

NFPA 80- 2010 and Proposed 2013 Edition

Standard for Fire Doors and Other Opening Protectives

TIA Log No. 1039

Reference: 6.3.1.7

Comment Closing Date: January 13, 2012

Submitter: Tim Klotz, Kelley Bros LLC

1. Revise 6.3.1.7.1 to read as follows

6.3.1.7.1 The clearances between the top and vertical edges of the door and the frame, and the meeting edges of doors swinging in pairs, shall be 1/8 in. \pm 1/16 in. (3.18 mm \pm 1.59 mm) for steel doors and ~~shall not exceed 1/8 in. (3.18 mm) and for wood doors.~~

Submitter's Substantiation: The statement "shall not exceed 1/8 in. (3.18 mm) for wood doors" in the current edition does not take into account any of the allowable industry standard manufacturing and installation tolerances.

ANSI, NAAMM (National Association of Architectural Metal Manufactures), SDI (Steel Door Institute), and WDMA (Window and Door Manufactures Association) all allow for acceptable tolerances in the manufacturing and installation processes. A steel frame manufactured and installed to industry standards, along with a wood door manufactured to industry standards can exceed the allowable 1/8 in. (3.18 mm) clearance. An example is that typically a single swing fire door would be pre-fit to include 1/8 in. clearance at the top and each vertical edge. In an ideal situation, the door and frame manufactured and installed to exact dimensions with no tolerances, 1/8 in. clearance would be maintained at the top and vertical edges. If either the door or frame is not exact but manufactured with acceptable tolerances the clearance at top or vertical edges can slightly exceed 1/8 in. In order to take these tolerances into account and not exceed the 1/8 in. clearance the wood doors would have to be pre-fit for less than 1/8 clearance on the top and vertical edge. This often leads to other issues such as binding due to frame manufacturing and installation tolerances, binding due to changes in humidity levels, and conflicts with hardware items such as edge or top of door mounted door position switches.

Additionally, the adoption of the UBC-7-2-97 Code and UL-10C positive pressure test requirements provides additional edge sealing protection for wood doors in the event of a fire. The concealed intumescent (Category A door) or the surface applied intumescent (Category B door) expand once they reach a specific temperature and seal the gap between the top and vertical edges of the door and frame. The expansion capability of this intumescent is more than sufficient to seal a gap that is 3/16 in. which meets the proposed new text in this TIA. Steel doors are currently allowed the additional (+,-) 1/16" in. clearance due to the fact that during a fire and high temperature a steel door will expand taking up the additional clearance allowed. The same principal seems to apply to positive pressure tested wood doors.

The stated NFPA 80 clearances are used by Authorities Having Jurisdiction to determine if an opening is compliant. If the clearances are greater than 1/8 in. the opening is not in compliance and can be subject to rejection and replacement. Although many AHJ's would be practical and allow doors to be slightly over the stated 1/8 in. some do not waiver at all and anything over 1/8 in. is not in compliance. There have been situations where doors have been rejected because the gap was .015 in. over the stated 1/8 in. This situation required replacement doors to be provided although the assembly would have performed its intended purpose as a fire door assembly. The wood door manufacture, steel frame manufacture, and frame installer are not responsible for non-compliance as they performed their task within their acceptable tolerances. The responsibility to bring opening into compliance rests directly on the distributor of these products which can only hold a manufacture or installer liable if they do not meet their industry tolerances.

As long as the fire protection ability is not compromised by the additional clearance of (+,-) 1/16 in. wood doors should be allowed the same clearances as steel doors currently have. The clearances stated in NFPA 80 should take into account positive pressure tested wood doors and the acceptable manufacturing and installation tolerances of steel frames and wood doors. This would help avoid costly replacements of doors or frames which slightly exceed the 1/8 in. clearance but would perform as required in the event of a fire.

Anyone may submit a comment by the closing date indicated above. To submit a comment, please identify the number of the TIA and forward to the [Secretary, Standards Council](#), 1 Batterymarch Park, Quincy, MA 02169-7471.

