

HOLLOW METAL MANUAL

NAAMM STANDARD

HMMA 850-14

NAAMM 09 14
METAL DOORS & FRAMES
Fire & Smoke Control Rated
8d

FIRE-PROTECTION AND SMOKE CONTROL RATED HOLLOW METAL DOOR AND FRAME PRODUCTS

FOURTH EDITION

NAAMM 09 14
METAL DOORS & FRAMES
Fire & Smoke Control Rated
8d



DISCLAIMER

This Manual was developed by representative members of and approved by the Hollow Metal Manufacturers Association (HMMA) Division of the National Association of Architectural Metal Manufacturers (NAAMM) to provide their opinion and guidance on the specification and use of fire-protection and smoke control rated hollow metal doors and frame product. This Manual contains advisory information only and is published as a public service by NAAMM. NAAMM disclaims all liability of any kind for the use, application or adaptation of material published in this Manual.

Current information on all NAAMM Standards is available by calling, writing or visiting the website of the National Association of Architectural Metal Manufacturers, www.naamm.org.

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FOREWORD

NAAMM published the first edition of this manual in 1974 entitled, "Fire-Rated Custom Metal Doors and Frames". Much progress has been made in the development of *hollow metal door and frame assemblies* capable of providing *fire-protection* in wall openings since the publication of the first edition. The second and third editions were published in 1983 and 2000 respectively.

This fourth edition, re-titled "Fire-Protection and Smoke Control Rated Hollow Metal Door and Frame Products", presents data on current practices within the industry with emphasis on the requirements of the International Building Code (IBC) in the United States. The information presented is based on the [2012 IBC](#), [NFPA 80-2010](#), the Reference *Standards* included on Page [4-3](#), UL LLC (Underwriters Laboratories - UL) (UL; [Doors - Cat. GSZN](#), [Frames - Cat. GVTV](#)), Warnock Hersey Inc./Intertek Testing Services ([WHI/ITS](#)) and Factory Mutual ([FM > Building Materials > FM Approval Class 4100](#)) *listings* of HMMA member manufacturers in effect on the publication date of this manual. Except for reference materials provided in [Section 4](#) this manual does not address the specific requirements of any other current or legacy national or model code.

Within this document references to the 2012 IBC and NFPA 80-2010 are footnoted as [x]. The footnotes for Chapter-Section Numbers and the Title/Topic names are included on Page [4-2](#). Where an NFPA 80 reference indicates Annex information, it too should be reviewed. Terms in *italics* indicate they are 'defined' in ANSI/NAAMM [HMMA 801](#), the IBC and/or NFPA 80 and used in that context. A list of these terms is included on Page [4-5](#).

Fire testing, *listing*, *labeling* and certification services are thoroughly covered. The section on hardware and its proper use with *fire-protection rated* doors has been considerably expanded. The section on *fire-protection rated* products describes *classified* doors and frames currently available from NAAMM/HMMA [member companies](#) together with requirements relating to *glazing materials* and their application.

To assist in quickly locating specific information this Adobe Pdf document contains internal and external hyper-linking. Clicking text high-lighted in [blue](#) will present the page on which it appears the website or document referenced.

Certain web-based hyper-links may require 'registration' by the user. Others, particularly those for test standards, are copyright protected and therefore free and public access to the full standard is not available. In these cases, when available, we have included links to the "Scope" portion of the document provided by most Standards Writing Organizations (SWO).

To ensure the most current information possible is presented, as member manufacturer's fire-protection rated products evolve, individual pages will be up-dated. Revised pages will be annotated with the effective month/year revision date in the bottom right corner.

NAAMM/HMMA is actively involved in the development of national and international codes, fire, life safety and product performance *standards*. NAAMM/HMMA provides its recognized expertise and fosters liaisons through various working committees of ASTM, ANSI, UL, WHI/ITS, NFPA, BHMA, AIA, DHI and other industry related organizations.

Values stated in this manual are presented in inch-pound units and their corresponding metric values are in parenthesis for reference purposes only.

It is believed that this fourth edition will prove to be an invaluable reference document for those responsible for specifying *fire-protection rated* products. NAAMM welcomes comments regarding the content of the manual and appreciates suggestions for improvement of future editions. Contact NAAMM-HMMA at 1-630-942-6591 or by email; info@naamm.org.

GENERAL INFORMATION

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Protection of Wall Openings

Hollow metal door and frame products play a crucial role in providing the fire and life safety protection required in any building. There are however a number of variations in their designs and performance levels. Therefore, in order to make the proper selection, it is essential that specifiers have adequate information on the different *fire door and frame products* available.

The International Building Code (IBC), published every three years by the International Code Council (ICC), is the defacto model code for the United States. Five editions (2000 to 2012, with or without amendments) have now been adopted in all 50 States and the District of Columbia. Each edition presents slightly differing requirements relating to building, fire and life safety. This document must therefore be read in conjunction with the specific edition in force for the project jurisdiction. Unless specifically indicated otherwise, code requirements take precedence over information presented in this document.

Fire-rating requirements are established by the governing building code and will depend on the uses or occupancy groups within the building (i.e.; the specific locations in the building and the potential fire hazards of particular areas). *Hollow metal fire door and frame products* achieve ratings ranging from ½ hour to a maximum of 3 hours which are determined by the exposure limitations of the assembly itself.

The basic requirements and limitations affecting the installation and maintenance of *fire door assemblies* are defined in the National Fire Protection Association, "Standard for Fire Doors and Other Opening Protectives", ANSI/NFPA 80, which is referenced in the IBC ^[11].

This manual provides information needed to select and specify swinging *fire door and window assemblies* to provide the level of *fire-protection* required.

For fire and life safety the IBC utilizes two distinct protection concepts; 'active' and 'passive'. 'Active protection' encompasses products or systems that initiate their 'operational mode' after the initial stages of a fire event, once either manually or *automatically* activated. They require inherent thresholds of pre-determined temperature rise, rate of temperature rise or products of combustion to 'trigger' the system, or human intervention. The most commonly used active systems are fire alarms and sprinklers.

'Passive protection' includes components, assemblies and systems providing *fire-protection* without any intervention (manual or *automatic*), have no 'activation trigger thresholds' and function before and during a fire event. *Fire door assemblies* and fire-rated walls are two primary examples.

The IBC defines the minimum standard for fire, life, building safety and construction. It however contains provisions which allow the reduction or removal of passive protection requirements based solely on the use of *automatic* sprinklers.

These provisions do not address the fundamental purpose of compartmentalization and pro-active, preventative measures available to protect human life. It provides for sprinkler protected areas without fire-rated separations or *fire door assemblies*.

Without the inherent performance characteristics of *hollow metal fire door and frame products*, their *self-closing* and *self-latching* requirements, the delay of a fire alarm due to human factors, activation thresholds and/or sprinkler system response times, presents a deadly, real-life opportunity for the spread fire and toxic combustibles to adjacent areas.

As well the IBC contains provision for what have been termed "sprinkler-protected windows" or "window sprinklers". ANSI/UL 9 or ANSI/NFPA 257 testing for *fire-protection rated window assemblies* is not required. The "*listings*" cover only the sprinkler. Limitations with respect to the framing are simply "non-combustible" with *glazing materials* indicated "*as listed*". Non-combustible does not encompass structurally appropriate at the temperature levels used in *fire-protection rated window assembly* fire tests. There are no requirements for *fire-protection rated window assemblies* or *glazing materials* in the *listings* or code for these windows.

HMMA firmly believes fire and life safety should be based on a fully balanced approach. This Association supports the appropriate use of active protection systems for their detection, suppression and extinguishing characteristics during fire events. However, issues such as seismic, severe wind storm or other natural disasters, monumental or localized power failures, system malfunctions, human error and the complexities of today's construction methods and materials necessitates passive *fire-protection* as the first line of defense.

Therefore, it is the recommendation of HMMA and its member manufacturers that *fire door and window assemblies* be specified irrespective of any code provisions for their reduction or elimination with the use of sprinklers.

As used in this document, the IBC and NFPA 80, the term *fire door assembly* refers to any combination of (swinging *hollow metal*) door, frame product, hardware and other accessories which together provide a specific degree of *fire-protection* to an opening. In addition, HMMA uses the term "frame products" to describe as a group; *frames, transom frames, sidelight and window assemblies*.

