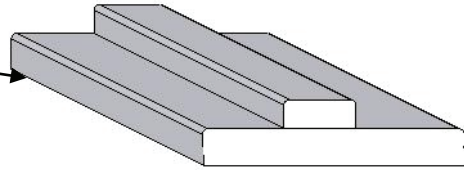
Doorjamb are divided into two major categories: interior and exterior. Standard interior jambs consist of two parts--a **“flat jamb”** and a stop. The stop is stapled to the jamb, usually through the stop into the jamb, but sometimes through the back of the jamb into the stop. The stop can be applied either before the jamb is machined (most common) or after the pre-hung door assembly is complete.

Another type of jamb used exclusively on interior units is the **“split jamb.”** This is normally made of two pieces of wood that fit together to form a single unit. The advantage of this type is that it can be adjusted to match exactly the thickness of the wall when the pre-hung door is installed. Split jambs can also be made from three pieces: two similar pieces that fit together to make a “flat jamb” and another piece attached to one of them to form the “stop”.

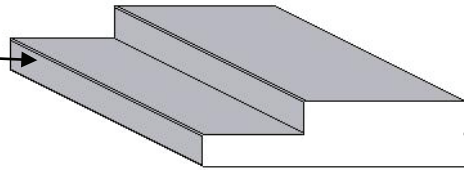
Exterior jambs are either **“single-rabbeted”** or **“double-rabbeted.”** They differ from interior jambs in that they are made from thicker material, and the stop and jamb are machined from the same piece of wood. Single rabbeted jambs are the most common. Double rabbeted jambs are used in entry door systems where a screen door or insulated weather door is used.

### Cross Section of Different Jamb types

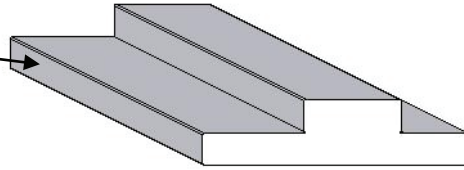
Flat Jamb with stop applied



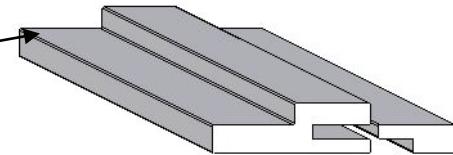
Single Rabbeted Jamb



Double Rabbeted Jamb



Split Jamb



## JAMB ASSEMBLIES

The previous section discussed the different types of jambs. This section will discuss the ways that jambs are put together to form the doorframe.

Side jambs are machined at one end to accept the head jamb. This is commonly referred to as the “dado.” The dado can be cut on the end of the jamb (as shown on the standard jamb, page 30) or a little in from the end (as shown on the lugged jamb page 31). The standard jamb is most common and is preferred when the door units are assembled using an automated assembly machine. The lugged jamb has an advantage in that it captures the head jamb more securely which makes the doorframe easier to assemble manually.

The head jamb fits into the dado on the side jamb. The dado, therefore, is as wide as the head jamb is thick.

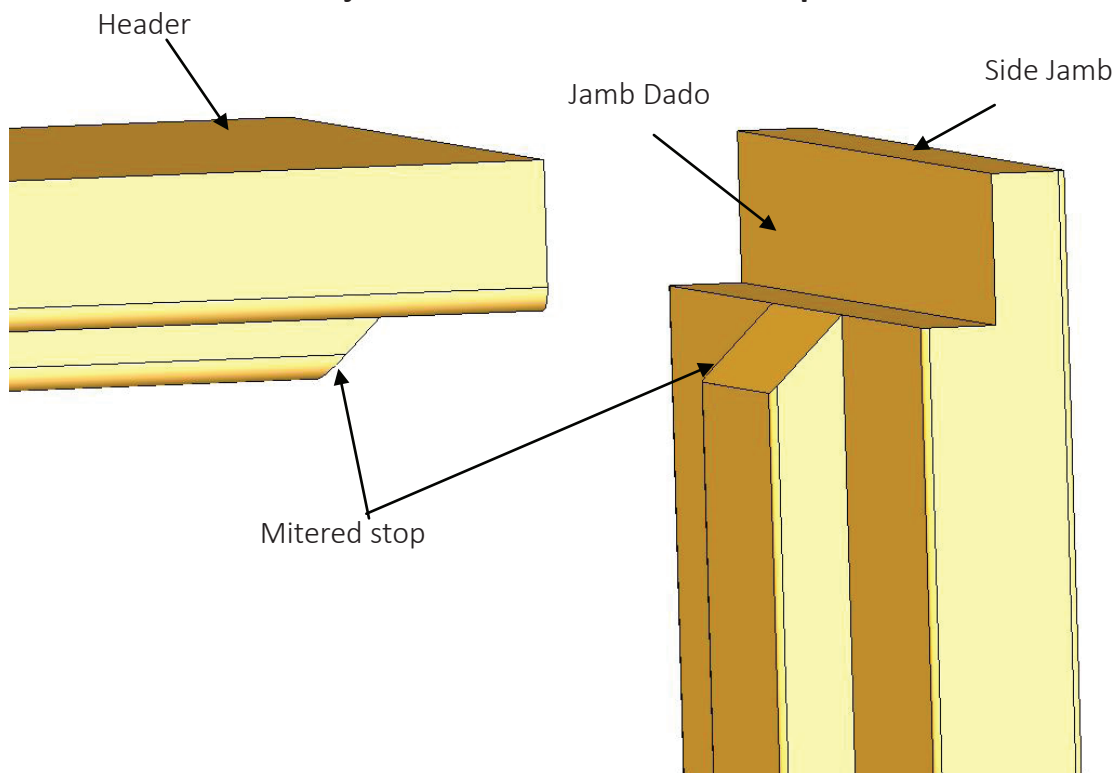
When the door stop is applied to the jambs before the units are assembled, it must be positioned correctly to allow the head jamb to fit all the way into the dado and for the stop on the side jamb to butt up against the stop on the head jamb. The stop on the head jamb is recessed the same amount as the depth of the dado on the side jamb. The stop on the side jamb is recessed the same amount as the thickness of the stop material. (see page 30)

If mitered stop material is used, the stop on the side jambs is positioned flush with the dado. The stop on the head jamb is recessed the depth of the dado. (see below)

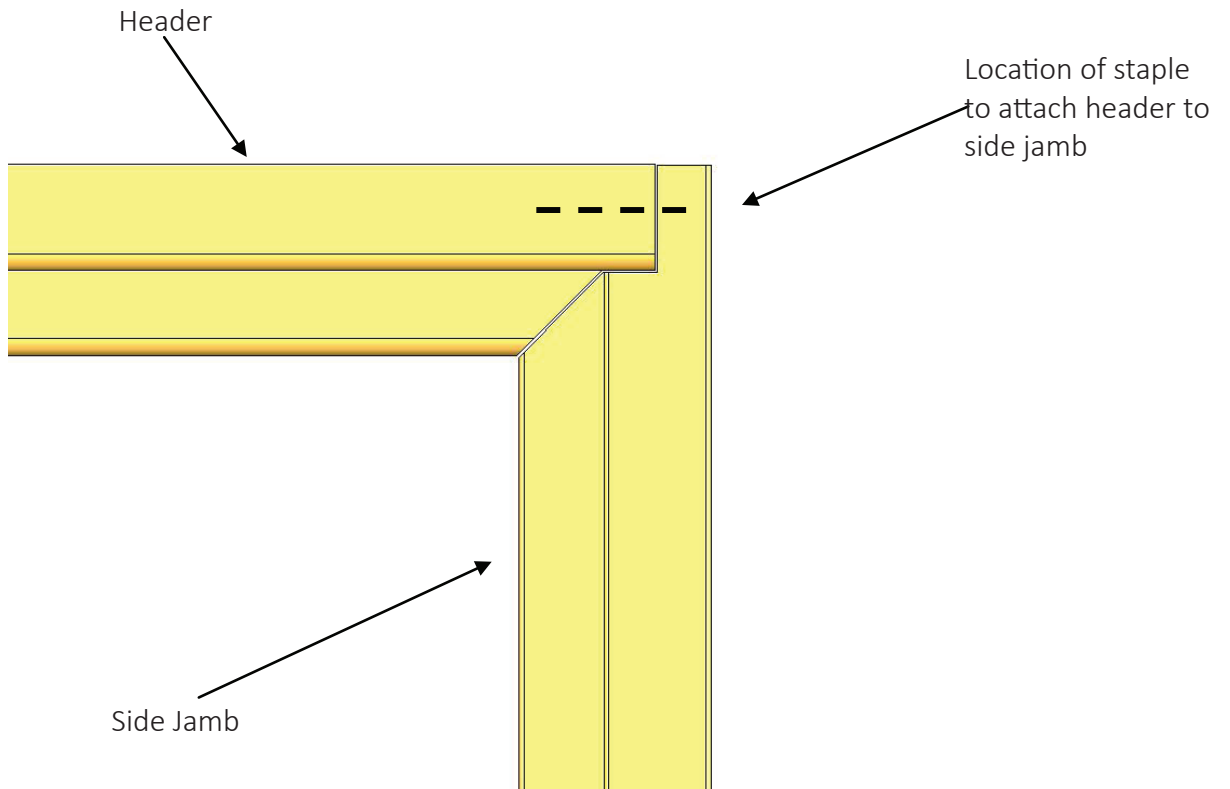
On exterior jambs, where the stop and jamb are the same piece of wood, the recesses are produced by saw cuts. Special saws equipped with dado heads are available to do this kind of cutting quickly and efficiently.

### Jamb Assemblies

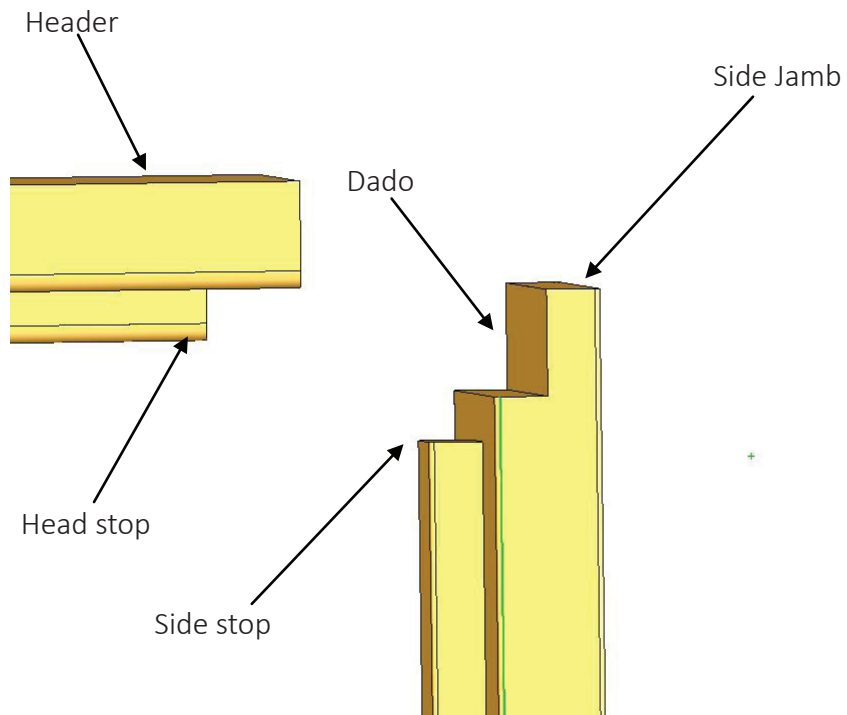
#### Flat jamb shown with mitered stop



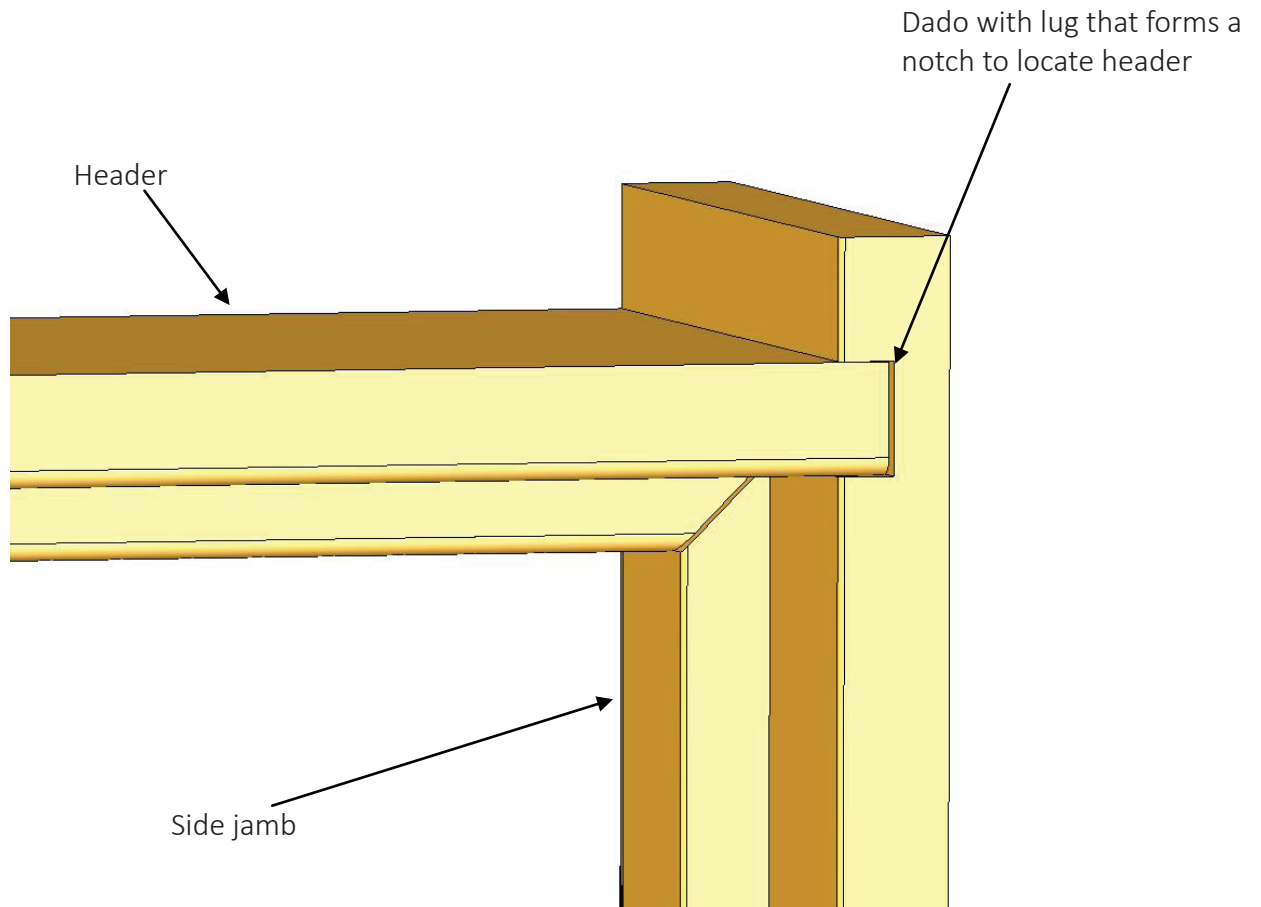
**Jamb Assemblies**  
**Flat Jamb shown with mitered stop**



**Jamb Assemblies**  
**Flat Jamb with square cut stop**



## Jamb Assemblies Flat Jamb with lugged dado shown



This method is not commonly used due to the fact that the lug has to be cut-off to install the door unit in the opening. The advantage of this method is that it holds the location of the header secure during shipping.

## DOOR TYPES AND SIZES

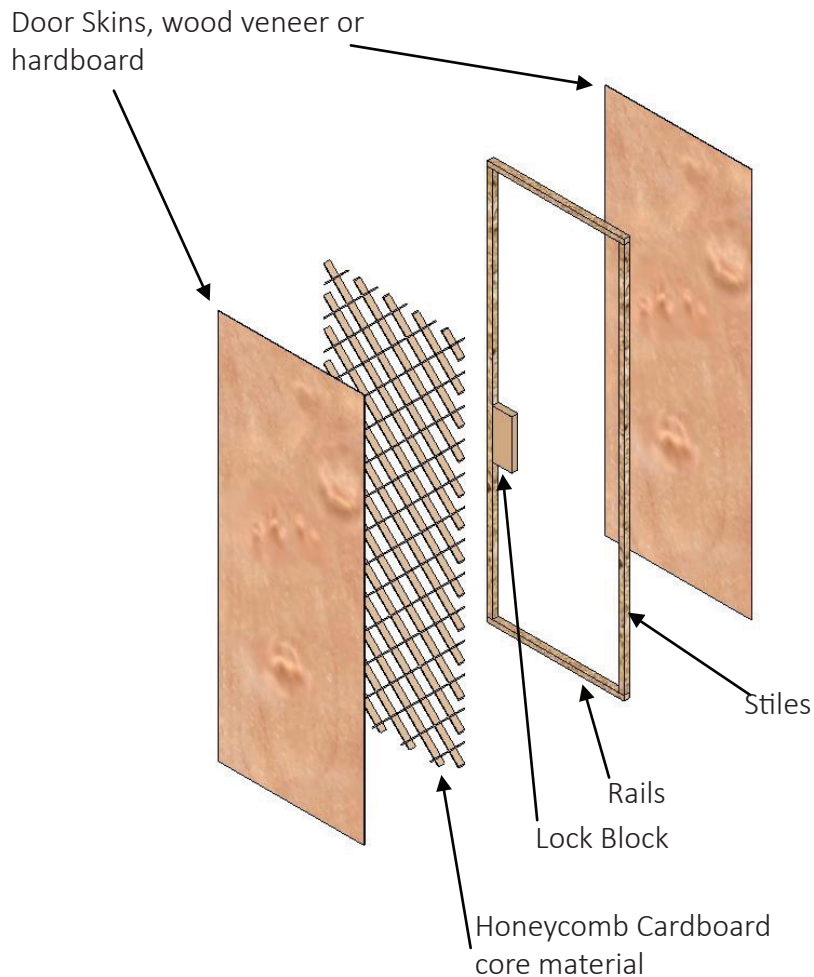
The drawings on the following three pages, show the three most common types of door construction. “Hollow Core” doors are used exclusively for interior applications. “Solid Core” and “Stile and Rail” doors are used primarily for exterior entrance doors but may be found in some interior applications. Hollow Core and Solid Core doors are sometimes referred to as “flush” doors. Stile and Rail doors are a more traditional type door and are used as entrance doors where added aesthetics are desired.

Hollow Core and Solid Core are somewhat similar in their construction. Both have a wood frame, a core and are covered with some kind of wood or wood product skin. Wood veneer or hardboard are the two common materials for door skins.

Stile and Rail doors are made up of a number of individual pieces of solid wood that are carefully fit and glued together. The material used can vary from door to door and manufacturer to manufacturer but Douglas Fir, Philippine Mahogany, Red Oak and White Oak are the most common. The value of a Stile and Rail door is in its aesthetic appeal.

