



PRODUCT GUIDE

Hollow Metal Lead Lined Doors:

- Standard HM Door
- Fire Label HM Door – 20 minute Positive Pressure
- Fire Label HM Door – 45 minute Positive Pressure
- Fire Label HM Door – 60 minute Positive Pressure
- Fire Label HM Door – 90 minute Positive Pressure

These doors are constructed with a single sheet of lead located in the center of the door extended to all edges using steel stiffeners as support. Single Door: 4'0" x 10'0" - Pairs: 8'0" x 10'0"

Lead Lined Wood Doors:

- Core Clad type - constructed with the lead under each face 1/32" to 1/4" lead
- Core Clad Type – Constructed with particle-core construction or structural composite lumber (SCL) core construction with lead thickness from 1/32" to 3/8"
- 20 Minute Core Clad with **20 minute neutral or positive pressure labels** for doors with lead thickness up to 3/8". Single Door: 4'0" x 8'0" - Pairs: 8'0" x 8'0"

FIRE RATINGS:

- **20 Minute NP** – *Neutral Pressure*
- **20 Minute PP** – *Positive Pressure Category A*
- **20 Minute PPFM** – *Positive Pressure Category B*

45 and 60 minute special lead lined mineral core construction lead lined wood doors are available in either Positive or Neutral Pressure environments with lead thicknesses up to 1/4".
Single Door: 4'0" x 8'0" - Pairs: 8'0" x 8'0"

- 45 to 60 Minute - NP - Neutral Pressure
- 45 to 60 Minute - PP - Positive Pressure Category (A)
- 45 to 60 Minute - PPFM - Positive Pressure Category (B)

FIRE RATINGS:

- 45/60 Minute NP – *Neutral Pressure*
- 45/60 Minute PP – *Positive Pressure Category A*
- 45/60 Minute PPFM – *Positive Pressure Category B*
- Center Lead Doors – Adhesive Bonded Center Lead Particle Board Core – (When shielding levels require more than 3/8" thick lead, bolted center lead construction is used.)

- Center Lead Doors – Bolted Center Lead Particle Board Core – (When shielding levels require more than 3/8" thick lead, bolted center lead construction is used.)
- Single Door: 4'0" x 8'0". (Sizes greater than 8'0" high are subject to mill acceptance.)
- Pairs: 8'0" x 8'0" (Sizes greater than 8'0" high are subject to mill acceptance.)

Options:

- Door Vision lite openings:
- Vision Lite Kits are available in both metal and wood. Lites are available on doors with lead to 1/8" maximum on labeled doors. Total area of the cut out cannot exceed 40 percent of door area (30" wide or 54" high maximum). 1,296 sq. in. maximum clear lite. Double glazing (lead glass/labeled wire glass) is required for all labeled doors.
- Can be supplied with a variety of wood veneers or plastic laminates
- Single doors or double paired doors with astragal - A lead lined astragal is installed as a part of the shielding system in a pair of doors. The astragal is a device to hold shielding lead in the space between the meeting stiles of the pair of doors to prevent direct radiation from passing through the space. It also shields over flush bolt locations for center lead doors

Hardware

We provide a complete line of door hardware that can be used on our lead lined doors, including locks, hinges, pivots, door closers, protection plates, etc. We stock Rixson L147xML19x26D pivots for 1 3/4" doors, Pemko CFM83SLFHD1 aluminum continuous hinges and Lead lined Yale 3501-Aluminum Closers. We are also able to lead line locks from various manufacturers to match your project requirements.

Options:

- **Hinges:** Pivot, Continuous or butt hinges
- **Locks, Strikes & Flushbolts:** Mortise / Cylindrical – (*Hospital Latch included*)- Surface Vertical Rods & RIM Exit Devices – (*Concealed Vertical Rods are not allowed*) - Unit Lock - Standard Strike & Electric - Top & Bottom Flush bolts & Fire Pins
- **Additional Preps:** Raceway / EPT / Magnetic Switches - Mortised Over-head Holders / Mortised Automatic door bottoms - Additional preps are available

