

**HOLLOW
METAL
MANUAL**

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METAL DOORS & FRAMES



ANSI/NAAMM HMMA 866-01
October 17, 2001

GUIDE SPECIFICATIONS
FOR STAINLESS STEEL
HOLLOW METAL
DOORS AND FRAMES

ANSI/NAAMM HMMA 866-01
October 17, 2001



METAL DOORS & FRAMES



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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 definition of terms used with hollow metal doors and frames. 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.

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FOREWORD

These specifications have been prepared in accordance with the CSI recommended format with Part 1-General, Part 2 – Product and Part 3 – Execution. Explanatory notes or instructions are shown in italics. Guide specifications are intended to be used as the basis for developing job specifications and must be edited to fit specific job requirements. Inapplicable provisions should be deleted, appropriate selections should be made where there are choices, and provisions applicable to the job should be added where necessary. Optional items or requirements are shown in brackets. Notes and instructions to specifiers are given in italics directly following or at the start of the paragraphs to which they apply. Notes that contain permissive language are not considered part of the standard. Dates given with ASTM and other standards were current at the time this specification was published. When a more recent standard is available, the specifier should verify its applicability to this guide prior to its inclusion. Note: While the CSI Section Format locates delivery, storage, and handling in Part 1, NAAMM standards include this under Part 3 – Execution.

Materials and fabrication methods are specified in detail in Part 2. Doors and frames made in accordance with these specifications have successfully met the testing and performance requirements of Paragraph 1.05. However, the materials and fabrication methods called for in these specifications, while providing an encompassing guide, are not meant to restrict the use of other materials and methods where it can be demonstrated through the specific testing procedures in Paragraph 1.06 that the construction can equal or exceed the performance levels specified in this paragraph. In order to ensure that a manufacturer's product meets the desired performance levels, the construction specifications must always include the testing and performance requirements of Paragraph 1.05 and the quality requirements of Paragraph 1.06.

This specification covers stainless steel hollow metal doors and frames constructed from the two commonly used alloys, Type 304 or 316 stainless steel conforming to ASTM A666 as well as the commonly used finishes, #2B-mill, #4-satin, and #8-mirror. Also, noteworthy, there are other available finishes offered by some HMMA member companies i.e. "hairline", #10-mirror, colored, etched and embossed. The specifier should contact one of these members or NAAMM headquarters for more information on these finishes. This specification provides for the following applications:

Highly Corrosive: Doors and frames are constructed using all Type 316 stainless steel internal parts and face sheets. This construction is for severely corrosive applications where corrosion resistance is the primary concern, such as in public swimming pools which are highly chlorinated.

Moderately Corrosive: Doors and frames are constructed using all Type 304 stainless steel internal parts and face sheets. This construction is for moderately corrosive applications where corrosion resistance and aesthetic appearance are of equal concern.

Aesthetic: Frame sections (hinge jambs, strike jambs, headers, etc) and door face sheets are constructed using Type 304 stainless steel. All other parts for both frames and doors are permitted to be fabricated from cold-rolled, hot-rolled pickled and oiled (HRPO), or A60 (ZF180) galvaneal as opposed to Type 304 stainless steel parts. This construction is for applications where aesthetic appearance is of primary concern.

It is important to understand that stainless steel alloys and the finishes that are applied to them are independent of one another. For example, if a high degree of aesthetic appearance and high corrosive resistance are both required, then this can be accomplished by the application of a high aesthetic finish to a Type 316 stainless steel constructed door. In the above three applications, a complete range of finishes including #4-satin and #8-mirror may be selected and applied to the stainless steel sheet. Alternatively, the stainless sheet may remain unfinished i.e. #2B-mill finish. The mill finish sheet may be supplied "as is" or may be chemically treated to allow for factory applied prime paint, then field applied finish paint.

It is recommended that the hardware supplier be consulted regarding suitable hardware for stainless steel doors and frames and for the specific application.