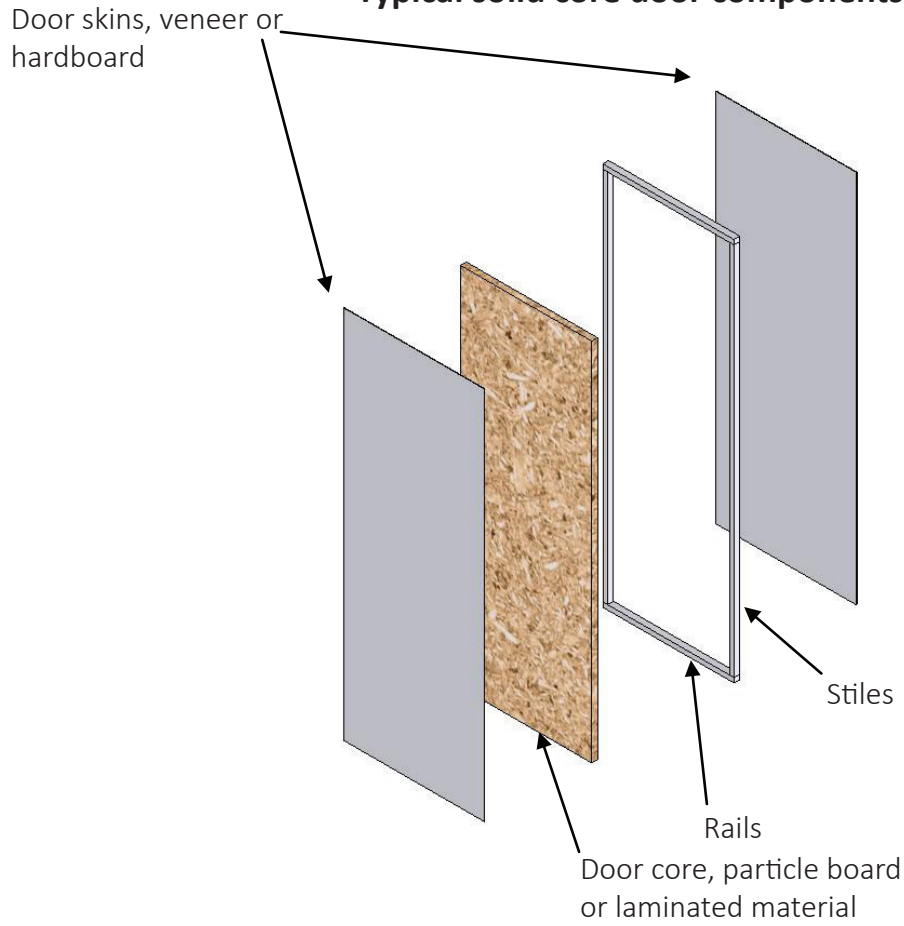
Doors are available in widths from 1’0” to 4’0” in 2” increments. The standard length for a door is 6’8”. Doors 7, 8, 9, and even 10 feet tall are available and are becoming increasingly more common.

### Typical interior hollow core door components

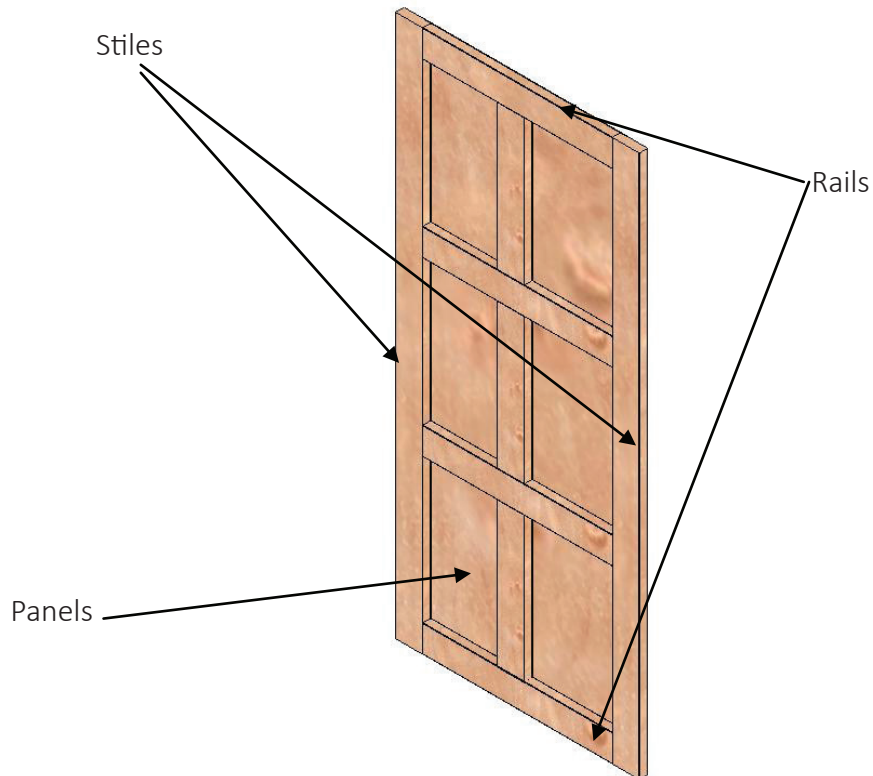




### Typical solid core door components



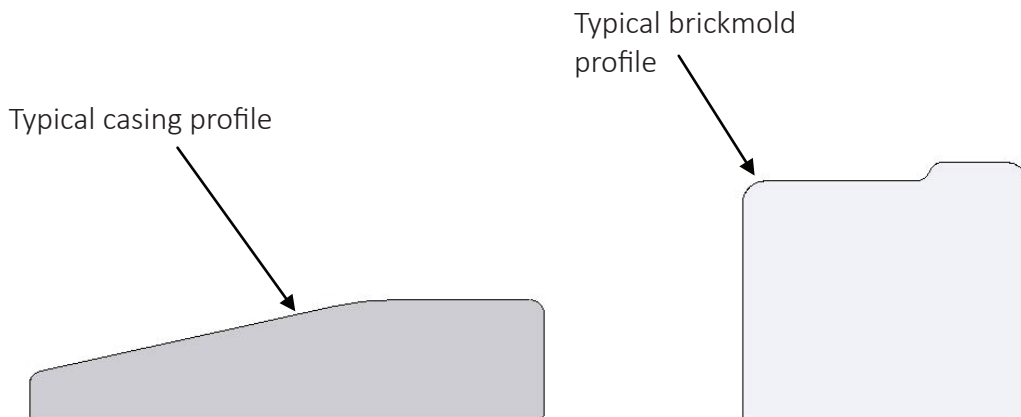
### Typical stile and rail door

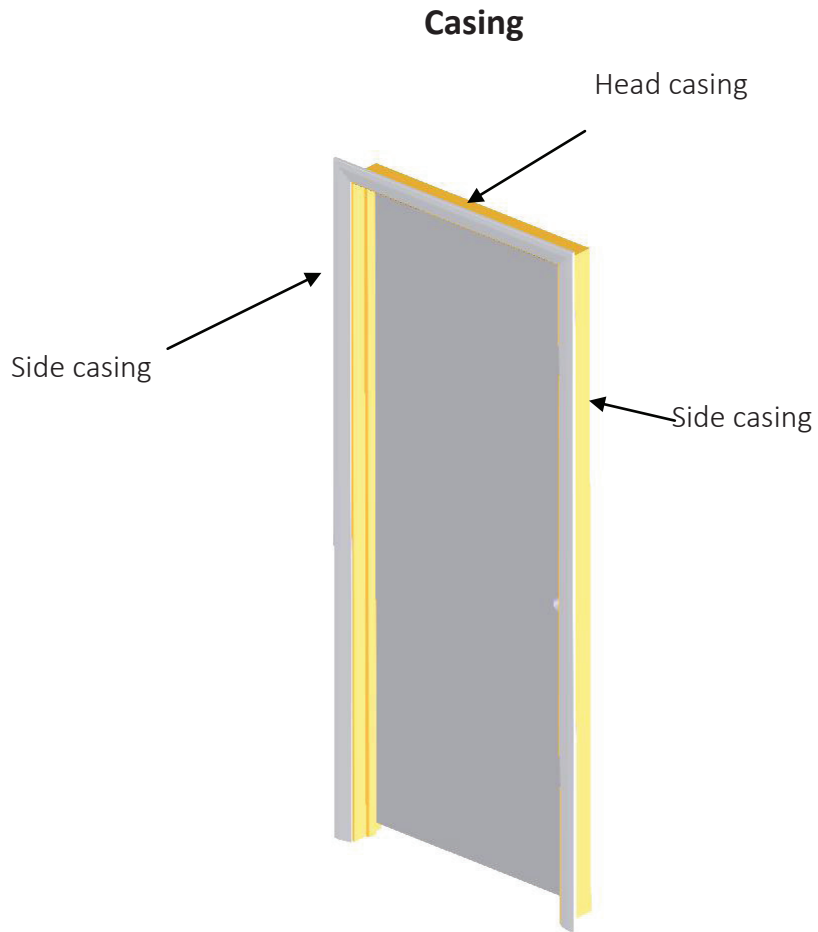


## CASING

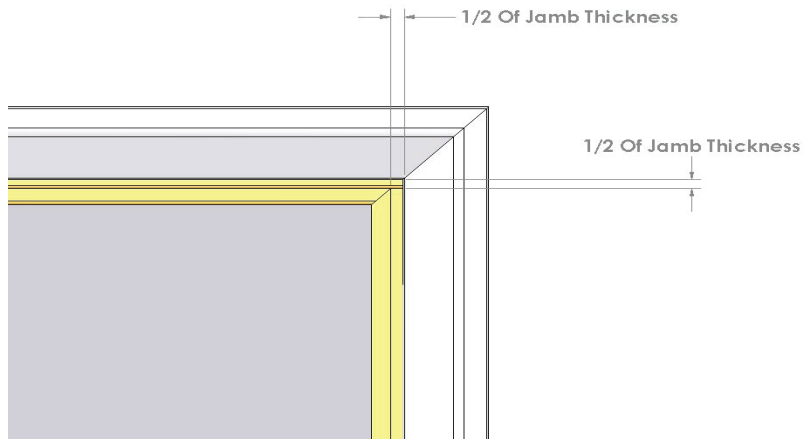
When a pre-hung door is installed, it is normally trimmed, or cased, around the edges of the jambs on both the inside and outside of the opening. For interior doors, the trim on both sides of the door is referred to as casing. On exterior doors, the trim on the inside is casing and trim on the outside is molding. Brickmold, as shown below, is a common exterior molding.

Casing and molding are usually mitered (cut at 45°) where it joins at the top corners. Sometimes, the outside molding is butt jointed (the top piece is set on top of the two side legs). This is usually done to create a rustic appearance or for other design considerations.



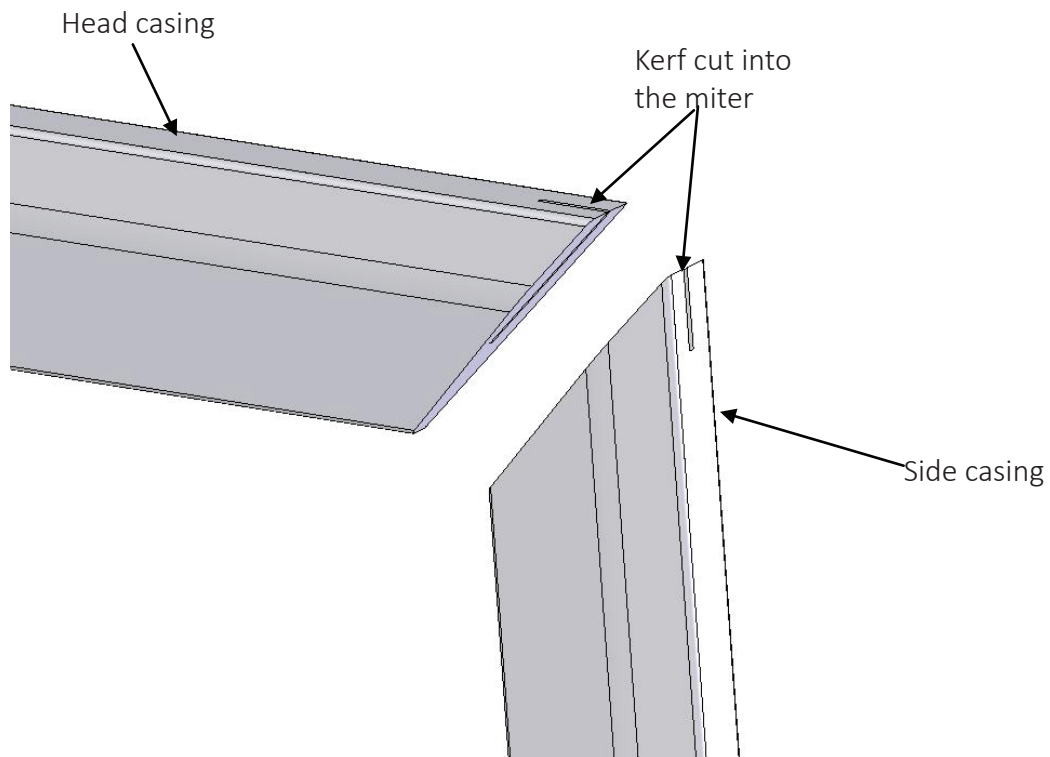


### Typical location of casing on jambs edge



## Kerfed Casing

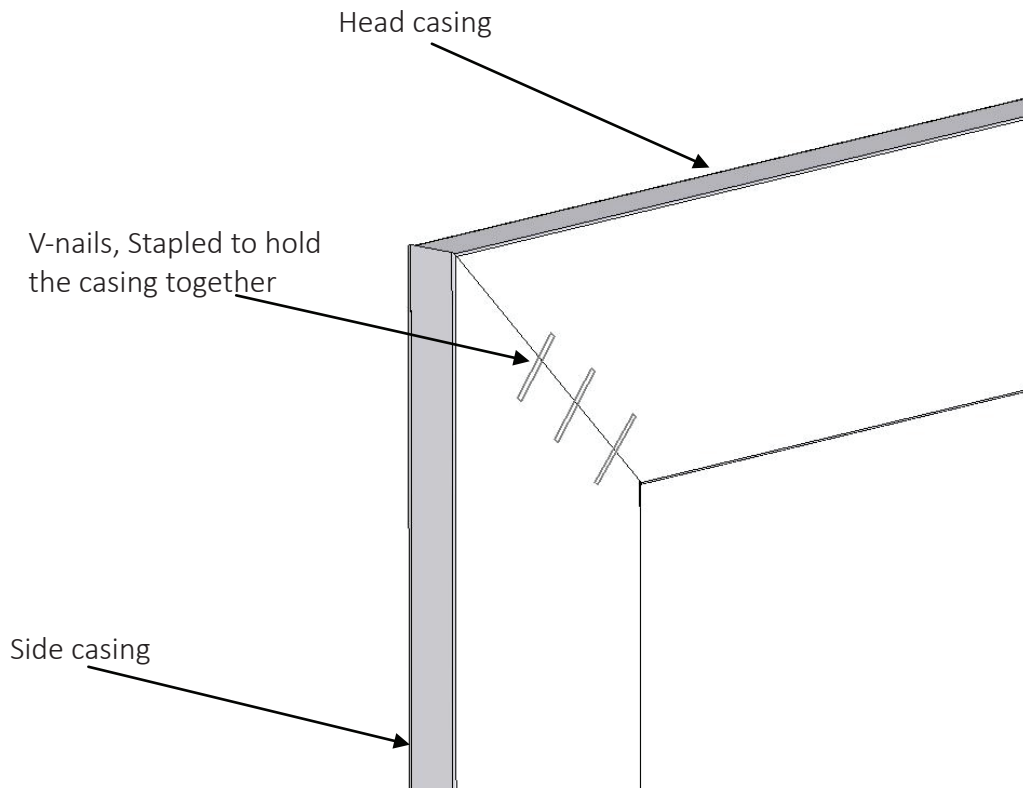
To hold the miters of casing or brickmold tightly aligned a process called “Kerfing” is done to the material after mitering. A thin slot as seen in the illustration is cut into the miter, then a special nail called a “Spline Nail” is driven into the slot of both the head and side casing.



## V-Nailed Casing

A common method for attaching the casing pieces to each other before assembly on the door is with a V-Nail machine. This machine will hold, then staple the miter of the head and side casings together.

In this illustration we are viewing the casing from the backside.



## **Picture Frame Casing**

When the three pieces of casing for one side of a door unit are pre-assembled, using either kerfing nails or V-nails, the assembled unit is called “Picture Frame Casing”

The casing, after assembly, would be taken to the door assembly process and attached to the unit. Shipping the casing pre-assembled is done due to it being very fragile and prone to breakage until it is stapled to the door unit.

# Shop Organization

## Section three

## SHOP LAYOUT THEORY

To operate a pre-hung door shop efficiently, three conditions must be met:

- Availability of material to production lines
- The right equipment for the desired production
- The proper flow of the manufacturing process in relation to raw material and finished product

This section will discuss these factors and will address the process of actually “laying out” a pre-hung door shop.

The availability of material to the production line (or lines) should be the first priority when designing an assembly line for producing pre-hung doors. Without the correct material at the proper place and at the proper time, efficient production is impossible. When material is received, it should be stored in an organized fashion. Blank doors should be stored according to type and size. Jamb stock should be organized with interior jambs separated from exterior jambs. Casing and stop material should likewise be separated and stored in an orderly manner.

The area required for receiving and for storing raw material would depend on production requirements and the amount of inventory required. The storage area should be large enough to allow the materials to be easily located and easily handled. The method used to move the raw materials from storage to the manufacturing area should be considered and the appropriate sized aisles provided.

Any time spent having to find material or handling it unnecessarily will add to the cost of producing each door unit.

Having the proper equipment for the desired production is equally as important as having the proper raw materials available. Without the proper tools, only limited production is possible.



## SHOP LAYOUT THEORY

The pre-hung door assembly line consists of two major elements:

- 1. The Primary Line**
- 2. The Secondary Lines.**

The primary line is the path the door follows. It contains the door machine, the assembly table(s) and the casing application area. The secondary lines are the path of the sub-components; i.e., jambs, stop casing, screws, hinges and any other parts used on completed units except for the door itself.

The primary line is the easiest to arrange. It is usually a straight line with a definite and obvious sequence of operations with each process or station manned continuously. The primary line should have a steady flow and pace that is established by the door machine operator. Any reason that causes the line to stop, or an operator to leave his position should be avoided.

To be efficient, the primary line must be supported constantly by the secondary lines. If the size of the operation requires that primary line personnel also supply sub-components, the sub-components should be stocked before production is started, with a coordinated restocking of all stations simultaneously. They should be stocked in as large a quantity as possible to reduce the frequency of starting and stopping the line.

The secondary lines contribute greatly to the labor content of the finished door units. It is often the most neglected and least efficient area in many shops. The machinery in the secondary lines (i.e., Strike Router, Trim Saws and Jamb Stitcher) should not be viewed as individual work stations, but as operation points along an assembly line. The machinery should be positioned with this in mind. The best approach is to first establish the most efficient flow of material, then position the machines along this flow rather than to design a material flow around arbitrarily placed machines.

From the time material is received until it is shipped as finished door units, it should always be moving in lines that are as straight as possible with as few stops as possible. The manufacturing area should have adequate space for working around equipment and the free movement of material. It should not be so spread out that time and energy are lost in the movement of personnel and material. The receiving area should be large enough to store the required raw materials. The shipping area should be set up with enough room to keep any surplus finished units that are not going to be immediately shipped.