Section 3 describes typical swinging *hollow metal fire doors and frame products* and the following application specific *hollow metal fire door assemblies*:

- Sound Control
- Commercial Security
- Detention Security
- Bullet Resistant
- Radiation Shielding

HMMA member manufacturers are continually improving existing products and introducing new ones to meet the evolving needs of codes, regulations and market demands. Contact the NAAMM office at (630) 942-6591, e-mail at info@naamm.org or any [member manufacturer](#) for assistance if the design criteria desired is beyond the scope of the products described in this manual.

Basic Requirements

Fire-protection of a wall opening requires a complete *fire door assembly*. The Architect must be certain that all components, which include the door, frame product, *glazing*, hardware and installation, have been proven to be capable of providing the level of *fire-protection* required by the governing code and are properly *labeled* per NFPA 80 ^[50]. Most typical combinations of these *labeled* components are presented in this manual.

Labels, certification or *listing marks* provide evidence that each component has been *listed* by a nationally recognized certification organization having a factory inspection service and has been constructed as detailed in the Follow-Up Service Procedures or Factory Inspection Manuals issued by the certification organization to the manufacturer.

Representative *hollow metal* door and frame product *labels* are shown on Page 1-10 under "Listing, Labeling and Certification Organizations".

Table 1 provides the typical relationship between the opening type and location, wall *fire-resistance rating* and *fire door assembly fire-protection rating* found in the 2012 IBC.

In addition to the data tabulated there are other important requirements which apply to all *fire doors*. Among these are the following:

1. Each component of a *fire door assembly* must meet its *listing* requirements, NFPA 80 ^[26] and, where required, be *labeled*. The *label* covers the design, construction and compliance of that specific component only.
2. Each *fire door* must be *self-closing* or close *automatically* in the event of a fire. It must also be *self-latching* and remain closed at the time of fire in order to provide a reliable *fire barrier* ^[20, 66].
3. *Automatically* closing doors may be held open by a separate, *labeled*, fail-safe door holder/release device or a hold-open mechanism which is an integral part of the basic closing device, provided the hold-open mechanism is released by one or a combination of *automatic* fire detectors acceptable to the *Authority Having Jurisdiction* ^[20, 52].

Type and Location of Assembly	Required Wall Fire-Resistance Rating (Hours)	Required Fire Door Assembly Fire-Protection Rating (Hours)
<i>Fire Walls and Fire Barriers</i>	4	3
	3	3
	2	1½
	1½	1½
<i>Shafts, Exit Enclosures and Exit Passageway Walls</i>	2	1½
<i>Fire Barriers</i>	Enclosures for Shafts, Exit Access Stairways and Ramps, Interior Exit Stairways and Ramps, Exit Passageway Walls	1
	Other Fire Barriers	1
	Other than Corridor Walls	¾
<i>Fire Partitions</i>	Corridor Walls	½
	Corridor Walls	1
	Corridor Walls	½
<i>Smoke Barriers</i>	1	¾(A,C,D)
Exterior Walls	3	1½
	2	1½
	1	¾
<i>Smoke Partitions</i>	None	None ^(D)

(A): Doors and their *glazing materials* may be tested as "No Hose Stream" (NHS) ^[15].

(B): *Frame product* and their *glazing materials* must be ½ Hr "With Hose Stream" (WHS) tested ^[14].

(C): *Frame product* and their *glazing materials* must be ¾ Hr "With Hose Stream" (WHS) tested ^[15].

(D): Smoke control tested and *labeled* in accordance with UL1784 and installation per NFPA 105 required ^[11,15].

WALL VS FIRE DOOR ASSEMBLY^[14] AND FIRE WINDOW ASSEMBLY^[21] FIRE RATINGS

TABLE 1

4. As per NFPA 80 ^[53] power operated *fire doors* must be equipped with a detection device which will *automatically* cut the power to the operator. The operator must then cause the door to close and latch.
5. *Fire doors* serving a required *means of egress* from places of assembly having an *occupancy load* of 100 persons or more must be equipped with *fire exit hardware*. Such hardware is *labeled* both for *fire* and *panic protection*. The *label* is intended to differentiate between *fire exit hardware* and *panic exit hardware*. Only *fire exit hardware* is permitted to be used on *fire door assemblies* per NFPA 80 ^[29, 41, 71].
6. Unless *listed* otherwise all pairs of hollow metal *fire doors* must be provided with an over-lapping steel *astragal*. Pairs of doors that require an *astragal* must have at least one attached in place so as to project approximately 3/4" (19 mm) or as otherwise indicated in the individual manufacturer's published *listings* ^[81]. NFPA 80 mandates that doors swinging in pairs within a *means of egress* cannot be equipped with *astragals* that inhibit the free use of either leaf.

The foregoing requirement essentially prohibits the use of overlapping *astragals* within a *means of egress* and restricts the hardware to:

- a. Two vertical rod *fire exit devices* (surface or concealed), or
- b. One door - Surface or concealed vertical rod *fire exit device* and open back *strike*, and
Other door - Latch or mortise *fire exit hardware*

For pairs of doors where only one leaf is needed to satisfy egress requirements the *active door* may have a latch or mortise *fire exit hardware*. The *inactive leaf* may have *self-latching* or *automatic flush bolts* or two point latch. A closed back *strike* would be used on the *inactive door*. An overlapping *astragal* may or may not be used as required by the individual manufacturer's *listing*. A *closer* is required on both doors and a coordinating device would be required in rooms of human occupancy.

7. *Fire door and window assemblies* must be installed in accordance with NFPA 80 ^[42, 59] and their *listings* ^[14]. Compliant operating clearances, recommended installation methods and tolerances are provided in NAAMM HMMA 840, "Installation and Storage of Hollow Metal Doors and Frames" and ANSI/NAAMM HMMA 841, "Tolerances and Clearances for Commercial Hollow Metal Doors and Frames".

All parts, *anchors* and accessories used in the installation, repair or maintenance of *fire-protection rated fire door* and *frame products* must be included in the Follow-Up Service (FUS) procedures or Factory Audit Manuals (FAM) of the original product manufacturer, as *approved* and issued by the certifier.

8. Upon completion of installation the IBC and NFPA 80 ^[44] require confirmation of the operation of all elements of each *fire door and fire window assembly* with a written record maintained and available to the *AHJ*.
9. NFPA 80 ^[45, 48] also requires these assemblies be operable at all times, maintained and inspected at least annually for compliance and a written, signed inspection report be maintained for the *AHJ*. Repair of items which could interfere with the operation of an assembly must be made and such repairs must be with parts from the original manufacturer, in accordance with the manufacturer's instructions and NFPA 80 ^[46, 49]. If repairs cannot be made the component or *fire door assembly* must be replaced. Maintenance and annual inspections are the responsibility of the building owner.

Classification of Fire Door and Frame Product

Fire doors are *classified* by hourly rating and temperature-rise rating (TRR). *Fire door frame products* are *classified* by hourly rating only. The hourly rating indicates the duration of the fire test exposure and associated hose stream. Together they are defined as the *fire-protection rating*. Generally *fire door* and *frame product* qualifying for a specific rating also qualifies for all lower ratings.

A temperature-rise rating (TRR) on a *fire door* is in addition to the *fire-protection rating*. It indicates the code required temperature rise permissible above ambient developed on the unexposed face of the door at the 30 minute point of a standard fire test. TRR *fire door labels* indicate the temperature rise does not exceed 450°F (232°C) as required by the 2012 IBC. Previous editions of the IBC include TRR's of 250°F, 450°F and 650°F at 30 minutes. The lower the temperature rating, the better the performance. Therefore, 250°F is a higher performance rating than 450°F or 650°F. If a TRR is not indicated on the *label* or it states "Temperature Rise Exceeds ..." these indicate a non-temperature-rise rated door.

TRR doors are mandated by the governing building code. The IBC ^[16] can require these in *interior exit stairways*, *ramps* and *exit passageways*. In some applications they can be required for *fire doors* installed in *fire walls* and *stairways* of multi-story buildings. The TRR is applicable to only the door and its *glazing materials*. Building codes ^[17] generally do not permit glazed frame product in openings requiring a TRR.

