DE LA FONTAINE

Imagine. We realize.

- PRODUCTS
- FRAME SELECTION
- DOORS SELECTION
- CONTACTS

PRODUCTS

- Materials
- Standards compliance
- Comparison with wood and aluminum doors and frames
- Product development
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- Installation
- Installation of knockdown frames
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Materials

MATERIALS

There are 4 types of carbon steel commonly used in the hollow metal door and frame industry:

- Cold rolled steel: Not corrosion resistant. Must be protected with rust inhibitive primer.
- Galvanized steel: Cold rolled steel with a zinc coating, for corrosion resistance (G designation). Should be primed.
- Galvannealed steel: Heat treated hot dipped galvanized steel with a zinc-iron coating (A designation). Suitable for immediate painting after normal cleaning.
- Stainless steel: Contains more chromium and nickel which offer high corrosion resistance.

De La Fontaine does not use cold rolled steel. Since the primer on cold rolled steel hollow metal doors and frames can be scratched easily at the jobsite, this leaves the substrate steel without corrosion protection. Our standard material is hot dipped galvanized steel which offers better corrosion resistance than primed cold rolled steel. This means a longer life-time for the door opening and less maintenance for the end user.

RECYCLED CONTENT:

The galvannealed steel from our supplier is made of approximately 58% of recycled steel. The post consumer content is 20% and the post industrial content is 25%. The balance of 13% is comprised of home scrap which is internally generated scrap from the steel processing operations.

The stainless steel from our supplier is made of approximately 80% of recycled content. The post consumer content is 20% and the post industrial content is 50%. The balance of 10% is comprised of home scrap.

REFERENCES:

ASTM A 240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dipped Process.
NAAMM/HMMA 802: Manufacturing of Hollow Metal Doors and Frames
ISSF: International Stainless Steel Forum
SRI: Steel Recycling Institute
NAS: North American Stainless
ArcelorMittal Dofasco

Materials

BACK TO MENU

PRODUCTS & SOLUTIONS:

A 40 Galvannealed	Hot dipped galvanized steel, with a zinc-iron alloy coating.
	Info: 0.40 ounce of zinc per square foot, total on both sides of metal sheet. **Recommended application:** Interior openings. **Benefit:** Corrosion resistance for masonry wall applications. **Limitation:** Not recommended for exterior openings. **Comment:** Suitable for immediate painting after normal cleaning.
A 60 Galvannealed	Hot dipped galvanized steel, with a zinc-iron alloy coating.
	Info: 0.60 ounce of zinc per square foot, total on both sides of metal sheet. **Recommended applications:** Exterior or wet areas. **Benefit:** Corrosion resistance for exterior applications. **Limitation:** None **Comments:** Suitable for immediate painting after normal cleaning. Slightly more expensive than A40 galvannealed steel.
G 90 Galvanized	Hot dipped galvanized steel, with a zinc coating.
	Info: 0.90 ounce of zinc per square foot, total on both sides of metal sheet. **Recommended applications:** Exterior openings near the ocean, highly corrosive environments. **Benefit:** Very good corrosion resistance. **Limitation:** Not immediately suitable for paint. Must be coated with a special primer. **Comments:** Spangled effect on steel. More expensive than A60 galvannealed steel.
Stainless Steel 304	Stainless steel, type 304, finish # 4 (satin finish).
	Info: Made of 18% chromium and 10% nickel. **Recommended applications:** Clean rooms (sterile), food processing installations, chemical plants, subways, esthetics. **Benefit:** High corrosion resistance. **Limitation:** Longer lead time required (3-4 weeks). **Comment:** 8 times the price of A 40 galvannealed steel.
Stainless Steel 316	Stainless steel, type 316, finish # 4 (satin finish).
	Info: Made of 17% chromium and 12% nickel. **Recommended applications:** Pool areas, water treatment facilities. **Benefit:** Maximum corrosion resistance. **Limitation:** Longer lead time required (3-4 weeks). **Comment:** 9 times the price of A 40 galvannealed steel.

Standards compliance

STANDARDS COMPLIANCE

We comply with the current version of the following standards:

NAAMM-NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

HMMA 810	Hollow Metal Doors
HMMA 820	Hollow Metal Frames
HMMA 831	Recommended Hardware Location for Hollow Metal Doors and Frames
HMMA 841	Tolerances and Clearances for Commercial Hollow Metal Doors and Frames
HMMA 850	Fire Rated Hollow Metal Doors and Frames
HMMA 860	Guide Specification for Hollow Metal Doors and Frames
HMMA 861	Guide Specification for Commercial Hollow Metal Doors and Frames
HMMA 866	Guide Specification for Stainless Steel Hollow Metal Doors and Frames
HMMA 867	Guide Specifications for Commercial Laminated Core Hollow Metal Doors and Frames

FIRE-RATED STANDARDS

NFPA 80	Standard for Fire Doors and Other Opening Protectives
NFPA 252	Standard Methods of Fire Tests of Door Assemblies
NFPA 257	Standard on Fire Test for Window and Glass Block Assemblies
CAN4-S104	Fire Test of Door Assemblies
CAN4-S106	Standard Method for Fire Tests of Window and Glass Block Assemblies
ANSI UL 10C	Standard for Positive Pressure Fire Tests of Door Assemblies
BS 476-22	Fire Test on Building Materials and Structures

ANSI-AMERICAN NATIONAL STANDARDS INSTITUTE

A115.1G	Specification for Hardware Preparation in Standard Steel Doors and Frames
A117.1	Manufacturing Tolerances Standard Steel Doors and Frames
A250.3	Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
A250.4	Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings
A250.6	Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
A250.8	Recommended Specifications for Standard Steel Doors and Frames
A250.10	Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
A250.13	Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies

ASTM-AMERICAN SOCIETY FOR TESTING AND MATERIALS

A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A240/A240M	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate,Sheet, and Strip for Pressure Vessels and for General Applications
C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
C1363	Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

SDI-STEEL DOOR INSTITUTE

100	Recommended Specification for Standard Steel Doors and Frames
112	Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames
118	Basic Fire Door Requirements

OTHERS

LEED-NC	Recycled content
IBC	International Building Code
NBC	National Building Code of Canada

Comparison with wood and aluminum doors & frames

Steel is commonly used in the construction industry. In this section, we would like to compare hollow metal to wood and aluminum doors and frames. We understand that specific products are sometimes required to meet specific applications but, hopefully, this chart will help the design professional in selecting the right product. The product performance is evaluated on different criteria, **number 1 rank being the best product**.

Criteria	Steel	Wood	Aluminum
Esthetic	3	1	2
Design options	2	1	3
Security	1	2	2
Durability	1	3	2
Fire rating	1	2	3
Sustainability	2	2	1
Weather resistance	2	3	1
Ease of maintenance	2	3	1
Ease of repair	1	3	2
Structural integrity (after installation of finished hardware)	1	3	2
Average	1.6	2.3	1.9

Overall, the hollow metal doors and frames perform better than the other products. De La Fontaine is now offering new products with design flexibility. You can add a distinctive touch to you projects and still get the benefits of steel. For more information, please refer to our *Promotional Brochures*.

In February 2012, SDI, HMMA and CSDMA sponsored a performance study of steel doors and frames compared to other material. You can read this study in the “Documents” section on our website.

Product development

De La Fontaine is committed to developing new products for your specific needs and projects. We have built our reputation on innovation, quality products, and service. This tradition is maintained and supported by:

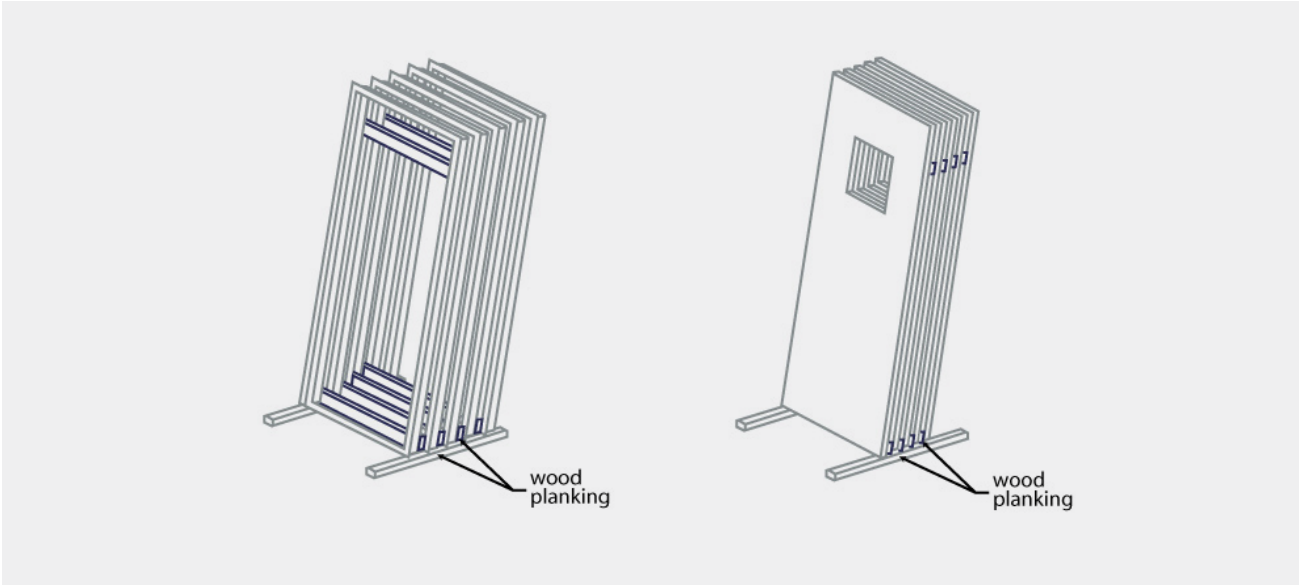
- A team of qualified people involved in our marketing, engineering and manufacturing departments.
- State-of-the-art equipment to manufacture quality products with flexibility.
- A R&D department including a in-house fire testing facility. Final fire tests are conducted and approved at ITS (Warnock Hersey) facility.
- Products designed for the pharmaceutical and correctional industries.
- Designs for hollow metal doors and frames including custom embossing, inlays and recessed panels.

Whenever you have specific design requirements, you can count on us to work with you. We like new challenges and want to improve our product lines, as we are committed to participating in the progress of the door opening industry.

Storage and handling

Although hollow metal doors and frames are built with steel material, they must be stored and handled carefully to avoid scratches, dents and damage. When receiving, storing and handling hollow metal doors and frames, we recommend the following procedure:

- Inspect products upon delivery. If there is any damage, notify the truck driver immediately.
- Remove cardboard and other wrappings to promote air circulation.
- Store products in a dry, clean and secured area.
- Place doors and frames at least 4” (102 mm) above the floor, on blocks or planks.
- Store doors and frames in an upright position, with welded frames header at the top.
- Provide a minimum of 1/4” (6.3 mm) space between doors and frames to promote air circulation.
- Do not drag products on the floor, as it could remove the primer and the zinc coating.



REFERENCES:

NAAMM/HMMA 840: Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.

Installation

Installation of hollow metal doors and frames is critical. Improper installation may cause the following problems:

- Narrow rough opening: The door will rub against the strike jamb and prevent the door from closing properly.
- Wide rough opening: Some anchors may not reach the studs on each side, creating insufficient anchoring. Frame could end up too wide causing improper latch engagement.
- Insufficient anchoring: Affects the life cycle and the security of the door opening.
- Twisted jambs: Prevent a tight contact between the door and the frame on the full perimeter, which may cause air infiltration and loss of energy on exterior openings.