The best method to optimize the total pre-hung door manufacturing system is to make a scale drawing of the entire operation including receiving, storage, processing and shipping. On the drawing make a line showing the primary line (the line the door follows from receiving to shipping) and then position the door machine and assembly tables. Again, this line should be as direct and straight as possible. Next, make similar lines for each component in the secondary line (again, from receiving to shipping) and position the associated machinery. You should now have a complete map of material travel. Personnel can now be added showing work areas. Once the layout is complete and all movement and processes considered, evaluation can be made by measuring efficiency levels (pg. 49).

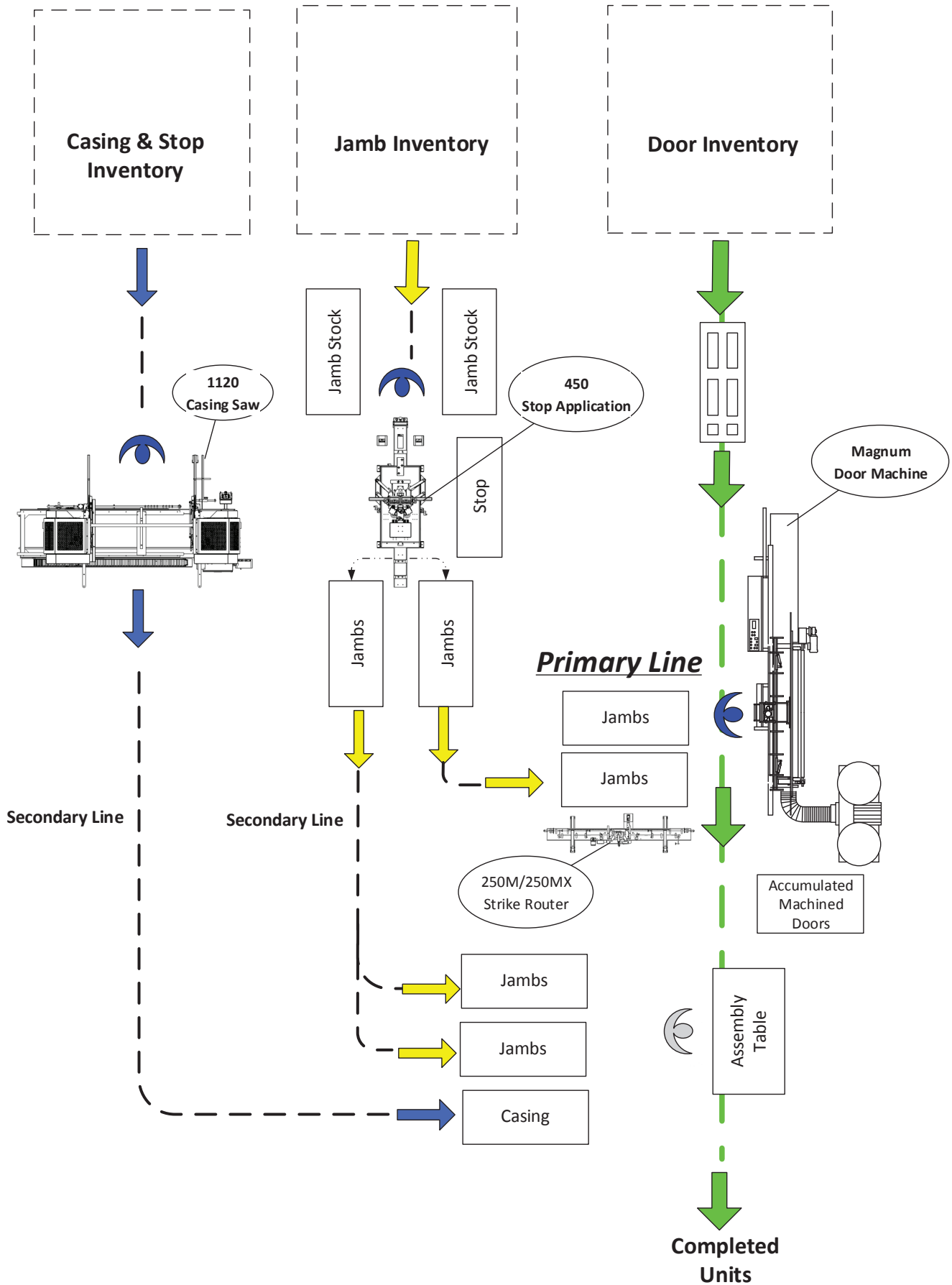
Determining the proper system for an existing shop or building may require compromises due to size and shape of available space. Weigh the compromises carefully. But remember, the primary objective is to maintain the “assembly line” process.

## COMPONENT FLOW

The Primary Product Material Flow (pg. 43) layout shows various materials and how they would flow through a typical door shop. As you can see, the primary line is a direct path but the sub-components and their various processes form a more complex routine. In optimizing this type of manufacturing area, all these processes need to be organized to easily flow toward the point of actual use on the primary line. This example shows an operation using flat jambs. If split jambs were used, the flow of sub-components would be different.

The use of material carts is highly recommended for efficient material handling. Without carts for the operators to pull material from it would be necessary to re-stock permanent racks at each process location. Re-stocking is double handling of material and can disrupt production.

Primary Product Material Flow



## MATERIAL HANDLING PROCEDURES

Manufacturing pre-hung doors is an assembly line process. Whether you are producing 50 or 500 doors per day, the same considerations should be made for material handling. From receiving to shipping, the entire process should be viewed as a system with all processes and materials in the system working together for optimum productivity and efficiency.

The assembly line required to manufacture pre-hung doors is a material handling process, and material handling adds labor costs. In fact, the labor involved in handling the door and its components, usually exceeds the labor involved in the actual machining and assembling the door unit itself. For this reason, it is most important that all aspects of material handling be analyzed before setting up a shop for production. Time invested in establishing good material handling procedures will be well invested.

Below is a list of basic handling rules that should be followed in any assembly line-based manufacturing operation:

1. Handle the material as few times as possible.
2. When material is received, put it immediately into its storage location.
3. Store material in the same configuration as it is received.
4. Handle material only to perform an operation on it or to position it in preparation for an operation.
5. Any time a piece of material is handled, do as many operations on it as possible.
6. Move material in the largest quantities possible. "One at a time" is very expensive.
7. All materials should always be flowing toward shipping throughout the entire process.
8. Machine operators should be working on material, not trying to find it!

The first and most important step in producing pre-hung door units is getting material through the assembly line process. Coordinate the material at receiving to insure that the correct material is sent to the manufacturing area before it is needed. This step would also insure that the material pulled is of a usable quality. The time involved in getting needed material or rejecting faulty material by the manufacturing area can determine whether or not that particular action is a profitable one.

The most efficient method to move materials from receiving to the places where they are needed is to use carts, mobile racks and fork lifts. These carts and racks would also take the place of permanent racks at each processing area. Restocking permanent racks is double material handling. It not only increases labor costs, but reduces flexibility when changing to a different type of material.

The goal for efficient operation is to have all materials in place along the assembly line before they are actually needed to avoid disrupting production. Again, carts and mobile racks are ideal as they can be quickly rolled into place to replace empty ones. To maintain continued production of the assembly line, a system should be established to insure proper flow of materials. Carts and racks must be loaded in advance and ready to go. Having the correct material at each station prior to its need is the goal.

To maintain smooth uninterrupted production, an orderly method of transferring finished units from the manufacturing stage to the shipping stage is required. Thus, someone would be designated the responsibility of accepting finished units from manufacturing for delivery. This person would be responsible for checking finished units against orders for accuracy and for quality.

The following illustration (pg. 46) shows various material paths in a typical shop. The method of material movement should be considered in each step.

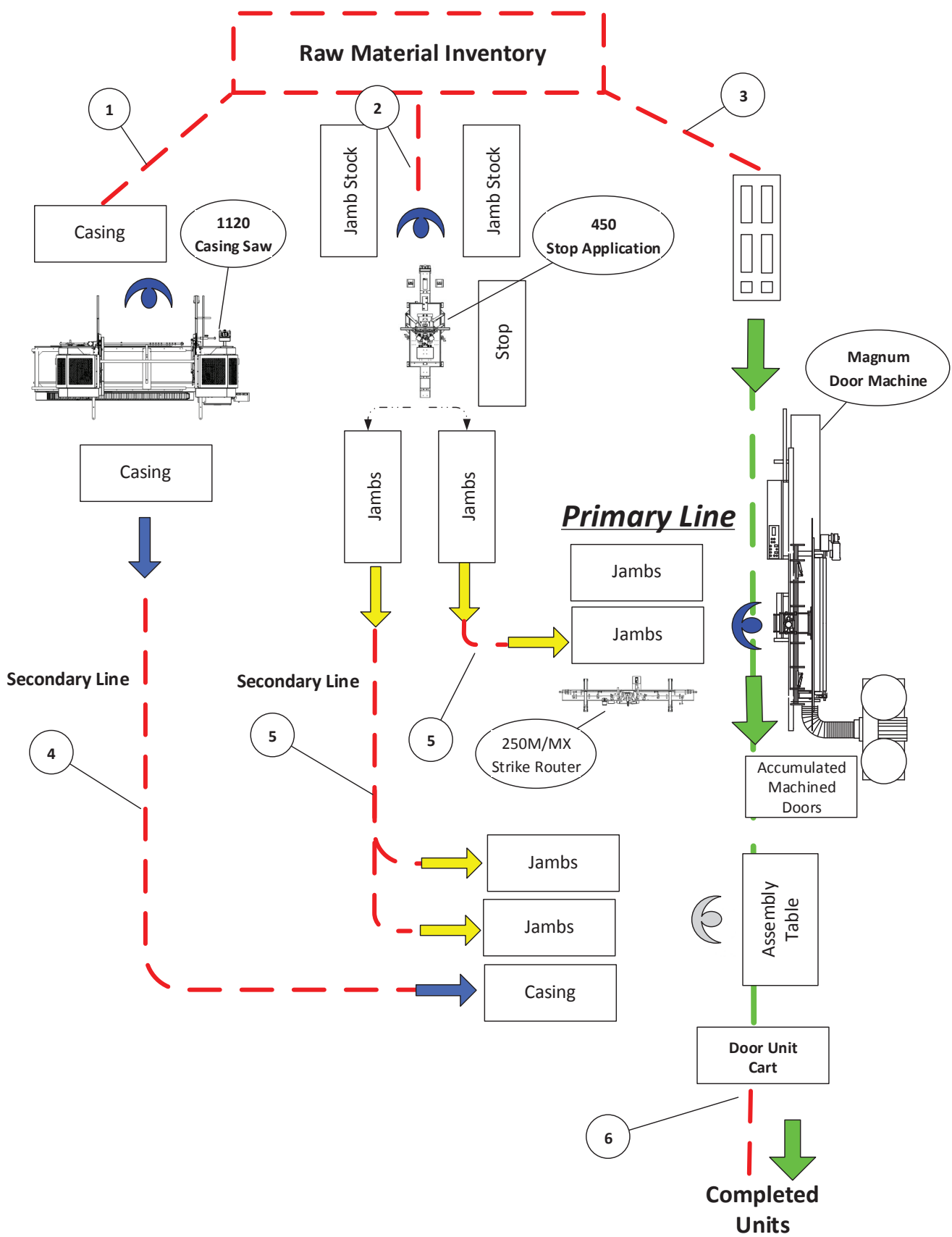
Steps 1, 2, and 3 are moving raw material from inventory to the first operation. Steps 1 and 2 are good candidates for using wheeled carts while step 3, the movement of door blanks could either be by forklift or by cart.

Steps 4 and 5, is the transfer of prepped jambs and casing to the assembly line. In each case this is best done with carts that can be quickly moved into place on the production line without disrupting the workflow. This situation also requires that the empty cart or rack be easily removed when empty. This is an area where many use a cart to “re-stock” a work area, this is to be avoided as it has two distinct problems, and they are;

- Stocking work area racks is double handling of material
- The action of restocking usually stops the production line.

Step 6, moving finished goods to shipping should be in such a way that the last time the door unit is handled as a single unit is when the assembly operator places in onto the cart, pallet, or rack. The units are shipped on the carts or racks that receive them from the last process of assembly.

### Moving Material Efficiently



## Operation Descriptions

The operations in the example are numbered 1 through 4. Following is a description of each function. In actual operation, functions 1 and 2 would be permanently staffed. Functions 3 and 4 could be operated by one person or part time for each operation.

### Operation #1

Door machine operator receives the blank door from the door cart, the hinge jamb from the jamb cart, and processes both through the door machine. Butts are applied, and the door and jamb are placed on the door accumulator.

This is a full time position with the operator never leaving his work area.

### Operation #2

The assembly table operator receives the door and jamb from the accumulator. Strike and head jambs from their respective carts, and complete the frame around the door. Casing is then applied and the finished unit is placed on the completed unit cart.

This is a full time position with the operator never leaving his work area.

### Operation #3

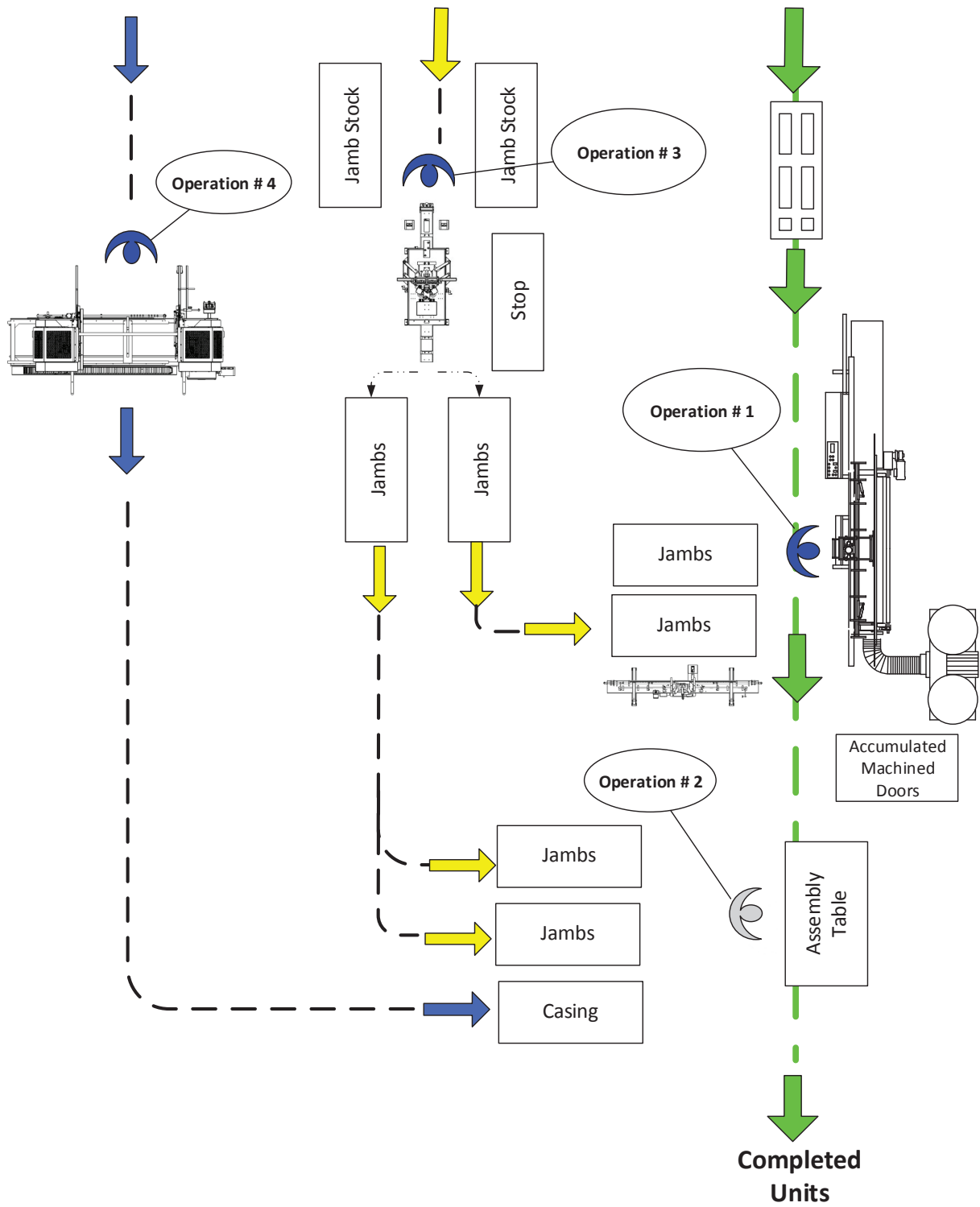
Stop-jamb stitching. Flat jamb stock from inventory and cut door stop is parked next to the stitching operation and processed through the stitcher. It is then placed on the cart. Both Side jambs are taken to the Magnum door machine. This arrangement allows the door machine operator to pull jamb stock for hinge jambs directly. The jambs for strike plate routing can be pulled from the same stock. Head jambs would be transported directly to the assembly table.

This is a part time position as this operator can produce more material than is required per shift. The duties of this operator would shift to machining strike jambs, moving stock to the assembly line or performing any custom functions such as modifying material with the radial arm, chop saw, or table saw.

### Operation #4

Miter saw operation. Casing or door stop from inventory is cut to finished length and placed on carts to transport to the next operation. Casing would go to the assembly table area and the door stop would go to jamb stitching operation.

### Operation Descriptions





## MEASURING EFFICIENCY LEVELS

Most door shops have unique requirements. The production needs per shift, materials, equipment, and layout all are variables. Setting up a shop to produce pre-hung door units with the lowest labor cost per door unit is a challenge, but is even more of a challenge without the ability to measure or benchmark the performance of the operation.

The machines that Norfield manufactures are used for many different applications. These differences in use make it hard to compare the output of doors per day, or doors per hour, between different operations. We have seen, as an example, customers with Magnums that barely produce 75 doors per shift, while others may get 225 doors per shift. This is not necessarily a difference between efficiency levels. The shop producing 75 doors per day may be making commercial doors with no two doors alike. The Shop that produces 225 doors per day may be producing interior doors with very little variation, possibly with door blanks purchased pre-sized and pre-beveled, using drive in bolts without a faceplate mortise.

The way to benchmark your shops efficiency level is to complete a series of measurements to establish a baseline.

Step 1. Using a stopwatch, time the production of 4 or 5 doors to establish a typical time per door standard. If while doing this timing the line stops for any reason, such as a lack of material, order sheet, hardware, or whatever reason, stop and start over again. Divide the total time by the number of doors for your “Time Per Door” value

Step 2. Calculate the number of man minutes per shift, deduct all breaks, meetings, functions other than door unit production. Establish a value for “Man Minutes Per Shift”

Step 3. Determine what you think would be an achievable goal for labor efficiency, this is a tricky calculation. In this type of work, 75 to 80 percent efficiency would be good.

Step 4. Determine your current “Door Units Per Shift”, this should be an average of production over at least 5 days production.

<b>An Example</b>		
Time Per Door	92 seconds	
Man Minutes Per Shift	400 Minutes, (24,000 Seconds per shift) (400 X 60)	
Employee Efficiency Goal	80%	
Current Door Units Per Shift	122	
Available Man seconds @ 80% Eff.	= <del>19,200</del> seconds	(80% of 24,000)
Available time divided by Time per door	=208.7	(19,200/92)
Current Door Units Per Shift=	122	
Difference	86.7	

These numbers are relatively typical. The question that usually arises is what causes the difference between actual units per shift and calculated units per shift. Which is an interesting question, as we have calculated efficiency to be 80%, which should give us realistic results.