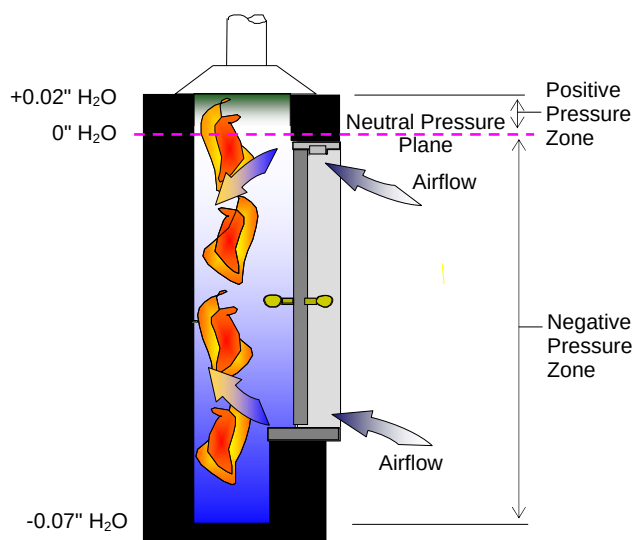
Fire Tests

The governing building code also specifies the test *standards* to be used for *fire door and window assemblies*. There are two basic protocols; "neutral" or "positive" pressure. These differ predominantly based on the position of the neutral pressure plane within the furnace during the fire exposure and the resulting pressures within the furnace.

The neutral pressure plane is the horizontal line inside the test furnace where the atmospheric pressure equals that in the lab. Neutral pressure tests have historically located the neutral pressure plane at the top of the test assembly. Positive pressure tests require it to be at 40" (1016 mm) above the sill. A schematic illustrating the basic differences is provided in Figures 1 and 2 below.

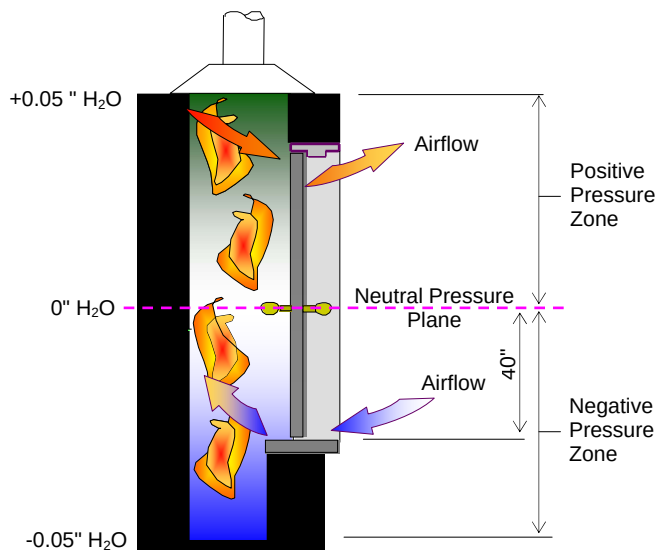
For *fire-protection rated doors, frames, transom and sidelight assemblies*, the IBC requires testing to ANSI/UL 10C or ANSI/NFPA 252. UL 10C is a positive pressure protocol and the IBC ^[14] requires NFPA 252 to be run under positive pressure.

For *fire-protection rated window assemblies and glazing materials* the IBC ^[21] mandates testing to ANSI/UL 9 or ANSI/NFPA 257, each under positive pressure.



NEUTRAL PRESSURE SCHEMATIC

FIGURE 1



POSITIVE PRESSURE SCHEMATIC

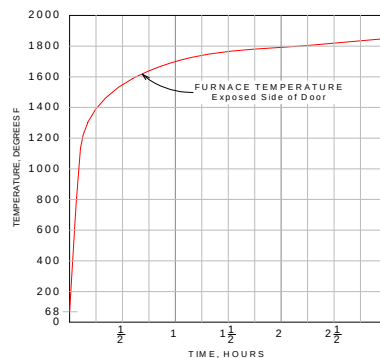
FIGURE 2

The fire test, which is generally the same in all the UL and NFPA *Standards* for doors, glazing and walls, consists of building the test assembly complete with hardware, *glazing* and wall *anchors* into a masonry, steel or wood stud wall, all contained in a movable structural steel rig. The test assembly, wall and rig are positioned on the face of a gas-fired furnace. After ignition the furnace temperature is controlled in accordance with the standard time-temperature curve shown in Figure 3 and the neutral pressure plane is located as per the specific code and test *standard* requirements.

Doors, frames, *paneled transom frames*, hardware and accessories can be tested for fire exposure periods up to 3 hours.

Except for glass block and special types of *glazing* designed for longer exposures, the length of fire exposure for glazed *transom, sidelight and window assemblies* is generally limited to ¾ hour ^[61].

For testing TRR doors thermocouples are attached to the non-fire (unexposed) side of the door(s) and may also be mounted on the *glazing materials*. These record the temperatures at each location. The test *standards* describe the quantity, placement and data recording intervals. In addition a cotton pad is passed over openings in or around the door(s) while the unexposed surface temperature is below 450°F (232°C) to determine whether the passage of flame or hot gases ignite combustibles through such openings.



STANDARD TIME-TEMPERATURE CURVE

FIGURE 3

Immediately after successfully completing the desired period of fire exposure the rig is moved from the furnace and the test assembly is subjected to the impact, erosion and cooling effects of a stream of water of specified nozzle pressure from a 2½" (63 mm) hose with a 1½" (28 mm) nozzle, commonly known as the "hose stream test". The water pressure and duration of application for the various *fire-protection ratings* are shown in Table 2. Fire tests of ½ hour *fire doors* and their *glazing materials* may be conducted without the hose stream as permitted by IBC.

The conditions of acceptance for performance of *fire doors* and frame product are generally the same in these test *standards* and are detailed in each.

Desired Fire-Protection Rating	Water Pressure At Base of Nozzle PSI (kPa)	Duration of Application: Sec/Ft ² (s/m ²) of Exposed Area
3 hours	45 (310)	3.0 (32)
1½ hour and over if less than 3 hours	30 (207)	1.5 (16)
1 hour and over if less than 1½ hours	30 (207)	0.9 (10)
Less than 1 hour	30 (207)	0.6 (6)

HOSE STREAM TEST - PRESSURE AND DURATION

TABLE 2

Upon completion of the fire exposure and hose stream tests the data collected, photographs and observations of the test lab engineer are combined into a test report. The test report will include a description of the components of the test assembly and wall and will be the basis of the *listings*.

Any variation from the construction tested may substantially change the performance characteristics of the assembly. When evaluated in conjunction with the manufacturer's previous test reports, *listings* and the certification organizations policies, procedures and experience, evaluations can be performed to expand the manufacturer's *listings*. Where evaluations determine that such alternatives will not adversely impact the performance characteristics their use can be permitted.

Although fire tests are performed on complete assemblies, testing, *listing* and certification of *hollow metal products* today is focused predominantly on individual components incorporating new technologies, constructions, features, or the adaptation of existing ones to meet specialized, unique applications and/or evolving code requirements.

In order to isolate the specific component under investigation all other elements of a test assembly will generally have been tested and certified previously. Based on their decades of experience, test and certification organizations require worst-case scenario assembly test configurations. This subjects the assembly to the most severe conditions possible and provides for the evaluation of each component and their interactions. UL and WHI have been utilizing HMMA '861' welded vertically stiffened type doors for decades to evaluate hardware and door related components for use on swinging hollow metal *fire doors*.

Glazing materials may also be fire tested to ANSI/UL 263 or ASTM E119, the *standards* used for walls [5, 12]. As such they are assigned a *fire-resistance rating* (FRR). A FRR comprises three (3) mandatory performance criteria; fire exposure, temperature-rise and hose stream endurance. As indicated in Table 1 the typical fire exposure durations are ½, 1, 1½, 2, 3 or 4 hours. For all FRR products the average TRR cannot exceed 250°F (121°C) during the fire exposure or 325°F (163°C) at any point on the entire test assembly. The time-temperature curve and hose stream duration for walls are calculated based on 100 sq. ft. (9.29 m²) of area. The hose stream pressure is the same as those for fire doors and frame product tests.