Fixing these problems may be extremely costly, particularly when the frame is permanently set in a masonry wall. A properly installed frame should be square, level, and plumb, with jambs in the same vertical plane. Qualified installers will install the frame and the door to assure the door opening will operate and perform the way it was designed.

When inspecting the jobsite, the following procedure can help to detect installation problems:

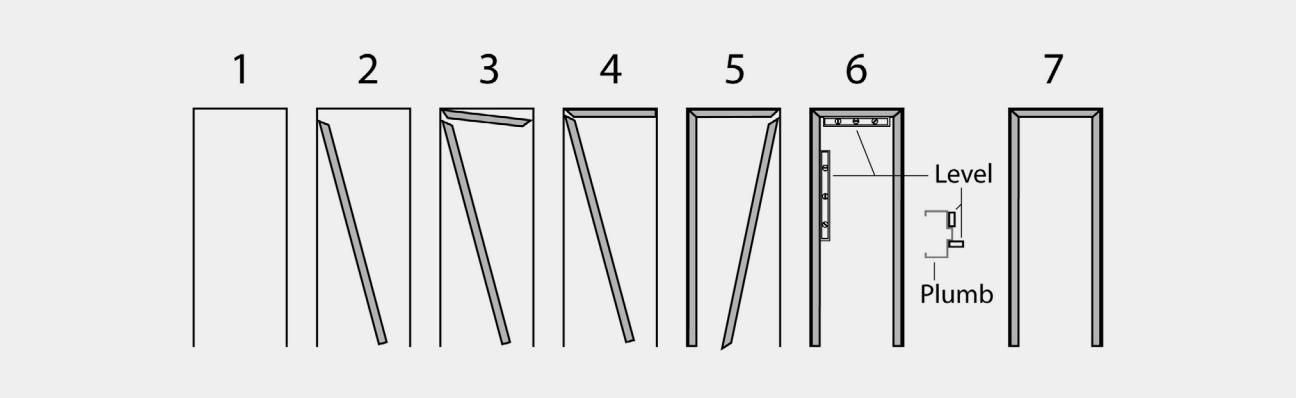
Installation

1. Standing on the pull side of the door opening, close the door. The door should close smoothly, without any interference or resistance, and remain latched positively.
2. Standing on the pull side of the door opening, while keeping the door closed and latched, try to pull the door. The movement of the door should be minimal.
3. Standing on the pull side of the door opening, verify the clearance between the door and the frame. The clearance should be 1/8” (3 mm) plus or minus 1/16” (1.6 mm), at head and both jambs.
4. Standing on the push side of the door opening, make sure the door makes contact with the silencers or the gasketing on the full perimeter of the opening.
5. When inspecting a knock down frame, the frame header should be tightly attached to the jambs.

REFERENCES:

NAAMM/HMMA 840: Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
SDI 105: Recommended Erection Instructions for Steel Frames.
SDI 110: Standard Steel Doors and Frames for Modular Masonry Construction.
SDI 122: Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
ANSI/DHI A 115.1G: Installation Guide for Doors and Hardware.

Typical installation of knockdown frames (KD)



1 Build the rough opening in the wall as follows:

- Height: Nominal door opening height + 1 1/4” (31.8 mm).
  Example: 84” + 1 1/4”= 85 1/4” (2133 mm + 31.8 mm = 2164.8 mm).
- Width: Nominal door opening width + 2” (50.8 mm).
  Example: 36” + 2” = 38” (914 mm + 50.8 mm = 964.8 mm).
- The rough opening should be square and level.

2 Lay down one jamb against one side of the rough opening.

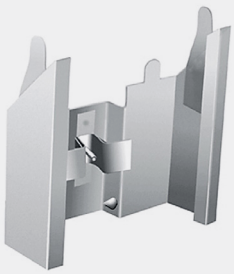
3 Assemble the horizontal header in the vertical jamb.

4 Slide both components to overlap the wall by approximately 1” (25.4 mm).

5 Assemble the second vertical jamb into the horizontal header. Slide the jamb to overlap the wall by approximately 1” (25.4 mm).

6 Complete the assembly between the vertical jambs and the horizontal header by bending the tabs or fastening the screws at the top of the horizontal header.

Typical installation of knockdown frames (KD)



Compression anchor

Drywall strap anchor

Screw base anchor

7 Fit the top of the frame between the wall studs by tightening the compression anchor at the top of each jamb.

8 Adjust the frame to be square, level, and plumb, with jambs in the same vertical plane.

9 Anchor the frame to the stud at the bottom of each jamb with the drywall strap or the screw base anchor (screws by others).

10 Anchor the frame to the stud at the center location with the drywall strap (must be installed on fire rated frames).

11 Verify the height and the width of the door opening (tolerance of 1/32” (0.8 mm)). The frame should be square, level, and plumb, with jambs in the same vertical plane.

REFERENCES:

De La Fontaine: Technical data book

Typical installation of welded frames

1. Remove the shipping bars at the bottom of the frame.
2. Adjust the frame to be square, level, and plumb with jambs in the same vertical plane.
3. Brace the frame with 2” x 4” (50.8 mm x 101.6 mm) wood studs, as shown in Figure 1.
4. Install temporary spreaders as shown in Figure 2, at the center and at the bottom location of the frame. The spreader dimension should be the same as the door opening width. This will prevent the frame from bowing inside the opening when building the surrounding wall.
5. Verify the height and the width of the door opening once more before building the wall (tolerance of 1/32” (0.8 mm)). The frame should be square, level and plumb with jambs in the same vertical plane.
6. Anchor the frame to the floor, at the bottom of each jamb, with the floor base anchor.

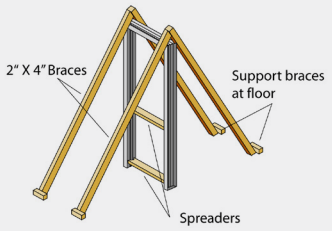


Figure 1: **Bracing the frame**

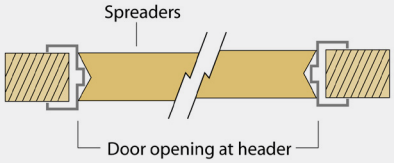


Figure 2: **Spreader**

Floor base anchor

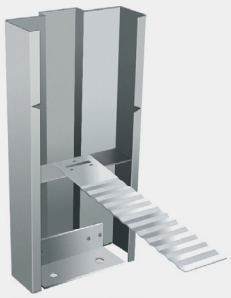
Typical installation of welded frames

7 Build the wall on each side.

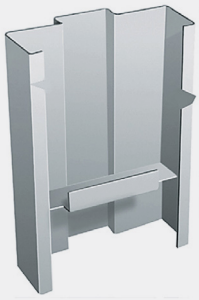
- Masonry block wall: Anchor the frame to the wall with wire masonry anchor or “T” masonry anchor, as wall is built. Install one anchor per 30” (762 mm) of door opening height or fraction thereof. Locate anchors as close as possible to the hinge reinforcements on the hinge jamb, and on the opposite side for the strike jamb.
- Drywall: Anchor the frame to the wall with steel stud anchors. Provide two # 10 screws per anchor (screws by others). On each jamb, install one anchor per 30” (762 mm) of door opening height or fraction thereof. Locate anchors as close as possible to the hinge reinforcements on the hinge jamb, and on the opposite side for the strike jamb.

8 Do not remove the temporary spreaders until the frame is permanently set into the wall.

Wire masonry anchor with floor base anchor



T masonry anchor with floor base anchor



Steel stud anchor

REFERENCES:

De La Fontaine: Technical data book

Finishes

PRIMER

A rust inhibitive primer must be applied on cold rolled steel to protect the surface against corrosion. However, galvannealed steel is suitable for immediate painting because the zinc content of this alloy protects the surface against corrosion.

Each manufacturer offers its own type of primer which can be water-borne or solvent-borne. Most important is to make sure it is a rust inhibitive primer and it complies with ANSI A250.10: *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.* This standard requires compliance with the following four tests:

1. Salt Spray Test
Description: The specimen is scribed with an X and exposed to a salt spray fog for a period of 120 continuous hours.

Minimal requirement: The paint film at the scored line shall not be undercut by rust more than 1/8" (3.2 mm) each side.

2. Condensation Test
Description: The specimen is exposed to a minimum of 100°F for a test period of 240 continuous hours.

Minimal requirement: The paint film may have any quantity of # 8 blisters, but no more than a few # 6 blisters. See visual chart in the standard.

3. Impact Test
Description: A small 1/2" (12.7 mm) diameter ball of 20 inch pounds is released on the specimen. After the impact, a tape is applied to the surface and pulled off sharply.

Minimal requirement: No paint removal other than at an area of 1/8" (3.2 mm) diameter at the center of the impact area.

4. Film Adhesion Test
Description: Vertical and horizontal cuts are made on the specimen. A pressure sensitive tape is then applied to the scribed surface and rapidly removed.

Minimal requirement: No adhesion loss less than a grade 3B. See visual chart in the standard.

De La Fontaine offers a water-borne primer which complies with current environmental standards and exceeds ANSI A250.10.

Finishes

FACTORY FINISHED PAINT

Numerous benefits are related to factory finished products such as better quality of paint and application, less coordination and time on the jobsite, and a lack of field volatile organic compounds (VOC's). This is an important asset for LEED projects.

Manufacturers of steel doors and frames offer different type of finished paint, either water-borne or solvent-borne but as design professionals you should make sure to review the compliance of the paint with the ANSI A250.3 standard: Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames. This standard requires compliance with the same tests as previously mentioned in ANSI A250.10 plus the following two tests:

1. Accelerated weathering resistance
Description: The sample is exposed to 18 hours of light exposure at 60°C followed by 6 hours of condensation cycle at 49°C.

Minimal requirement: No rust, checking, cracking, erosion or flaking shall be present. Few blisters and chalking are acceptable according to the visual chart in the standard. No more than 50% decrease in gloss and 10% change in color.

2. Abrasion test
Description: An apparatus using an abrasion wheel tests the paint resistance.

Minimum requirement: The paint film shall have a wear index of 0.10 mg weight loss per cycle or less. Usually, prefinished products are available in the manufacturer's standard colors or custom colors chosen by the designer. An approved control sample is required.

De La Fontaine offers a liquid paint and a powder coating paint specially developed for our products. Our direct-to-metal coatings exceed the ANSI A250.3 standard.

REFERENCES:

ANSI A250.3 : Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
ANSI A250.10: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

FRAME SELECTION

- Steel gauges for frames
- Frame profiles
- Frame assemblies
- Anchoring systems
- Hardware reinforcements
- Frame elevations
- Fire testing under positive pressure

BACK TO MENU

Steel gauges for frames

Depending on the application, there are three reasons why you should consider hollow metal frames with heavier gauges:

- Structural strength: With heavier gauge, the end user gets a longer lifetime for the door opening.
- Security: A frame with heavier gauge is much more difficult to bend at the strike location.
- Resistance to dents: A frame with heavier gauge is much more difficult to damage.

The hollow metal frame carries the load of the entire opening. If the gauge of the frame is too light, it may cause door sagging, which will prevent the door from closing properly. For a minimal investment, the end user can get a 14-gauge frame instead of a 16-gauge frame, which represents 25% more steel. In high abuse and high security areas, heavier gauges should be part of the product selection criteria.