The answer is that you can produce 86 more doors per shift, or reduce your labor cost per unit by over half with the same production.

Our experience shows us that typically the reason for the difference is at least one or more of the following;

- An operator leaving his work area, stopping the line
- A problem with the shop order that needs clarification, stopping the line
- A lack of materials (doors, jambs, hardware), stopping the line.

Once you have determined that you have room for improvement, you can begin identifying the inefficiencies in your production lines. One proven method is to write down what you feel are the most common causes, such as material or paperwork shortages. Give someone on the line the task of marking down each time there is a stoppage on the line next to the reason. After a period of time, you can see where the culprits are and go to work on eliminating the causes. Re-arranging the secondary material lines, or changing the work order forms are typical tasks that can cause improvements.

Periodically you can measure to establish your “Time per Door” and “Current Doors per shift” to see if your changes are making a difference.

Another method to identify inefficiencies is video taping. This is best done with the cooperation of the line operators. Making the line more efficient makes the operators’ job easier, so video taping during production is a positive action.

If the camera is placed on a tri-pod and then ignored, the operator normally loses the self-conscious aspect created by management filming an employee working. The results of this video are usually surprising as problems that arise become obvious when the tape is played back at a higher than normal speed.

Stoppage on the line is usually caused by one or more of the line operators leaving the work area then returning later. When asked where they went they usually had a legitimate reason, such as finding the right jamb, getting another door, etc. Stopping these errands will result in higher production and an easier, less hassles job for the operators.

A good example is when the inevitable happens and a door on the line is damaged, or the material is bad, don’t stop the entire line until resolution is found, continue on with production, and have a part time or floater worker step in to fix the problem, keep the assembly line moving.

However you measure, once you apply your fixes you need to measure again to make sure that you have not only fixed the targeted inefficiencies, but that you have not created new ones. Measure, apply fixes and measure again.

## PNEUMATIC LAYOUT

The layout of the pneumatic system for the pre-hung door manufacturing facility is of primary importance. Without the proper air supply, the door hanging equipment (most of which is air-operated) will not function adequately. There are five factors to consider when establishing the pneumatic layout for a door shop:

1. Sizing the compressor and air dryer.
2. Sizing the feed lines and drops.
3. Location of the compressor system.
4. Filtration of contaminants.
5. Designing the system.

### Sizing the Compressor and Air Dryer

To determine the correct size for the air compressor and air dryer, first total all the air-consuming operations within the area to be serviced. The total may require correction for intermittently operated machines, but all machinery that could be operated simultaneously should be totaled. Once the total has been established, it is recommended that the size of the compressor be 30% to 50% larger than the calculated consumption to allow for line loss, reduced duty cycle, and future additions.

All air compressors produce water which can be harmful to pneumatic tools and machines. Therefore, it is highly recommended that a refrigerated air dryer be used. In-line filters only remove particle pollution thus allowing moisture (water vapor) to pass into the system. The size of the dryer should be matched to the C.F.M. rating of the air compressor, not the calculated air consumption of the air-operated tool and machines. This effectively oversizes the dryer for the same reasons as the compressor: line loss, duty cycle, and future additions.

### Sizing the Feed Lines and Drops

The pipe size used in an air system is determined by the flow (C.F.M.) and the length of the run. The chart below shows how length effects the pipe size.

SCFM Flow	Length of Run - Feet									Compr. HP
	25	50	75	100	150	200	300	500	1000	
4	½	½	½	½	½	½	½	¼	¼	1
12	½	½	½	¾	¾	¾	¾	1	1	3
20	¾	¾	¾	¾	1	1	1	1 ¼	1 ¼	5-
30	¾	¾	1	1	1	1	1 ¼	1 ¼	1 ¼	7 ½
40	¾	1	1	1	1 ¼	1 ¼	1 ¼	1 ½	1 ½	10
60	1	1	1 ¼	1 ¼	1 ¼	1 ¼	1 ½	1 ½	2	15
80	1	1 ¼	1 ¼	1 ¼	1 ½	1 ½	1 ½	2	2	20
100	1 ¼	1 ¼	1 ¼	1 ½	1 ½	2	2	2	2 ½	25
120	1 ¼	1 ½	1 ½	1 ½	2	2	2	2 ½	2 ½	30
160	1 ¼	1 ½	1 ½	2	2	2	2 ½	2 ½	3	40
200	1 ½	2	2	2	2	2 ½	2 ½	3	3	50
240	1 ½	2	2	2	2 ½	2 ½	2 ½	3	3	60
300	2	2	2	2 ½	2 ½	3	3	3	3 ½	75
400	2	2 ½	2 ½	2 ½	3	3	3	3 ½	4	100
500	2	2 ½	2 ½	3	3	3	3 ½	3 ½	4	125

Also, in determining the proper size to use, consider that the larger the size used, the less velocity the air will have. This allows the air more opportunity to cool after being compressed which enables the moisture to condensate out of the air before it reaches the machines or tools (thus the need for water traps).

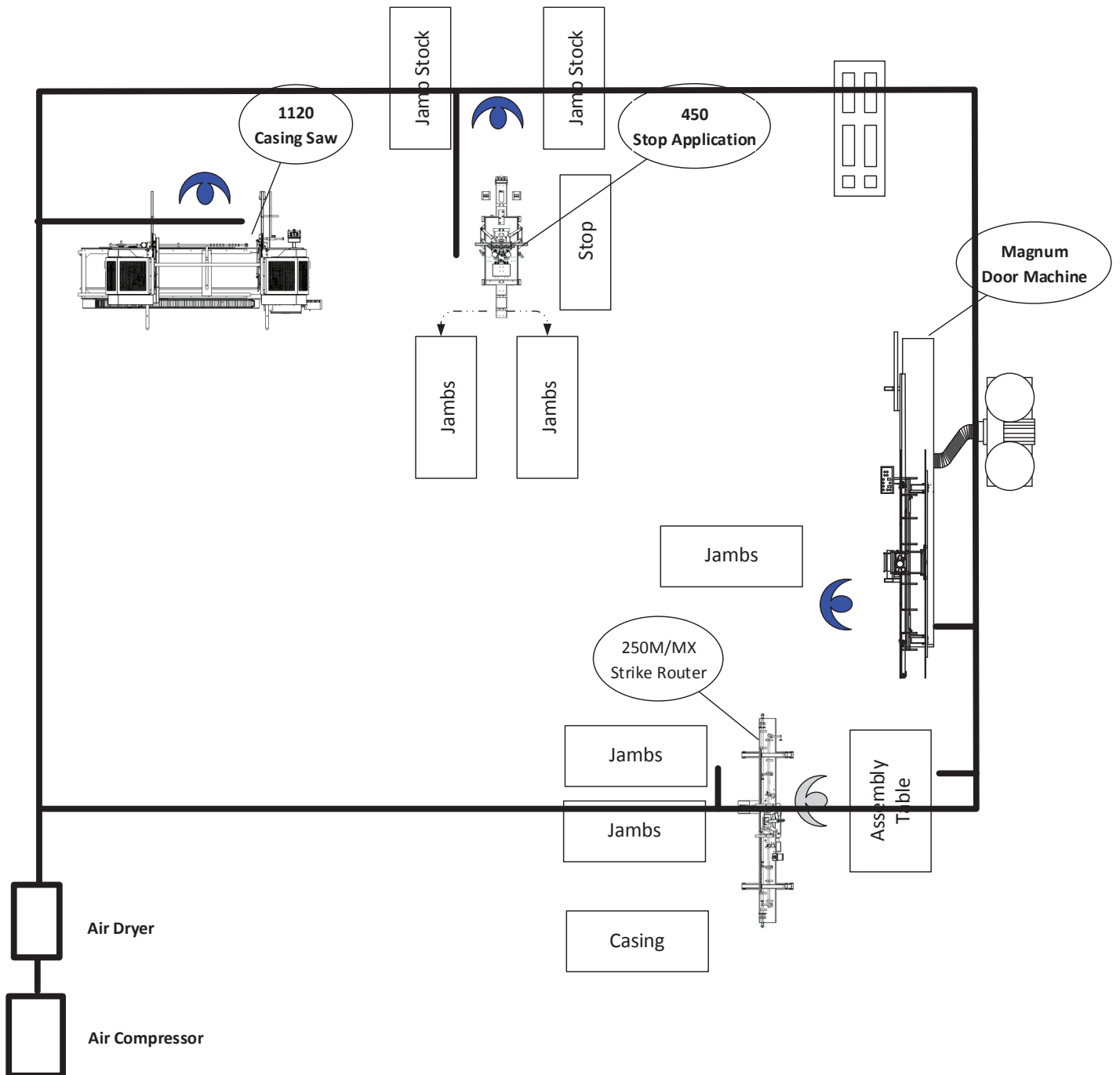
Over-sizing the lines also creates an accumulator, or surge tank, which reduces the pressure drop along the system when large amounts of air are intermittently used along the system.

#### Location of the Compressor

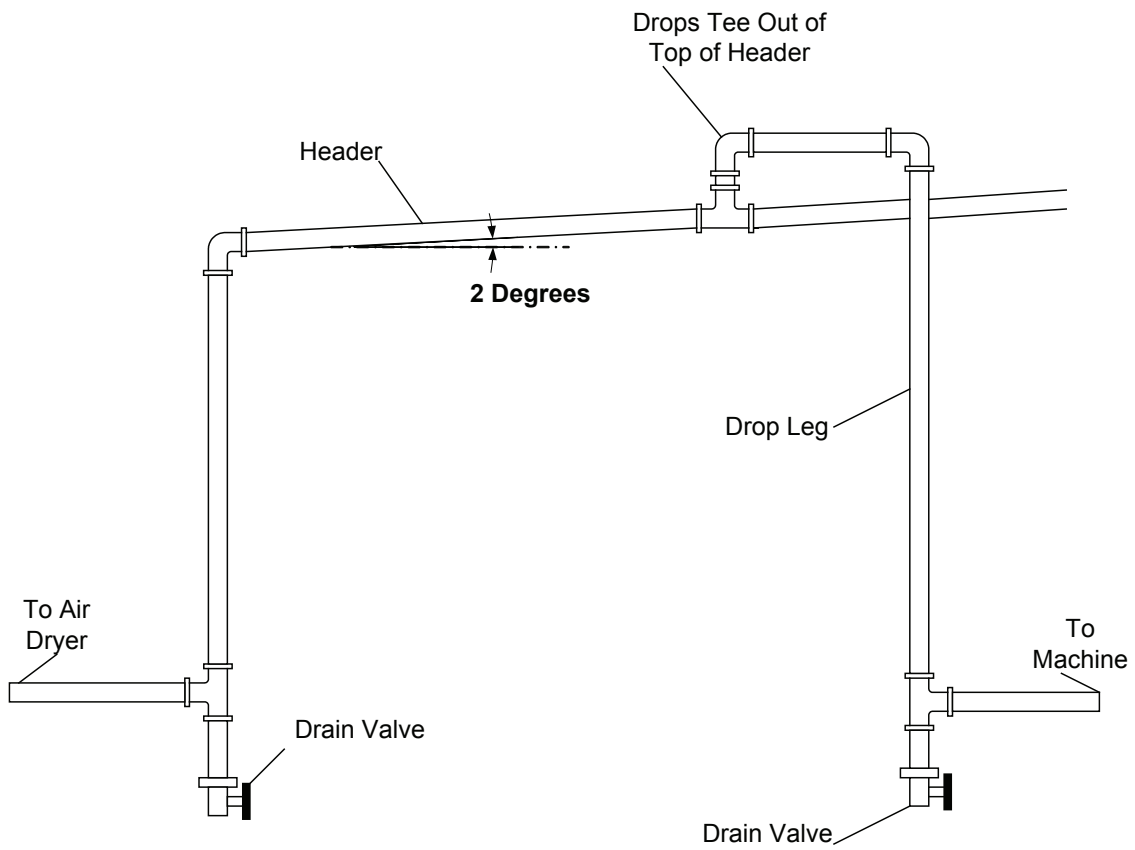
The air compressor and air dryer should be located as close to the air-consuming operations as possible to reduce the line loss caused by long runs and to eliminate large pipe sizes.

The compressor will be affected by extreme heat or cold and dust in the air intake. A common practice is to pipe the air intake through an exterior wall or place the compressor outside (shielded from direct weather). Good access to the compressor and dryer for periodic maintenance should also be considered.

### Pneumatic layout loop system



### Pneumatic layout detail



## Filtration of Contaminants

All of Norfield's machines are equipped with a Filter-Regulator-Lubricator (F.R.L.) to remove oil, dirt, grit, rust, pipe scale, and all other contaminants from the air system. However, mainline filtration is also required to protect hand-held pneumatic tools, such as staple guns and air screwdrivers, and to protect the entire air system from contamination.

A major problem with almost all air systems is a lack of proper maintenance to the filters, compressor and air dryer. It is highly recommended that a periodic maintenance schedule be adopted and followed.

## Designing the System

Layout of the air system is more than just getting the air from point A to point B and pipe size. The feeder loop should have at least a 2 degree slope toward a drop leg to encourage accumulated moisture to gather at a drain point. When a "tee" is placed in the loop, it should tap the top of the feeder loop so as not to allow accumulated moisture and contaminants to enter the drop leg. The drop should also have a "tee" for its tap point and continue downward to its drainage point.

## ELECTRICAL LAYOUT

To determine the electrical layout for a pre-hung door shop, draw a scale floor plan showing all machinery requiring electricity. Label the electrical requirements of each machine. Next, position circuit breaker panels near each machine accessible to the machine operator. These are recommended for the disconnection of power to each machine when performing maintenance or at the end of each workday.

If you are establishing a new shop and/or adding machinery to an existing one, it is advised that the voltage available in the building where the machinery will be located be checked. In some cases, 208V, 3-Phase may be available in a building adjacent to the one that has 230V, 3-Phase. Checking the voltage will avoid possible confusion later.

Most of Norfield's machines are set-up to operate with a choice of 3-Phase voltage input to match the voltage availability locally (i.e., 208V, 230V or 460V). When ordering machinery, make sure that the voltage ordered matches that of your area and building. In some cases transformers are supplied and in others the machines are wired directly, be sure to discuss your needs with Norfield's sales staff.

If you move machinery to a new location and the available voltage is different than at the previous location, the machines can usually be converted to the correct voltage by either changing certain electrical components in the machine or by adding transformers to the input voltage. In either case, the work should be done by a qualified electrician who is familiar with 3-Phase installations, or by a Norfield Service Technician.

When connecting power to Norfield machinery (or any machinery, for that matter), refer to the installation instructions or the service manual. Again, electrical connections should only be made by a qualified electrician.



# Sample shop layouts

## Section four

## Up to 75 Doors per shift

### Machinery

- |                                |  |
|--------------------------------|--|
| 1. E-Series / Signature Magnum | Door machine for special, custom, interior, and exterior units |
| 2. 250M / 250MX                | Strike jamb router   |
| 3. Miter/Casing Saw            | Cuts jamb, casing, and stop                                    |
| 4. Radial Arm Saw              | Cuts jamb and stop material to length                          |
| 5. Table Saw                   | For ripping doors or jambs to custom size                      |

### Machine Capacity Rate

Magnum = 30 doors per hour

### Manpower Requirements

3 people

### Operator 1

Door Machine Operator performs all machining to door and hinge jamb, including hinge butt application.

### Operator 2

Door Unit Assembler assembles the frame around the door and applies casing to complete the door unit. This operator is also responsible for machining the strike jambs on the 250M.

### Operator 3 (Part Time)

Miter/Casing Chop Saw Operator cuts jamb, casing, and stop material to the appropriate length and performs any custom modifications. Not a full time job unless added to door pulling and all supply to the primary line.

### Approximate Floor Space Requirement

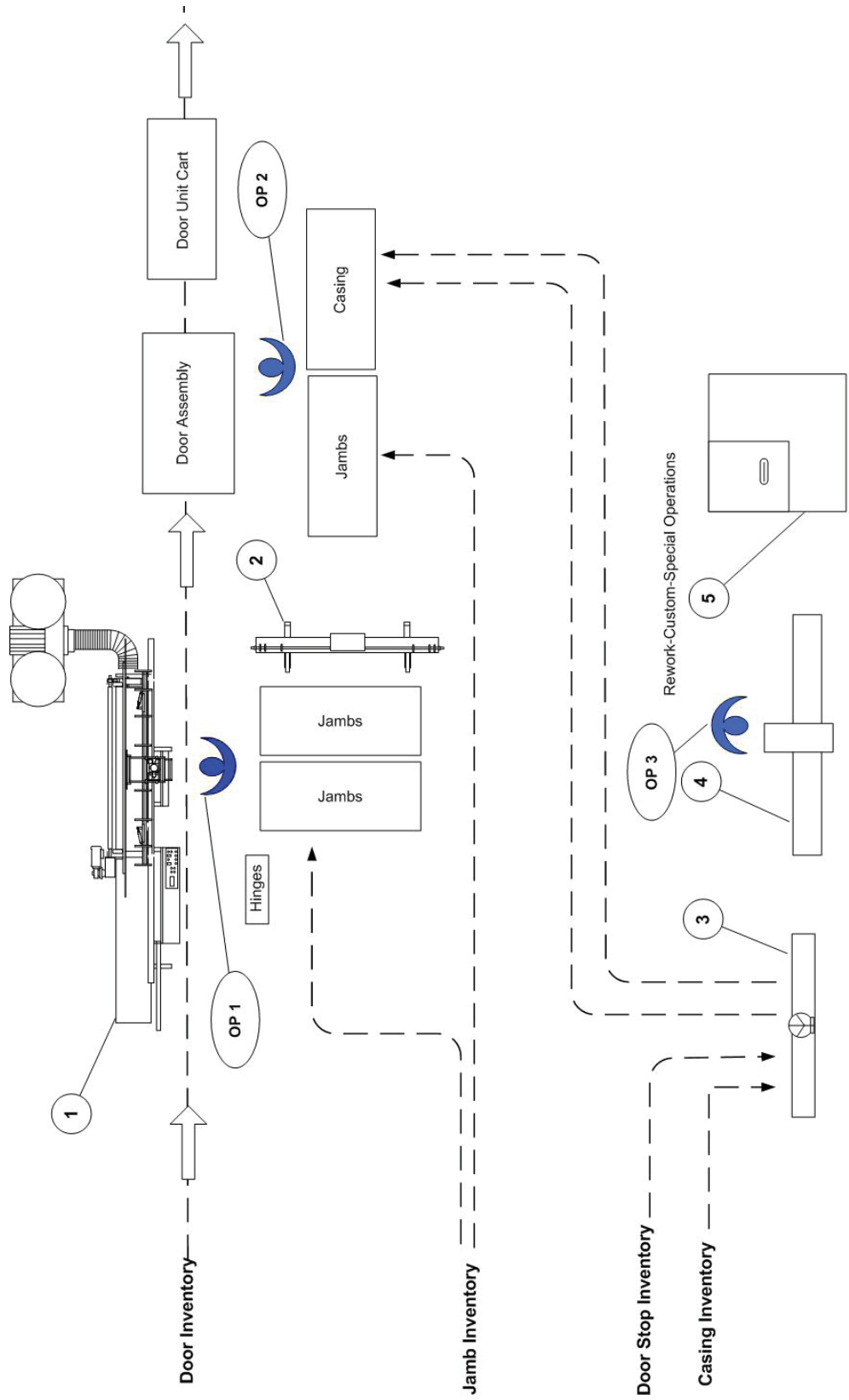
3,500 Square Feet

### Approximate Electrical Requirement

30 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

15 C.F.M. @ 90 P.S.I.



Magnum Shop

## 75-200 Doors per shift

### Machinery

- |                              |                                       |
|------------------------------|---------------------------------------|
| 1. E-Series Signature Magnum | Door machine                          |
| 2. Magnum Loader             | Loads a stack of doors                |
| 3. Magnum Un-loader          | Tilts door horizontal for assembly    |
| 4. 250M / 250MX              | Strike jamb router                    |
| 5. 450                       | Stop jamb stitcher                    |
| 6. 1120                      | Double end trim saw                   |
| 7. Radial Arm Saw            | Cuts jamb and stop material to length |
| 8. Chop Saw                  | Cuts and miters custom materials      |
| 9. Door Cut-Off Saw          | Cuts doors for custom applications    |

### Machine Capacity Rate

Magnum = 30 doors per hour

### Manpower Requirements

4 people

### Operator 1

Door Machine Operator performs all machining to door and hinge jamb, including hinge butt application.

