

# TOLERANCES AND CLEARANCES FOR COMMERCIAL HOLLOW METAL DOORS AND FRAMES



This standard was developed by representative members of and approved by the Hollow Metal Manufacturers Association Division (HMMA) of the National Association of Architectural Metal Manufacturers (NAAMM) to provide their opinion and guidance on the specification and use of swinging sound control hollow metal doors and frames. This standard contains advisory information only and is published as a public service by NAAMM and its HMMA Division.

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**National Association of Architectural Metal Manufacturers**

800 Roosevelt Road, Building C, Suite 312  
Glen Ellyn, IL 60137  
Tel: 1-630-942-6591 • Fax: 1-630-790-3095  
[www.naamm.org](http://www.naamm.org)

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800 Roosevelt Rd.

Bldg. C, Suite 312

Glen Ellyn, IL 60137

Phone: (630) 942-6591 Fax: (630) 790-3095

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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.

Operating clearances for Commercial Security, Detention Security, and Sound Control doors and frames depend upon the requirements of specified hardware. See ANSI/NAAMM HMMA 862, Guide Specifications for Commercial Security Hollow Metal Doors and Frames, ANSI/NAAMM HMMA 863, Guide Specifications for Detention Security Hollow Metal Doors and Frames, and ANSI/NAAMM HMMA 865, Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames. Operation of sound control doors and frames is dependent on the clearances of individual manufacturer's design.

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 ANSI A250.11
- B. ANSI/NFPA 80 -2007, Standard for Fire Doors and Fire Windows
- 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. 43 <sup>rd</sup> 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  $\pm 1/16$  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 .....  $\pm 1/32$  in. (0.8 mm)
    - b. Stop .....  $\pm 1/32$  in. (0.8 mm)
    - c. Rabbet for door/glass/panel .....  $\pm 1/32$  in. (0.8 mm)
    - d. Depth .....  $\pm 1/16$  in. (1.5 mm)
    - e. Throat .....  $\pm 3/32$  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.*

4 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.

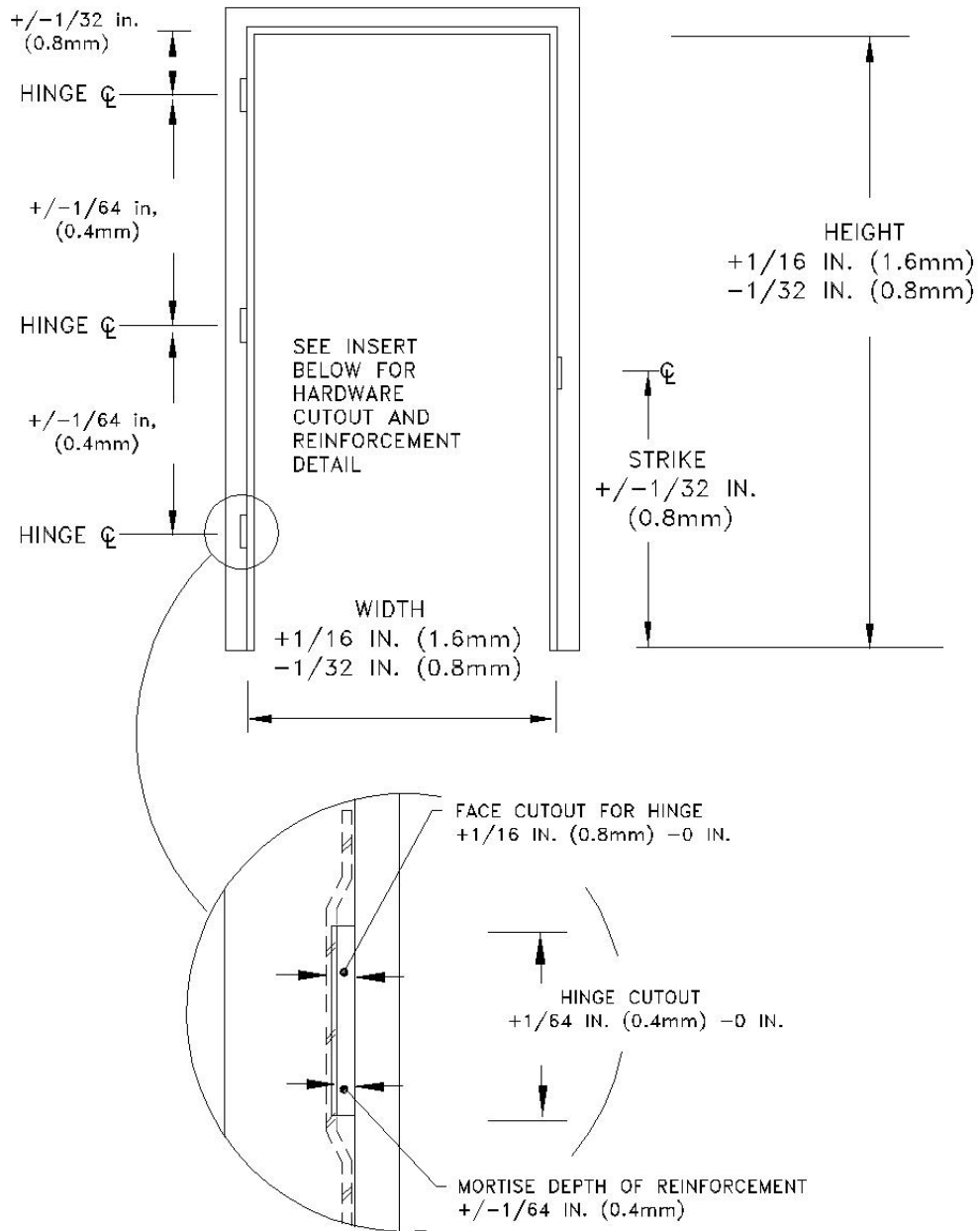
*Architects, installers and end users must be aware of thermal bow which can affect edge clearances. Thermal bow is a temporary condition that occurs when opposing sides of a door are exposed to extreme temperature differences. The effects of thermal bow depend upon the color of the door, door construction, 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)  $\pm$  1/16 in. (1.5 mm)
  - 2. Between meeting edges of pairs of doors.....1/8 in. (3.1 mm)  $\pm$  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."*