PRODUCTS & SOLUTIONS

	Standard	High Abuse	High Security
Interior Openings	16-gauge 0.056” 1.6 mm	14-gauge 0.071” 2.0 mm	12-gauge 0.105” 2.7 mm
Exterior Openings	16-gauge 0.056” 1.6 mm	14-gauge 0.071” 2.0 mm	12-gauge 0.105” 2.7 mm

NOTE: For quality purpose, De La Fontaine purchases a heavier gauge than what is recommended by the standards.

REFERENCES:

NAAMM HMMA 862: Guide Specifications for Commercial Security of Hollow Metal Doors and Frames.
De La Fontaine: Steel table

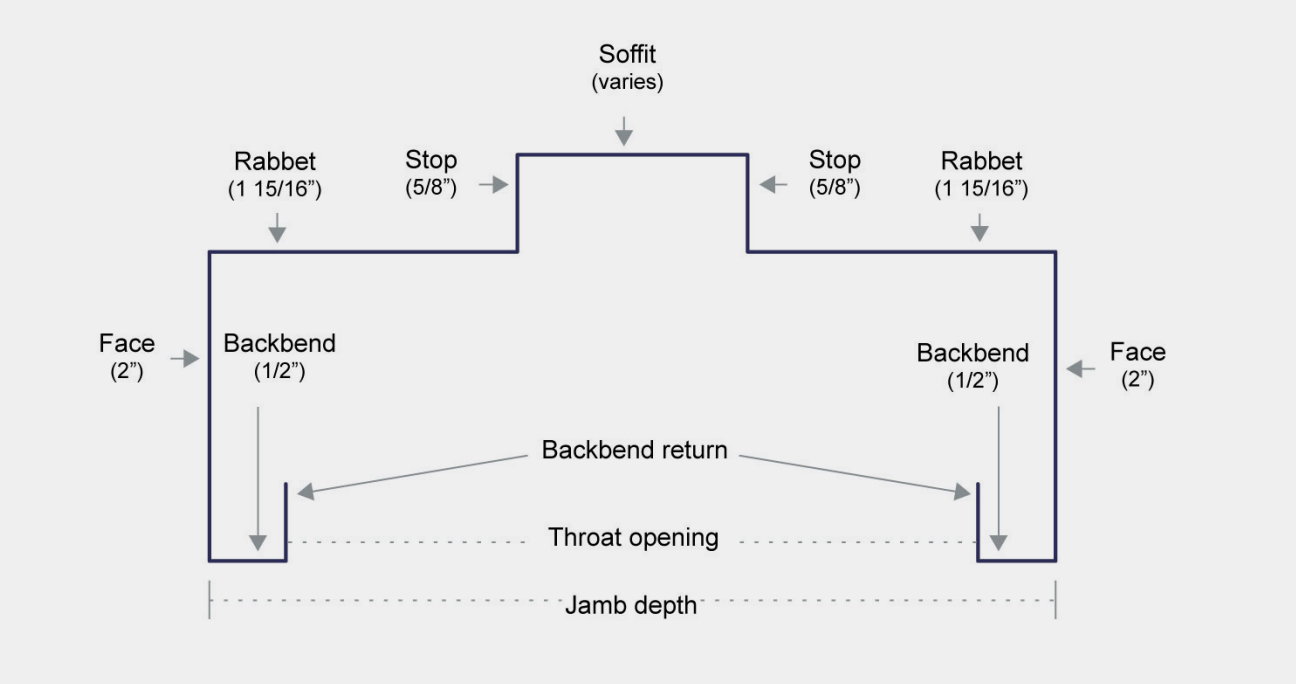
Frame profiles

When selecting a frame profile, you should consider the following aspects:

- Fire rating: It is important to find out if special profiles have been fire-tested.
- Wall anchors: Some special profiles may require special anchoring systems.
- Esthetic: Different profiles are available to meet the design requirements of your project.
- Wall conditions: The profile could be either for drywall or masonry applications.
- Door thickness: The dimension of the rabbets must be adapted to the door thickness.

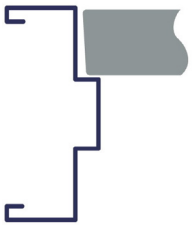
Since we brake form our frames, we can manufacture different profiles with the same lead time (2-3 weeks). Brake forming allows sharper bends, which adds to the esthetic value and ease of assembly between the frame components.

Frame profile terminology and typical dimensions



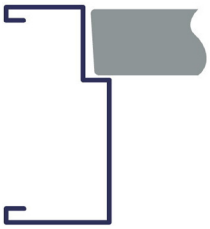
Frame profiles

STANDARD PROFILES



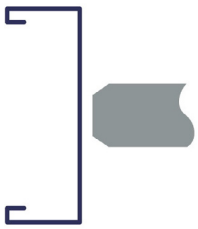
Equal or unequal double rabbet profile.

Info: Fire-rated up to 3 hours.
Recommended application: Standard
Benefit: Excellent lead time from all manufacturers.
Limitations: Common design. Minimum jamb depth 3 5/8" (92 mm).
Comment: Unequal rabbet was used in the past to accommodate 1 3/8" (35 mm) thick doors on the smaller rabbet.



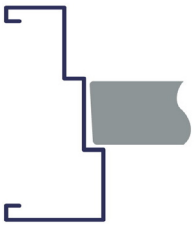
Single rabbet profile.

Info: Fire-rated up to 3 hours.
Recommended application: Standard.
Benefit: Accommodates smaller wall dimensions.
Limitations: Minimum jamb depth 2 9/16" (65 mm). For fire rating, minimum 4 1/2" (114.3 mm) jamb depth.
Comment: May also be selected for design considerations.



Cased open profile.

Info: Not fire-rated.
Recommended applications: Double acting doors, sliding doors, frames with special gasketing.
Benefit: Door can swing in both directions.
Limitation: No fire rating available since there is no stop in the profile.
Comments: Sometimes used for sound transmission class (STC) and lightproof openings.



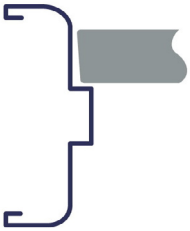
Double egress profile.

Info: Fire-rated up to 3 hours.
Recommended applications: Cross corridors, smoke partitions, horizontal exits.
Benefit: Control the flow of traffic in opposite directions.
Limitation: None.
Comment: Standard dimension of the smaller face could be either 1 3/8" (35 mm) or 2" (50.8 mm).

Frame profiles

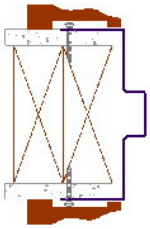
SPECIAL PROFILES

These profiles are only a few examples of what De La Fontaine can do. Our production line is flexible and our people love the challenge involved with manufacturing innovative products; let us know about your special design requirements.



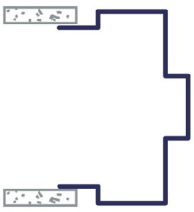
Radius profile.

Info: Fire-rated up to 90 minutes
Recommended application: Special design.
Benefit: Offers more esthetic value.
Limitations: Wide throw hinges may be required for some applications. May requires hardware coordination.
Comment: True radius profile, including at hinge locations.



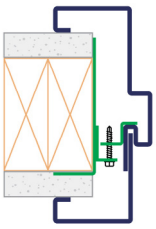
Less return profile.

Info: Fire-rated up to 90 minutes.
Recommended applications: Hotels, assisted living facilities, historic buildings.
Benefit: Accommodates an applied wood molding over the face of the frame.
Limitation: Longer installation time, due to the anchoring system.
Comments: Strength of hollow metal frame with the warm feeling of wood. Wood trim by others. To comply with the fire rating, hard wood must be used.



Shadow line profile.

Info: Fire-rated up to 90 minutes.
Recommended application: Special design.
Benefit: Offers more esthetic value.
Limitation: Cleanliness consideration.
Comment: Has been fire-tested by just a few manufacturers.



Split frame profile.

Info: Fire-rated up to 90 minutes.
Recommended applications: Prefinished openings and retrofit application.
Benefits: Reduces coordination and time on jobsite, flexible ajustement, lack of field VOC's.
Limitation: Prefinished product, need to be handle with care.
Comment: Face welded unit available in different configurations; single-frame, double-frame, sidelite, transform frame and borrowed lite. For more information, refer to the technical data sheet.

Frame Assemblies

There are three basic types of frame assemblies:

- Field assembled knock down frame: The 3 components of the frame (header, strike jamb and hinge jamb) are assembled on the jobsite, usually after the wall is up.
- Face welded frame only: The 3 components of the frame are face welded only. The frame is usually installed before the wall is up, which allows better anchoring to the wall and the floor.
- Fully continuously welded frame: The 3 components of the frame are fully continuously welded from face to face, including the rabbets, the stop and the soffit. The frame is usually installed before the wall is up, which allows better anchoring to the wall and the floor.

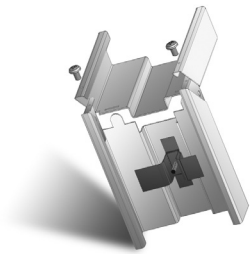
Knock down frames are widely used in the industry. They are convenient for the manufacturer because they are easy to ship in bundles. They are convenient for the stocking distributors because they are easy to stock on shelves. They are convenient for the contractor because they can be installed after the wall is up. But unfortunately, they are not always the best product for the end user. Knock down frames usually come with minimal anchoring between the frame and the wall, which compromises the lifetime and the security of the door opening.

Welded frames, either face welded or fully continuously welded, offer an excellent anchoring system for the benefit of the owner of the building. Welded frames are available in 3 weeks' lead time and the additional cost is minimal for a galvannealed frame.

Frame Assemblies

PRODUCTS & SOLUTIONS:

De La Fontaine offers the following options:

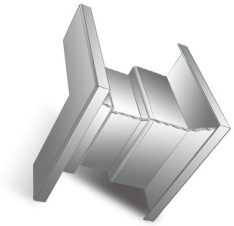


Field assembled knock down frame.

Info: Frame components mechanically attached (tabs or screws).
Application: For installation after the wall is up.
Benefits: Jobsite scheduling, available fire-rated.
Limitation: Minimal anchoring.
Comment: Should be considered carefully.

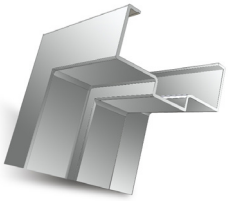
Frame face welded only.

Info: Welds must be primed with a rust inhibitive primer.
Application: Standard
Benefit: Excellent anchoring.
Limitation: Usually installed before the wall is up. Exception: existing masonry openings, see anchoring section.
Comment: De La Fontaine offers a 2-3 weeks lead time



Fully continuously welded frame.

Info: Welds must be primed with a rust inhibitive primer.
Application: Standard.
Benefit: Excellent anchoring.
Limitation: Usually installed before the wall is up. Exception: existing masonry openings, see anchoring section.
Comment: De La Fontaine offers a 2-3 weeks lead time.



Fully continuously welded frame with sanitary weld.

Info: Fully continuously welded on door opening side (exposed side).
Recommended applications: Clean rooms (sterile), food processing, chemical plants.
Benefit: Prevents germs from developing in the seam between the jambs and the header.
Limitation: Longer lead time requirement (4-5 weeks). Must be installed before the wall is up.
Comment: More expensive than a continuous weld.

Anchoring systems

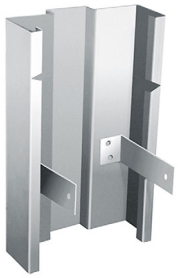
The selection of an anchoring system depends on the frame assembly and on the wall conditions.