### Operator 2

Door Unit Assembler assembles the frame around the door and applies casing to complete the door unit.

### Operator 3

450 operator, applies stop to flat jambs and stocks the primary line as well as machining the strike jambs on the 250M.

### Operator 4 and 5

1120 operator and any custom jamb or door prep.

Since the stations shown are not full time jobs, operators 4 and 5 are the same person, filling into to supply sub-components to the line as needed. Usually these positions include pulling blank doors and all sub-components

### Approximate Floor Space Requirement

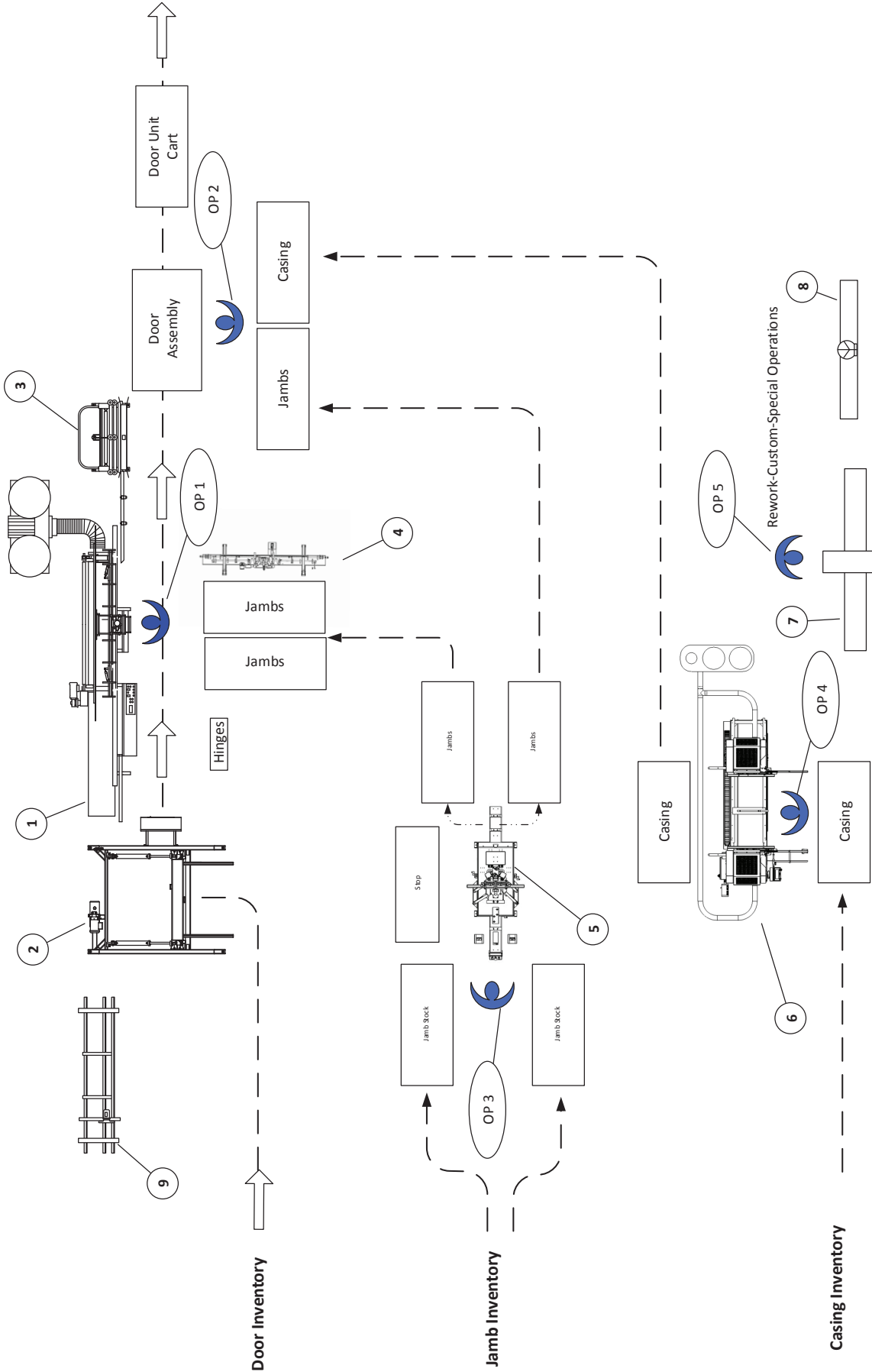
4,000 Square Feet

### Approximate Electrical Requirement

50 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

30 C.F.M. @ 90 P.S.I.



High Volume Magnum Shop

## 200-300 Doors per shift w/Custom and Exterior Doors

### Machinery

- |                                       |  |
|---------------------------------------|--|
| 1. E-Series / Signature Series Magnum | Door machine for interior doors                      |
| 2. Magnum Loader                      | Loads a stack of doors                               |
| 3. Magnum Un-loader                   | Tilts door horizontal for assembly                   |
| 4. 250M / 250MX                       | Strike jamb router                                   |
| 5. Magnum                             | Door machine for special, custom, and exterior units |
| 6. Magnum Loader                      | Loads a stack of doors                               |
| 7. Magnum Un-loader                   | Tilts door horizontal for assembly                   |
| 8. 250M / 250MX                       | Strike jamb router                                   |
| 9. 450                                | Stop jamb stitcher                                   |
| 10. 1120                              | Double end trim saw for mitering casing              |
| 11. Door Cut-Off Saw                  | Cuts doors for custom applications                   |
| 12. Radial Arm Saw                    | Cuts jamb and stop material to length                |
| 13. Miter/Casing Chop Saw             | Cuts jamb, casing and stop                           |

### Machine Capacity Rate

Magnum = 30 doors per hour

### Manpower Requirements

6 people

### Operators 1 and 3

Door Machine Operator performs all machining to door and hinge jamb.

### Operator 3 and 4

Door Unit Assemblers assemble the frame and apply casing to the door unit.

### Operator 5

450 Operator prepares flat jambs by applying stop.

### Operators 6 and 7

1120 operator, since the stations shown are not full time jobs, operators 6 and 7 are the same person, filling in to supply sub-components to the line as needed. Usually these positions include pulling blank doors and all sub-components.

### Approximate Floor Space Requirement

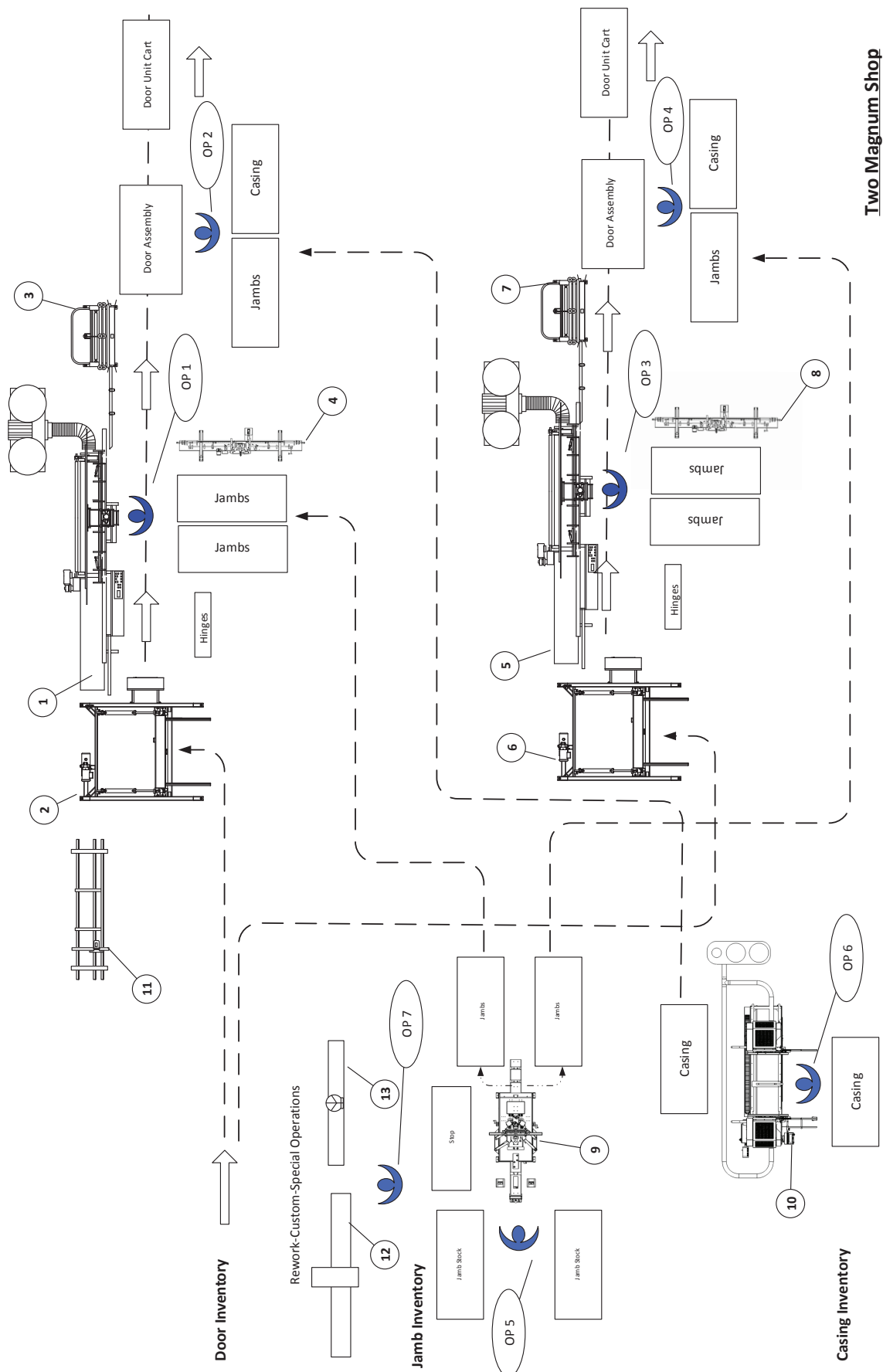
5,525 Square Feet

### Approximate Electrical Requirement

80 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

40 C.F.M. @ 90 P.S.I.



## 300-400 Doors per shift

### Machinery

- |                                       |   |
|---------------------------------------|---|
| 1. 4000 System                        | Automated door machine system                       |
| 2. 250M/250MX                         | Strike jamb router                                  |
| 3. Magnum Door Loader                 | Loader for stack loading of Magnum                  |
| 4. E-Series / Signature Series Magnum | Door machine for special, custom and exterior units |
| 5. Magnum Un-Loader                   | Door rotation for feeding assembly table            |
| 6. 450                                | Stop jamb stitcher                                  |
| 7. 1120                               | Double end trim saw                                 |

### Machine Capacity Rate

- |             |   |                   |
|-------------|---|-------------------|
| 4000 System | = | 45 doors per hour |
| Magnum      | = | 30 doors per hour |

### Manpower Requirements

7 people total for both lines, plus stock-puller/warehouse worker (not shown).

### Operator 1

4000 System Machining Stage Operator.

### Operator 2

4000 System Assembly Stage Operator.

### Operator 3

4000 System Casing Applicators

### Operator 4

Magnum Operator- custom specials and exteriors.

### Operator 5

Door Unit Assemblers- for custom, special, and exterior units; frame assembly and casing application.

### Operator 6

450 Operator, for casing and jamb preparation.

### Operator 7

1120 Operator, for casing and jamb preparation. Also stocks primary line.

### Approximate Floor Space Requirement

6,000 Square Feet

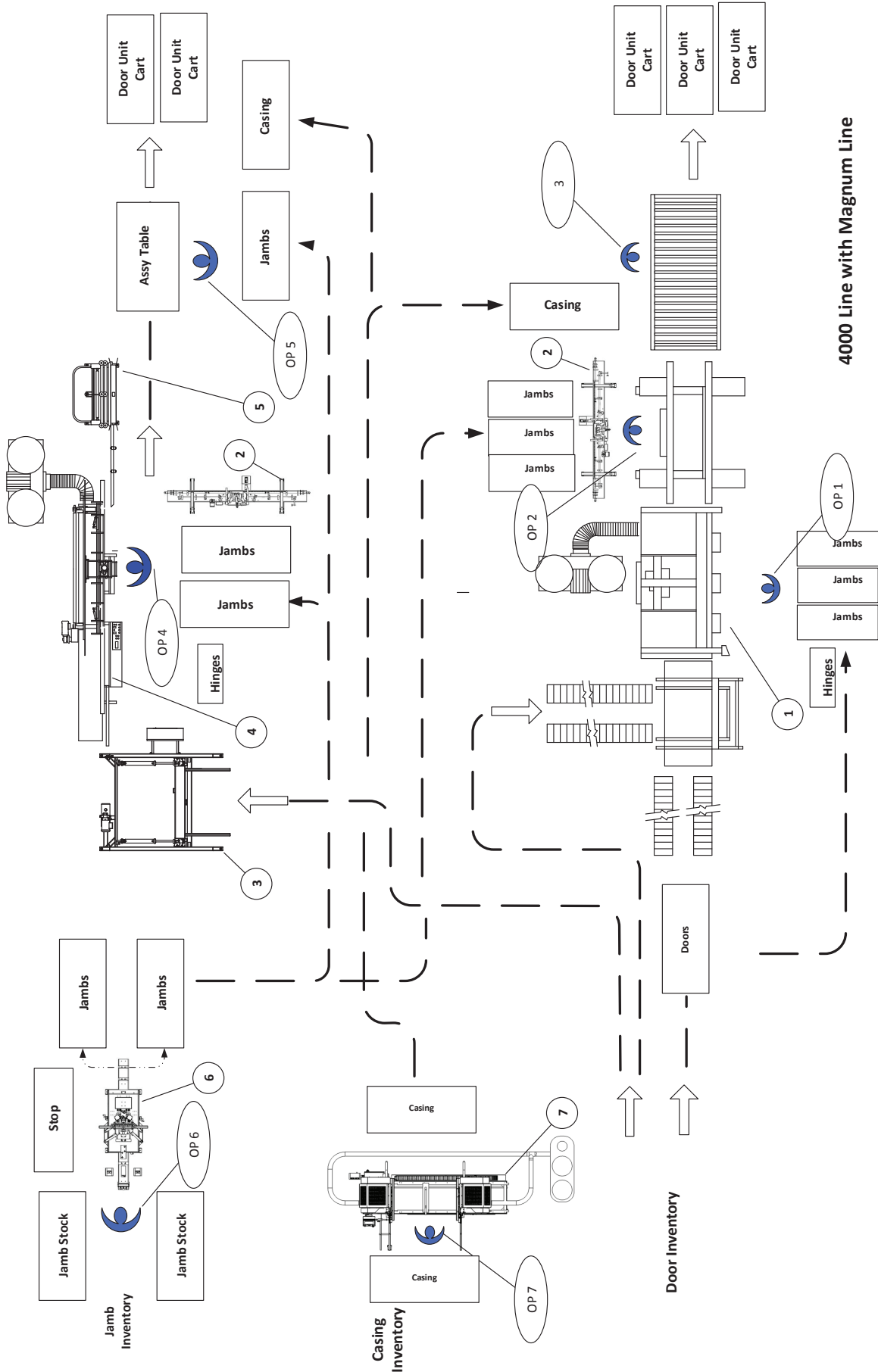
### Approximate Electrical Requirement

100 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

60 C.F.M. @ 90 P.S.I.





### 300-400 Doors per shift, large variety

#### Machinery

1. Eagle System	Automated door machine system
2. 250M /250MX	Strike jamb router
3. Magnum Door Loader	Loader for stack loading of Magnum
4. E-Series / Signature Series Magnum	Door machine for special, custom and exterior units
5. Magnum Un-Loader	Door rotation for feeding assembly table
6. 450	Stop jamb stitcher
7. 1120	Double end trim saw

#### Machine Capacity Rate

Eagle System	=	45 doors per hour (6'8" to 8'0")
Magnum	=	30 doors per hour

#### Manpower Requirements

7 people total for both lines, plus stock-puller/warehouse worker (not shown).

#### Operator 1

Eagle System Machining Stage Operator.

#### Operator 2

Eagle System Assembly Stage Operator.

#### Operator 3

Eagle System Casing Applicators

#### Operator 4

Magnum Operator- custom specials and exteriors.

#### Operator 5

Door Unit Assembler- for custom, special, and exterior units; frame assembly and casing application.