**Figure 1**



HMMA Figure # 1



HOLLOW METAL  
MANUFACTURER'S  
ASSOCIATION

a Division of



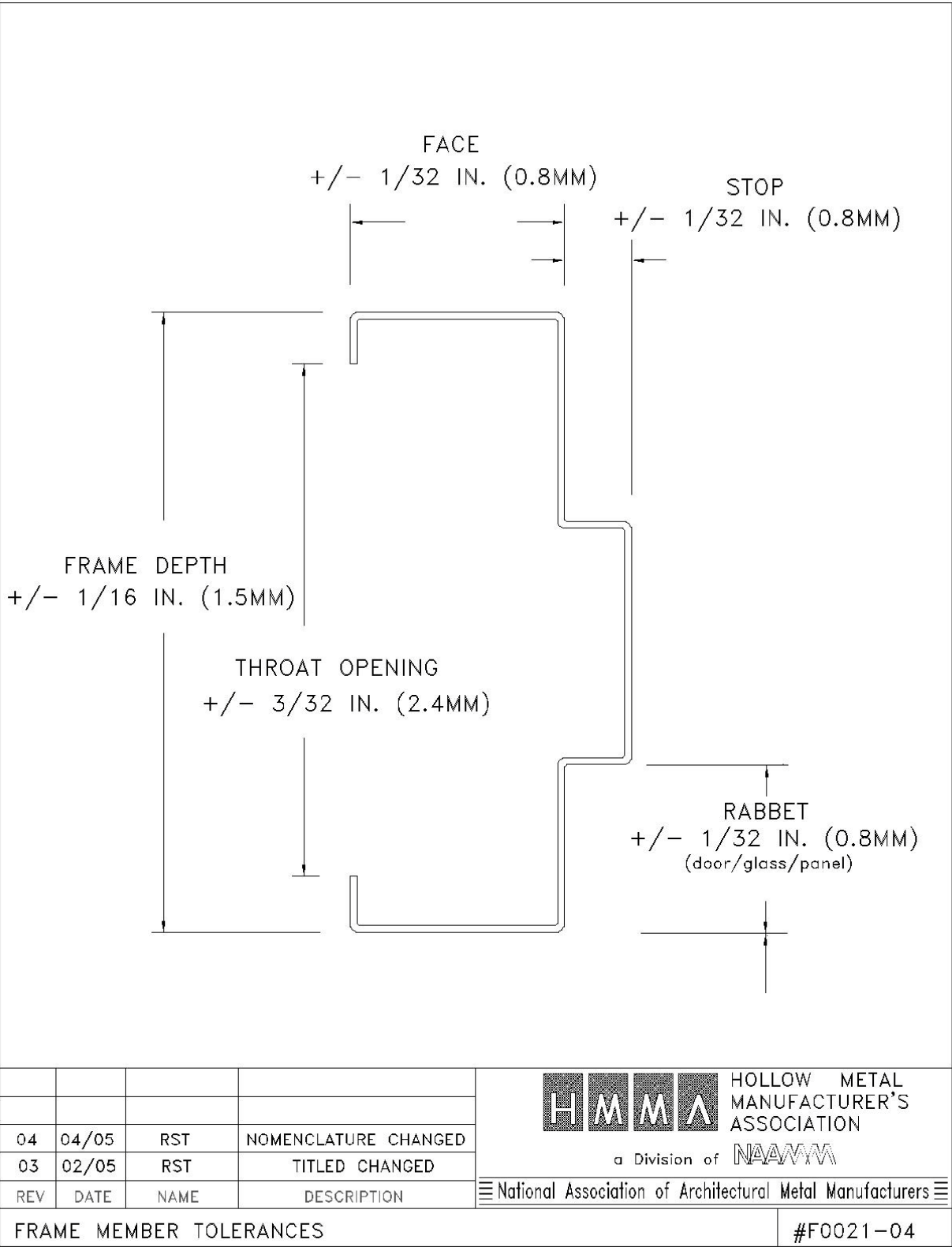
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Frame Manufacturing Tolerances