Annex A

Tolerances

The detailed descriptions of frame installation techniques that follow refer to plumbing, squaring and aligning the frame. The details in figure A1 indicate the maximum allowable tolerances in this area.

Note: Annex A is excerpted from ANSI/DHI A115.IG, "Installation Guide for Doors & Hardware" in order to define installation tolerances that should not be exceeded in order to maintain the operative integrity of the assembly.

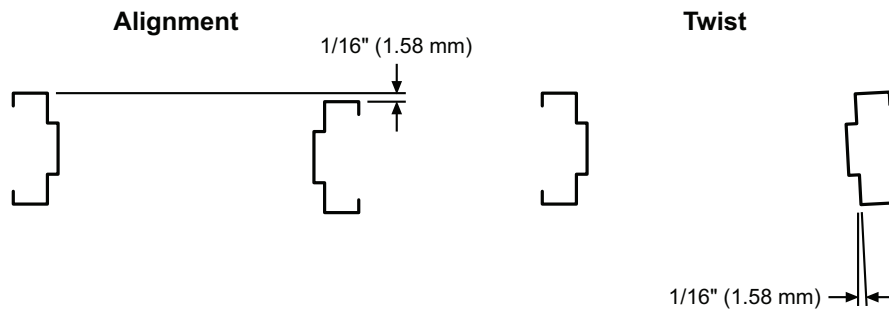
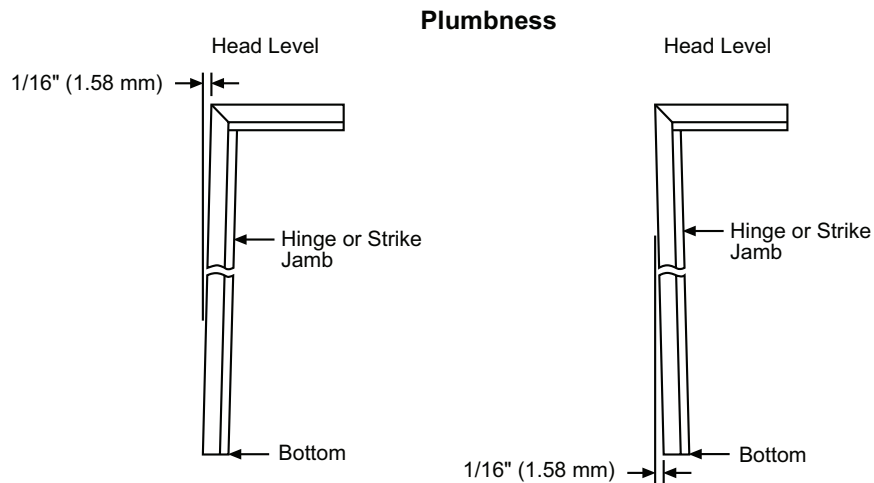
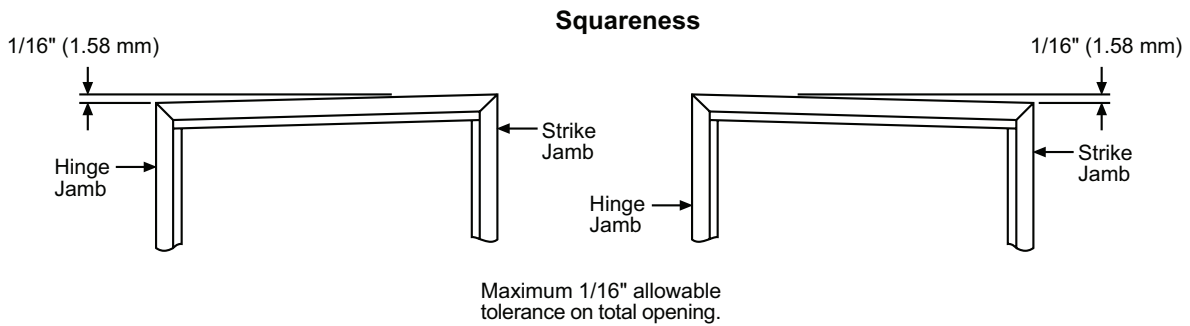


Figure A1 – Installation tolerances

1. REFERENCED DOCUMENTS

Note: The publications listed in this section form a part of this standard 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 standard prior to its inclusion.