For hollow metal doors and frames not requiring stainless steel construction, give consideration to NAAMM Standard HMMA 860, Guide Specifications for Hollow Metal Doors and Frames and/or ANSI/NAAMM Standard HMMA 861, Guide Specifications for Commercial Hollow Metal Doors and Frames. If security is a factor, there are two hollow metal standards available – NAAMM Standard HMMA 862, Guide Specifications for Commercial Security Hollow Doors and Frames and ANSI/NAAMM Standard HMMA 863, Guide Specifications for Detention Security Hollow Metal Doors and Frames. For acoustic applications, give consideration to ANSI/NAAMM Standard HMMA 865, Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames.

PART 1 - GENERAL

1.01 SUMMARY

This Section includes stainless steel hollow metal products, including doors, panels, frames, and windows as shown in the contract documents.

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

- A. Stainless steel hollow metal doors, swing or sliding types, including [glass moldings and stops] [louvers] [other] as shown in the contract documents.
- B. Stainless steel hollow metal panels similar in construction to doors.
- C. Stainless steel hollow metal frames, transom frames, sidelight and window assemblies, including [glass moldings and stops] [louvers] as shown in the contract documents.

1.03 RELATED SECTIONS

- A. Section 08700 - Builders Hardware
- B. Section 08720 - Weatherstripping and Seals
- C. Section 08800 - Glass and Glazing Material
- D. Section 09900 - Painting

Note: This specification covers only those products listed in the foregoing paragraphs. Not included in this section are hardware, weatherstripping, gaskets, items furnished by others, field painting, and protection at the building site of products furnished under this section.

1.04 REFERENCES

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 A250.4 2000, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
- B. ANSI/NAAMM HMMA 801-98, Glossary of Terms for Hollow Metal Doors and Frames
- C. ANSI/NFPA 80-1999, Standard for Fire Doors and Windows
- D. ANSI/NFPA 252-1999, Standard Methods of Fire Tests of Door Assemblies
- E. ANSI/NFPA 257, Standard for Fire Test for Window and Glass Block Assemblies
- F. ANSI/UL 9, Fire Test for Window Assemblies
- G. ANSI/UL 10B-97, Fire Tests of Door Assemblies, 8th edition
- H. ASTM A 653/A 653M-99, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot-Dip Process
- I. ASTM A 666-00, Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- J. ASTM A 1008/A 1008M-00, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
- K. ASTM A 1011/A 1011M-00, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability
- L. ASTM C 143/C143M-00, Test Method for Slump of Hydraulic Cement Concrete
- M. NAAMM HMMA 802-92, Manufacturing of Hollow Metal Doors and Frames
- N. NAAMM HMMA 820-87, Hollow Metal Frames
- O. NAAMM HMMA 830-87, Hardware Preparation and Locations for Hollow Metal Doors and Frames

- P. NAAMM HMMA 831-97, Recommended Hardware Locations for Hollow Metal Doors and Frames
- Q. NAAMM HMMA 840-99, Installation and Storage of Hollow Metal Doors and Frames
- R. NAAMM HMMA 850-00, Fire-Rated Hollow Metal Doors and Frames
- S. UBC 7-2(1997), Fire Tests of Door Assemblies
- T. UBC 7-4(1997), Fire Test of Window Assemblies
- U. UL 10C-98, Positive Pressure Fire Tests of Door Assemblies

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ASTM ASTM International
 100 Barr Harbor Drive
 West Conshohocken, Pennsylvania 19428-2959
 (610) 832-9585 www.astm.org

NAAMM National Association of Architectural
 Metal Manufacturers
 8 South 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

UBC Uniform Building Code
 International Conference of Building Officials (ICBO)
 5360 Workman Mill Road
 Whittier, California 90601-2298
 (562) 692-4226 www.icbo.org

UL Underwriters Laboratories, Inc.
 333 Pfingsten Road
 Northbrook, Illinois 60062
 (847) 272-8800 www.ul.com