Tested to these *Standards* they are considered "transparent, translucent, composite panels or walls". With recent changes to the IBC [12] and NFPA 80 [36] these *glazing materials* may also be used in TRR *fire doors* within the limitations of the glazing manufacturer's listings if the *glazing material* is also certified and labeled to UL 9, UL 10C, NFPA 252 or NFPA 257. Installation of such *glazing materials* in *fire-protection rated* frame product does not provide assembly compliance for openings requiring a *fire-resistance rating* to UL 263 or ASTM E119. Fire-resistance ratings for glazing materials and products are only possible when installed as part of the FRR system as explicitly described by the certification agency's certification directory for that product.

Products tested only to ISO, BSI, DIN or Euro-Norm fire test *standards* are not permitted for use in projects requiring US code compliance.

Smoke Control Rated Assemblies

Smoke control assemblies (also referred to as "air leakage rated") reduce the migration of smoke and gases from a fire area to a protected area during the initial stages of a fire. They are mandated by the governing building code generally for assemblies in a *means of exit*, *corridors* and *smoke barriers*.

ANSI/UL 1784, "Air Leakage Tests of Door Assemblies" is the test *standard* mandated by the IBC^[11, 15]. It is not part of the fire tests described above and is performed on separate samples, independent of fire tests. Therefore a smoke control rating is separate from and in addition to any *fire-protection* or TRR which may be required.

Assemblies are tested with the doors swinging into and out of a pressurized test chamber at room temperature and 400°F (205°C), at three (3) pressure differentials; 0.1", 0.2" and 0.3" of water (25, 50 and 75 Pa). The IBC^[11, 15] and ANSI/NFPA 105 require a maximum air leakage rate of 3 ft³/minute/ft² (0.9 m³/minute/m²) of door area at a pressure of 0.1" of water (25 Pa) for both ambient and 400°F (205°C). A schematic of the test apparatus appears in Figure 4.

Since 3-sided *hollow metal frames* do not react in any significant way when heated to 400°F (205°C) the door and gasketing are the critical components for assembly compliance. As a result UL, WHI/ITS and FM frames are not required to bear "smoke control" compliance *labels*.

All doors require some type of gasketing to meet the smoke control requirements. This gasketing is different from and in addition to the edge-sealing systems which may be required for wood doors to meet positive pressure fire test requirements.

UL, WHI/ITS and the IBC^[18] have adopted a common symbol to identify fire rated product which is also smoke control compliant. The UL or WHI/ITS *label* will include . The symbol may appear on the product's fire *label* or may be on a separate *label* as illustrated in Figure 5.

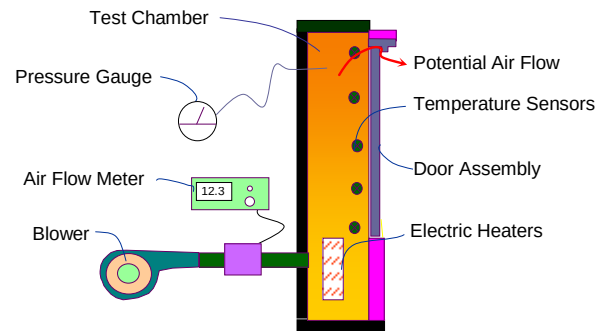
The IBC^[11, 15] requires smoke control assemblies to be installed in accordance with ANSI/NFPA 105, "Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives" and the field installation instructions provided with each component product.

The IBC^[11] also has provision for smoke control assemblies in openings which are not *fire-protection rated*. In such applications the door and gasketing are provided with smoke control *labels* only as shown in Figure 5 but without the  symbol.

As well the IBC allows for doors which "provide an effective barrier to limit the transfer of smoke" or be "close fitting"^[1,2,3,9,10,11]. These are not required to be *fire-protection* or smoke control rated.

UL and WHI/ITS have adopted the following system of product categories to define the various components required for positive pressure and/or smoke control compliant swinging door and frame assemblies;

- Category A; *Fire doors* which do not require the addition of other components such as edge seals to comply with positive pressure requirements.
- Category B; *Fire doors* which require the addition of a Category G edge seal to comply with positive pressure requirements. The edge seals are added to the door edge or frame.
- Category C; *Fire door frames* which require a Category B door to comply with positive pressure requirements. (Three-sided *hollow metal frames* are generally not required to be positive pressure tested and are therefore not included in Category C.)
- Category D; Generally "special purpose" door and frame assemblies which are tested and *labeled* only as an assembly.
- Category E; Builders hardware which contains combustible components or is intended for installation above the neutral pressure plane (40" (1016 mm) off the floor).
- Category F; Light kits not manufactured by the door manufacturer for installation in Category A or B *fire doors*.
- Category G; Edge sealing systems applied to doors or frame product which may or may not provide compliance for smoke control but must be installed on Category B doors for positive pressure compliance.
- Category H; *Fire-protection rated* gasketing materials which are installed on Category A and B doors to comply with the additional requirements of NFPA 105 and UL1784 for smoke control compliance.



SMOKE CONTROL TEST APPARATUS

FIGURE 4



SMOKE CONTROL DOOR LABELS

FIGURE 5

Category J; Gasketing materials which can be installed on *fire doors* for weather stripping or sound control purposes but which do not contribute to the door complying with positive pressure requirements and may or may not contribute to meeting smoke control requirements.

Fire-protection and smoke control rated *hollow metal doors* are generally Category A. They must be installed with *labeled hollow metal fire door frames* and may be used with Category E hardware, Category H gasketing and may be prepared for or provided with Category F light kits.

When only a smoke control rating is required *hollow metal doors* in *hollow metal frames* with Category H gaskets may be used.

Fire-protection rated hollow metal sound control, commercial or detention security, bullet-resistant, radiation shielding or other application specific assembly designs may be provided under Category D.

Safety Rated Glazing Materials

The IBC ^[19,21] and NFPA 80 ^[84] also require *glazing materials* in certain locations to comply with the Consumer Product Safety Commission *standard 16 CFR 1201*, "Safety Standard for Architectural Glazing Materials" for human impact resistance (HIR) in addition to the applicable fire test *standard*.

Fire test protocols do not include provision for HIR testing. Therefore, when mandated, in addition to its fire *label*, *glazing materials* must be permanently *marked* to indicate compliance with the code specified HIR *standard*.

Most HIR certifications are provided through the Safety Glazing Certification Council (SGCC), although other 3rd party certifiers are used by *glazing* manufacturers.

Listing, Labeling and Certification Organizations

Qualified *fire doors*, frame product and related items are identified as such only by the presence of a *label* authorized by a certification organization acceptable to the *AHJ* such as Underwriters Laboratories (UL), Warnock Hersey/Intertek Testing Services (WHI/ITS) or Factory Mutual (FM).

The IBC ^[18] requires *fire door assemblies*, *fire window assemblies* and smoke control assemblies to be *labeled* by an *approved* agency and the *label* must comply with the requirements in NFPA 80 ^[57,63,83].

Labels appropriate for various conditions and requirements are provided as evidence that the product complies with the code mandated test *standards*.

Certification organizations have developed independent policies regarding the information presented on their *labels* based on code mandated requirements. All fire *labels* indicate; the certification organization name and "*mark*" (logo); the manufacturer (by name, logo or control number); wording such as "Listed", "Approved", "Certified" or "Classified"; a description of the product such as "Fire Door", "Fire Door Frame" or "Fire Window Frame"; and a serial or control number.

All *fire door labels* must indicate the code required ^[18] *fire-protection rating*. *Fire door frame labels* may include the code required ^[18] *fire-protection rating*. Per NFPA 80 ^[86], UL and WHI/ITS, frames bearing a *label* without an hourly rating and provided with masonry wall *anchors* are a maximum 3 hour *fire-protection rated*. Frames bearing a *label* without an hourly rating and provided with steel stud or wood stud *anchors* are a maximum 1½ hour *fire-protection rated*.

Fire door and frame product *labels* are permitted to include the maximum *fire-protection rating* the product, as provided, is eligible for, but must be at least equal to or greater than required by the governing code. As an example, hollow metal *fire doors* may be provided and *labeled* as 3 hour, installed in a frame with masonry wall *anchors* in an opening which only requires a 1½ *fire-protection rating*.