- A. ANSI A250.11 Recommended Erection Instructions for Steel Frames
- 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.
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 New York, New York 10036
 (212) 642-4900 www.ansi.org

NAAMM National Association of Architectural Metal Manufacturers
 800 Roosevelt Road, Bldg C, Suite 312
 Glen Ellyn, Illinois 60137
 (630) 942-6591 www.naamm.org

NFPA National Fire Protection Association
 1 Batterymarch Park
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 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..... $\pm 3/64$ in. (1.2 mm)
 - b. Height..... $\pm 3/64$ in. (1.2 mm)
 - c. Thickness..... $\pm 1/16$ 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
6. Hardware (See figure 1 & 3):
 - a. Cutouts.....Template dimensions + $1/64$ in. (0.4 mm), - 0
 - b. Location..... $\pm 1/32$ in. (0.8 mm)
 - c. Between hinge centerlines..... $\pm 1/64$ in. (0.4 mm)
 - d. Face cutout for hinge.....+ $1/16$ in. (1.5 mm), -0
 - e. Mortise depth of reinforcement..... $\pm 1/64$ 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 $\pm 1/16$ " (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 widthmeasured 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 heightmeasured vertically between the frame head rabbet and top of floor or bottom of frame minus jamb extension at each jamb and across the head; $\pm 3/64$ in. (1.2 mm)
 - c. Squarenessmeasured 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. Twistmeasured 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. Plumbnessmeasured 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.

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 jambs1/8 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."