- Knock down frame: The drywall strap anchor or the screw base anchor are standard options.
- Welded masonry frame: The wire masonry anchor, the “T” masonry anchor or the existing wall anchor are standard options.
- Welded drywall frame: Steel stud anchor (“Z” bracket anchor) is the most common anchor.

Welded frames offer excellent anchoring, typically 3 to 4 anchors per jamb, in addition to a floor base anchor, while field assembled knock down frames usually come with minimal anchoring, typically 1 to 2 anchors per jamb.

Anchoring systems

TYPICAL ANCHORING SYSTEMS FOR KNOCK DOWN FRAMES:

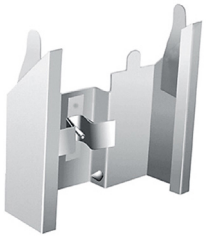


Drywall strap anchor.

Info: Usually, the contractor is not using the anchor at the center location, since the gypsum board is already installed.
Application: Field assembled knock down frames.
Benefit: Easy to install the frame after the wall is up.
Limitation: Minimal anchoring: 2 anchoring points per jamb at the most.
Comment: Should be considered carefully. If the center location anchor is not installed properly, it will void the fire label.

Screw base anchor.

Info: Usually, there is no anchor at the center location.
Application: Field assembled knock down frames.
Benefit: Easy to install the frame after the wall is up.
Limitation: Minimal anchoring: 1 anchoring point per jamb at the most.
Comment: Should be considered carefully.



Compression anchor (standard with knock down frames).

Info: Installed at the top of the jamb; does not prevent door sagging.
Application: Field assembled knock down frames.
Benefit: Easy to install the frame after the wall is up.
Limitation: Provides pressure at the top of the frame only, between the studs.
Does not provide positive anchoring.
Comment: Should be considered carefully.

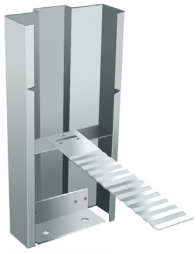
Anchoring systems

BACK TO MENU

TYPICAL ANCHORING SYSTEMS FOR WELDED FRAMES:

Wire masonry anchor.

Info: 7-gauge (0.187”/4.8 mm), 10” (254 mm) long.
Application: Masonry block walls.
Benefit: Typically 3 or more anchoring points per jamb, in addition to a floor base anchor.
Limitation: The frame must be installed before the wall is up.
Comment: Excellent anchoring system.



“T” Masonry anchor.

Info: 16-gauge (0.056”/1.4 mm), 10” (254 mm) long.
Application: Masonry block walls.
Benefit: Typically 3 or more anchoring points per jamb, in addition to a floor base anchor.
Limitation: The frame must be installed before the wall is up.
Comment: Excellent anchoring system.

Existing masonry wall anchor.

Info: 18-gauge (0.044”/1.1 mm), expansion bolts are 3/8” (9.5 mm) in diameter x 4” (102 mm) long (bolts by others except on fire rated frames).
Application: Butts up to existing masonry wall conditions.
Benefit: Typically 3 or more anchoring points per jamb, in addition to an inverted floor base anchor.
Limitation: It is not always possible to install the inverted floor base anchor because of finished floor condition.
Comment: Excellent anchoring system if used with inverted floor base anchor.

Steel stud (“Z” bracket) anchor.

Info: 18-gauge (0.044”/1.1 mm), requires two #10 screws per anchor for positive anchoring (screws by others).
Application: Drywall with steel studs.
Benefit: Typically 3 or more anchoring points per jamb, in addition to a floor base anchor.
Limitation: The frame must be installed before the wall is up.
Comment: Excellent anchoring system.

Floor base anchor (standard with welded frames).

Info: 16-gauge (0.056”/1.4 mm) welded anchor (adjustable floor base anchor also available).
Application: Welded frames.
Benefit: Substantial improvement on the strength of the anchoring system.
Limitation: Cannot be used with floor tiles on existing wall applications.
Comment: Exclusively used with welded frames. Inverted floor base anchor would be required at existing openings.

Hardware reinforcements

The hardware reinforcements are critical for the security and the life cycle of the opening. Without proper hinge reinforcements, the door will sag which will prevent the door from closing and latching properly. The following elements have an impact on the quality of hardware reinforcements:

- **Gauge:** Thicker gauge material is simply a stronger material.
- **Shape:** A reinforcement with a 90-degree angle is stronger than a flat reinforcement.
- **Threads:** Tapped holes with more threads will give more strength to the reinforcement.

Typically, surface applied hardware is factory reinforced only. Mortise hardware is factory reinforced, drilled and tapped for template hardware.

PRODUCTS & SOLUTIONS:

Standard 10-gauge (0.129”/3.3 mm) high frequency hinge reinforcement.

Info: With the flange, as strong as 7-gauge (0.187”/4.8 mm) flat hinge reinforcement.
Application: Standard and heavy-weight hinges, high frequency openings. Mortar box added to single return profile.
Benefit: Prevents door sagging.
Limitation: Heavy-weight doors require continuous hinges, pivots or floor closers.
Comment: Exceeds ANSI A250.6.

Standard 14-gauge (0.071”/1.8 mm) strike reinforcement.

Info: 22-gauge (0.032”/0.8 mm) dust (mortar) box standard.
Application: ANSI 4 7/8” strike.
Benefits: Box protects space for proper latch projection and adds to esthetic value. Prevents mortar from filling tapped holes.
Comment: Complies with ANSI A250.6.

Standard 12-gauge (0.105”/2.7 mm) closer reinforcement.

Info: 14” (356 mm) in length.
Applications: Regular and parallel arm surface closers.
Benefit: Ensures positive fastening for surface door closers.
Comment: Exceeds ANSI A250.6.

REFERENCES:

ANSI A250.6: Hardware on Standard Steel Doors - Reinforcement Application.

Frame elevations

Frame elevations enhance interior designs and improve quality of life by creating more light inside the building. There are four basic types of frame elevations:

- **Borrowed lights:** Glass light without door opening.
- **Side lights:** Door opening with a glass light on one side or both sides.
- **Transom lights:** Door opening with a glass light above.
- **Transom side lights frames:** Door opening with a combination of side lights and transom lights.

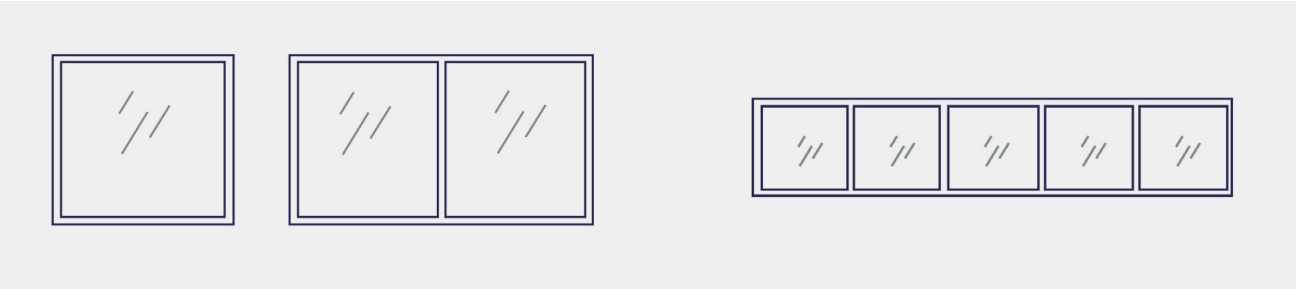
For one-hour fire-rated walls, frame elevations used to be limited to 1,296 in (0.84 m) of exposed glass with a maximum of 54" (1.37 m) in any directions. Through innovation, with the use of ceramic glass, it is now possible to increase the exposed glass dimensions while enjoying clear glass instead of wired glass. Further informations regarding fire rating is available in the Fire Rated Frames section.

REFERENCES:

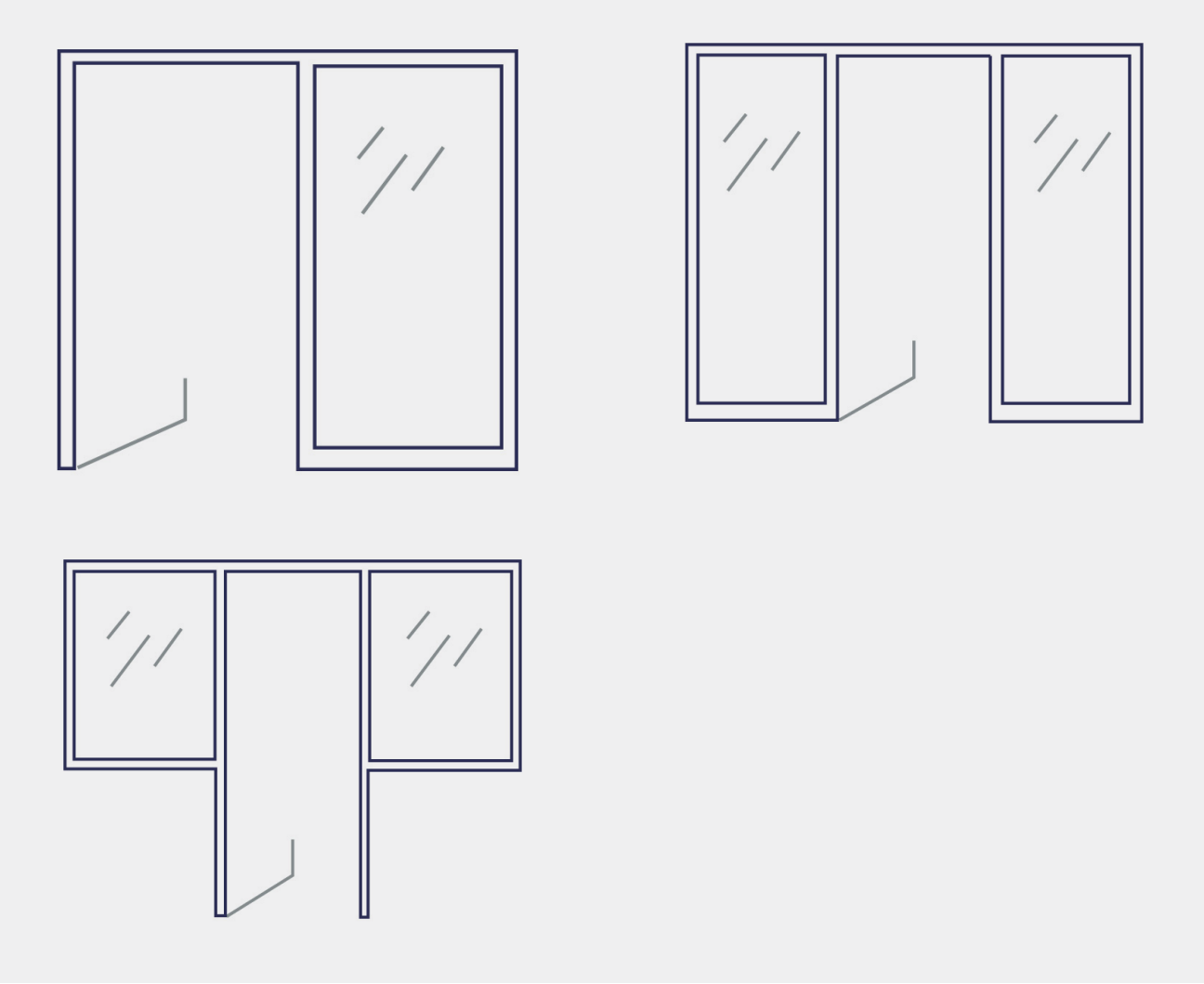
NFPA 80: Standard for Fire Doors and Other Opening Protectives.
NFPA 257: Standard for Fire Test for Window and Glass Block Assemblies.
IBC: International Building Code.