To comply with code mandated requirements all *fire doors* used in positive pressure jurisdictions must be *labeled* for and bear a statement indicating compliance with the specific test *standard* in force. UL requires the inclusion of "UL 10C" on the *fire door label* and WHI the statement "Positive Pressure to UL 10C/NFPA 252" to indicate compliance. In addition there must be statements as to the temperature rise performance and references to installation instructions. The above statements may be included on the *fire door label* or a separate "supplemental" *label*. The instructions, provided separately, must detail all aspects of installation necessary to comply with the positive pressure requirements for the specific door.

As indicated earlier, where smoke control requirements are mandated in the governing code, the  symbol must also be included ^[18]. Again this may be incorporated on the *fire door label* or appear on a supplemental one.

The rating of the installed assembly is equal to the lowest rating of any component. (ie; An opening composed of a frame with a 1½ hour *label*, a door with a ¾ hour *label* and hardware with 3 hour *labels* would be deemed a ¾ hour assembly, based on the ¾ hour door.)

If any required component of the assembly is omitted, does not comply with its *listed* installation requirements, is not maintained or any installed component requiring a *label* does not bear a *label*, then the entire assembly is considered non-labeled.

In addition, the installation of non-labeled components on *fire-protection rated* and *labeled fire door or window assemblies* is not permitted, voids the *labels* and rating of the assembly.

Certification organizations may also require additional information on their specific *labels*. Examples include differentiating between doors reinforced for *fire exit hardware* and those for *single-point* locks/latches. Certification organizations may require a Factory Identification *Mark* to identify the facility applying the *label*.

The IBC ^[18] requires *fire door assembly labels* to comply with NFPA 80 ^[27] which provides for adhesive-backed metal or mylar *labels*, metal *labels* which can be riveted or welded to the product, or *labels* embossed (stamped) directly in the product. See Page 1-10 for facsimiles of UL and WHI/ITS IBC and NFPA 80 compliant *fire door and frame product labels* applied by member manufacturers. Printed metal or mylar applied *labels* are not intended to be painted. Embossed applied tin frame *labels* should be painted to avoid corrosion and possible obscuration. Labels embossed directly in frame product may be painted, however they must be legible afterward.

As per NFPA 80 ^[28] *labels* must be located so as to be readily visible and convenient for identification after installation. Except as noted, below *labels* are applied at approximately eye level on a frame hinge jamb and the hinge edge of each door leaf. If continuous hinges are specified, metal or mylar *labels* are generally applied to the inside of the top end channel or the top of a welded steel top cap (if provided) at the hinge end for *hollow metal doors* and at the hinge end of the head/horizontal *transom mullion* door rabbet for frame product.

UL, WHI/ITS and FM evaluate products on the basis of their performance under the fire endurance and hose stream tests already described. They require that their representatives witness the fire test when conducted at facilities other than their own. When inter-laboratory agreements exist this requirement may be waived.

Fire testing is only the first stage of the *listing*, certification and *labeling* process. UL, WHI/ITS and FM Follow-Up Service (FUS) programs verify *labeled* product conformance by conducting frequent unscheduled inspections for quality control and product fabrication at the *labeling* facility.

Fire *labels* are applied only at the manufacturer's factory or the facilities of UL or WHI/ITS *approved* distributors for that manufacturer ^[18].

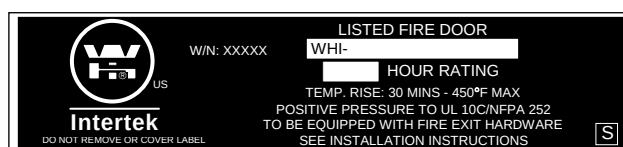
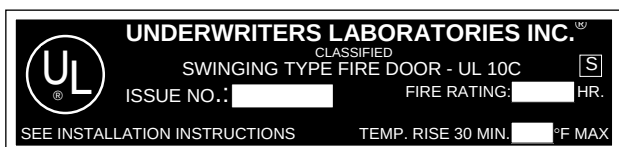
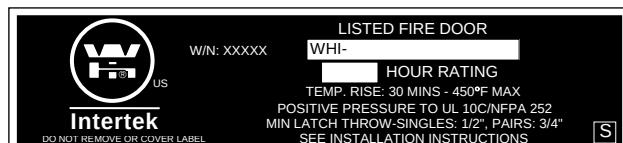
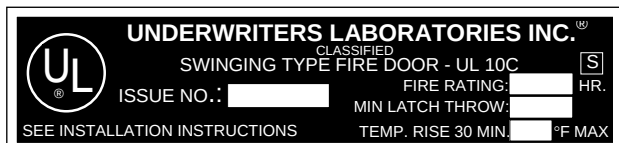
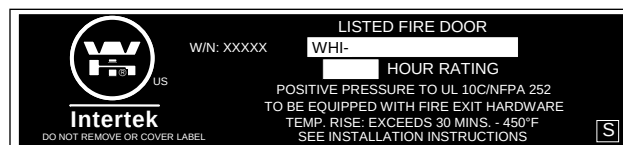
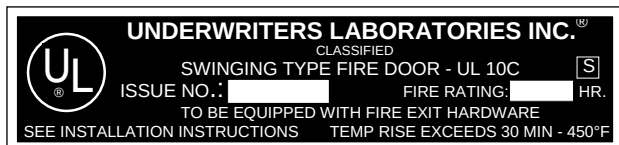
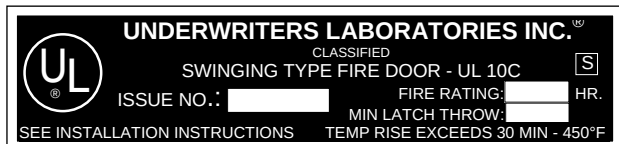
Authorization for the application of fire *labels* is granted under UL or WHI/ITS Certification / Listing Agreements and Licenses and their respective Follow-Up Service (FUS) Procedures or Factory Audit Manuals (FAM). These detail the responsibilities and the requirements for *labeling* relating to the construction, size and rating of eligible products.

The IBC ^[18] allows components of the same *fire door or window assembly* to be *listed* and *labeled* by different certification organizations.

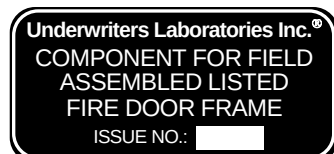
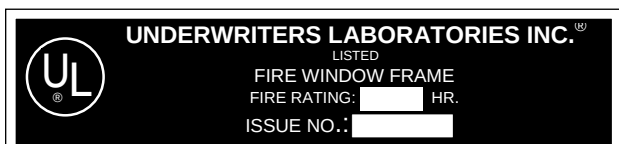
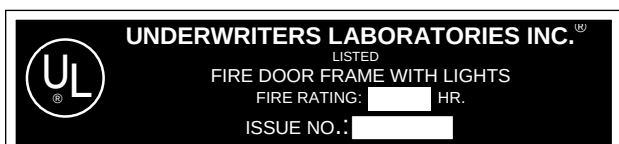
Codes, by-laws or other regulations may contain provisions, applications or requirements which contradict those of UL and/or WHI/ITS. In such cases the minimum requirements of the certification organization must be met before their *labels* can be applied.

When a door or frame does not comply with the certification organization's minimum requirements, the manufacturer cannot *label* the product, however upon request may provide a Letter of Certification (LOC) attesting to the construction of the product.

Representative UL and WHI/ITS Labels Used on Hollow Metal Fire Doors



Representative UL and WHI/ITS Labels Used on Fire Door Frame Product

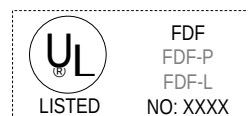


Applied to components of field assembled UL KD, Slip-On or field spliced *frame product*, removable HM mullions and panels.

Note: Manufacturer must also be identified on each product either by;

- A supplementary label bearing the manufacturer's name, or
- A combination label bearing the required information together with the manufacturer's name, or
- A label bearing the certifier's procedure, file or reference number for the manufacturer.
- A reference number to the manufacturer's name or file

Representative UL and WHI/ITS Embossed Frame Labels



Embossed (stamped) into *frame product* hinge jamb or hinge mullion. Fire-protection rating is 3 hours with masonry anchors, 1½ with wood or steel stud anchors, unless indicated otherwise. "NO: XXXX" is a specific identifier assigned by the certification agency to individual manufacturers.