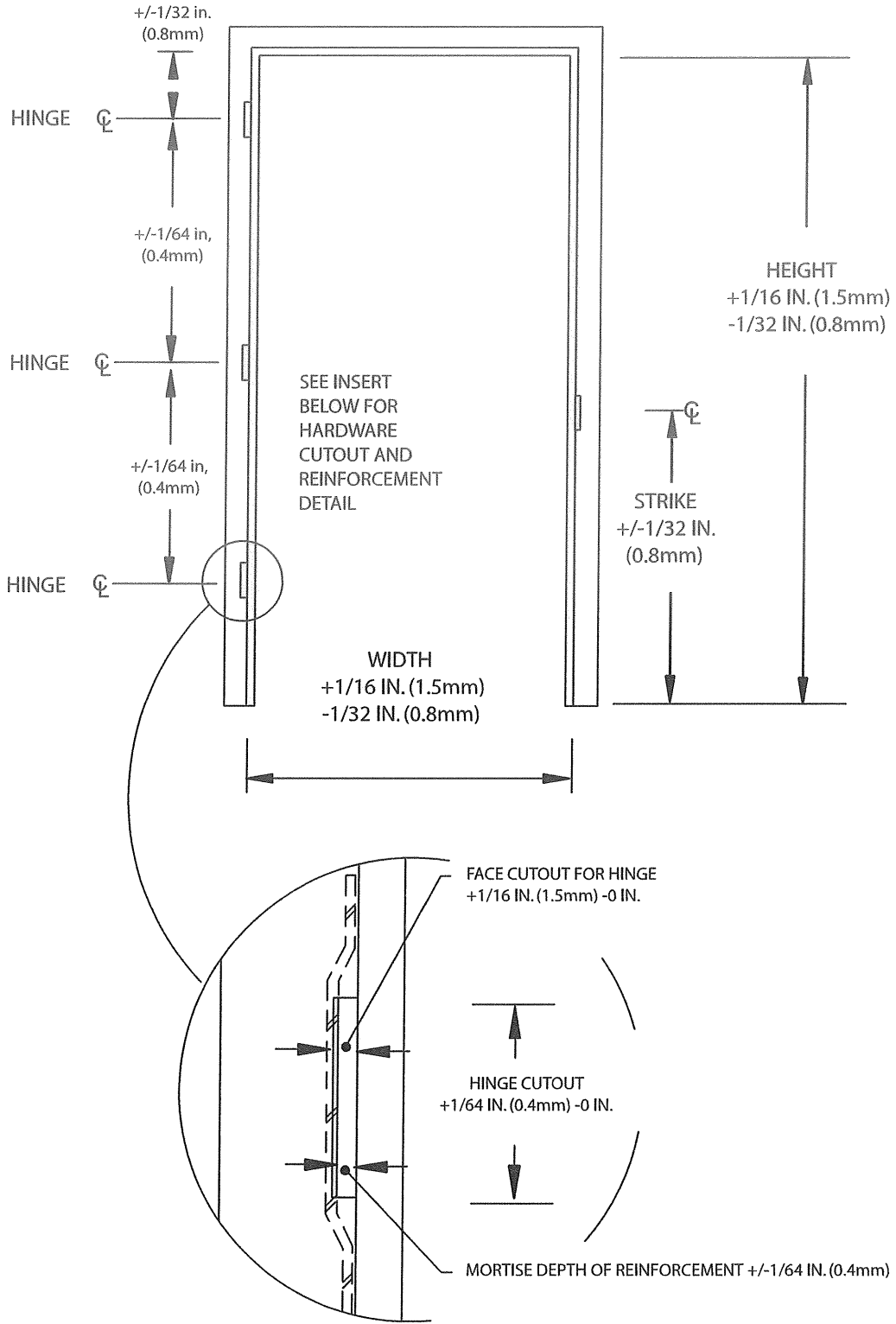


FIGURE 1
FRAME TOLERANCES

3.3 Factory Applied Coatings

Since factory applied coatings (primer, finish paint, etc.) are subject to performance standards rather than thickness, the dry film thickness is irrelevant. Such coatings must comply with performance criteria of:

ANSI/SDI A250.3 – *Test Procedure and Acceptance Criteria for Factory Applied Finished Painted Steel Surfaces for Steel Doors and Frames*

OR

ANSI/SDI A250.10 – *Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames*.

4 Frame Tolerances

4.1 Frame Cross Section Profile

Permissible tolerances in frame profile surfaces are as shown below:

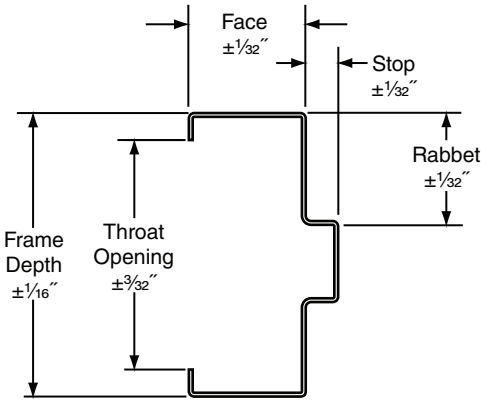


Figure A – Profile Tolerances

4.2 Frame Opening & Vertical Locations

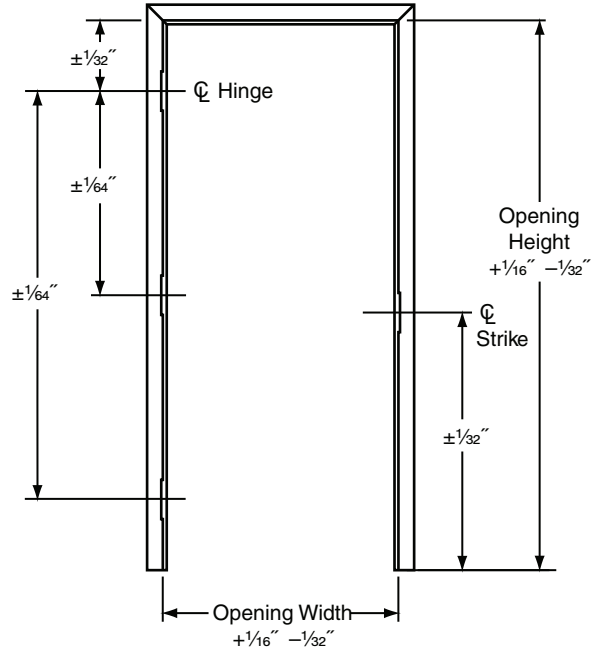


Figure B – Opening Tolerances

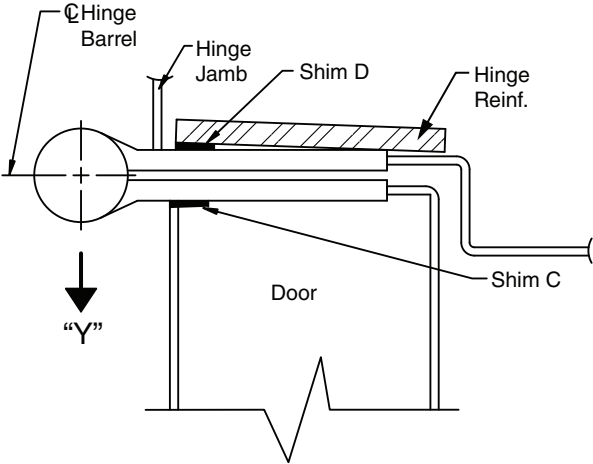
4.3 Bow or Twist of Jambs or Header

Realizing that frames are somewhat “pliable,” and require bracing and alignment during installation, allowable deformation (bow, twist, etc.) of jambs or header of frame **prior to installation** shall not result in a reduction of opening sizes more than 1/16” beyond those shown in Figure “B” when measured at any point.

4.4 Horizontal Alignment of Door Within Rabbet

Hinge and strike backsets shall allow the horizontal centerline of the door to be in line with the horizontal centerline of the frame rabbet ± 1/32” **prior to installation**. Figure “C” is an example based on a 1 3/4” door in a 1 15/16” rabbet.

7.1.2 Figure "K" shows how to relocate the pivot point away from the jamb.



- Using shim "C" only, door will be relocated in direction of Arrow "Y".
- Using "D" only, both door and centerline of hinge barrel will move in the direction of Arrow "F".
- Using both shims "C" and "D" will relocate the door in direction of Arrow "F" by a greater amount than by using either "C" or "D" alone. The centerline of hinge barrel will be relocated the same as by using shim "D" alone.

Figure K – Hinge Bind, Shims C and D

7.2 Frame Installation Tolerances

While this document is mainly concerned with tolerances relating to the manufacturing process, openings will not function properly if the frame is not installed within recognized tolerances.

Figures "L-M-N-O" show examples of the accuracy to be maintained while setting frames. Instructions for installation may be found in ANSI A250.11.