Frame elevations

BORROWED LIGHTS:

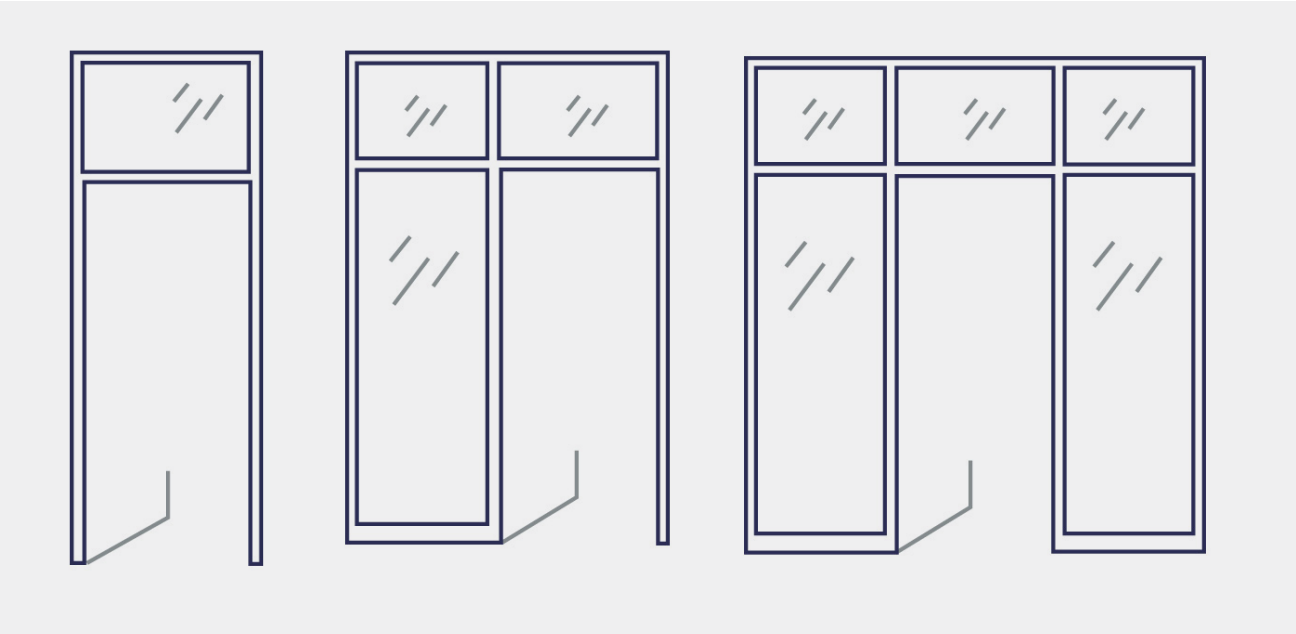


SIDE LIGHTS:

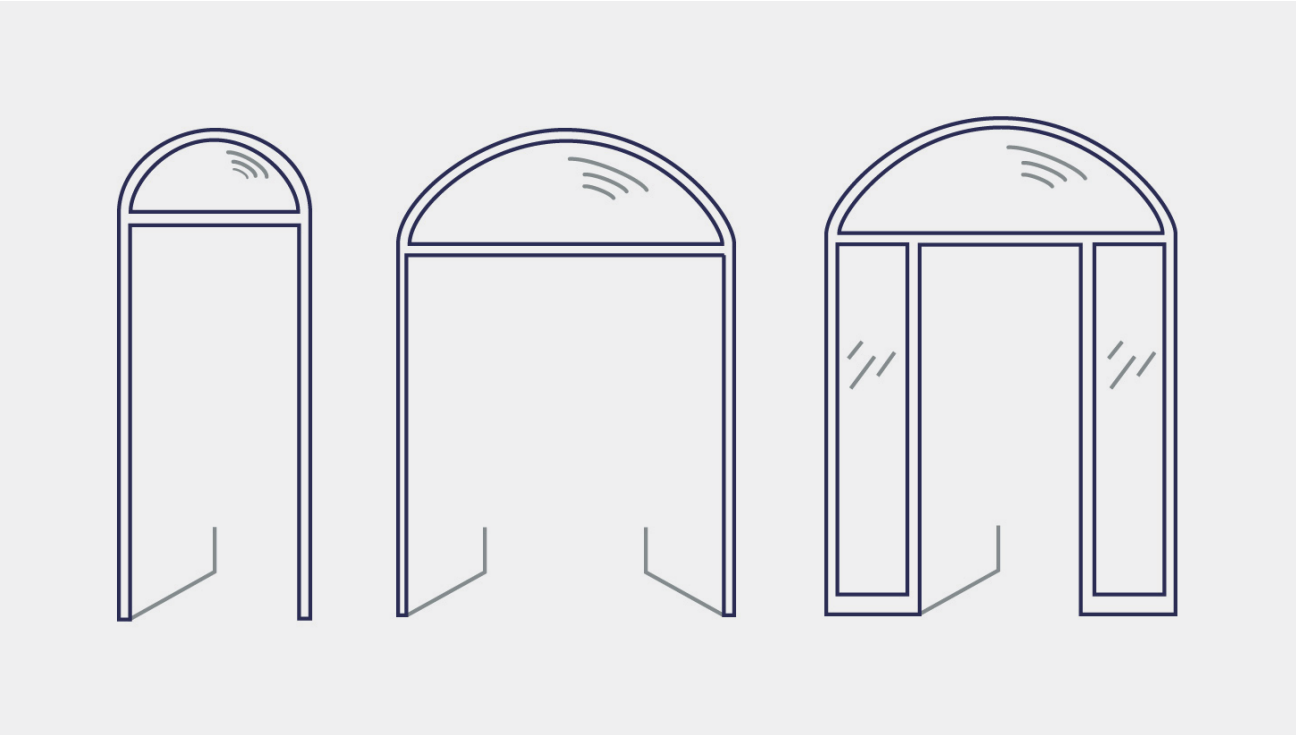


Frame elevations

TRANSOM LIGHTS AND TRANSOM SIDE LIGHTS

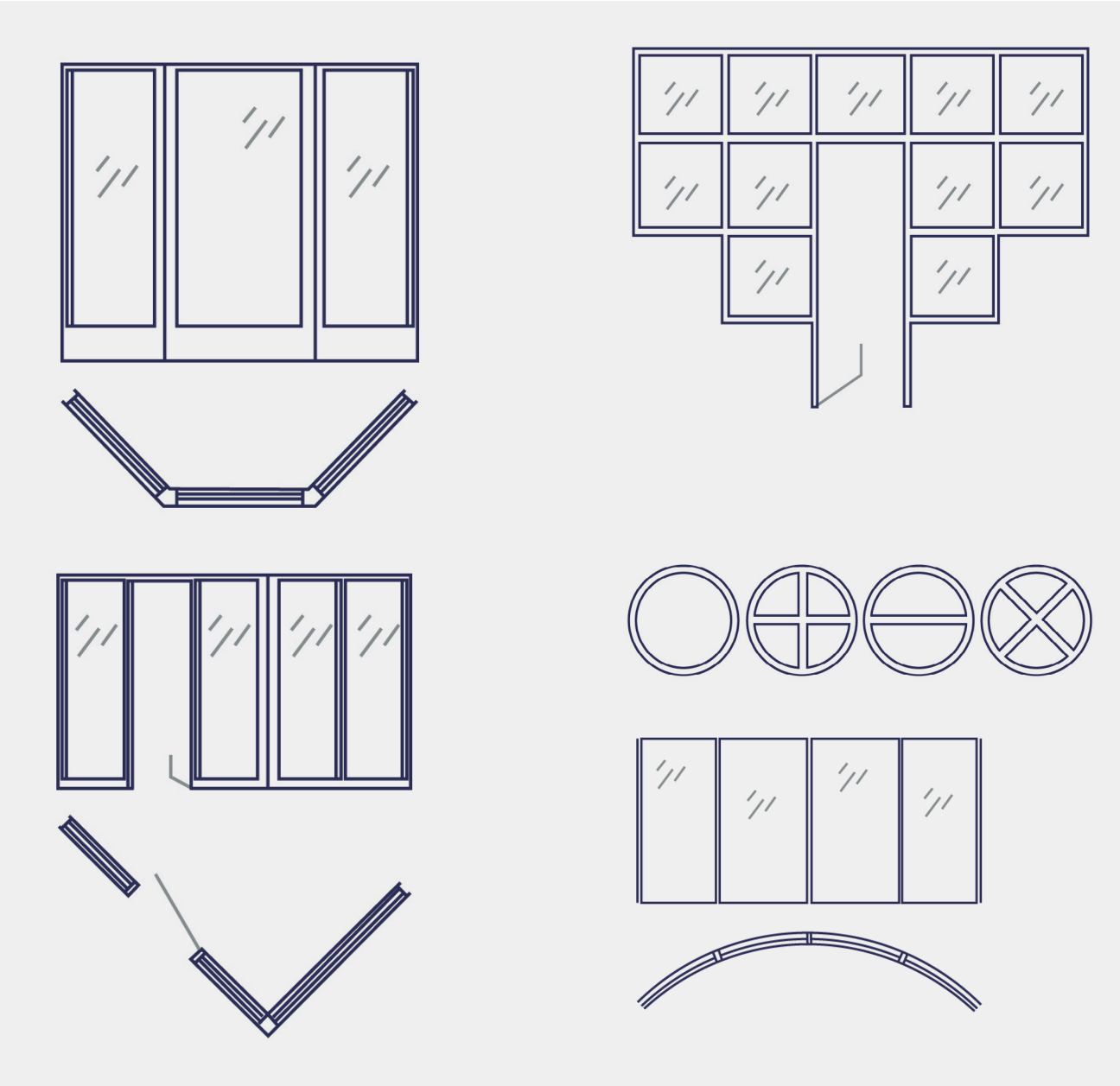


ARCHED FRAMES WITH LIGHTS



Frame elevations

SPECIAL FRAMES:



Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

3-sided galvannealed steel frames

Description	180 minutes	90 minutes	45 minutes	20 minutes
Standard Profile SR and DR series 16- and 14-gauge (0.056”/1.4 mm 0.071”/1.8 mm)	8’0” x 8’0” (2.4 m x 2.4 m)	8’0” x 10’0” (2.4 m x 3.0 m)	8’0” x 10’0” (2.4 m x 3.0 m)	8’0” x 10’0” (2.4 m x 3.0 m)
Double egress profile SR series, welded 16- and 14-gauge (0.056”/1.4 mm 0.071”/1.8 mm)	Not tested	8’0” x 10’0” (2.4 m x 3.0 m)	8’0” x 10’0” (2.4 m x 3.0 m)	8’0” x 10’0” (2.4 m x 3.0 m)
Less retrun frame LR series 16-gauge (0.056”/1.4 mm)	Not tested	4’0” x 8’0” (1.2 m x 2.4 m)	4’0” x 8’0” (1.2 m x 2.4 m)	4’0” x 8’0” (1.2 m x 2.4 m)

LIMITATIONS:

- 180 minutes fire-rated frames must be welded.
- Minimum jamb depth: 3 1/4” (83 mm).
- Maximum jamb depth: 14 1/2” (368 mm).

Please do not hesitate to contact us for more detailed information on our fire-rated products in stainless steel.