#### Operator 6

450 Operator, for casing and jamb preparation.

#### Operator 7

1120 Operator, for casing and jamb preparation. Also stocks primary line.

#### Approximate Floor Space Requirement

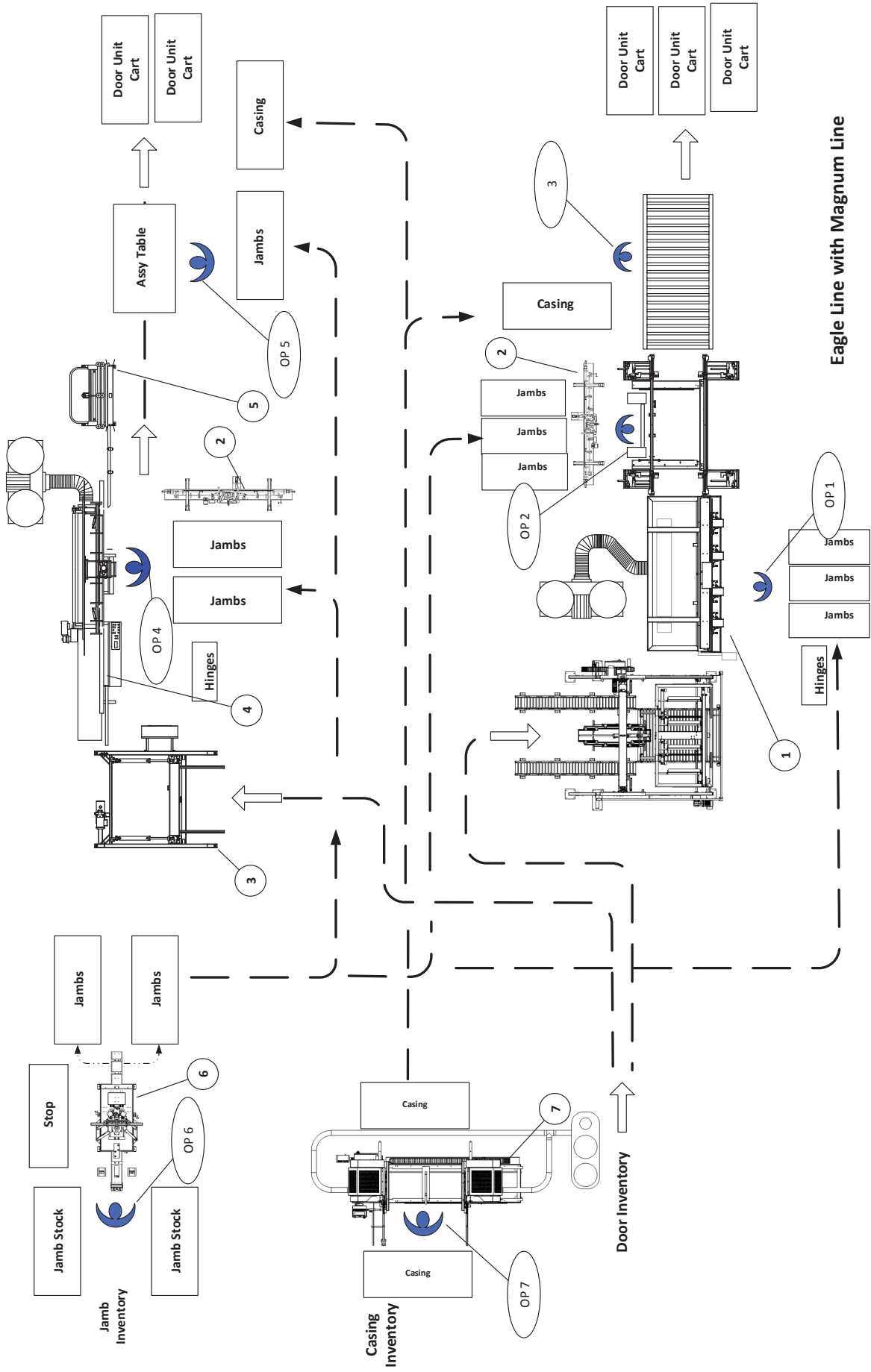
6,000 Square Feet

#### Approximate Electrical Requirement

100 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

#### Approximate Air Supply

60 C.F.M. @ 90 P.S.I.



Eagle Line with Magnum Line

## 400-600 doors per shift

### Machinery

1. 5000 System	Single Stack Door Loader
.	High volume interior door line
	Assembly Table
2. Magnum Loader	Door loader for Magnum
3. E-Series / Signature Series Magnum	Door Machine
4. Magnum Un-Loader	Door Un-Loader for Magnum
5. 450	Stop jamb stitcher
6. 250M / 250MX	Strike jamb router
7. 2300ASR	Automatic strike plate router
8. 1120	Double end trim saw

### Machine Capacity Rate

5000 System	=	60 doors per hour
Magnum	=	30 doors per hour

### Manpower Requirements

10 people, 7 operators and 3 stock pullers (not shown)

#### Operator 1

5000 System Machining Stage Operator.

#### Operator 2

Assembly Stage Operator.

#### Operator 3

Casing Applicators.

#### Operator 4

Magnum Operator- custom specials and exteriors.

#### Operator 5

Door Unit Assemblers- for custom, special, and exterior units; frame assembly and casing application.

#### Operator 6

450 Operator, for casing and jamb preparation.

#### Operator 7

1120 Operator, for casing and jamb preparation. Also stocks primary line.

### Approximate Floor Space Requirement

7,700 Square Feet

### Approximate Electrical Requirement

100 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

70 C.F.M. @ 90 P.S.I.



## 500-900 doors per shift

### Machinery

1. High Speed 5000 System	High volume interior door line
2. 2300ASR	Automatic strike plate router
3. 450	Stop jamb stitcher
4 1120	Double End Trim Saw

### Machine Capacity Rate

High Speed 5000 System = 120 doors per hour

### Manpower Requirements

5 operators, 2 stock pullers if casing is not applied

7 operators, 2 stock pullers if casing is applied

- The method and requirements of packaging and labeling could affect the operator count

### Operator 1

5000 System Machining Stage Operator.

### Operator 2

Assembly Stage Operator.

### Operator 3

Door unit packaging and labeling.

(if casing is applied, add two additional operators)

### Operator 4

450 Operator, for casing and jamb preparation.

### Operator 5

1120 Operator, for casing and jamb preparation.

### Approximate Floor Space Requirement

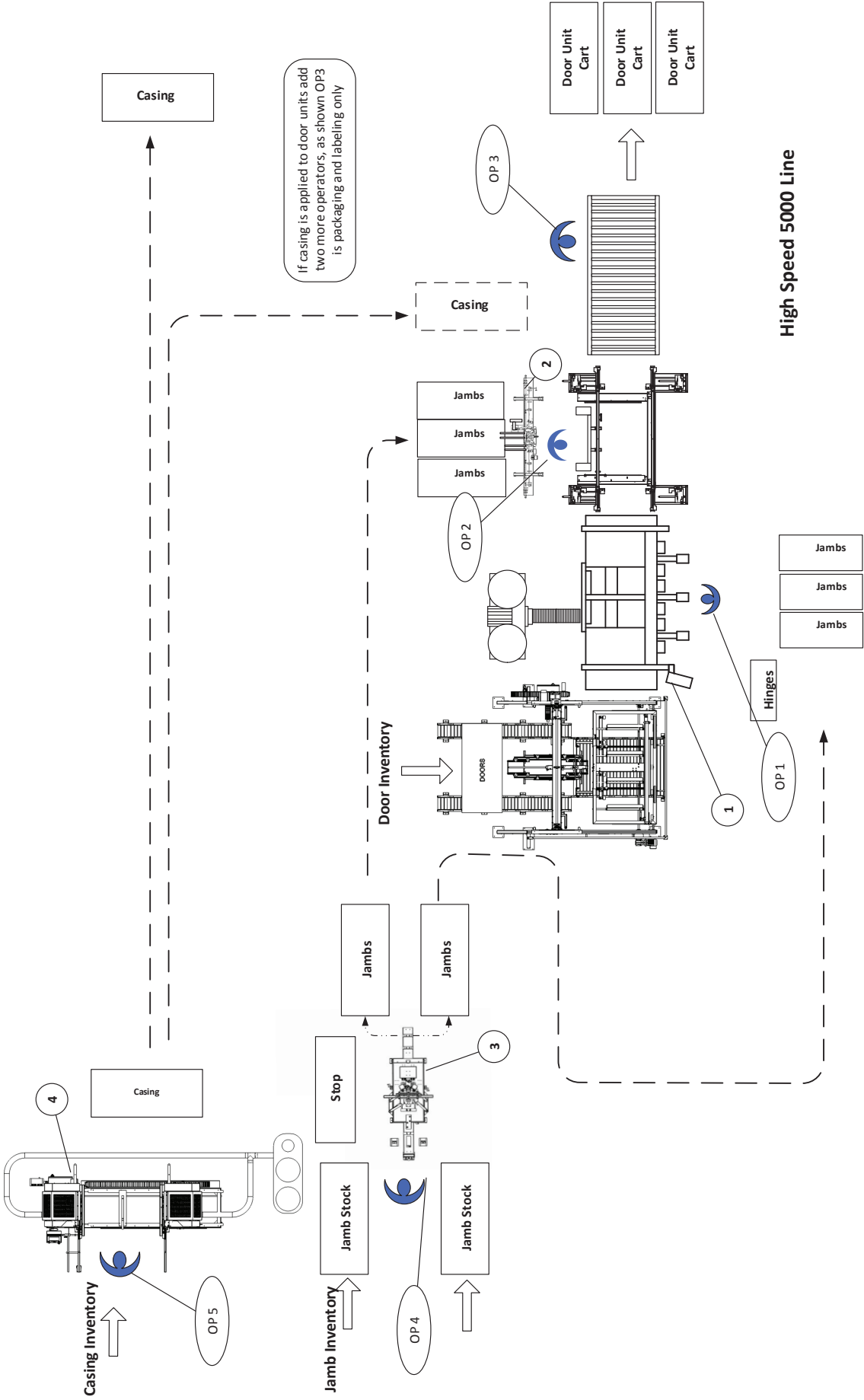
7,700 Square Feet

### Approximate Electrical Requirement

100 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

70 C.F.M. @ 90 P.S.I.



## Steel and Fiberglass door lite cut-out and assembly (Up to 150 Doors)

### Machinery

- |                          |   |
|--------------------------|---|
| 1. 3800                  | Metal door window lite cut-out and lock preparation |
| 2-6. Time Fold Series    | Metal door assembly system                          |
| 7. Radial Arm Saw        | Cuts jamb and stop material to length               |
| 8. Miter/Casing Chop Saw | Cuts jambs, casing, and stop                        |

### Machine Capacity Rate

- |                        |   |   |
|------------------------|---|---|
| 3800 Door Lite Machine | = | Up to 150 doors per day                   |
| Time Fold Series       | = | 30-200 doors per day (depending on setup) |

### Manpower Requirements

#### Operators 1, 2, and 3

Metal Door Unit Assemblers assemble metal exterior door units.

#### Operator 4

3800 Operator machines metal door lite cut-outs and lock prep.

#### Operators 5 and 6 (Part Time)

Part time special operations and modification workstations. Operators 1 thru 4 could perform these tasks as work load changes.

### Approximate Floor Space Requirement

4,950 Square Feet

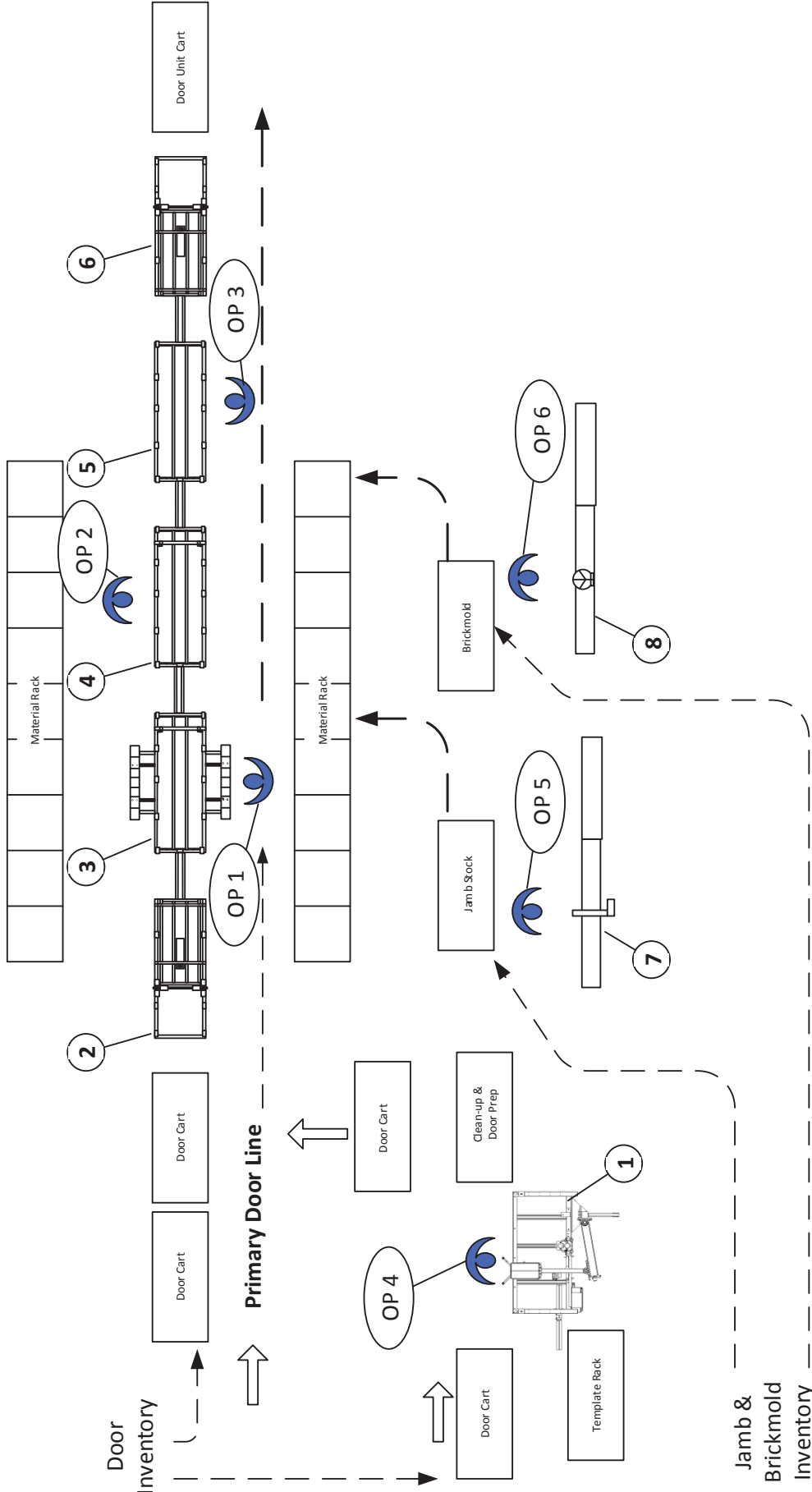
### Approximate Electrical Requirement

20 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

### Approximate Air Supply

5 C.F.M. @ 90 P.S.I.





3800 / Time Fold Line

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## **Steel and Fiberglass door lite cut-out and assembly (Up to 150 Doors)**

### **Machinery**

- |                          |   |
|--------------------------|---|
| 1. 4800                  | Metal door window lite cut-out and lock preparation |
| 2-6. Time Fold Series    | Metal door assembly system or EDM                   |
| 7. Radial Arm Saw        | Cuts jamb and stop material to length               |
| 8. Miter/Casing Chop Saw | Cuts jambs, casing, and stop                        |

### **Machine Capacity Rate**

- |                        |   |   |
|------------------------|---|---|
| 4800 Door Lite Machine | = | Up to 150 doors per day                   |
| Time Fold Series       | = | 30-200 doors per day (depending on setup) |

### **Manpower Requirements**

#### **Operators 1, 2, and 3**

Metal Door Unit Assemblers assemble metal exterior door units.

#### **Operator 4**

4800 Operator machines metal door lite cut-outs and lock prep.

#### **Operators 5 and 6 (Part Time)**

Part time special operations and modification workstations. Operators 1 thru 4 could perform these tasks as work load changes.

#### **Approximate Floor Space Requirement**

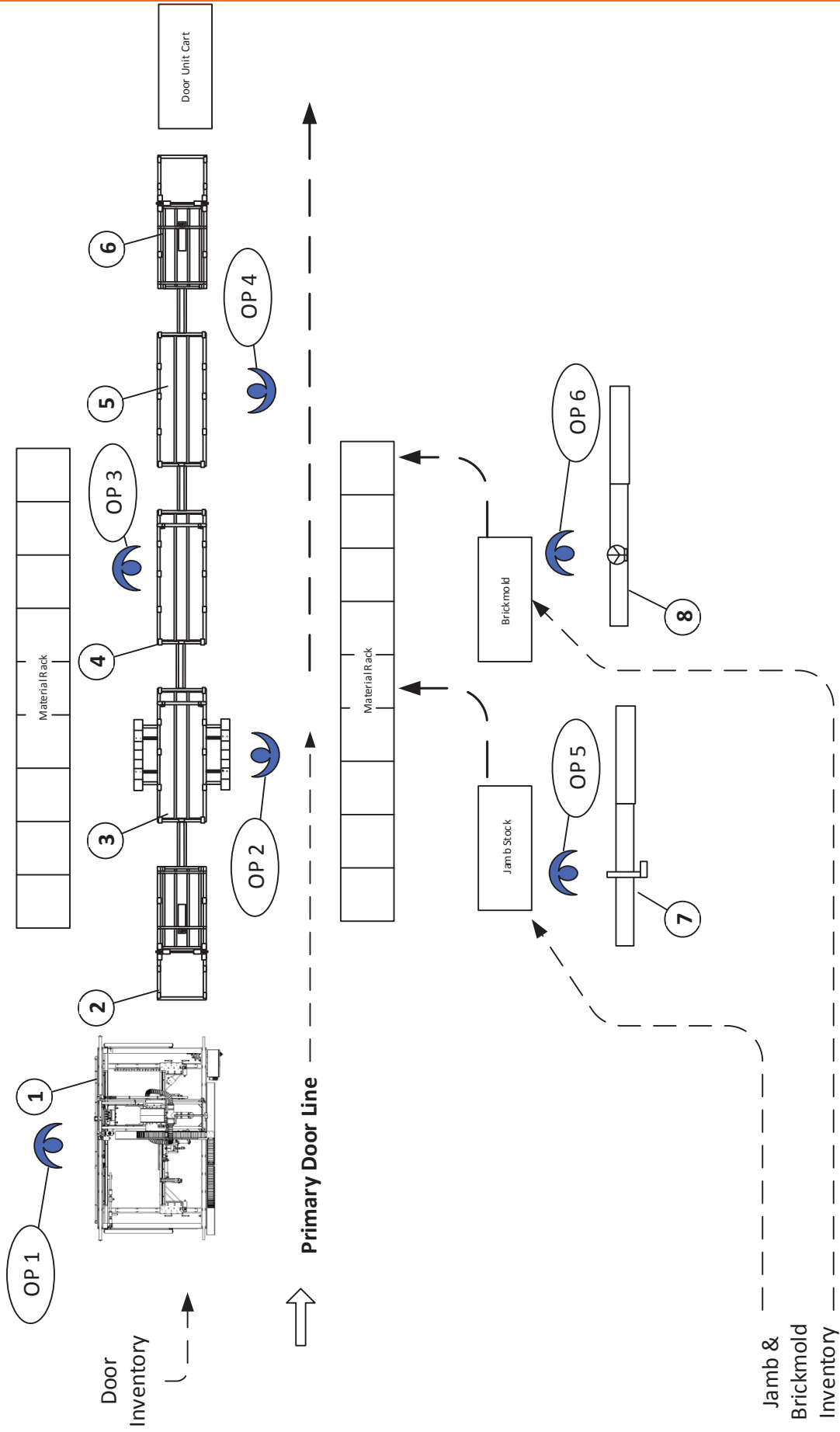
4,950 Square Feet

#### **Approximate Electrical Requirement**

20 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

#### **Approximate Air Supply**

5 C.F.M. @ 90 P.S.I.



4800 / Time Fold Line

---

## **Steel and Fiberglass door lite cut-out and assembly (200 + Doors per Shift)**

### **Machinery**

- |                          |   |
|--------------------------|---|
| 1. 4900CNC               | Metal door window lite cut-out and lock preparation |
| 2. 530L                  | Door Loader   |
| 3. EDM                   | Door assembly system (EDM)                          |
| 4. Radial Arm Saw        | Cuts jamb and stop material to length               |
| 5. Miter/Casing Chop Saw | Cuts jambs, casing, and stop                        |

### **Machine Capacity Rate**

- |                           |   |   |
|---------------------------|---|---|
| 4900CNC Door Lite Machine | = | 200 + doors per day                       |
| EDM                       | = | 30-200 doors per day (depending on setup) |

### **Manpower Requirements**

#### **Operator 1**

4900 Operator machines metal door lite cut-outs and lock prep.

#### **Operators 2 and 3**

Metal Door Unit Assemblers assemble metal exterior door units.