Abbreviations: FDF = Fire Door Frame
Optional: FDF-P = Fire Door Frame - Paneled
FDF-L = Fire Door Frame - Glazed



Field Labeling and Field Modifications

The application of *labels* or the modification of *labeled* door or frame product in the field is not permitted except under UL or WHI/ITS Field Inspection Programs ^[47]. Field modification not authorized by the manufacturer or performed by other than the manufacturer's designated certifier are not permitted, will void the fire-rating of the entire opening, the manufacturer's warranty and any liability. Contact the product manufacturer for additional information on these programs.

The following are not considered field modifications by NFPA 80 ^[25], UL or WHI/ITS and are therefore permitted to be performed on site.

1. Drilling of; function holes for *labeled* locks and *fire exit hardware*; ¾" (19 mm) diameter holes (maximum) for *labeled* door viewers ^[35] and; drilling and tapping required for mounting *labeled* hardware.
2. Installation of *listed* and *labeled* 3rd party *astragals*, hardware, gaskets and other related items.
3. Installation of *astragals* provided by the door manufacturer.
4. Installation of *labeled glazing materials*, 3rd party *labeled glazing* kits or *fire door* louvers in prepared door openings.
5. Installation of *labeled glazing materials* in frame product.
6. Installation of *protective plates* on doors in accordance with ANSI/NFPA 80 ^[79] and the protective plate manufacturer's *listings* and installation instructions.
7. Installation of the frame manufacturer's *approved* loose wall *anchors*, hollow metal removable *mullions*, flush or rabbeted hollow metal *panels* (above doors) in frame product.
8. Assembly of *knocked-down*, slip-on or field spliced frame product ^[60].
9. Installation of signage in accordance with NFPA 80 ^[25].

Design Limitations

It is essential that the Architect recognizes the design limitations of *fire door* and *window assemblies* required to be *fire-protection rated* and *labeled*. Some of these limitations have already been covered but there are others too, which cannot be disregarded.

Hollow metal fire doors and frames may be manufactured from hot rolled, cold rolled, galvanized, galvanized or stainless steel. Frames are available with single or double rabbet profiles.

Additional design limitations due to hardware, code or other regulatory requirements are provided on Page 3-32 and are applicable to all manufacturers.

Fire door and window assemblies are not designed, intended, or by code and NFPA 80 ^[24,54,56] permitted to be *load bearing* elements. Structural support from over-head wall loads must be provided independently as part of the wall system.

Only *labeled fire-protection rated (FPR)* or where permitted, *fire-resistance rated (FRR) glazing materials* may be used ^[13,19,34,63,83]. The IBC mandates *FPR glazing materials* must comply with the requirements and limitations of NFPA 80 and *FRR glazing materials* may only be used within the limits of their individual *listings* ^[19,31]. *Glazing materials* must meet all code specified impact safety standards ^[19,32]. Refer to [Tables 3 and 4](#) on Pages 1-14 and 1-15 for the general limitations on *labeled glazing materials* permitted in *fire-protection rated hollow metal door and frame product*.

Glazing materials are not generally supplied or installed by the hollow metal manufacturer. However coordination between the Architect, general contractor, *glazing* supplier, *glazing* installer and the door and frame manufacturer are imperative to ensure the hollow metal is prepared appropriately and the installed *glazing materials* will not void the fire-rating of the opening ^[33].

The 2012 IBC ^[14] does not permit *glazing materials* in doors greater than 1½ hour rating. For glazed frame product greater than ¾ hour rating, the frame and *glazing material* must be *fire-resistance rated* and rated equal to that of the partition ^[14,62].

The selection of hardware is of particular importance. Only hardware which is *labeled* to the appropriate fire and hose stream standards is permitted. The type of hardware specified may limit the assembly size or *fire-protection rating*.

Self-closing devices are required on all *fire doors* and the *inactive leaf* of all pairs must have *automatic* or *self-latching* top and bottom bolts except when used on rooms not normally occupied by humans. Refer to the IBC ^[20], NFPA 80 ^[87] and Page 2-3 for exceptions.

All single doors and the *active leaves* of pairs must be provided with an active latch which cannot be held in the retracted position ^[20]. When *single-point latching hardware* is used the maximum permissible door size may be governed by the length of the latch throw. These limitations may differ from manufacturer to manufacturer due to differences in construction details.

Panic exit hardware is not permitted on *fire doors*. To be acceptable such devices must also be *labeled* as *fire exit hardware*.

These regulations are some of the most important with respect to hardware. They indicate the complexity of the rules affecting design features. For a more comprehensive and detailed explanation of hardware requirements see [Section 2](#), "Hardware for Swinging Hollow Metal Fire Doors" and [Section 3](#), "Hollow Metal Fire Doors and Frame Product" in this document.

Listings for *labeled* doors, frame product, hardware, *glazing materials* and other certified components may be found in the "[Fire Resistance Directory](#)" published by Underwriters Laboratories, the Warnock Hersey/Intertek Testing Services "[Directory of Listed Products](#)" and the Factory Mutual Research "[Approval Guide](#)".

Each product category in the certification listings also includes a preamble which details the parameters to which the products are tested, evaluated and certified. Limitations with respect to variations from the preamble for size, rating, construction or application will be detailed in the individual product's *listing*.

Requests for information, clarification or assistance are welcomed by members of the Hollow Metal Manufacturers Association, a Division of NAAMM.

Local Regulations; The Architect's Responsibilities

It should be emphasized that the foregoing has of necessity dealt with generally accepted national requirements but not all of these *standards* necessarily apply in all locations. A 'jurisdictional hierarchy' exists for codes and *standards*. The IBC can be modified by individual States, which can then be amended by County or 'regional' codes. Municipal codes, regulations and bylaws can then supersede all the foregoing. Interpretation and enforcement of building code, by-law or other regulatory requirements are the responsibility of the local *Authority Having Jurisdiction (AHJ)*. The *AHJ* generally bases their requirements on the local building code, NFPA *standards* and normally requires products to bear *fire labels*. Such products must conform in every respect to the *labeling* or approval requirements of the certification organization.

It is not the intent of this document to provide definitive, detailed information relating to building compartmentalization or to define the required fire ratings for the openings on a specific project. Once the Architect has fully defined these requirements, HMMA members can provide their expertise in meeting these needs.

The Architect therefore must be knowledgeable of the local code as well as requirements imposed by the owner or the insurance company. The Architect must analyze, interpret and determine all relevant requirements.

The Architect must establish and denote in the specifications the fire test methods governing the *fire doors and frame products*. For each opening the Architect's project door and frame schedule must indicate which openings are to be rated, the *fire-protection ratings* required, all temperature-rise, smoke control, human impact ratings and the materials that are acceptable.

The Architect must resolve, in advance, such conflicts as may exist between codes and *labeling* requirements and clearly specify what is to be provided so as to avoid any possible misunderstandings.

The hardware specifier is responsible for ensuring that the appropriate types of hardware are used. The door manufacturer, who is generally nationally oriented, often located at some distance from the job site, cannot be expected to be familiar with all local requirements unless the Architect provides this information. It is the Architect's responsibility, therefore, not only to ensure that the building is properly designed and protected from a fire, life safety and regulatory stand-point, but to fully inform the door manufacturer as to what is required under local regulations to accomplish this.

Guidelines for Proper Usage

The following guidelines should be observed:

1. Ensure that the project specifications and door and frame schedules include all essential information regarding *fire door* and *window assemblies* such as the mandated test *Standard(s)*, the required *fire-protection rating*, temperature-rise rating, smoke control rating, type of door design, desired jamb and trim profiles and type of frame anchorage.
2. Specify that *fire doors, frames and hardware* be supplied by manufacturers subscribing to a nationally recognized Certification, *Listing* and Follow-Up Service program.
3. Specify that all *fire doors and frames* have the proper fire *labels* attached. Use only *labeled* frames with *labeled* doors. Use only *labeled* hardware with *labeled* doors.
4. Ensure that sizes of doors and frames do not exceed those allowed.
5. If the doors and/or frame products are to be glazed ensure that the types, dimensions, areas and fire-ratings are within prescribed limits and that only *labeled glazing materials* are used.
6. Ensure that the proper types of hardware (hinges, latches, *closers*, etc.) are specified and that no chains, hook-backs or other devices are installed to prevent the free operation and latching of the door at any time.
7. If unique designs of doors or frames are contemplated, acceptability may need to be obtained by testing or evaluation. Such processes are time consuming and costly.
8. If special frame profiles are used, ensure that they comply with the *fire-rating* requirements and are compatible with the specified hardware.
9. Ensure that combustible floor coverings do not extend through openings protected by 3 hour *fire door assemblies* ^[43].
10. Check the requirements of the local code, by-laws and the insurance company involved for any other regulatory requirements.
11. Ensure that door and frame *labels* are not altered, removed or relocated in the field and that printed metal or mylar *labels* are not painted.

