Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simply majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether they have approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall give the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretation should be addressed to the sponsor whose name appears on the title page of this standard.

**CAUTION NOTICE:** This American National Standard can be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards can receive current information on all standards by calling or writing the American National Standards Institute.

This standard was developed by representative members of the Hollow Metal Manufacturers Association Division (HMMA) of the National Association of Architectural Metal Manufacturers (NAAMM) to provide their opinion and guidance on the manufacturing tolerances including installation and operating clearances of hollow metal frames and doors. This standard contains advisory information only and is published as a public service by NAAMM and its HMMA Division. NAAMM and its HMMA Division disclaim all liability of any kind for the use, application, or adaptation of material published in this standard.

Readers can receive current information on all NAAMM Standards by calling, writing, or visiting the website of the National Association of Architectural Metal Manufacturers, www.naamm.org
# TABLE OF CONTENTS

Foreword .............................................................................................................................................. 1  
1. REFERENCED DOCUMENTS ...................................................................................................... 2  
2. MANUFACTURING TOLERANCES ........................................................................................... 2  
3. INSTALLATION TOLERANCES .................................................................................................... 3  
4. OPERATING CLEARANCES ........................................................................................................... 4  
Figures .................................................................................................................................................... 5
FOREWORD

Accurate fabrication and installation are essential to the performance of doors and frame product. The requirements for manufacturing and installation are given in the following Sections. The manufacturer is responsible for producing doors and frame product that comply with these Sections. However, it is important to recognize that proper installation is not the responsibility of the hollow metal manufacturer. For this reason, the requirements for installation should be included in the Section of the specifications where installation work is specified. It shall be the responsibility of the general contractor, using experienced installers, to perform the work outlined below. For additional information regarding installation see NAAMM HMMA 840, “Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames”.

Hollow metal doors are undersized to fit the door opening in the frame. Final clearances and relationship between door and frame product depend on the setting of the frame and the hanging and adjustment of the door and hardware. Recommended clearances must be met to ensure functional operation.


The values stated in inch-pound units are to be regarded as the standard. Corresponding metric values are included in the parenthesis for reference purposes only.
1. REFERENCED DOCUMENTS

Note: The publications listed in this section form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. When a more recent standard is available, the specifier shall verify its applicability to this Guide prior to its inclusion.

A. ANSI A250.11 Recommended Erection Instructions for Steel Frames


C. NAAMM HMMA-810 TN01-03 Technical Note, “Defining Undercuts.”

D. NAAMM HMMA-840-99 Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames

ANSI American National Standards Institute, Inc.
25 W. 43rd Street
New York, New York 10036
(212) 642-4900 www.ansi.org

NAAMM National Association of Architectural Metal Manufacturers
8 S. Michigan Avenue
Chicago, Illinois 60603
(312) 332-0405 www.naamm.org

NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, Massachusetts 02269
(617) 770-3000 www.nfpa.org

2. MANUFACTURING TOLERANCES

A. Manufacturing tolerances shall be maintained within the following limits:

1. Frame product for singles or pairs of doors (See Figure 1)
   a. Width, measured between rabbets at the head:
      nominal opening width + 1/16 in. (+1.5 mm), - 1/32 in. (-0.8 mm)
   b. Height (total length of jamb rabbet):
      nominal opening height + 1/16 in. (+1.5 mm), - 1/32 in. (-0.8 mm)

2. Frame for glazing materials or panels, height and width of each opening ± 1/16 in. (1.5 mm)

3. Surface flatness of factory assembled frame product (measured in any direction with straight edge placed on face of frame product)............. Max. 1/8 in (3.1 mm)

4. Cross sectional profile dimensions (See Figure 2)
   a. Face ..........................................................± 1/32 in. (0.8 mm)
   b. Stop ..........................................................± 1/32 in. (0.8 mm)
   c. Rabbet for door/glass/panel...............................± 1/32 in. (0.8 mm)
   d. Depth ..........................................................± 1/16 in. (1.5 mm)
   e. Throat ..........................................................± 3/32 in. (2.4 mm)

Frames overlapping walls (except slip-on construction) to have throat dimension 1/8 in. (3.1 mm) greater than dimensioned wall thickness to accommodate irregularities in wall construction.
5. Doors; Tolerances for actual hollow metal door sizes are as follows (See Figure 3):
   a. Width .......................................................... ± 3/64 in. (1.2 mm)
   b. Height ......................................................... ± 3/64 in. (1.2 mm)
   c. Thickness ...................................................... ± 1/16 in. (1.5 mm)
   d. Perimeter flatness* ......................................... 1/16 in. (1.5 mm) maximum
   e. Surface flatness ........................................... 1/8 in. (3.1 mm) maximum
   f. Twist .......................................................... 1/16 in. (1.5 mm) maximum
   g. Squareness .................................................. 1/16 in. (1.5 mm) maximum

   Surface flatness is applicable to doors up to 48" in width and 120" in height. Doors that exceed these measurements will possible exceed this tolerance and are not considered defective as long as they operate/function properly.