#### **Operators 4 and 5 (Part Time)**

Part time special operations and modification workstations. Operators 1 thru 4 could perform these tasks as work load changes.

#### **Approximate Floor Space Requirement**

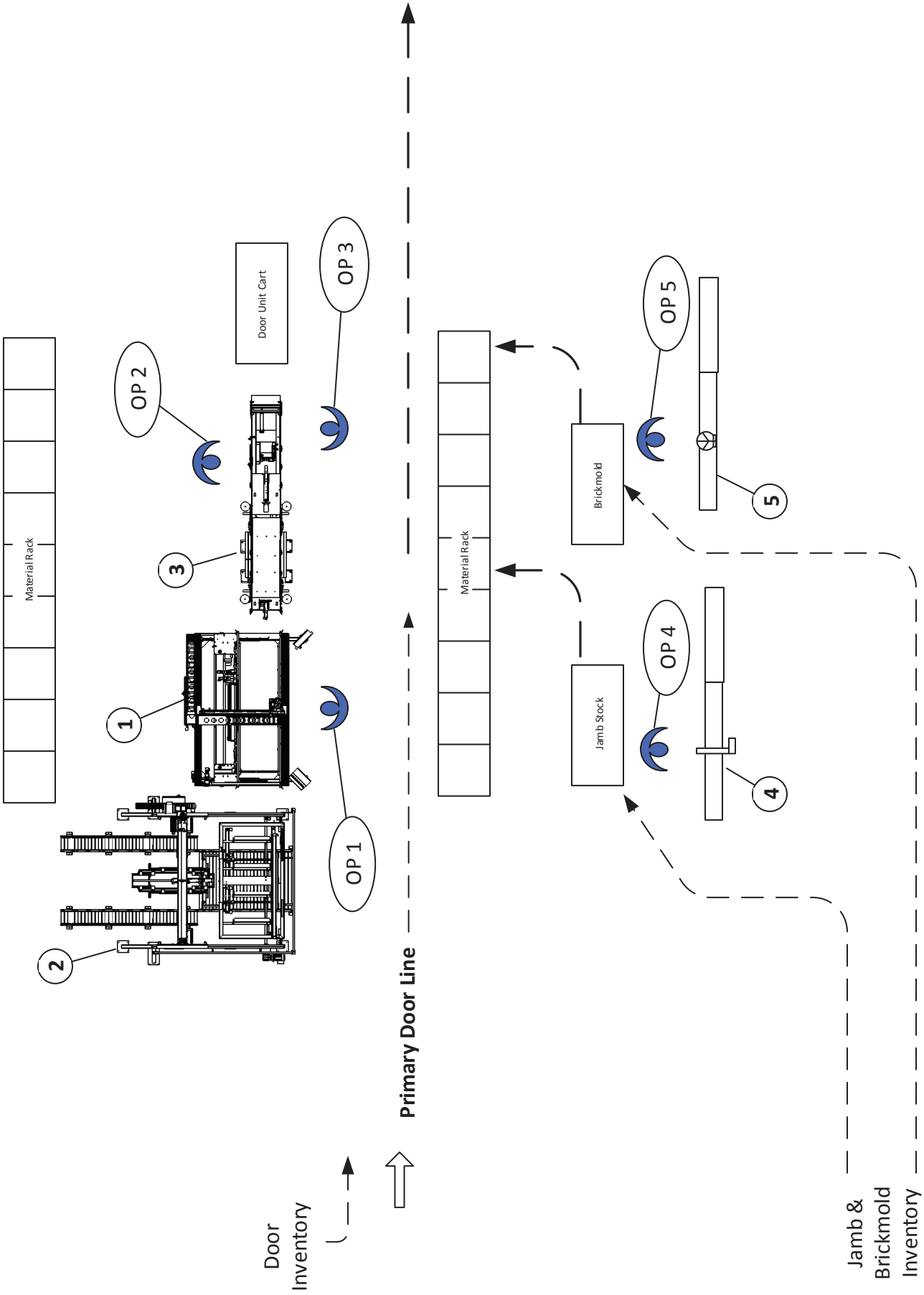
5,500 Square Feet

#### **Approximate Electrical Requirement**

85 Ams @ 230 Volt 3-Phase (Plus Vacuum Input )

#### **Approximate Air Supply**

36 C.F.M. @ 90 P.S.I.



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## **Steel and Fiberglass door lite cut-out and assembly (250 + Doors per Shift)**

### **Machinery**

- |                            |  |
|----------------------------|--|
| 1. 4900CNC                 | Metal door window lite cut-out and lock preparation    |
| 2. 530L                    | Door Loader  |
| 3. Eagle                   | Automated door machine - (hinge mortise & application) |
| 4. EDM                     | Door assembly system (EDM)                             |
| 5. 360S                    | Door Rotating and Unloading                            |
| 6. Radial Arm Saw          | Cuts jamb & stop material to length                    |
| 7. Miter / Casing Chop Saw | Cuts jambs,casing and stops                            |

### **Machine Capacity Rate**

- |                           |   |   |
|---------------------------|---|---|
| 4900CNC Door Lite Machine | = | 200 + doors per day                       |
| EDM                       | = | 30-200 doors per day (depending on setup) |

### **Manpower Requirements**

#### **Operator 1**

4900CNC Operator machines metal door lite cut-outs and lock prep.

#### **Operator 2**

Eagle

#### **Operators 3 and 4**

Metal Door Unit Assemblers assemble metal exterior door units.

#### **Operators 5 to 8 (Part Time)**

Part time special operations and modification workstations. Operators 1 thru 4 could perform these tasks as work load changes.

#### **Approximate Floor Space Requirement**

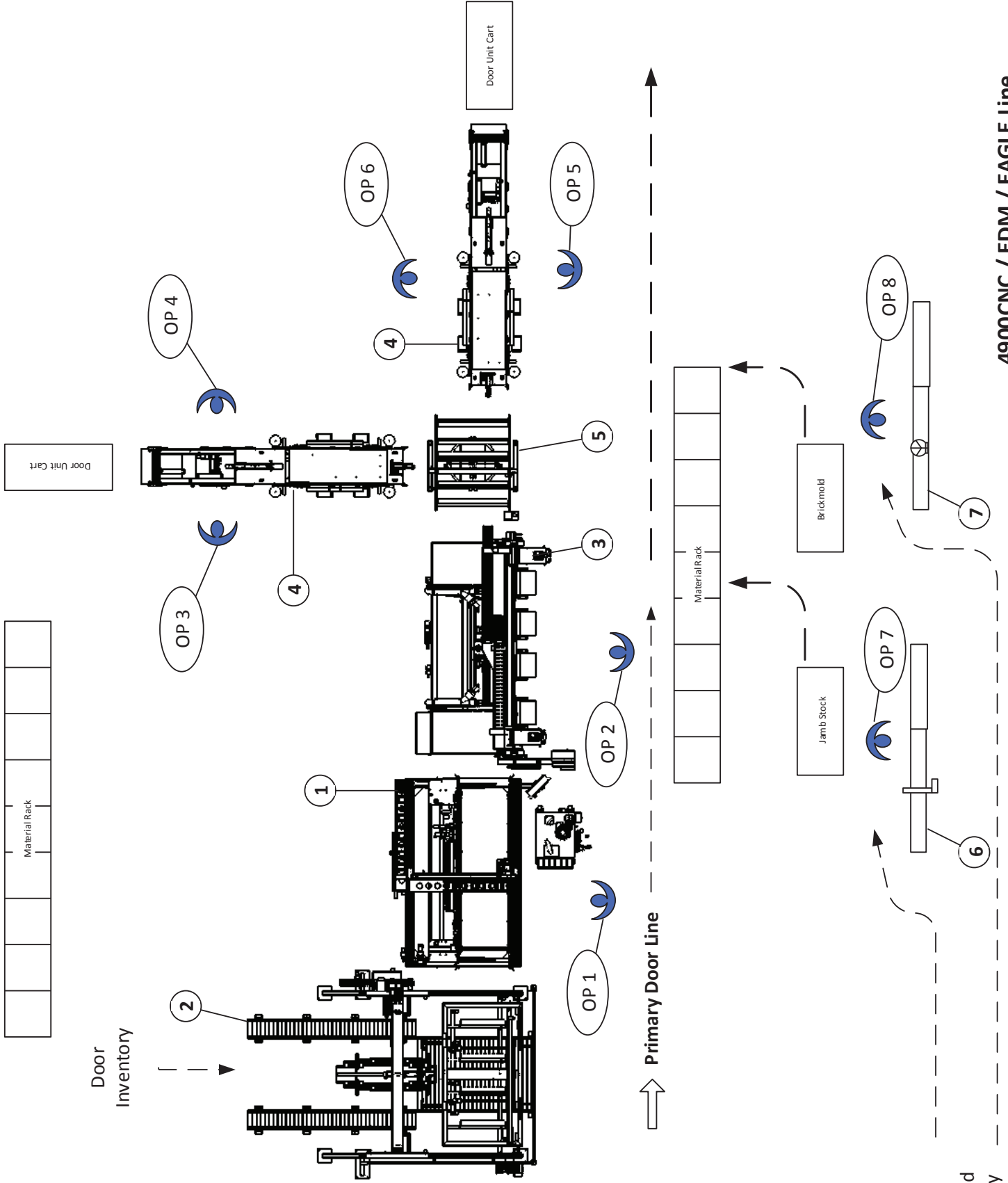
6,000 Square Feet

#### **Approximate Electrical Requirement**

125 Amps @ 230 Volt 3-Phase (Plus Vacuum Input )

#### **Approximate Air Supply**

110 C.F.M. @ 90 P.S.I.



## Manual Prehanging Shop

<b>Tools</b>	Norfield P/N's
1. Workstation or work table	
2. Hingemaster Hinge Routing Fixtures	MFG56015
3. Door stand	MFG200
4. 1-1/2 HP Router	DEW616
5. 1/2 " Cordless Screwdriver	DEW980
6. Planer	BOS1594
7. Slick plane	WOO1100
8. Lock Boring Kit	TEM101
9. Strikemaster Strike Jamb Routing Kit	TNS200
10. Table Saw	
11. Miter Chop Saw	DEW705
12. Radial Arm Saw	
13. Staple Guns	
14. Material Racks and Carts	
15. Work Benches	

### Capacity Rate

5 doors per hour

### Manpower Requirements

2 people

### Operator 1

Performs all machining operations to the doors and hinge jambs. Also takes the blank doors and hinge jambs from carts and performs all the machining operations including hinge butt application; places the door with the hinge jamb attached near the assembly tables.

### Operator 2

Machines the strike jamb, assembles frame and applies casing to complete the door unit. The door and hinge jamb are placed on the assembly table where the head jamb and strike jamb are stapled in. Casing is applied and the completed unit is stacked in a completed unit cart.

### Approximate Floor Space Requirement

1,500 Square Feet

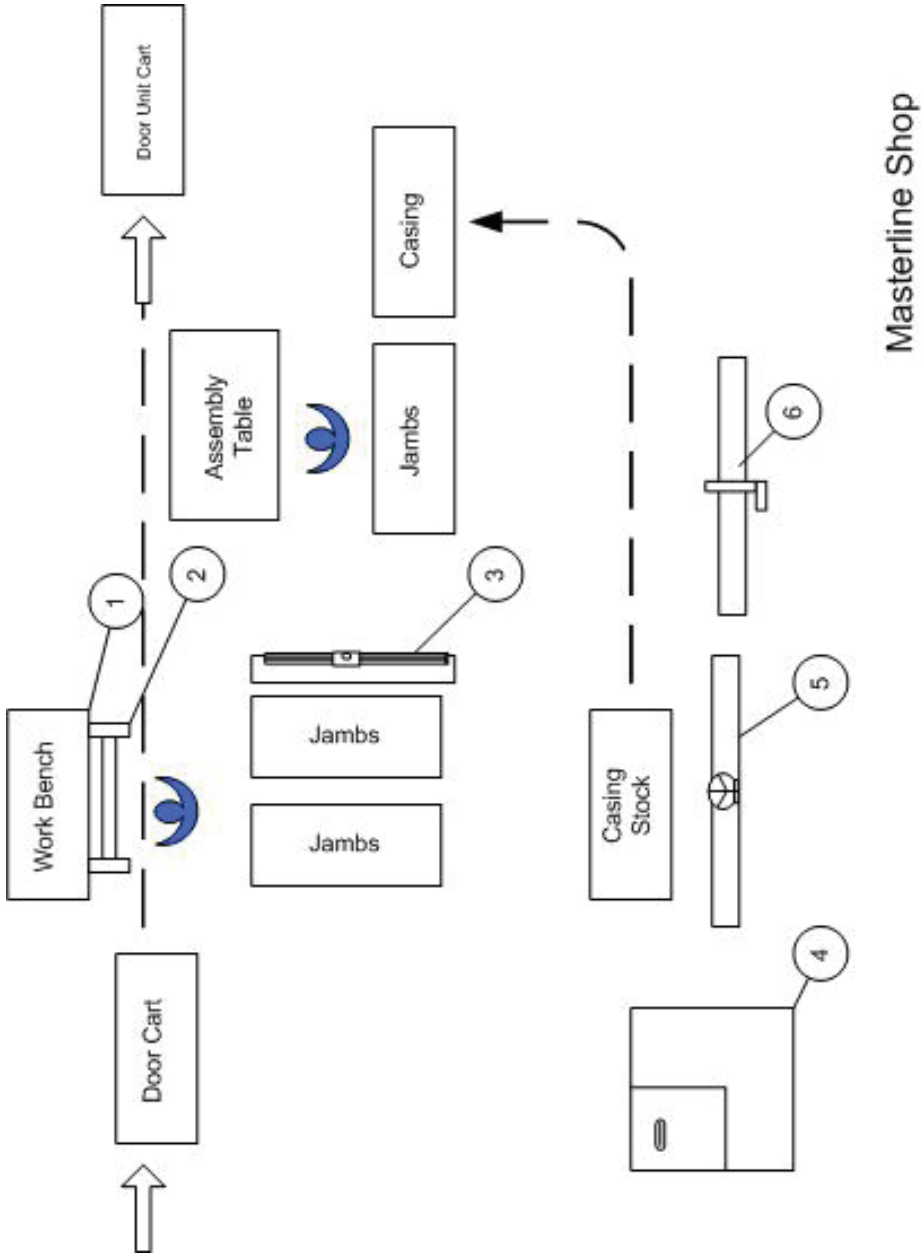
### Approximate Electrical Requirement

30 Amps @ 115 Volt 1-Phase  
(Does Not include any Vacuum)

### Approximate Air Supply

10 C.F.M. @ 9



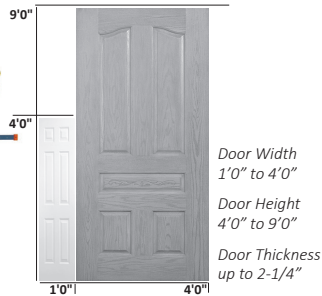


Masterline Shop

# PREHANGING SYSTEMS

## MAGNUM LINE

### E SERIES MAGNUM



#### FEATURES

- Automatic face plate routing
- Quick change backset 2-3/8" & 2-3/4"
- Quick change 3-1/2 degree hinge mortise
- Bolt on wear surfaces
- Machine doors from 4' to 9' tall and from 1' to 4' wide
- Raised molding compatible
- One 8' (for doors up to 8') and one 9' integrated stop systems for quick change between pre-set hinge patterns

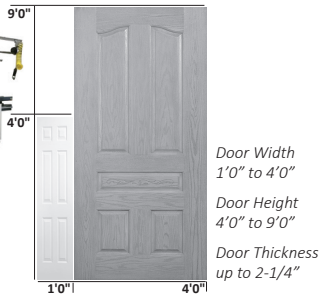
- Partial lock boring for door pulls
- Pneumatic jamb lift adjustment to ensure a perfect fit
- Insert cutters for low cost cutting blade replacement
- Self-centering butt router for easy hinge mortising
- 3.5° beveler/sizer
- Variable speed power feed allows for soft and hardwood doors
- Infinite door width adjustment
- Beveler/sizer bypass

## OR

### MAGNUM SYSTEM

#### FOR PREHANGERS WHO SPECIALIZE IN CUSTOM LINES

#### DOOR SPECS



#### FEATURES

- Raised molding compatible
- Two 8' (for doors up to 8') and one 9' integrated stop systems for quick change between pre-set hinge patterns
- Scaled index bar for door matching and special hinge patterns
- Pneumatic jamb adjustment to allow for perfect fit
- 3.5° faceplate mortising for beveled doors
- Self-centering router for easy hinge mortising
- 3.5° beveler/sizer and 3.5° hinge mortising
- Variable-speed powerfeed for soft & hardwoods
- Combination door jamb stop
- Partial lock boring for door pulls
- Insert cutters for low-cost replacement
- Dust collection plumbing for safety
- Upgrade options available

**OPTIMUM SPEED/SHIFT: Up to 200 doors**

#### VERTICAL LINE SYSTEM COMPONENTS SIGNATURE SERIES MAGNUM MAGNUM LOADER MAGNUM UNLOADER



### MAGNUM LOADER

#### FEATURES

- 2,800 lb. capacity allows for stacks of the heaviest doors
- 48" stack height (including pallet) accommodates most house jobs
- Heavy-duty construction for long life
- Photo-eye automatically stages the next door
- Simple, operator-friendly controls



### MAGNUM UNLOADER

#### FEATURES

- Non-marking rollers
- Foot pedal activation
- Tilts 90° vertical to horizontal
- Connector bracket



**CAN ALSO ADD TO  
MAGNUM LINE:**

**8900**

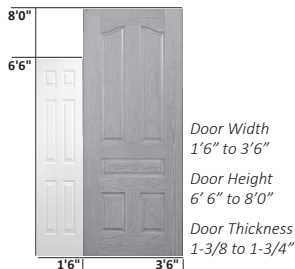
**4100AC**

## EAGLE LINE

### EAGLE SYSTEM

#### FOR PREHANGERS REQUIRING AUTOMATION, SPEED AND VERSATILITY

#### DOOR SPECS

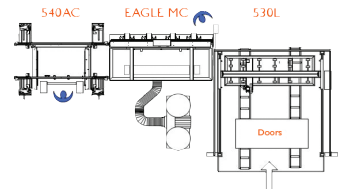


#### FEATURES

- 7" touchscreen controls with on-screen diagnostics & help screens
- Integrated system control
- One-touch change between A & B hinge patterns
- Raised molding ready
- Auto door position and door feed
- Auto width indexing
- Flush hinge-mortising on double beveled doors
- Interior/exterior ready for both wood and fiberglass
- Centrally located ergonomic controls
- Non-marking rubber rollers
- Dust collection plumbing for safety
- Upgrade options available

**OPTIMUM SPEED/SHIFT: Up to 400 doors**

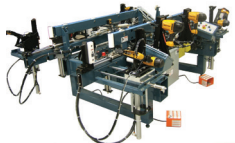
#### HORIZONTAL LINE SYSTEM COMPONENTS EAGLE MC 560 SIZER/BEVELER 530 LOADER 540 ASSEMBLY CENTER