Ranges of Types and Sizes Available

Hollow metal fire doors and frames of various ratings and designs are supplied by member manufacturers. Some offer a wide variety; others a more limited choice. Because the requirements for 3 hour assemblies are the most severe the choices are limited. The range available for the other ratings is much broader and since each manufacturer has its own methods of construction, each offers a somewhat different selection. The development and improvement of *fire door* design is an ongoing process and the selection of products changes from time to time.

[Section 3](#), Hollow Metal Fire Doors and Frame Product, provides detailed information on the *fire-protection rating* and availability of NAAMM-HMMA products. Once the Architect has determined the requirements from a *fire-protection rating* stand-point, to select the appropriate project specific constructions, refer to NAAMM [HMMA 805](#), "Recommended Selection and Usage Guide for Hollow Metal Doors and Frames". This document provides detailed guidance based upon performance expectations including occupancy types, projected usage, impact probability, abuse and maintenance and is comprehensive with regard to the application of products covered by our [HMMA 860-Series](#) Guide Specifications.

The industry's leading manufacturers of *fire-protection rated* doors and frames are members of the Hollow Metal Manufacturers Association. A summary of representative types of doors and frames offered by member companies are shown on Pages [1-14](#) and [1-15](#) and more detailed information in [Section 3](#). Each company provides its own product literature describing in detail the items it produces. Before specifying *fire door assemblies* the literature of the intended supplier should always be consulted. The NAAMM website (www.naamm.org) contains a roster with links to [member companies](#).

Representative Types of Hollow Metal Fire Doors^(C) (See Table 3 for Glazing Limitations)

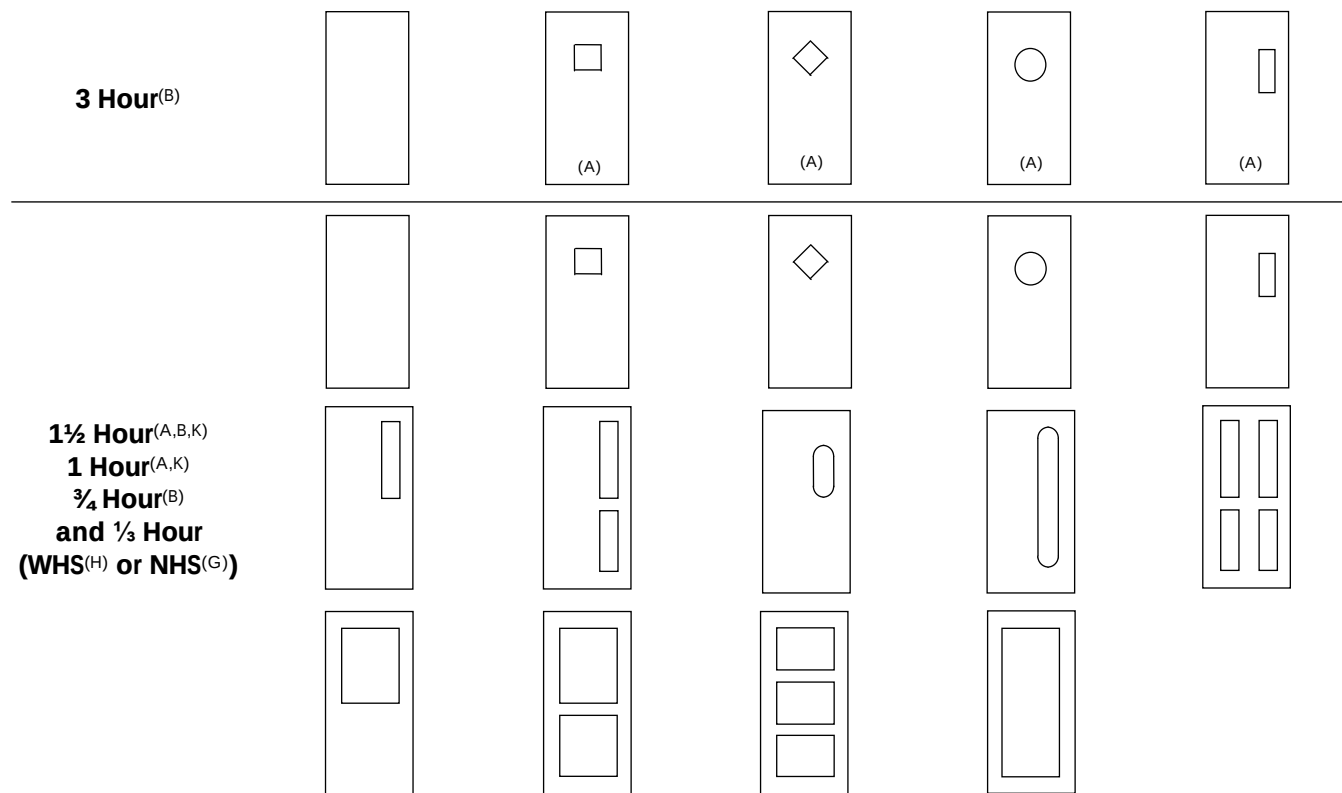


Table 3 summarizes, by *fire-protection* or *fire-resistance rating*, the maximum areas, widths and heights^(M) of commercially available *glazing materials* labeled by either **UL** or **WHI/ITS** for use in positive pressure compliant *hollow metal fire doors*. Users are advised to consult individual *glazing* manufacturer's *listings* for specific limitations, restrictions, requirements and Human Impact Resistance (HIR) compliance.

Labeled Material		3 Hour ^(A,E,N)	1 1/2 Hour ^(A,E,N)	1 Hour ^(A,E,N)	3/4 & 1/2 Hour ^(D) (WHS ^(H))	1/2 Hour (NHS ^(D,G))	3/4 & 1 1/2 Hour TRR Doors ^(A,E,N)
Laminated Glazing ^(L)	Area	100 in ² (0.065 m ²)	4990 in ² (3.23 m ²)	4990 in ² (3.23 m ²)	4990 in ² (3.23 m ²)	4990 in ² (3.23 m ²)	4990 in ² (3.23 m ²)
	Width	12" (305 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)
	Height	33" (838 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)	126" (3200 mm)
Ceramic Glazing ^(K)	Area	100 in ² (0.065 m ²)	2034 in ² (1.32 m ²)	3204 in ² (2.07 m ²)	3204 in ² (2.07 m ²)	3204 in ² (2.07 m ²)	100 in ² (0.065 m ²)
	Width	12" (305 mm)	36" (914 mm)	36" (914 mm)	36" (914 mm)	36" (914 mm)	12" (305 mm)
	Height	33" (838 mm)	56 1/2" (1435 mm)	89" (2260 mm)	89" (2260 mm)	89" (2260 mm)	33" (838 mm)
1/4" (6 mm) Wired Glass With Specialized Glazing Compounds ^(J,K)	Area		2208 in ² (1.43 m ²)	2208 in ² (1.43 m ²)	2856 in ² (1.84 m ²)	3289 in ² (2.12 m ²)	100 in ² (0.065 m ²)
	Qty of Lights	Not Permitted	Up to 4 lights	Up to 4 lights	No Limit	No Limit	1 light
	Width		12" (305 mm)	12" (305 mm)	34" (864 mm)	36" (914 mm)	12" (305 mm)
1/4" (6 mm) Wired Glass ^(J,K)	Area		100 in ² (0.065 m ²)	100 in ² (0.065 m ²)	1296 in ² (0.84 m ²)	3289 in ² (2.12 m ²)	100 in ² (0.065 m ²)
	Width	Not Permitted	12" (305 mm)	12" (305 mm)	54" (1372 mm)	36" (914 mm)	12" (305 mm)
	Height		33" (838 mm)	33" (838 mm)	54" (1372 mm)	92" (2337 mm)	33" (838 mm)
3/8" (9.5 mm) Cement Board	Area				3072 in ² (1.99 m ²)	3072 in ² (1.99 m ²)	
	Width	Not Permitted	Not Permitted	Not Permitted	36" (914 mm)	36" (914 mm)	Not Permitted
	Height				96" (2438 mm)	96" (2438 mm)	