6. Hardware (See figure 1 & 3):
   a. Cutouts.........................................................Template dimensions + 1/64 in. (0.4 mm), - 0
   b. Location ...................................................... ± 1/32 in. (0.8 mm)
   c. Between hinge centerlines.............................. ± 1/64 in. (0.4 mm)
   d. Face cutout for hinge .................................... + 1/16 in. (1.5 mm), -0
   e. Mortise depth of reinforcement ...................... ± 1/64 in. (0.4 mm)

   These tolerances provide a reasonable guideline for manufacturing of hollow metal products. However, it should be noted that the cumulative effect of manufacturing tolerances at or near their maximum levels could have an effect on operating clearances. Tolerance buildup occurs when several tolerances are at or near their maximums. Care should be taken to keep each of these tolerances as close to zero as possible.

3. INSTALLATION TOLERANCES

A. The installer shall perform the following:

   1. Prior to installation, the area of floor on which the frame is to be installed, and within the path of door swing, shall be checked for flatness and levelness. Permissible tolerance is +/- 1/16" (1.5 mm). If the floor exceeds this, it is the general contractor’s responsibility to correct the area that is out of tolerance before the frame is installed.

   2. During the setting of the frame check and correct as necessary for opening width, opening height, squareness, alignment, twist and plumbness. Permissible frame product installation tolerances shall be maintained within the following limits: (see Figure 4)

      a. Opening width ...............measured from rabbet to rabbet at top, middle and bottom of frame; + 1/16 in. (1.5 mm), - 1/32 in. (0.8 mm)
      b. Opening height .............measured vertically between the frame head rabbet and top of floor or bottom of frame minus jamb extension at each jamb and across the head; ± 3/64 in. (1.2 mm)
      c. Squareness ...............measured at rabbet on a line from jamb, perpendicular to frame head; not to exceed 1/16 in. (1.5 mm)
      d. Alignment .................measured at jambs on a horizontal line parallel to the plane of the face; not to exceed 1/16 in. (1.5 mm)
      e. Twist .......................measured at opposite face corners of jambs on parallel lines perpendicular to the plane of the door rabbet; not to exceed 1/16 in. (1.5 mm)
f. Plumbness measured at jambs on a perpendicular line from the head to the floor; not to exceed 1/16 in. (1.5 mm)

Prior to installation, doors and frame shall be checked for correct size, swing, fire rating and opening number.

Brace, level and square frame as specified in HMMA 840 and ANSI A250.11

Hardware shall be applied in accordance with hardware manufacturers’ templates and instructions.

These tolerances provide a reasonable guideline for proper installation of hollow metal frame product. However, it should be noted that the cumulative effect of the installation tolerances at or near their maximum levels could result in sufficient misalignment to prevent the door from functioning properly. Installers should be careful not to create a tolerance buildup. Tolerance buildup occurs when several tolerances are at or near their maximums. Care should be taken to keep each of these tolerances as close to zero as possible.

3. Proper door edge clearances shall be maintained in accordance with Section 4 except for special conditions otherwise noted. Where necessary, steel hinge shims, furnished by the installer, shall be used to maintain clearances.

Architects, installers and end users must be aware of thermal bow which can affect edge clearances. Thermal bow is a temporary condition that occurs when opposing sides of a door are exposed to extreme temperature differences. The effects of thermal bow depend upon the color of the door, door construction, ambient temperatures on each side of door (extreme hot or cold climates), and direct sunlight. An example of a door susceptible to this condition would be an exterior door on the southern side of a building exposed to direct sunlight. A door exposed to direct sunlight may bow and appear to be warped during part of the day and then straighten as the direct sun passes over it. The effects of thermal bow can be reduced by painting the exposed surface of the door a lighter color.

4. OPERATING CLEARANCES

A. Edge clearance for swinging hollow metal doors and as specified in ANSI/NFPA 80, shall be provided for the functional operation of the assembly and shall not exceed the following (for all door heights):

1. Between doors and frame at head and jambs........1/8 in. (3.1 mm) ± 1/16 in. (1.5 mm)
2. Between meeting edges of pairs of doors............1/8 in. (3.1 mm) ± 1/16 in. (1.5 mm)

B. Floor clearance for fire rated swinging hollow metal doors shall not exceed 3/4" (19.0 mm). Floor clearance shall be provided for the functional operation of all swinging hollow metal doors and shall not be less than 1/8" (3.1 mm)

The Architect must define the distance from the top of the floor/finished floor to top of floor covering so appropriate undercuts can be provided. Floor/Finish Floor is defined as the top of the concrete or structural slab. HMMA uses the term ‘top of floor covering’ to describe the NFPA term ‘nominal surface of floor covering’. Please refer to HMMA-810 TN01-03 Tech Note, “Defining Undercuts.”
### Drawing Index