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Galvanealed steel elevations with intumescent glazing tape (wired glass and ceramic glass)

Transom lights, side lights and borrowed lights
Standard profile, SR and DR series
16-gauge (0.056”/1.4 mm), welded

The following chart contains the maximum dimensions. Only tested for 20 minutes and 45 minutes.

Description	45 minutes	20 minutes
Unit size in drywall partition (WxH)	12’8” x 11’4” (3.9 m x 3.5 m)	12’8” x 11’4” (3.9 m x 3.5 m)
Unit size in masonry partition (WxH)	13’6” x 12’0” (4.1 m x 3.7 m)	13’6” x 12’0” (4.1 m x 3.7 m)
Exposed glass	4704 in² (3 m²)	4704 in² (3 m²)
Exposed glass per lite	4704 in² (3 m²)	4704 in² (3 m²)
Maximum width of exposed glass	106” (2.7 m)	106” (2.7 m)
Maximum height of exposed glass	106” (2.7 m)	106” (2.7 m)

LIMITATIONS:

- Listed glazing products: Wired Glass (Pilkington, Asahi, Central Glass) and Ceramic Glass (firelite). www.fireglass.com
- Listed intumescent glazing tape: Pemko www.pemko.com
- Glass thickness: 1/4” (6 mm).
- Jamb depth: 5 3/4” (146 mm).
- Maximum face dimension: 4” (102 mm).
- Maximum sill dimension: 8” (203 mm).
- Stop height dimension: 5/8” (16 mm).
- For transom lights and side lights, respect door opening size limitations
- Please verify this information with your glass manufacturer.

Please do not hesitate to contact us for more detailed information on our fire-rated products in stainless steel.

BACK TO MENU

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Split frame in galvannealed steel

Single, pair, side lights, transom and borrowed lights
Equal rabbet profile, DR series
16-gauge (0.056”/1.4 mm/)
Face welded

Description	90 minutes	60 minutes
Maximum dimensions	8’2” x 10’ 3/4” (2.5 m x 3.1 m)	10’ x 11’5” (3.1 m x 3.5 m)

DOOR SELECTION

- Steel gauges for doors
- Door cores
- Door construction
- End channels
- Vertical door edges
- Vision kits
- Louvers
- Astragals
- Hardware reinforcements
- Door models
- Door elevations
- Fire testing under positive pressure

BACK TO MENU

Steel gauges for doors

Depending on the application, there are three reasons why you should consider hollow metal doors with heavier gauges:

- Structural strength: Heavier gauge means more rigidity thus longer lifetime for the door opening.
- Security: A heavier gauge door is more difficult to compress at the lock location.
- Resistance to dents: A heavier gauge door is more difficult to damage.

In high abuse and high security areas, heavier gauges should be part of the product selection criteria.

PRODUCTS & SOLUTIONS

De La Fontaine offers the following gauges:

	Standard	High Abuse	High Security
Interior Openings	18-gauge 0.044” 1.1 mm	16-gauge 0.056” 1.4 mm	12-gauge 0.105” 2.7 mm
Exterior Openings	16-gauge 0.056” 1.4 mm	16-gauge 0.056” 1.4 mm	12-gauge 0.105” 2.7 mm

NOTE: For quality purpose, De La Fontaine purchases a heavier gauge than what is recommended by the standards.

REFERENCES:

NAAMM HMMA 862: Guide Specifications for Commercial Security of Hollow Metal Doors and Frames.
De La Fontaine: Steel table

Door cores

When selecting a core, you should consider the following aspects:

- **Door location:** Interior doors are typically filled with honeycomb. Exterior doors should be insulated for energy efficiency with polystyrene or polyurethane.
- **Level of security:** Security areas and detention center doors are typically reinforced with steel stiffeners.
- **Code compliance:** A temperature rise fire door core may be required in stairwell doors to comply with codes.

Temperature rise fire doors protect people escaping from a building in a fire. For example, if the fire is on the 7th floor of a building, people coming down from the upper floors will be protected from heat and fire in the stairwell by a stairwell door with a temperature rise core

This protection could be 90 minutes for fire rating, and a temperature rise of 450°F in 30 minutes, on the unexposed face of the door. This level of temperature may sound particularly high, but as long as people do not make contact with the door, they will be safe to escape in the stairwell. Note that 250°F doors also exist with a mineral core.

REFERENCES:

NFPA 252: Standard Methods of Fire Tests of Door Assemblies.
IBC: International Building Code.

Door cores

PRODUCTS AND SOLUTIONS:

De La Fontaine offers the following options

Honeycomb.

Info: 1" (25 mm) cells with phenolic resin.
Recommended application: Standard interior openings.
Benefit: Less stress on hinges because of light core.
Limitation: Limited insulating factor, not recommended for exterior doors.
Comment: The total recycled content is 40%. This includes 100% of post-consumer content and 60% of new material. (The percentage may vary from one supplier to another)

Polystyrene block.

Info: Isolation factor: R value = 7.03 (hr °F-sq/ft)/BTU per ASTM C518.
Recommended application: Exterior openings.
Benefits: Good insulating factor. Less stress on hinges because of light core.
Limitation: Not the best option for extremely cold areas.
Comment: Excellent bonding with the door skins. The total recycled content is 69.4 %. This includes 33.6 % post-consumer content and 35.8 % post-industrial content. (The percentage may vary from one supplier to another)

Urethane block.

Info: Isolation factor: R value = 8.66 (hr °F-sq/ft)/BTU per ASTM C518.
Recommended applications: Exterior openings in extremely cold areas. Cold storage.
Benefits: Excellent insulating factor. Less stress on hinges because of light core.
Limitation: Approximately 3 times the price of polystyrene core.
Comment: Slight decrease of insulating performance over the years.

Temperature rise.

Info: Available in 250, 450 and 650°F temperature rise in 30 minutes.
Recommended applications: Vertical exits (stairwells), passage-ways.
Benefit: Protect people from heat and fire when escaping from a building in a fire.
Limitation: More stress on hinges because of heavier weight.
Comments: May not be required in buildings equipped with sprinkler systems. Refer to your Local Building Code requirements.

Steel stiffened door.

Info: 18-gauge (0.044"/1.1 mm) stiffeners 4" (102 mm) to 6" (152 mm) apart, center to center. Polystyrene or urethane between stiffeners.
Recommended applications: High security areas. Detention facilities.
Benefit: Adds strength to the door.
Limitation: More stress on hinges because of heavier weight.
Comment: Steel stiffeners compromise the insulating factor of the door.

Door construction

When selecting the door construction, you should consider the following aspects:

- Building type.
- Frequency level.
- Abuse level.
- Security level.

Openings in high frequency, high abuse or high security areas require a full flush continuously welded door. Since the edge of the door is reinforced and continuously welded, a door that is fully continuously welded is stronger than a standard lock seam on edge door. A lock seam on edge door is only spot welded at the top and the bottom of the door edge, without edge reinforcements.

The term “full flush” means there is no visible seam on the face of the door. A vertical seam may be permitted on the door edges if the door is not qualified as a seamless door. A seamless door has no visible seams on the vertical edges, for more esthetic value.

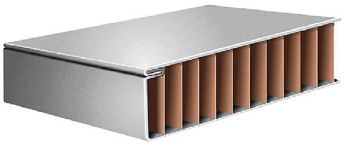
REFERENCES:

ANSI A250.4: Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.
NAAMM/HMMA 861: Guide Specification for Commercial Hollow Metal Doors and Frames.
NAAMM/HMMA 863: Guide Specification for Detention Security Hollow Metal Doors and Frames.

Door construction

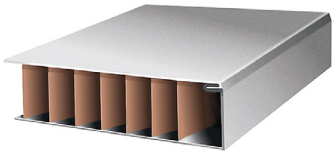
PRODUCTS & SOLUTIONS:

De La Fontaine offers the following options:



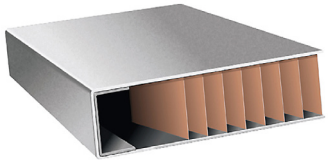
Full flush lock seam on edge door with visible seams.

Info: No channel reinforcement in door edges. Visible seam on vertical edges.
Recommended application: Standard openings.
Benefit: Economical.
Limitations: Not recommended for doors in high abuse, high frequency or high security areas.
Comment: Does not qualify as a seamless door.



Full flush lock seam on edge door with putty filled

Info: No channel reinforcement in door edges. No visible seam on vertical edges.
Recommended application: Standard openings.
Benefit: More esthetic value.
Limitations: Not recommended for doors in high frequency, high abuse or high security areas.
Comments: Qualifies as a seamless door. More expensive than a lock seam on edge door by approximately $60.



Full flush with continuously welded seams.

Info: Channel reinforcements in door edges. No visible seam on vertical edges.
Recommended applications: High frequency, high abuse or high security areas.
Benefits: Heavy duty construction with esthetic value.
Limitation: None.
Comments: Qualifies as a seamless door. More expensive than an intermittently welded seam and filled edge door by approximately $80.

Stile and Rail door.

Info: Visible seams on door faces.
Recommended applications: High frequency, high abuse or high security areas.
Benefits: Heavy duty construction with esthetic value.
Limitation: None.
Comments: Recommended for full glass doors. Higher price than a fully welded door.

End channels

End channels, or horizontal edges, are used to close both ends of the hollow metal doors. The selection of an end channel should take into account the following aspects:

- **Door location:** Exterior doors must have a sealed flush channel at the top to prevent water infiltration inside the door. The bottom part of exterior doors should have weep holes to prevent condensation inside the door.
- **Hardware preparation:** Overhead stops/ holders, concealed door closers, floor closers, pivots and automatic door bottoms will affect the preparation of end channels.
- **Possibility of contraband:** Flush end channels are recommended when openings pose a risk of hiding something inside the cavity of end channels.
- **Special application:** Sterile room applications require sealed flush channels or continuously welded at both ends of the door to prevent germ infiltration inside the door.

Typically, end channels are manufactured with 16-gauge (0.056”/1.4 mm) material. They are also available in heavier gauges for security or detention areas.

Vinyl end channels should be considered with reserve. If not installed properly, they may rub against the frame header and prevent the door from operating normally. They cannot be installed on fire-rated doors.

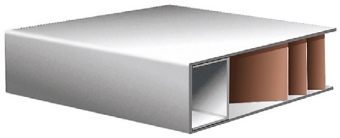
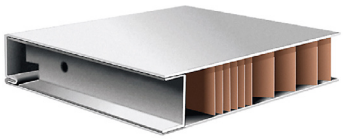
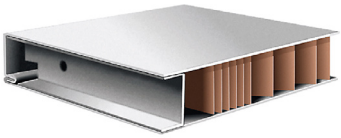
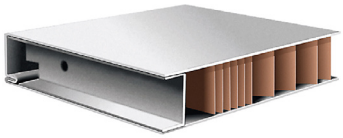
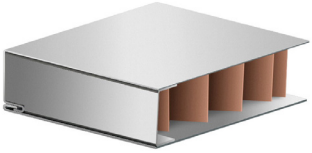
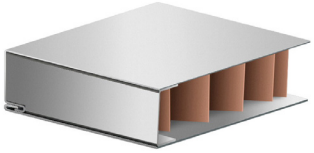
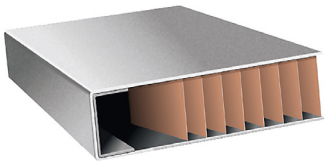
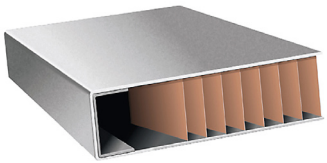
REFERENCES:

NAAMM HMMA 861: Guide Specification for Commercial Hollow Metal Doors and Frames.