1.05 TESTING AND PERFORMANCE

- A. Performance Test for Steel Doors and Hardware Reinforcings
1. The test specimen shall be a 3'-0" x 7'-0" (914 mm x 2134 mm) nominal size 13/4 in. (44 mm) door. The test specimen shall be representative of the material to be provided.
 2. The specimen shall be tested in accordance with the ANSI A250-4 procedure and shall meet the Acceptance Criteria for the Level A doors.
 3. Test reports or certificates of compliance shall include a description of the test specimen, procedures used in testing, and indicate compliance with the acceptance criteria of the test.
- B. Labeled Fire-Rated Doors, Door Frames and Window Frames
1. Doors and frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect in the contract documents. Such doors and frames shall be constructed as tested in accordance with ANSI/NFPA 252 [ANSI/UL 10B] [UL 10C, UBC 7-2] and listed and/or classified for labeling by a recognized testing agency having a factory inspection service.
Note: UBC 7-2, and UL 10C, provide for positive pressure testing to accommodate the requirements of some jurisdictions.
 2. If doors or frames specified by the Architect in the contract documents to be fire-rated cannot qualify for appropriate labeling because of design, hardware or other reasons, the Architect shall be so advised before fabricating work on that item is started.
Note: Refer to NAAMM HMMA 850, Fire-Rated Hollow Metal Doors and Frames.
 3. Window frames shall be provided for those openings requiring fire protection ratings as determined and scheduled by the Architect in the contract documents. Such windows shall be constructed as tested in accordance with [ANSI/NFPA 257] [UL 9] [UBC 7-4] and listed for labeling by a recognized testing agency having a factory follow-up inspection service.
Note: ANSI/NFPA 257 and UBC 7-4 provide for testing under positive pressure.

1.06 QUALITY ASSURANCE

- A. Manufacturer's Qualifications
1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating stainless steel door and frame assemblies of the types specified.
 2. Manufacturer shall provide evidence of having a quality control system in place.
- B. Quality Criteria
1. All door and frame assemblies shall meet the requirements of Paragraph 1.05 of these specifications.
 2. Fabrication methods and product quality shall meet ANSI/NAAMM HMMA 866-01.

1.07 SUBMITTALS

- A. Submittal Drawings
1. Show dimensioned door and frame elevations and sections.
 2. Show listing of opening descriptions including locations, thicknesses, and anchors.
 3. Show location and details of openings.
- B. Samples (Note: If not required, delete Article 1.07.B)
1. Door: 1'-0" (305 mm) x 1'-0" (305 mm) corner section with hinge preparation showing top and internal construction.

2. Frame: 1'-0" (305 mm) x 1'-0" (305 mm) corner section showing welding of head to jamb. Include hinge mortise, reinforcement and plaster guard in one rabbet and glazing stop applied as specified in the opposite rabbet. Glazing stop shall be applied to both head and jamb section to show corner joint.
3. Samples shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved. Downgrading of quality demonstrated by comparison with the samples may be cause for rejection of the work.

1.08 WARRANTY

- A. Stainless steel hollow metal work shall be warranted from defects in workmanship and quality for a period of one (1) year from date of shipment, when stored, installed, and painted (if applicable) in accordance with NAAMM HMMA 840-99.

PART 2 – PRODUCTS

2.01 STAINLESS STEEL HOLLOW METAL DOORS

A. Materials

1. Door face sheets shall be manufactured from [Type 304] [Type 316] stainless steel conforming to ASTM A 666. It shall be free of buckles, waves or other defects.
2. Components shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel conforming to ASTM A 1008/A 1008M CS Type B, hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M CS Type B, or zinc-coated steel conforming to ASTM A 653/A 653M CS Type B Coating Designation A60 (ZF180)].
3. Both Exterior and Interior Doors: Face sheets shall be 0.042 in. (1.0 mm) minimum thickness.

Note: It is recommended that materials for face sheets and components be coordinated in accordance with the following guidelines with regard to applications:

Highly Corrosive: Doors and frames are constructed using all Type 316 stainless steel internal parts and face sheets. This construction is for severely corrosive applications where corrosion resistance is the primary concern, such as in public swimming pools, which are highly chlorinated.

Moderately Corrosive: Doors and frames are constructed using all Type 304 stainless steel internal parts and face sheets. This construction is for moderately corrosive applications where corrosion resistance and aesthetic appearance are of equal concern.

Aesthetic: Frame sections (hinge jambs, strike jambs, headers, etc) and door face sheets are constructed using Type 304 stainless steel. All other parts for both frames and doors are permitted to be fabricated from cold-rolled, hot-rolled pickled and oiled (HRPO), or A60 (ZF180) galvaneal as opposed to Type 304 stainless steel parts. This construction is for applications where aesthetic appearance is of primary concern.