#F0930-01

Figure 2



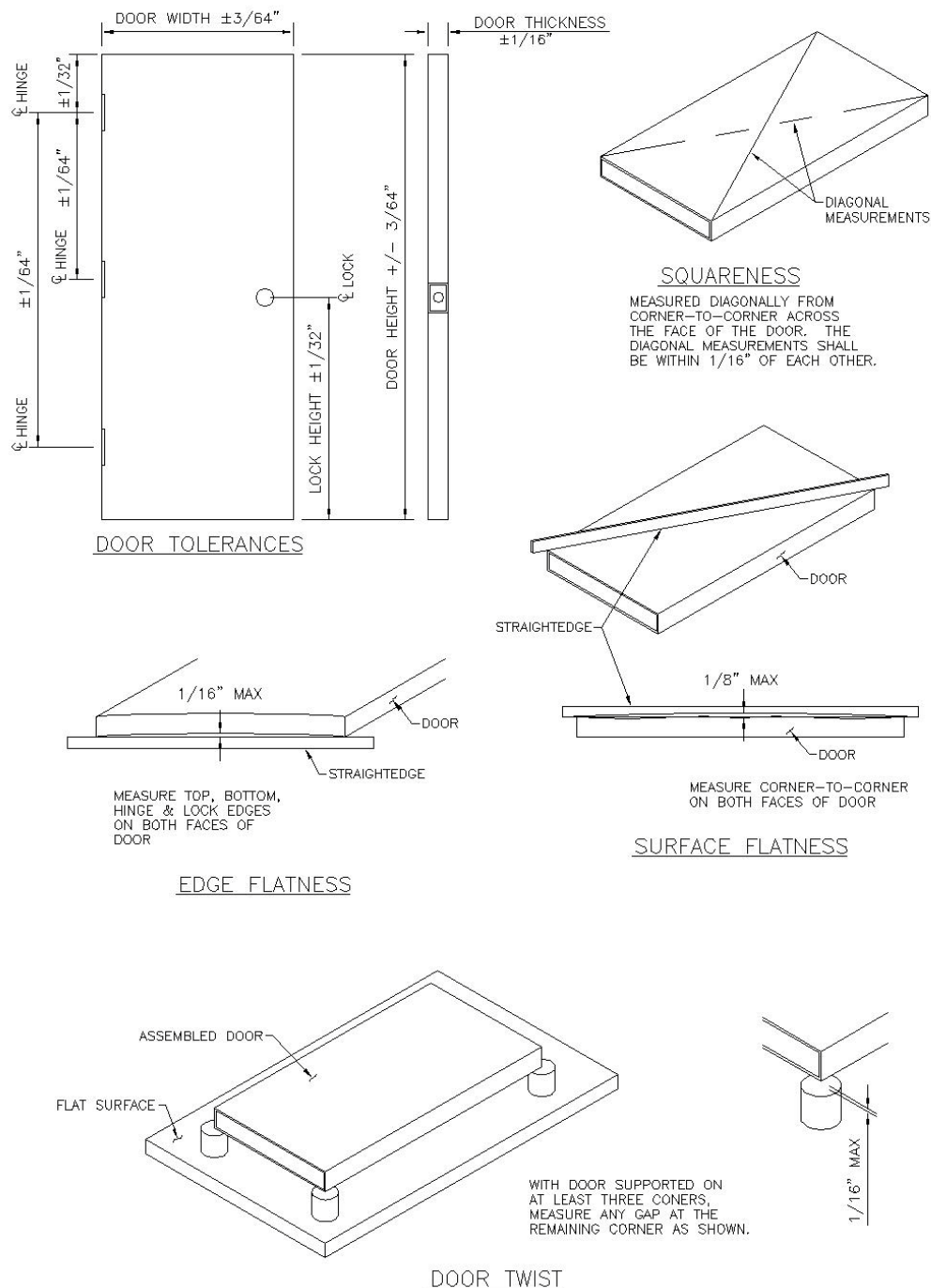


Figure 3  
Door Manufacturing Tolerances

CORNERS OF JAMBS ON PARALLEL LINES, PERPENDICULAR TO THE PLANE OF THE DOOR RABBET.



## **RECOMMENDED GUIDE SPECIFICATIONS FOR HOLLOW METAL DOORS AND FRAMES**

**HMMA 860 - Hollow Metal Doors 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**

**NAAMM**

**HMMA 865 - Sound Control Hollow Metal Door and Frame Assemblies**

**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**

**ANSI/NAAMM**

**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 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**

**ANSI/NAAMM**

**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**