(A): Where permitted by the AHJ

(B): Including TRR

(C): *Glazing material* may limit the types of doors permitted

(D): Maximum per light

(E): Maximum area per leaf

(G): NHS = No Hose Stream

(H): WHS = With Hose Stream

(J): With or without safety film (with safety film = HIR)

(K): *Fire-Protection Rated (FPR)*. See Note N

(L): *Fire-Protection Rated and Fire-Resistance Rated*

(M): Must meet all 3 criteria

(N): The 2012 IBC^[14] requires lights greater than 100 in² area in doors exceeding 3/4 hour fire rating to use *fire-resistance rated (FRR) glazing*

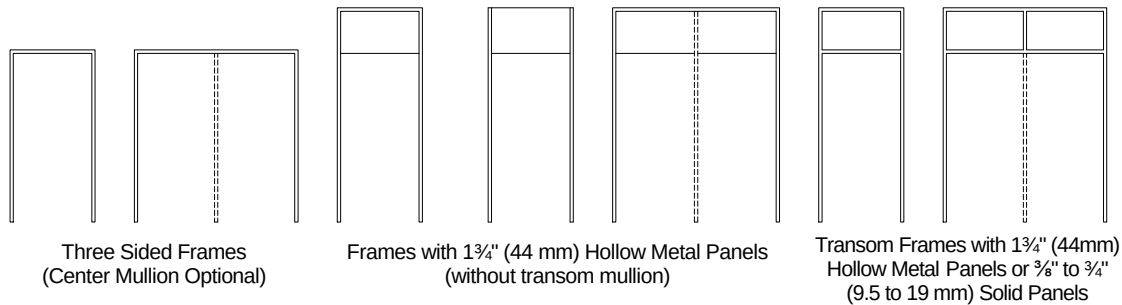
Note: Not all types or maximum sizes are available from all manufacturers

LABELED GLAZING MATERIALS FOR HOLLOW METAL FIRE DOORS

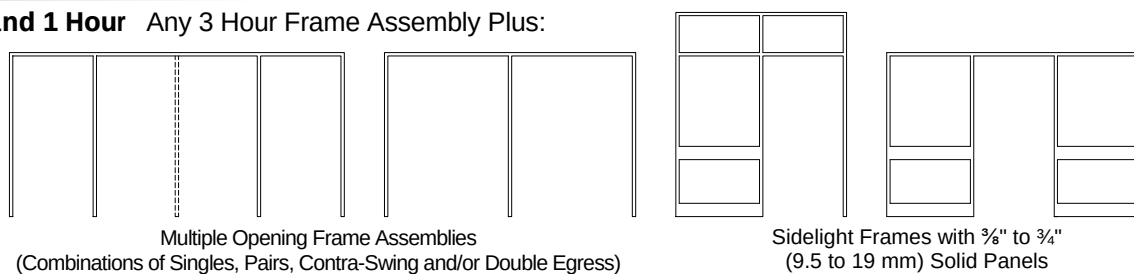
TABLE 3

Representative Types of Fire Door Frame Product

3 Hour



1½ Hour and 1 Hour Any 3 Hour Frame Assembly Plus:



¾ Hour and ½ Hour (WHS^(A)) Any 3, 1½ or 1 Hour Frame Assembly Plus:

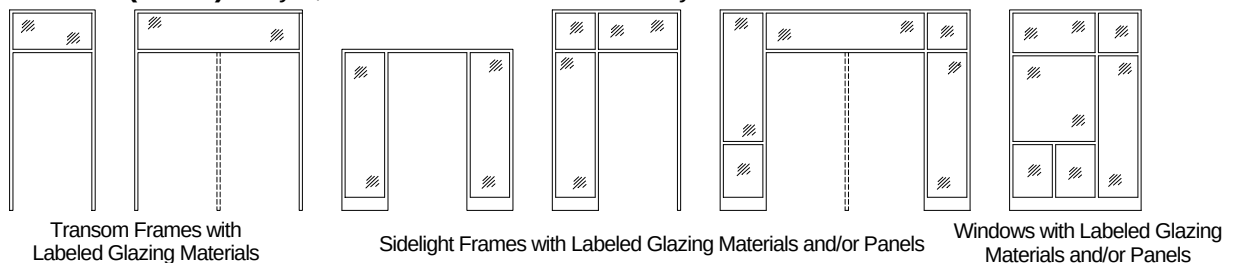


Table 4 summarizes by *fire-protection rating*, the maximum individual areas, widths and heights of commercially available materials *labeled* by either **UL** or **WHI/ITS** for use in positive pressure compliant *transom, sidelight and window assemblies*. Users are advised to consult individual *glazing* manufacturer's *listings* for specific limitations, restrictions, requirements and Human Impact Resistance (HIR) compliance.

Labeled Material		3 Hour ^(E)	1½ Hour ^(E)	1 Hour ^(E)	¾ Hour ^(A,B)	½ Hour (WHS ^(A,B))
Panels ^(D)	Area	4608 in ² (2.97m ²)	4608 in ² (2.97m ²)	4608 in ² (2.97m ²)	4608 in ² (2.97m ²)	4608 in ² (2.97m ²)
	Width	96" (2438 mm)	96" (2438 mm)	96" (2438 mm)	96" (2438 mm)	96" (2438 mm)
	Height	48" (1219 mm)	48" (1219 mm)	48" (1219 mm)	48" (1219 mm)	48" (1219 mm)
Laminated Glazing	Area		3724 in ² (2.4m ²)	3724 in ² (2.4m ²)	5605 in ² (3.62m ²)	6272 in ² (4.05m ²)
	Width	Not Permitted	111" (2818 mm)	111" (2818 mm)	96" (2438 mm)	106½" (2705 mm)
	Height		111" (2819 mm)	111" (2819 mm)	96" (2438 mm)	106½" (2705 mm)
Ceramic Glazing	Area		2627 in ² (1.69m ²)	3325 in ² (2.15m ²)	3325 in ² (2.15m ²)	3325 in ² (2.15m ²)
	Width	Not Permitted	56½" (1435 mm)	95" (2413 mm)	95" (2413 mm)	95" (2413 mm)
	Height		56½" (1435 mm)	95" (2413 mm)	95" (2413 mm)	95" (2413 mm)
¾" (6 mm) Wired Glass ^(C) With Specialized Glazing Compounds	Area				4608 in ² (3.03m ²)	4608 in ² (3.03m ²)
	Width	Not Permitted	Not Permitted	Not Permitted	100" (2540 mm)	100" (2540 mm)
	Height				100" (2540 mm)	100" (2540 mm)
¾" (6 mm) Wired Glass ^(C)	Area				1296 in ² (0.84 m ²)	1296 in ² (0.84 m ²)
	Width	Not Permitted	Not Permitted	Not Permitted	54" (1372 mm)	54" (1372 mm)
	Height				54" (1372 mm)	54" (1372 mm)

(A): WHS = With Hose Stream; The IBC ^[15] permits *fire door assemblies* in 1 hr *corridor walls* and *smoke barriers* with *fire doors* and their *glazing materials* at ½ hr NHS but requires *frame product* and their *glazing materials* to be ¾ hr WHS rated.

(B): For ½ hr partitions *fire doors* and their *glazing materials* may be ½ hr NHS tested, however *frame product* and their *glazing materials* must be ½ hr WHS rated.

(C): With or without safety film (with safety film = HIR)

(D): Provided as an integral part of the frame product and as such the frame *label* includes the *panels*

(E): The 2012 IBC ^[14,21] and NFPA 80 ^[62] do not permit *fire-protection rated* glazed frame product where the required *fire-rating* exceeds ¾ hour

Note: Not all types or maximum sizes are available from all manufacturers

LABELED MATERIALS FOR TRANSOM, SIDELIGHT AND WINDOW ASSEMBLY OPENINGS

TABLE 4

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