### 540AC ASSEMBLY CENTER

#### FEATURES

- Ergonomic operator controls
- Foot pedal operation
- Extended header clamps for secure clamping
- Auto width adjustment
- Adjustable staple patterns
- Manual sequential control allows operator to step forward & backward through the machine cycle
- Split jamb capability



### 560SB SIZER BEVELER

#### FEATURES

- System integration for touchscreen control from Eagle MC
- Quick change between two undercut settings
- Raised molding capable
- Adjustable powerfeed wheels
- Vacuum ready
- Auto width index
- Electronic calibration



### 530L SINGLE STACK LOADER

#### FEATURES

- Safety cage for complete operator safety (not shown)
- Minimal air requirements for economical and quieter operation
- Built in rollers for processing raised molding pre-finished and metal doors without marking
- Electric horizontal and vertical travel for smooth and adjustment free operation
- Infeed conveyor and pallet catch allows for staging multiple pallets
- Integrated control using the Eagle MC touch-screen



### 360S MATERIAL STAGING DEVICE

#### FEATURES

- Foot pedal activation
- Rotates 360°
- Tilts from 80° vertical to 0° horizontal
- Will maneuver a 200lb. door easily and smoothly
- Rollers glide material into place
- Built for years of rugged use



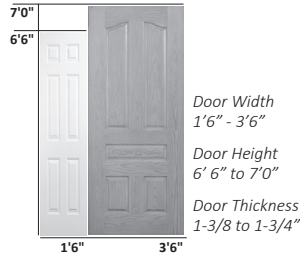
# PREHANGING SYSTEMS

## 5000 LINE

### 5000 SYSTEM

FOR HIGH-SPEED, HIGH-VOLUME PREHANGERS

#### DOOR SPECS



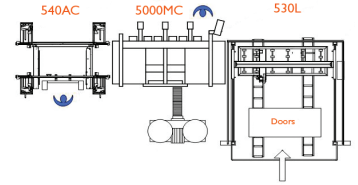
#### FEATURES

- Automatic door width adjustment
- Automatic door feeding, and positioning for right or left hand doors
- Automatic pre-drill for 3-1/2" hinges
- Automatic hinge application- operator places hinges on applicators
- Automatic 2-1/8" lock bore, latch bore and faceplate routing
- Center-mounted start controls ergonomically placed for operator
- E-stop with air dump releases pinch points and clamps for safety
- Door pull boring for closet doors
- Simplified sensors ensure reliability at higher operating speeds
- Machine clamps the door up for varying door thickness
- Simplified re-positioning of door for handling changes
- 7" operator touchscreen with graphical interface for ease of use

OPTIMUM SPEED/SHIFT: Up to 800 doors

### HORIZONTAL LINE SYSTEM COMPONENTS

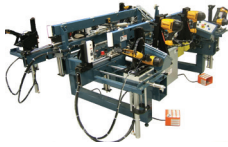
5000 MC  
530 LOADER  
540 ASSEMBLY CENTER



### 540AC ASSEMBLY CENTER

#### FEATURES

- Ergonomic operator controls
- Foot pedal operation
- Extended header clamps for secure clamping
- Auto width adjustment
- Adjustable staple patterns
- Manual sequential control allows operator to step forward & backward through the machine cycle
- Split jamb capability



### 530L SINGLE STACK LOADER

#### FEATURES

- Safety cage for complete operator safety (not shown)
- Minimal air requirements for economical and quieter operation
- Built in rollers for processing raised molding pre-finished and metal doors without marking
- Electric horizontal and vertical travel for smooth and adjustment free operation
- Infeed conveyor and pallet catch allows for staging multiple pallets
- Integrated control using the Eagle MC touch-screen



### 560SB SIZER BEVELER

#### FEATURES

- System integration for touchscreen control from Eagle MC
- Quick change between two undercut settings
- Raised molding capable
- Adjustable powerfeed wheels
- Vacuum ready
- Auto width index
- Electronic calibration



### 360S MATERIAL STAGING DEVICE

#### FEATURES

- Foot pedal activation
- Rotates 360°
- Tilts from 80° vertical to 0° horizontal
- Will maneuver a 200lb. door easily and smoothly
- Rollers glide material into place
- Built for years of rugged use

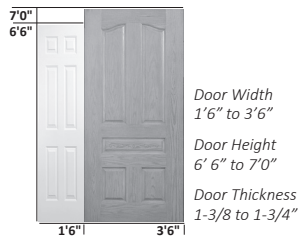


## 4000 LINE

### 4000 SYSTEM

FOR COST-EFFECTIVE PRODUCTION OF HOUSE PACKAGES

#### DOOR SPECS



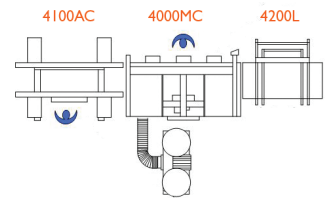
#### FEATURES

- Bottom-up clamping system, which accommodates both interior and exterior doors
- Underside lock drilling enables exit cut viewing for quality control
- Superior dust collection system
- Chip breaker to achieve crisp clean mortising
- Automatic lock, latch and faceplate machining
- Industrial grade material and parts for longevity

OPTIMUM SPEED/SHIFT: Up to 300 doors

### HORIZONTAL LINE SYSTEM COMPONENTS

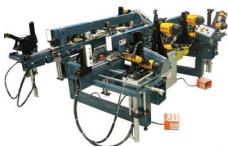
4000 MC  
4100 ASSEMBLY CENTER



### 540AC ASSEMBLY CENTER

#### FEATURES

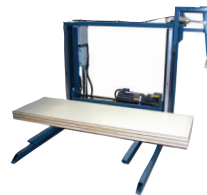
- Ergonomic operator controls
- Foot pedal operation
- Extended header clamps for secure clamping
- Auto width adjustment
- Adjustable staple patterns
- Manual sequential control allows operator to step forward & backward through the machine cycle
- Split jamb capability



### 4200L LOADER

#### FEATURES

- Automatic vertical indexing to position door at proper work height, eliminating adjustments
- Infinitely adjustable for stacking, de-stacking, loading or unloading of materials



### 360S MATERIAL STAGING DEVICE

#### FEATURES

- Foot pedal activation
- Rotates 360°
- Tilts from 80° vertical to 0° horizontal
- Will maneuver a 200lb. door easily and smoothly
- Rollers glide material into place
- Built for years of rugged use



# AUXILIARY MACHINERY

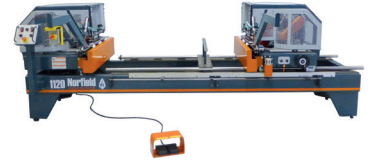
## 1120 AUTOMATIC CASING SAW HIGH SPEED PRODUCTION OF PREHUNG DOOR CASING LEGS AND HEADS

### DOOR SPECS

Casing Jamb and Brick Mold	
• Width	1" to 4-1/2"
• Thickness	3/8" to 1-1/2"
Undercut/sill cut angle	0° to 10°
<b>AVE. CYCLE TIME:</b>	25 piece/minute

### FEATURES

- Top-down saw stroke
- Pre-set length adjustment
- Foot pedal cycle start/stop
- Powered angle adjustment
- Standard dust collection shrouding
- Easy-load hopper feed



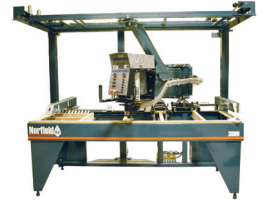
## 3800 DOOR LITE MACHINE THE INDUSTRY'S MOST RELIABLE DOOR LITE MACHINE

### DOOR SPECS

• Door height	6'6" to 8'0"
• Thickness/width	1-3/4" thick / 4'0" wide
• Lock bore sizes	1-1/2" to 2-1/8"
• Lock backset	2-3/8" to 2-3/4"
• Faceplate width	Adjustable to 1-1/8"
• Faceplate length	Adjustable to 2-1/2"

### FEATURES

- Eight location clamping system provides a firm grip on the door
- Adjustable RPM speed control accommodates both wood and metal cutting
- Industrial air filter, dryer and regulator for long life
- Three location clamping actuation
- Protective Neoprene pads that protect the material from marring
- Upgrade options available



## 4800XP DOOR LITE MACHINE ENGINEERED FOR YEARS OF USE

### DOOR SPECS

• Door height	up to 8'0"
• Door width	10" to 3'6"
• Door thickness	1-3/8" to 2-1/4"
• Lock bore Sizes	1-1/2" to 2-1/8"
• Lock backset	2-3/8" to 2-3/4"
• Faceplate width	Adjustable to 1-1/8"
• Faceplate length	Adjustable to 2-3/4"

### FEATURES

- XY controls eliminate the need for templates when cutting square or rectangle door lites
- Template holder for round or oval door lites
- Adjustable RPM speed control accommodates both wood/fiberglass and metal cutting
- Industrial air filter, lubricator and regulator for long life
- Oscillating quill for greater bit life



## 8900 DEEP LOCK MORTISER DEEP LOCK MORTISING AND FACEPLATE ROUTING IN ONE MACHINE

### DOOR SPECS

• Door width	no limit
• Door height	6' 4" to 9'0"
• Door thickness	1-3/8" to 2-1/4"
• Pocket length	1" to 8"
• Pocket depth	n/a to 6"
• Pocket width	3/4" to 1-1/4"
• Faceplate length	1/2" to 8-1/2"
• Faceplate width	1" to 1-1/4"
• Faceplate depth	n/a to 3/8"

**AVG. CYCLE TIME:** 1-1/2 minutes

### FEATURES

- Edge processing ideal inline with Magnum or as a stand-alone
- Self-centering clamp compensates for different door thicknesses
- Quick-change setups for different sizes and depths of mortise
- No templates needed for faceplate routing
- Faceplate routing can be done with square to face of door or on a 3° bevel; change-over time approximately 15 seconds
- Doors greater than 8'-0" can be processed using a layout line system
- Programmable logic controller improves safety and reliability
- Infinite adjustment capability



## BALL CATCH MACHINE LOW COST STAND ALONE SOLUTION FOR DRILLING BALLCATCH

### DOOR SPECS

• Door width	1'0" to 4'0"
• Door height	2'0" to 9'0"
• Door thickness	1-3/8" to 1-3/4"
• Ball catch drill dia.	3/4", 7/8", 15/16", 1"

### FEATURES

- Quick change drill locator (no tools required)
- Pneumatic door clamping with foot valve
- Self centering drill guide (1-3/8" & 1-3/4")



## EXTERIOR DOOR MACHINE INSERTS DOOR LITES INTO DOORS, ATTACH JAMBS & MOULDING

### DOOR SPECS

• Door width	2'-6" to 3'0"
• Door height	6'-8" to 8'0"
• Door thickness	1-3/4"

**ASSEMBLY TIME:** Under 3 minutes

### FEATURES

- Inserts door lites into doors
- Attaches jambs and moulding
- Used to assemble door frames
- Tool trays for supplies
- Raises and flips door
- Tilt arm raises door to vertical position for easy off loading
- Locking level for adjustable jamb support height
- Corner support for head jamb and sill plate installation



## TIME FOLD SERIES METAL DOOR ASSEMBLY WITH LITE INSERTION IN LESS THAN THREE MINUTES

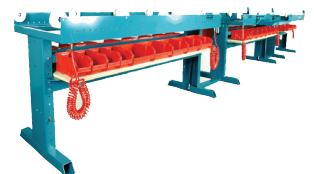
### DOOR SPECS

• Door width	2'-6" to 3'0"
• Door height	6'-8" to 7'0"
• Lock bore sizes	1-1/2" to 2-1/8"

**ASSEMBLY TIME:** Under 3 minutes

### FEATURES

- Work content is easily balanced among all personnel on the line
- Materials are available at each location to facilitate consistent work flow
- Tools are stored on units and are easily accessible
- Upgrade options available



# JAMB MACHINERY

## 250M STRIKE/JAMB ROUTER FAST, VERSATILE AND 9-FOOT JAMB-READY

### DOOR SPECS

Material	Max
• Width	no limit
• Length	up to 9' 0"
• Thickness	to 1-5/8"

Process any strike up to 4-7/8" long, including T-strike

**MAX. CAPACITY:** 30 cycles/minute

### FEATURES

- Processes more than 75 types of strike plates with quick change template system
- Adjustable deadbolt stop system to accurately place the deadbolt bore
- Processes any strike up to 4-7/8" long, including T-strike
- Includes 2-1/4" – 1/4R full lip template and 2-3/4" – 1/4R deadbolt template
- Upgrade options available



## 250MX STRIKE JAMB ROUTER FAST, VERSATILE AND 9-FOOT JAMB-READY

### DOOR SPECS

Material	Max
• Width	no limit
• Length	up to 9' 0"
• Thickness	to 1-5/8"

Can machine a two feature combination, up to 6-1/2"

**MAX. CAPACITY:** 12 cycles/minute

### FEATURES

- All existing 250M templates can be used on the 250MX
- Operator has router power control through a dual thumbswitch setup mounted in the router handle.
- Quick change stop position to go from 6-8 to 8-0 jams without using tools
- Frame legs are adjustable
- Upgrade options available



## 350H HINGE JAMB ROUTING STATION PROCESS DOOR AND JAMB FOR HINGES IN ONE PASS

### DOOR SPECS

• Door width	1'0" to 3'6"
• Door height	to 8'0"
• Door thickness	1-3/8" to 1-3/4"
• Hinge size	3-1/2" to 5"
• Jamb width	2-1/2" to 10-1/2"
• Jamb length	to 8,0"
• Jamb thickness	3/8" to 1-1/2"

**AVG. CYCLE TIME:** 30 seconds

### FEATURES

- Pneumatic jamb adjustment to ensure a perfect fit
- Single point dust collection plumbing
- Self-centering butt router for easy hinge mortising
- Cycle time varies with material type- typical cycle time is 30 seconds
- Magnum-style hinge jamb routing
- Index bar with integrated stop system for different hinge patterns
- Quick-change setup for different hinge sizes



## 450 FLOW-THROUGH STITCHER VERSATILE AND 9-FOOT JAMB-READY

### DOOR SPECS

• Jamb width	3-1/2" to 8"
• Jamb thickness	7/16" to 7/8"
• Stop width	1" to 2"
• Stop thickness	1/4" to 5/8"
• Reveal	1-7/16" to 1-13/16"
• Staple spacing	2" from top and 3" from bottom of stop

with 10-1/4" between staples or finish nails in standard mode.

**AVG. CAPACITY:** 12 cycles/minute

### FEATURES

- Foot pedal activation
- Mounts for standard capacity guns
- Non-marking rubber wheels
- Adjustable mode allows for custom staple spacing
- Upgrade options available



## 440S MANUAL STOP STITCHER

### DOOR SPECS

• Jamb length	up to 100"
• Jamb width	3-1/2" to 10"
• Jamb thickness	3/8" to 3/4"
• Stop width	1" to 2"
• Stop thickness	1/4" to 3/8"
• Reveal	1-7/16" to 1-13/16"

**AVG. CAPACITY:** 5 units/minute

### FEATURES

- Foot pedal activated clamps to hold material in place
- Adjustable gun mount for left or right-handed operator
- Easily adjustable reference stops.
- Includes BT1855 Stanley bosch gun



## 1700HJR HINGE JAMB ROUTER CAPABLE OF MACHINING UP TO 8 JAMBS PER MINUTE

### DOOR SPECS

• Hinge specs	3" to 4-1/2"
• Jamb length	70" to 96"
• Jamb width	2-1/2" to 10-1/2"
• Jamb thickness	1/2" to 1-5/8"

**AVG. CAPACITY:** 8 jams/minute

### FEATURES

- Quick change hinge locations
- Accommodates a variety of jamb widths and lengths
- Foot pedal operation for ease of use
- Dust collection ready for operator safety
- Mortise hinges from 3" to 4-1/2"



## 2300 AUTOMATIC STRIKE ROUTER WILL MEET THE NEEDS OF THE HIGHEST VOLUME DOOR SHOP

### DOOR SPECS

• Strike plate type	Full lip only
• Strike plate sizes	2-1/4" to 3"
• Jamb length	70" to 96"
• Jamb width	2-1/2" to 10-1/2"
• Jamb thickness	3/8" to 1-1/2"

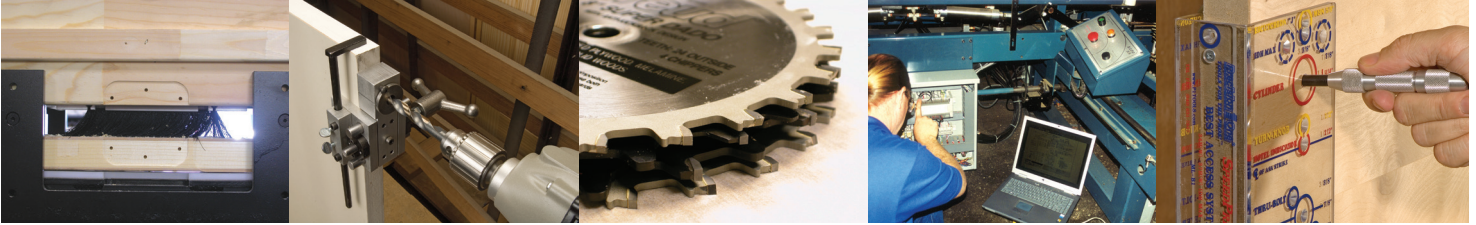
**AVG. CAPACITY:** 5 cycles/minute

### FEATURES

- Infinitely adjustable jamb stops
- Accommodates a variety of jamb widths and lengths
- Foot pedal operation for ease of use
- Dust collection ready for operator safety
- Adjustable strike plate sizes from 2-1/4" to 3"
- Automation allows the operator to multi-task



# Machinery · Tools · Supplies · Service



## MACHINERY

Norfield has focused on the design and manufacture of quality pre-hanging machinery since 1959. Our goal has been to continue to serve this ever-changing industry by providing machinery that offers greater flexibility. We are also responding to your need to meet condensed production times by designing high-speed pre-hanging machinery. Our manufacturing standards remain at the superior level that is a hallmark of Norfield machinery.

## TOOLS

As your supplier, we understand the demands the market places on specialization. For instance, we have tools that allow you to make ADA compliance simple, tools that will ensure greater accuracy for many applications, and tools that will help speed up your processes. And some of them are only available from us. We demand the same high quality of production when we build these specialized tools for you.

## SUPPLIES

Norfield's commitment to you includes having over 3,000 machinery parts and pre-hanging supplies available to you at the fastest possible speed. We run at a 98.9% stocking rate, so rest assured: what you need is usually on our shelves. If you place your order by 2:30 p.m. PST, we guarantee it for next-day delivery. For those of you with extensive needs, we also offer long-term *scheduled* deliveries of frequently used machine parts and supplies.

## SERVICE

In our desire to be your pre-hanging supplier of choice, we are dedicated to keeping your operation running at its optimum. We fully certify our Field Engineers to maintain and repair all Norfield machinery, as well as many others. To ensure a high and consistent level of service, you will be assigned an engineer from your area. This also reduces response times, in many cases to only hours. And our Field Engineers also stock an abundance of parts, further reducing your downtime.

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