End channels

PRODUCTS & SOLUTIONS:

De La Fontaine offers the following options:

LOCATION	TOP END CHANNEL	BOTTOM END CHANNEL
Exterior openings Top channel: Sealed flush channel. Bottom channel: Inverted channel with weep holes.		
Interior openings Top channel: Inverted channel. Bottom channel: Inverted channel.		
Openings with possible contraband Top channel: Non-sealed flush channel. Bottom channel: Non-sealed flush channel.		
Sanitary applications Top channel: Sealed flush channel, continuously welded. Bottom channel: Sealed flush channel, continuously welded.		

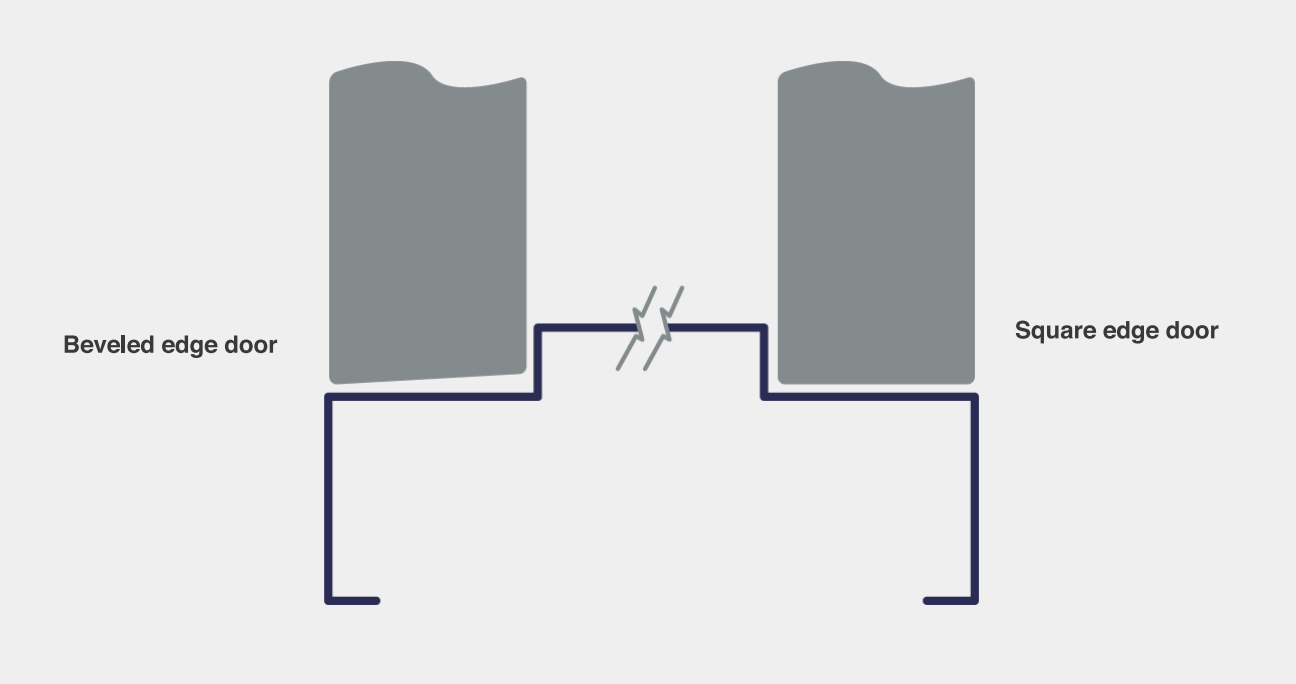
Vertical door edges

Vertical door edges may be square, with a 90-degree angle to the door face, or beveled with an 87-degree angle to the door face (usually expressed as 1/8" in 2"). Your choice of vertical door edges depends on whether the door is active or inactive.

- **Active door:** Active doors beveled on both sides (hinge side and lock side) offer a better fit in the frame and facilitate the door opening and closing.
- **Inactive door:** Inactive doors in paired openings, which are not used as frequently, are usually square on the strike side to perform as the frame rabbet on a single door opening.

Stock doors supplied by some manufacturers are made with a square edge on both sides. They are convenient for the stocking distributor since they are reversible, which means they could be used as a left-hand or a right-hand door. These doors are not recommended as active doors since they can rub against the strike jamb when closing if the frame is not perfectly installed, preventing the door from closing and latching properly.

Beveled edge door vs. Square edge door:



Vision kits

Vision kits are offered in 3 different designs. These designs can be classified as follows:

- Overlapping vision kits: For standard applications, they overlap the door faces.
- Inserted vision kits: Inserted between the door faces, they prevent conflict with finish hardware.
- Full flush seamless vision kits: Seamless and flush with the door face, these kits are commonly used in sanitary applications, for esthetic design or where security is important.

The sandwich overlapping vision kit, with 2 components coming together from each side of the door, is the most commonly used in our industry. This vision kit offers a nice design and the corner sections are welded.

Other standard overlapping vision kits, with 8 distinct components, are not recommended. Their design is not esthetically pleasing and the corner sections are not welded.

Channel reinforcements in the cut-out perimeter are required on full glass and half glass doors to preserve the structural integrity of the door.

Vision kits

PRODUCTS & SOLUTIONS:

De La Fontaine offers the following options:

Sandwich overlapping vision kit.

Info: 18-gauge (0.044”/1.1 mm) material, welded corner sections.
Recommended application: Standard openings.
Benefits: Economical, easy installation.
Limitation: Potential conflict with finish hardware (exit devices, locksets).
Comment: Excellent design for standard applications.

Full flush seamless vision kit.

Info: Vision kit is flush with the door faces.
Application: Sanitary applications.
Benefits: Prevents germ infiltration between vision kit and door faces. Prevents conflict with finish hardware (exit devices, locksets).
Limitation: Higher price.
Comment: Excellent design for specific applications.

Inserted vision kit.

Info: 16-gauge (0.056”/1.4 mm) material, lite kit inserted between the door faces.
Applications: Detention facilities, psychiatric centers.
Benefits: Prevents conflict with finish hardware (exit devices, locksets). Flush surface for inmate security.
Limitation: Not as aesthetically pleasing
Comment: Excellent quality/price design.

Louvers

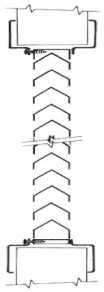
Door louvers promote air circulation through the doors. They should be selected carefully to remain in compliance with building codes. The following points must be noted:

- **Per IBC,** louvers shall not be used in corridors and smoke barriers.
- **Per NFPA 80,** only labeled fire door louvers shall be used in fire doors.

Labeled fire door louvers are equipped with a fusible link. During a fire, the lead component melts, closes the blades and prevents air circulation through the door louver. This simple mechanism prevents fire from spreading from one side of the door to the other.

PRODUCTS & SOLUTIONS:

De La Fontaine offers the following option:



Sandwich overlapping louver.

Info: 18-gauge (0.044"/ 1.1mm) material, inverted "Y" blades, welded corners, 50% free flow area. (Fire-rated louvers available on demand)
Application: Non fire-rated openings.
Benefit: Economical.
Limitation: Potential conflict with protective plates (push plates, kick plates).
Comment: Cannot be used in corridors and smoke barriers.

REFERENCES:

IBC: International Building Code.
NFPA 80: Standard for Fire Doors and Other Opening Protectives.

Astragals

Astragals are used for the following reasons:

- **Fire rating:** Most manufacturers require an astragal for 3-hour fire-rated paired openings.
- **Smoke gasketing:** Prevents smoke from passing between the doors in a smoke barrier.
- **Security:** Protects the latch bolt from vandalism, when installed on the active door.
- **Weather conditions:** Prevents the elements from infiltrating between the doors and inside the building.

Per NFPA 80, doors swinging in pairs, when located near an exit, should not be equipped with astragals that inhibit the free use of either leaf. In these situations, the selection of astragals manufactured from non-steel material such as vinyl, EPDM, silicone or pile might be an alternative solution.

There are 2 basic types of astragal: the flat astragal and the “Z” type astragal.

PRODUCTS & SOLUTIONS:

De La Fontaine offers the following options:

Flat astragal

Info: 12-gauge (0.105”/2.7 mm) material, welded or fastened with screws.
Application: Paired openings with one active door and one inactive door.
Benefits: Economical. Less potential conflict with hardware components.
Limitation: Conflict with the strike lip when installed on the active door.
Comments: Usually installed on the inactive door. Can be welded and installed at the factory for more security.

“Z” type astragal.

Info: 14-gauge (0.071”/1.8 mm) material, welded or fastened with screws.
Application: Paired openings with one active door and one inactive door.
Benefit: Stronger design.
Limitation: Must be prepared for hardware components (flush bolts, strike).
Comments: Usually installed on the inactive door and prepared for hardware. Can be welded and installed at the factory for more security.

REFERENCES:

NFPA 80: Standard for Fire Doors and Other Opening Protectives.

Hardware reinforcements

The hardware reinforcements are critical to the security and the life cycle of the opening. Without proper hinge reinforcements, the door will sag and prevent proper closing and latching. The following elements have an impact on the quality of hardware reinforcements:

- **Gauge:** Thicker gauge material means stronger material.
- **Shape:** A reinforcement with a 90-degree angle is stronger than a flat reinforcement.
- **Threads:** Tapped holes with more threads strengthen the reinforcement.

Typically, surface applied hardware is factory reinforced only. Mortise hardware is factory reinforced, drilled and tapped for template hardware.

REFERENCES:

ANSI A250.6: Hardware on Standard Steel Doors Reinforcement-Application.
De La Fontaine: Technical data book.

Hardware reinforcements

PRODUCTS AND SOLUTIONS:

Standard 10-gauge (0.129”/3.3 mm) high frequency hinge reinforcement.

Info: With the flange, as strong as 7-gauge (0.187”/4.8 mm) flat hinge reinforcement.
Applications: Standard and heavy-weight hinges, high frequency openings.
Benefit: Prevents door sagging.
Limitation: Heavy-weight doors require continuous hinge, pivots or floor closers.
Comment: Exceeds ANSI A250.6.

Standard mortise lock reinforcement.

Info: 12-gauge (0.105”/2.7 mm) lock front, 16-gauge (0.056”/1.4 mm) box reinforcement.
Application: Mortise locksets.
Comment: Exceeds ANSI A250.6.

Standard cylindrical lock reinforcement.

Info: 12-gauge (0.105”/2.7 mm) lock front, 18-gauge (0.044”/1.1 mm) spacer.
Application: Cylindrical locksets.
Comment: Exceeds ANSI A250.6.

Standard closer reinforcement.

Info: 5” high x 20” in length (127 mm x 508 mm), 16-gauge (0.056”/1.4 mm) or 14-gauge (0.071”/1.8 mm).
Applications: Regular and parallel arm surface door closers.
Benefit: Ensures positive fastening for surface door closers.
Comments: Complies with ANSI A250.6

Door models

Hollow metal products offer numerous benefits such as durability, security, fire-rated compliance and a high percentage of recycled content. Unfortunately, design and aesthetic were often compromised in the industry's early years. Most steel mills offer interesting pre-embossed panel doors; however, the choice, the material and the dimensions are limited.