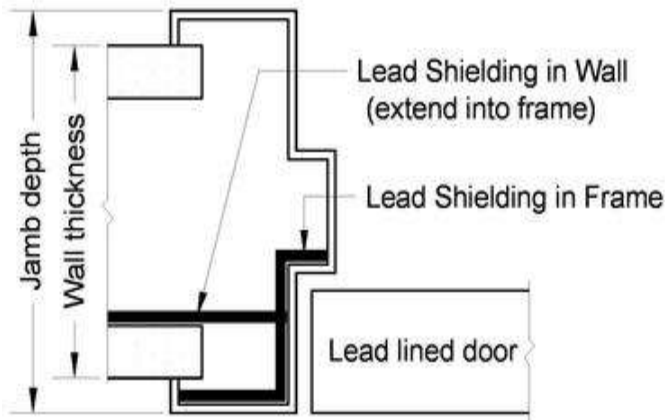
Hollow Metal Lead Lined Frames:

- Welded with lead thickness from 1/32" to 3/4" as required
Maximum Sizes: Single - 4'0" x 12'0" or Pair - 8'0" x 12'0"
- Knock Down with lead thickness from 1/32" to 1/8" as required
The Knock Down version is commonly used in existing walls.
Maximum Sizes: Single - 4'0" x 12'0" or Pair - 8'0" x 12'0"

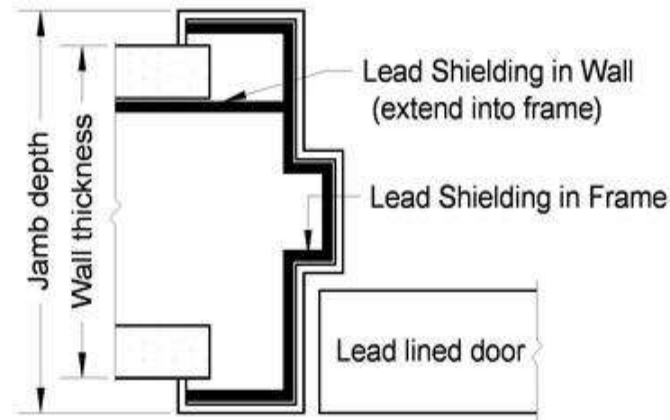
Door frames are normally lead lined on the door side of the jamb if the lead in the wall is on the same side of the partition (**refer to our Type 1 detail**). But if the lead door and the lead in the walls are on opposite sides, then the entire frame needs to be lead lined (**refer to our Type 2 detail**). This eliminates any risk of

a radiation leakage at the stop of the frame if the radiation is emitted from the machine at a direct angle to the door frame.

These frames are normally welded and we recommend using welded frames when possible. However, there are instances such as with existing construction where installing welded frames is not feasible. For those occasions, the door frames can be supplied as knock down if the lead thickness is less than or equal to 1/8".



TYPE 1 FRAME



TYPE 2 FRAME

Hollow Metal Lead Lined Window Frames:

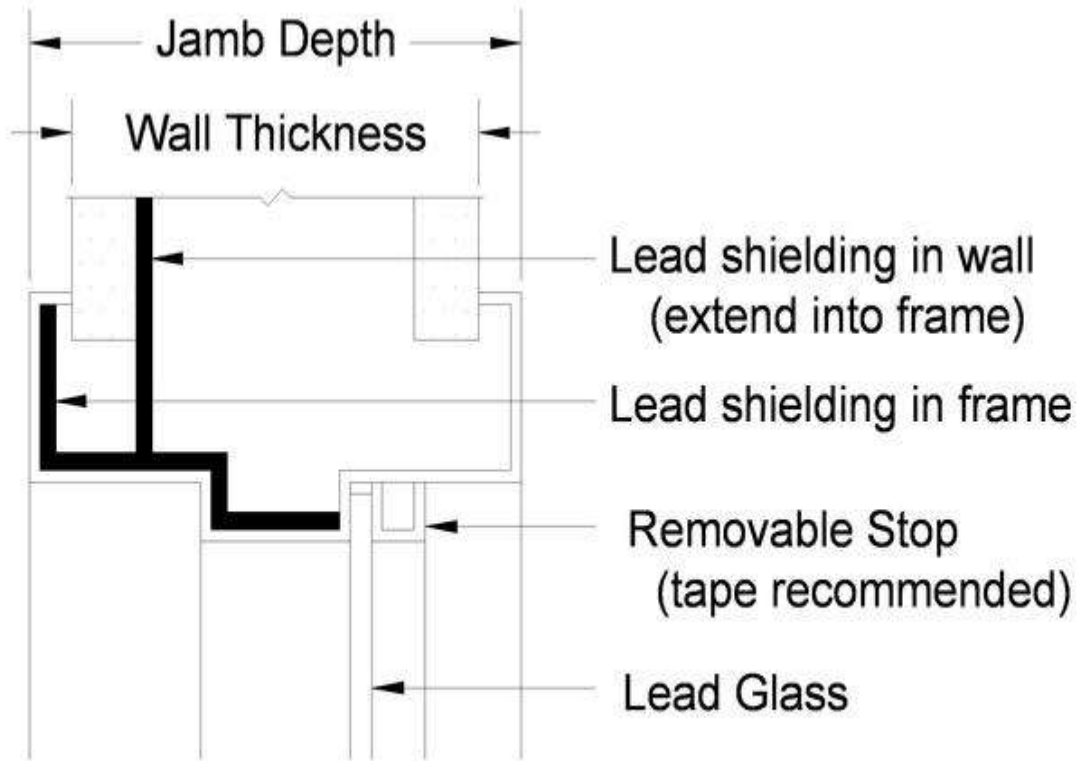
- Welded Hollow Metal Frame: It is designed for new construction - ***Simplest and most economical***