<table>
<thead>
<tr>
<th>Figure #</th>
<th>Description</th>
<th>HMMA Ref. #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frame Opening Tolerance</td>
<td>FO930-01</td>
</tr>
<tr>
<td>2</td>
<td>Sectional Profile Tolerance</td>
<td>F0021-03</td>
</tr>
<tr>
<td>3</td>
<td>Door Tolerances</td>
<td>DO580-01</td>
</tr>
<tr>
<td>4</td>
<td>Frame Installation Tolerances</td>
<td>F0690-04</td>
</tr>
</tbody>
</table>
FIGURE 1
FRAME TOLERANCES

HEIGHT
+1/16 IN. (1.5mm)
-1/32 IN. (0.8mm)

WIDTH
+1/16 IN. (1.5mm)
-1/32 IN. (0.8mm)

SEE INSERT BELOW FOR HARDWARE CUTOUT AND REINFORCEMENT DETAIL

FACE CUTOUT FOR HINGE
+1/16 IN. (1.5mm) -0 IN.

HINGE CUTOUT
+1/64 IN. (0.4mm) -0 IN.

MORTISE DEPTH OF REINFORCEMENT +/- 1/64 IN. (0.4mm)
FIGURE 2
CROSS SECTION PROFILE TOLERANCES

THROAT OPENING
+/- 3/32 IN. (2.4mm)

FRAME DEPTH
+/- 1/16 IN. (1.5mm)

RABBET +/- 1/32 IN. (0.8mm)
(doorglass/panel)

FACE
+/- 1/32 IN. (0.8mm)

STOP
+/- 1/32 IN.
(0.8mm)
**FIGURE 3**

**DOOR TOLERANCES**

- **WIDTH**: +/- 3/64 IN. (1.2mm)
- **HEIGHT**: +/- 3/64 IN. (1.2mm)
- **THICKNESS**: +/- 1/16 IN. (1.5mm)
- **SQUARENESS**: Measured diagonally from corner to corner across the face of the door. Maximum 1/16 in. (1.5mm) difference.
- **PERIMETER FLATNESS**: Measured Top, Bottom, Hinge & Lock edge, on both faces of door.
- **SURFACE FLATNESS**: Measured corner to corner on both faces of the door.
- **DOOR TWIST**: With door supported at corners, measure gap between door and block at the remaining corner.

---

**NAAMM HMMA 841-13**

**TOLERANCES AND CLEARANCES FOR COMMERCIAL HOLLOW METAL DOORS AND FRAMES**

8
FIGURE 4
FRAME INSTALLATION TOLERANCES

PLUMBNESS; MEASURED AT JAMB ON A PERPENDICULAR LINE FROM THE HEAD TO THE FLOOR.

ALIGNMENT; MEASURED AT JAMBS ON A HORIZONTAL LINE PARALLEL TO THE PLANE OF THE FACE.

TWIST; MEASURED AT OPPOSITE FACE CORNERS OF JAMBS ON PARALLEL LINES, PERPENDICULAR TO THE PLANE OF THE DOOR RABBET.

SQUARENESS; MEASURED AT RABBIT ON A LINE FROM JAMB PERPENDICULAR TO FRAME HEAD.

PROFILE MAY VARY AS A FUNCTIONAL DESIGN

MAXIMUM TOLERANCE 1/16 IN. (1.5mm)
RECOMMENDED GUIDE SPECIFICATIONS FOR HMMA HOLLOW METAL DOORS AND FRAMES

HMMA 860 — Hollow Metal Door and Frames
ANSI/NAAMM HMMA 861 — Commercial Hollow Metal Doors and Frames
ANSI/NAAMM HMMA 862 — Commercial Security Hollow Metal Doors and Frames
ANSI/NAAMM HMMA 863 — Detention Security Hollow Metal Doors and Frames
ANSI/NAAMM HMMA 865 — Swinging Sound Control Hollow Metal Doors and Frames
ANSI/NAAMM HMMA 866 — Stainless Steel Hollow Metal Doors and Frames
ANSI/NAAMM HMMA 867 — Commercial Laminated Core Hollow Metal Doors and Frames

RELATED HMMA DOCUMENTS
HMMA 800 — Introduction to Hollow Metal
HMMA 801 — Glossary of Terms for Hollow Metal Doors and Frames
HMMA 802 — Manufacturing of Hollow Metal Doors and Frames
HMMA 803 — Steel Tables
HMMA 805 — Recommended Selection and Usage Guide for Hollow Metal Doors and Frames
HMMA 810 — Hollow Metal Doors
HMMA 820 — Hollow Metal Frames
HMMA 830 — Hardware Selection for Hollow Metal Doors and Frames
HMMA 831 — Recommended Hardware Locations for Hollow Metal Doors and Frames
HMMA 840 — Installation and Storage of 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 890 — Technical Summary
HMMA 810-TN01 — Defining Undercuts
HMMA 820-TN01 — Grouting Hollow Metal Frames
HMMA 820-TN02 — Continuously Welded Frames
HMMA 820-TN03 — Guidelines for Glazing Hollow Metal Transoms, Sidelights and Windows
HMMA 840-TN01 — Painting Hollow Metal Products
HMMA 840-TN02 — Maintenance of Installed Hollow Metal Products