B. Construction

1. Doors shall be of types, sizes and construction in accordance with the contract documents and shall meet the performance requirements of Section 1.05.
2. Door edge constructions:
 - [a. Continuously welded seam: Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door with no visible seams on their faces or vertical edges. Edges shall be polished to match door face sheets in accordance with 2.06, Finish.]

See "welded, continuously" in the Glossary of Terms for Hollow Metal Doors and Frames, ANSI/NAAMM HMMA 801.

Continuously welded edge seams are recommended where sanitary conditions are of primary concern i.e. hospital or clean room environments.

OR

- [b. Door edges shall be joined by a continuous interlocking seam the full height of the door (lock seam), resulting in a visible vertical seam at both edges of the door.]

OR

- [c. Door edges shall be joined by projection welds, spot welds, or tack welds applied to the edge seam inside the door, 6" (152 mm) o.c. maximum spacing, such that there are no exposed welds or weld marking on the exposed side of the edge seam, resulting in a visible vertical seam at both edges of the door.]

In the case of stainless steel doors, visible seam edge construction is suitable for commercial applications because stainless steel possesses a higher degree of ruggedness and durability than carbon steel.

- 3. Door thickness shall be 13/4 in. (44 mm) nominal. Doors shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of metal used.

- 4. Core Constructions:

- [a. Steel Stiffened: The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.026 in. (0.6 mm) minimum thickness, spaced so that the vertical interior webs shall be no more than 6 in. (152 mm) apart and securely fastened to both face sheets by welds spaced a maximum of 5 in. (127 mm) o.c. vertically. Spaces between stiffeners shall be filled with fiberglass or mineral rock wool batt-type material. Stiffeners shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].]

Note: Welded steel stiffeners produce spot weld marking on the face sheets of stainless steel doors, and this marking cannot be removed entirely. Therefore, welded stiffener construction should be used only when finished appearance is of little concern and ruggedness is the primary consideration i.e. factory applications and food plants. Also, this construction may be used when the door face is to be clad with a second sheet of stainless steel designed to serve as the finished door face.

OR

- [b. Laminated Core: Door face sheets shall be stiffened by a paper honeycomb or foam plastic core that is laminated with adhesive under pressure between the face sheets.]

OR

- [c. Laminated Steel Stiffened: The door shall be stiffened by continuous vertically formed steel sections which, upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.026 in. (0.6 mm) minimum thickness, spaced so that the vertical interior webs shall be no more than 6 in. (152 mm) apart and securely fastened to both face sheets by adhesive. Spaces between stiffeners shall be filled with fiberglass or mineral rock wool batt-type material. Stiffeners shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].]

- 5. The top and bottom edges shall be closed with a continuous steel channel, not less than 0.053 in. (1.3 mm) thickness, [welded to both face sheets spaced 2 in. (50.8 mm) from each end and 6 in. (152 mm) o.c. maximum][securely fastened using adhesive].