Maximum Sizes: 4'0" x 8'0" (Max glass size offered)

Slip-type or split-type Hollow Metal Frame: is a two-piece frame that "plugs" together into a rough opening after the wall is finished and is *ideal for existing construction*. Each frame is designed for a specific wall thickness and is secured with screws after both pieces are inserted into the opening. These frames are lead-lined to match the shielding level of the wall where they are installed.

Maximum Sizes: 4'0" x 8'0" (Max glass size offered)

Window Frames normally have lead on the radiation source side of the partition see below. They are typically fixed welded units, but they can be supplied as a two-piece slip type if the wall must be framed prior to the window frame's arrival on site or if they are to be installed into an existing partition.

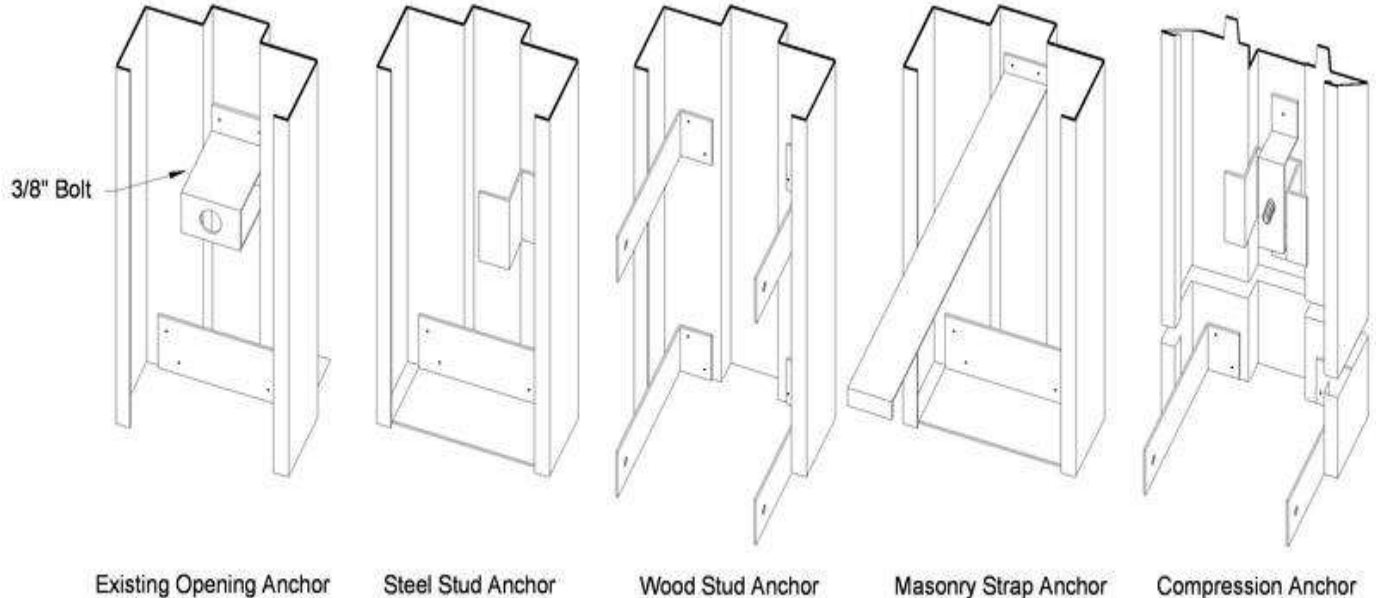


Lead Lined Window Frame Detail

Lead Lined Frames can have many of the same anchors as non lead lined frames. See below for some typical anchors for our lead lined frames.