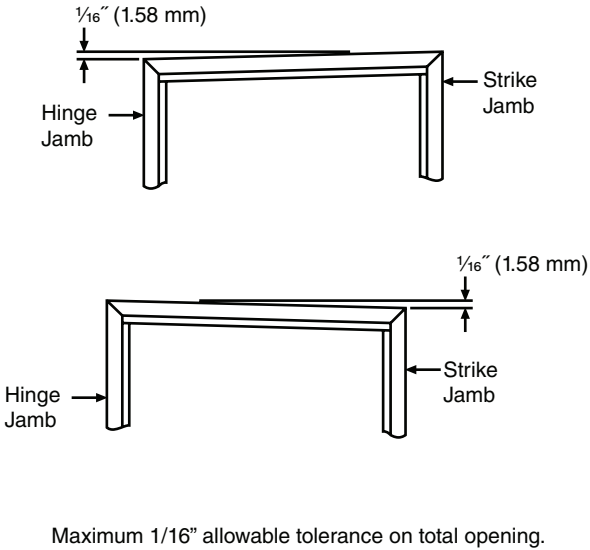


Figure L – Squareness

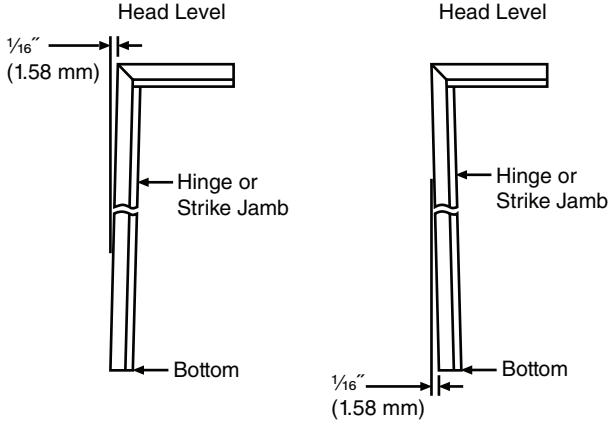


Figure M – Plumbness

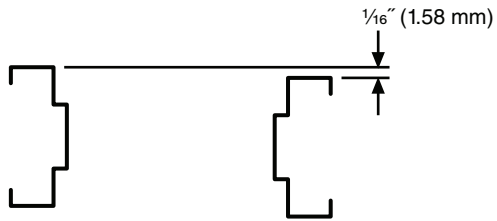


Figure N – Alignment

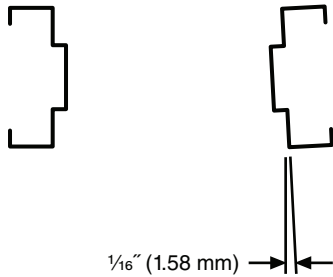


Figure O – Twist

7.3 Troubleshooting

Further information regarding corrective actions for door & frame openings may be found in SDI-122.

P-2: Suggested Installation Chart

Extra Heavy Duty: This duty level typically involves doors where use is considered heavy and frequent, and requires the highest minimum performance standards.

Heavy Duty: This duty level typically involves doors where usage is moderate, and requires intermediate minimum performance standards.

Standard Duty: This duty level typically involves doors where frequency of use is low, and requires the lowest minimum performance standards.

Extra Heavy Duty	Heavy Duty	Standard Duty
Classroom	Assisted Living Room Entry	Closet
Patient Rooms	Office - Interior Passage	Wardrobe
Bathroom - Public	Stairwell	Bathroom - Private
Dorm Room	Mechanical Service	Small, low usage Office
Assembly areas	Hallway	
Auditorium Entry	Hotel/Motel Room Entry	
Detention/Correctional	Storage	
Bullet Resistant	Apartment/Condo Entry	
Gymnasium/Locker Room	X-Ray	
Surgical Entry	Acoustic	
Trauma Centers	Medical Examination Room	

P-3: Dimensional Tolerances

Doors

Width: $\pm 1/16$ in. (± 1.6 mm) not prefit
 $\pm 1/32$ in. (± 0.8 mm) factory prefit
 Height: $\pm 1/16$ in. (± 1.6 mm)
 Thickness: $\pm 1/16$ in. (± 1.6 mm)

Hardware Machining

Hinge Mortises

Location: $\pm 1/32$ in. (± 0.8 mm)
 Height: $+1/32$ in., -0 in. ($+0.8$ mm, -0 mm)
 Depth: $+0.025$ in., -0 in. ($+0.6$ mm, -0 mm)
 Backset: $+0$ in., $-1/32$ in. ($+0$ mm, -0.8 mm)

Lock Fronts

Location: $\pm 1/32$ in. (± 0.8 mm)
 Height: $+1/32$ in., -0 in. ($+0.8$ mm, -0 mm)
 Width: $+1/32$ in., -0 in. ($+0.8$ mm, -0 mm)
 Depth: $+0.025$ in., -0 in. ($+0.6$ mm, -0 mm)

Typical Prefit Clearances for Factory Prefit Doors & Transoms	
Non-fire rated Doors	
Top & Hinge Edges:	1/8 in. (3 mm) clearance
Lock Edge, Single Door:	1/8 in. (3 mm) clearance
Meeting Edges, Pairs:	1/16 in. (1.6 mm) per leaf
Bottom Edge:	3/4 in. (20 mm) maximum from floor, 3/8 in. (10 mm) maximum from top of raised
Non-fire rated Transoms, Side Lites & Dutch Doors	
Width & height:	Per manufacturer's specifications
Fire Rated Openings	
See latest edition of NFPA 80 Standard for Fire Doors and Fire Windows for prefit clearance requirements on fire rated doors.	

P-4: Flame Spread Smoke Development

Doors covered by this standard are exempt per NFPA 101.