The most common models are:

6-panel door

4-panel door

2-panel door

Door models

Top arched 2-panel door

Top arched 2-panel door with embossed lines

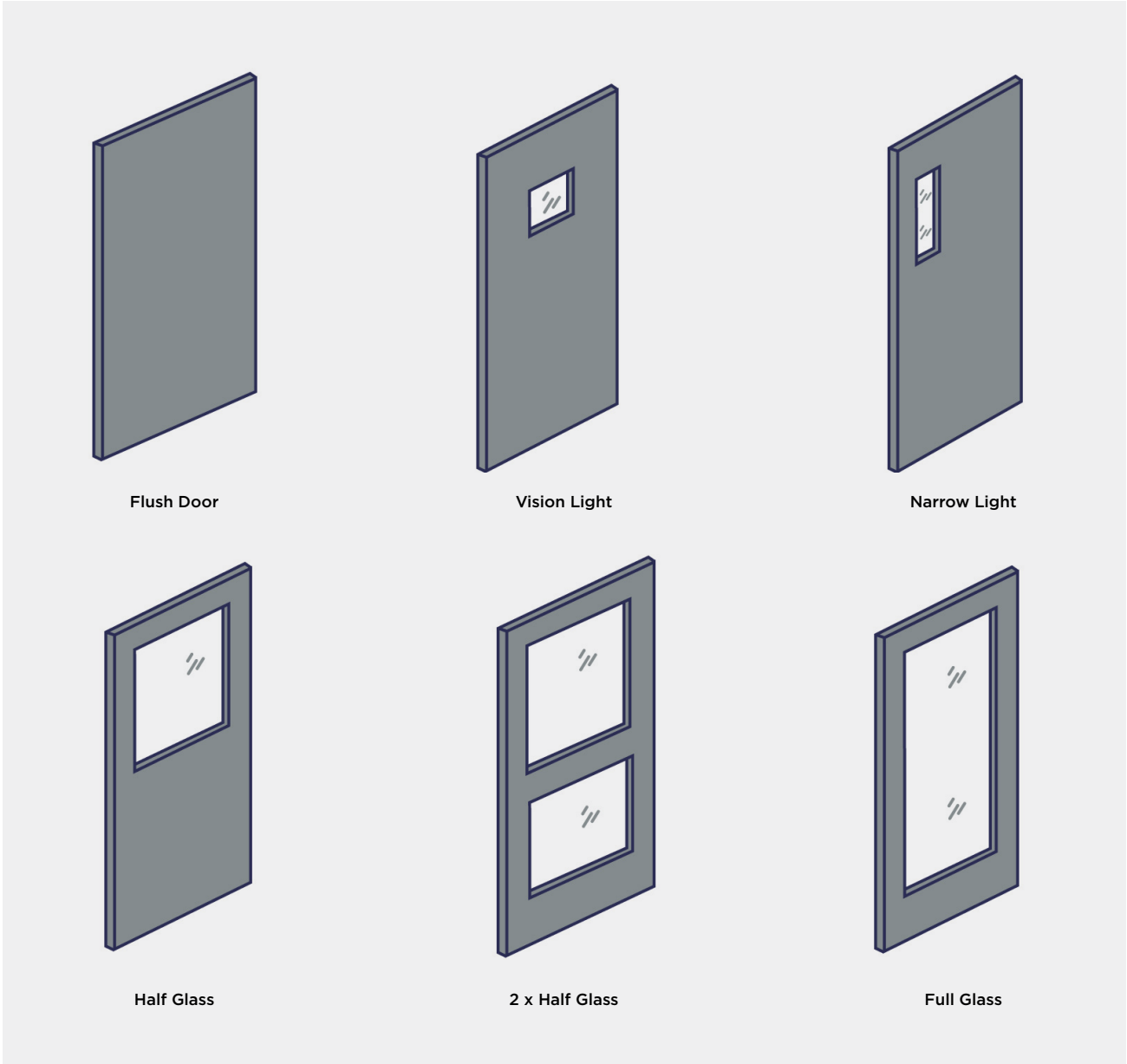
Over the past years, De La Fontaine's Research & Development department worked tirelessly every day to innovate and maximize the potential of new technologies to offer design flexibility in hollow metal doors.

The results are exclusive, creative and can be personalized for each project. You can add a distinctive signature to hollow metal doors by using custom embossing, recessed panels or by adding inlays of different materials such as painted galvannealed steel, stainless steel, plastic laminate, brass and wood moldings on the face of the door. These products are fire-rated up to 180 minutes in positive pressure (UL 10C).

For more detailed information regarding these unique products, please refer to their technical data sheets located in the "Documents" section of our website.

Door elevations

In buildings where they are used, doors with lights enhance the overall design and add to the quality of life by allowing more light in the rooms. The following types of door elevations are the most common in our industry:



Door elevations

When selecting the **exposed glass dimension**, you should keep in mind the following points:

- The top rail should have a minimum of 8” (203 mm) to provide enough space for parallel arm surface closers.
- The middle rail should have a minimum of 8” (203 mm) high and the center line should be 40” (1016 mm) above the finished floor base on code requirements for exit hardware.
- The bottom rail should have a minimum of 10” (254 mm) (per ICC/ANSI A117.1).
- The lock stile should have a minimum of 6” (152 mm) to provide enough space for mortise locksets.
- The bottom of the lite should be at a maximum of 43” (1092 mm) above the finished floor (per ICC/ANSI A117.1).

Through innovation, with the use of ceramic glass, it is now possible to increase the exposed glass dimensions and the fire rating while enjoying clear glass instead of wired glass. For more information, refer to the fire-rated doors section.

REFERENCES:

IBC: International Building Code.
NFPA 80: Standard for Fire Doors and Other Opening Protectives.
ICC/ANSI A117.1: Accessible and Usable Building and Facilities.

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Galvannealed steel standard hollow metal door.
Lock seam on edge or continuously welded construction, PA, CW series, 18-, 16- and 14-gauge, thickness 1 3/4”

Core	Fire rating	Maximum dimensions
Honeycomb	180 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Honeycomb	90 minutes	Single: 4’0” x 9’6” (1.2 m x 2.9 m) Pair: 8’0” x 9’6” (2.4 m x 2.9 m)
Polystyrene	90 minutes	Single: 4’0” x 9’0” (1.2 m x 2.7 m) Pair: 8’0” x 9’0” (2.4 m x 2.7 m)
Urethane (1)	90 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Steel Stiffened	90 minutes	Single: 4’0” x 10’0” (1.2 m x 3 m) Pair: 8’0” x 10’0” (2.4 m x 3 m)

COMMENT:

No astragal required on a 3-hour fire-rated pair of doors up to 8’0” x 8’0” (2.4 m x 2.4 m) since De La Fontaine successfully past the test.

NOTE :

(1) **Hardware limitations, please contact us**

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Custom embossed door, CED series, galvannealed steel, thickness 1 3/4”

Core	Gauge	Fire rating	Maximum dimensions
Honeycomb	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	180 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Honeycomb	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 9’6” (1.2m x 2.9 m) Pair: 8’0” x 9’6” (2.4 m x 2.9 m)
Polystyrene	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 9’0” (1.2 m x 2.7 m) Pair: 8’0” x 9’0” (2.4 m x 2.7 m)
Urethane (1)	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Steel Stiffened (2)	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 10’0” (1.2 m x 3 m) Pair: 8’0” x 10’0” (2.4 m x 3 m)
Mineral	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Inlay door, INL series, galvannealed steel, thickness 1 3/4”

Core	Gauge	Fire rating	Maximum dimensions
Honeycomb	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	180 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Honeycomb	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 9’6” (1.2 m x 2.9 m) Pair: 8’0” x 9’6” (2.4 m x 2.9 m)
Polystyrene	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Urethane (1)	18 (0,044”/1.1 mm) 16 (0,056” 1.4 mm)	90 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)

NOTE :

(1) **Hardware limitations, please contact us**
(2) **Design limitations**

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Recessed panel door, RPD series, galvannealed steel, thickness 1 3/4”

Core	Gauge	Fire rating	Maximum dimensions
Honeycomb	18 (1.1 mm), 16 (1.4 mm)	180 minutes	Single: 4’0” x 8’0” (1.2 m x 2.4 m) Pair: 8’0” x 8’0” (2.4 m x 2.4 m)
Honeycomb	18 (1.1 mm), 16 (1.4 mm)	90 minutes	Single: 4’0” x 9’6” (1.2 m x 2.9 m) Pair: 8’0” x 9’6” (2.4 m x 2.9 m)
Polystyrene	18 (1.1 mm), 16 (1.4 mm)	90 minutes	Single: 4’0” x 9’0” (1.2 m x 2.7 m) Pair: 8’0” x 9’0” (2.4 m x 2.7 m)

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Galvannealed steel hollow metal door with lights -1/4”(6.3 mm) wired glass

Description	90 minutes	45 minutes	20 minutes
Maximum overall exposed glass dimension	100 in^2 (0.065 m^2)	1296 in^2 (0.8 m^2)	3289 in^2 (2.1 m^2)
Maximum exposed glass dimension per light	100 in^2 (0.065 m^2)	1296 in^2 (0.8 m^2)	3289 in^2 (2.1 m^2)
Maximum width of the exposed glass	12” (305 mm)	54” (1.4 m)	36” (0.9 m)
Maximum height of the exposed glass	33” (0.8 m)	54” (1.4 m)	92” (2.4 m)

COMMENTS:

Please verify this information with your glass manufacturer.
Not available for 180 minutes

REFERENCES:

NAAMM/HMMA 850 : Fire-Rated Hollow Metal Doors and Frames

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Galvannealed steel hollow metal door with lights - 1/4" (6.3 mm) wired glass or ceramic glass with intumescent glazing tape

Description	90 minutes	45 minutes	20 minutes
Maximum overall exposed glass dimension	2208 in^2 (1.43 m^2)	2856 in^2 (1.84 m^2)	2856 in^2 (1.84 m^2)
Maximum exposed glass dimension per light	552 in^2 (0.36 m^2)	2856 in^2 (1.84 m^2)	2856 in^2 (1.84 m^2)
Maximum width of the exposed glass	12" (305 mm)	34" (864 mm)	34" (864 mm)
Maximum height of the exposed glass	46" (1168 mm)	84" (2134 mm)	84" (2134 mm)

COMMENTS:

- Listed glazing products: Wired Glass (Pilkington, Asahi, Central Glass) and Ceramic Glass (fireLite). www.fireglass.com
- Listed intumescent glazing tape: Pemko www.pemko.com
- Multiple lights permitted (maximum of 4 lights per door for 90 minutes fire-rated doors).
- Not available for 180 minutes
- **Please verify this information with your glass manufacturer.**

Fire testing under positive pressure

FIRE TEST UNDER POSITIVE PRESSURE UL 10-C

Galvannealed steel hollow metal door with lights - ceramic glass

Description	180 minutes	90 minutes	45 minutes	20 minutes
Maximum overall exposed glass dimension	100 in^2 (0.065 m^2)	4032 in^2 (2.6 m^2)	4136 in^2 (2.67 m^2)	4738 in^2 (3.1 m^2)
Maximum exposed glass dimension per light	100 in^2 (0.065 m^2)	4032 in^2 (2.6 m^2)	4136 in^2 (2.67 m^2)	4738 in^2 (3.1 m^2)
Maximum width of the exposed glass	12” (305 mm)	48” (1219 mm)	50 3/4” (1289 mm)	93 1/2” (2375 mm)
Maximum height of the exposed glass	33” (838 mm)	84” (2134 mm)	81 1/2” (2070 mm)	93 1/2” (2375 mm)

COMMENT:

Please verify this information with your glass manufacturer.

REFERENCES:

NAAMM/HMMA 850 : Fire-Rated Hollow Metal Doors and Frames