Note: Lead is not shown for clarity.

Note: Bolts Supplied with UL Labeled Frames



TYPICAL ANCHORS FOR LEAD LINED FRAMES

The lead thickness required for frames must meet or exceed the shielding requirements as defined by the project physicist. ***We offer lead thicknesses starting at 1/32" up to 1/2"***. Our standard frames are primed 16 gage cold rolled steel. Heavier lead applications (for 1/4" lead and greater) may require 14 or 12 gage steel.

Positive Pressure Fire Labels (New Page – linked from the Product Guide)

Evolution and Explanation of Positive Pressure

The 1997 revision of the Uniform Building Code (UBC) includes a requirement for Fire Door Assemblies to be tested in a manner which more closely duplicates observations made in room fire experiments and which also corresponds to the test levels already specified in most international jurisdictions.

When a fire starts in a closed room, heat generated causes gases to rapidly build and expand. This creates a "positive" pressure in the room and this pressure attempts to force smoke and gas out of the area. The hot gases also tend to rise.

Once the fire is fully developed, the pressure differential between the inside of the room and outside reaches an equilibrium where negative pressure in the room exists in the lower part of the room and positive pressure exists above that. The area where these two meet is generally called the "Neutral Pressure Plane".

In the United States, this neutral plane is considered to be located at 40 inches above the floor for door assemblies and is consistent with observations made during room testing. In fact, door tests require that the test chamber be neutral in pressure as the test begins and that the neutral plane be elevated in the test

chamber in the first few minutes of the test to be at 40 inches above the door within four minutes after the test is initiated. This simulates the behavior of a fire beginning in a room and becoming fully involved in four minutes.

The UBC test standard that applies is UBC 7-2-1997, Part I (UL-10C).

Positive Pressure and Wood Doors

The positive pressure inside the test room creates a technical challenge for wood doors in particular. The pressure tends to drive hot gases out of the room between the door and its frame, requiring in most designs special treatment on stiles and the top rail.

It is possible to seal the door to frame gap with an intumescent material, a compound which expands under heat to fill the gap and prevent hot gases from causing the door to fail at its edges. A number of manufacturers offer this material.

MarShields Experience in Positive Pressure Labeling

MarShield offers successfully tested both Category A and Category B lined wood doors in 20 minute ratings, as well as 45 and 60 minute ratings.

Pairs of lead lined doors require a lead lined astragal to shield against radiation leakage at the meeting stiles. This area is especially vulnerable in fire. MarShield designs have successfully passed a 20 minute test with a wood lead lined astragal by incorporating intumescent material in the stile of one of the doors. In a fire, the intumescent expands at the meeting stiles just as it does between the hinge stile and top rail and the metal frame. This system is used by MarShield for all three types of 20 minute pair labels: Neutral Pressure as well as Positive Pressure Categories A and B. It is also possible to use a listed metal edge and lead lined astragal, and some customers prefer this approach. In this case, intumescent material must be applied to the metal edge of one leaf for Positive Pressure Category A and B doors only.)

For 45 minute and 60 minute pairs, a lead lined metal edge and astragal must be used.

This type of labeled door, if properly designed, constructed, and tested can be listed for use with almost all types of listed door hardware. See the ITS-Warnock Hersey listings for hardware exclusions by manufacturer.

Door weight is a special consideration for lead lined doors and the use of pivot type hinges is common. Pivot hinges transfer some of the door weight to the floor, reducing stress on the frame and its attachment to the building. MarShield has 20 minute, 45 minute and 60 minute PP listing in both Category A and B for pivots, earned through specific testing. Continuous hinges are also made for this high door weight and are listed for Positive Pressure installations