6. Exterior doors shall be closed flush at the top edge. Where required for attachment for weatherstripping, a flush steel closure channel shall also be provided at the bottom edge. Openings shall be provided in the bottom closure channel of exterior doors to permit the escape of entrapped moisture.
7. Edge profiles shall be provided on both vertical edges of doors as follows:
 - Single acting doors – beveled 1/8 in. (3 mm) in 2 in. (50.8 mm) profile
 - Double acting doors – rounded on 2-1/8 in. (54 mm) radius
8. Hardware reinforcements:
 - a. Doors shall be mortised, reinforced, drilled and tapped at the factory for templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated mortised hardware apply, doors shall be reinforced, with drilling and tapping done by others in the field. Hardware reinforcements shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].
 - b. Minimum thickness for hardware reinforcements shall be as follows:
 - Full mortise hinges and pivots 0.167 in. (4.2 mm)
 - Reinforcements for lock fronts 0.093 in. (2.3 mm) or 0.053 in. (1.3 mm) unitized reinforcement with extruded tapped holes that provide equivalent number of threads as 0.093 in. (2.3 mm).
 - Concealed holders or surface mounted closers 0.093 in. (2.3 mm)
 - Internal reinforcements for other surface applied hardware 0.067 in. (1.7 mm)
 - c. In cases where electrically operated hardware is required, and indicated on architectural door schedule, conduit, hardware enclosures and/or junction boxes within the door shall be provided. Access plates, where required, shall be the same material and thickness as the door face sheet and shall be fastened with #8-32 machine screws or #6 sheet metal screws, minimum of four (4) at a spacing not to exceed 12 in. (305 mm) o.c.
9. Provide stainless steel moldings to secure glazing by others in accordance with glass sizes and thickness shown on contract documents. Moldings shall be [Type 304][Type 316] stainless steel not less than 0.032 in. (0.8 mm) thickness with tight fitting butt or mitered corner joints.
10. Louvers shall be of the welded [inverted vee type] [Y type] [face sheet pierced] construction. The inverted vee and Y type vanes shall be stainless steel not less than 0.042 in. (1.0 mm) thickness. Insect screens and/or bird screens shall be provided on louvered doors in exterior locations where shown on contract documents.

2.02 STAINLESS STEEL HOLLOW METAL PANELS

- A. Hollow metal panels shall be made of the same materials and construction and finished in the same way as specified in Section 2.01 of this specification.

2.03 STAINLESS STEEL HOLLOW METAL FRAMES

Note: Provisions of Section 2.03 are applicable to frames, transom frames, sidelights, and window assemblies.

A. Materials

1. Frame sections shall be manufactured from [Type 304] [Type 316] stainless steel conforming to ASTM A 666. It shall be free of buckles, waves or other defects.
2. Components shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel conforming to ASTM A 1008/A 1008M CS Type B, hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M CS Type B, or zinc-coated steel conforming to ASTM A 653/A 653M CS Type B Coating Designation A60 (ZF180)].
3. Interior and exterior openings: For door openings 4'-0" (1219 mm) or less in width and for window frames, steel shall be 0.053 in. (1.3 mm) minimum thickness. For door openings greater than 4'-0" (1219 mm) in width, steel shall be 0.067 in. (1.7 mm) minimum thickness.

Note: See Note in Paragraph 2.01.A.

B. Construction

1. Door Frames shall be [welded][knock down][slip-on] units, and side-lites and multi-lites shall be welded units, all of the sizes and types shown on approved submittal drawings. All frames shall be constructed in accordance with these specifications and meet performance criteria specified in Section 1.05. Frames shall be constructed in accordance with NAAMM HMMA 820 with regard to joint designs and welding techniques.
2. Finished work shall be neat in appearance, square, and free of defects, warps and buckles. Stainless steel members shall be straight and of uniform profile throughout their lengths.
3. Jamb, header, mullion and sill profiles shall be in accordance with the frame schedule and as shown on the approved submittal drawings.
4. Corner joints shall have all contact edges closed tight with faces mitered and stops either butted or mitered.
5. Flush face joints at mullions, sills, and transoms shall be continuously welded and smoothly finished.
6. Minimum depth of stops shall be 5/8 in. (15.8 mm). Cut-off stops, where shown, shall be capped at heights as shown on approved submittal drawings.

It is recommended that cut-off stops not be used at exterior, lead lined, or gasketed openings, or when the required finish is higher than Number 4.

7. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be at least the same thickness as the frame. Field joints shall be made in accordance with the contract documents and shall be assembled in the field by others.
8. Hardware Reinforcements:
 - a. Frames shall be mortised, reinforced, drilled and tapped at the factory for templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated mortised hardware apply, frames shall be reinforced, with drilling and tapping done by others in the field. Hardware reinforcing shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].

- b. Minimum thickness of hardware reinforcing plates shall be as follows:
- Hinge and pivot reinforcements 0.167 in. x 1.25 in. x 10 in. length (4.2 mm x 31.7 mm x 254 mm)
 - Strike reinforcements..... 0.093 in. (2.3 mm) or 0.053 in. (1.3 mm) unitized reinforcement with extruded tapped holes that provide equivalent number of threads as 0.093 in. (2.3 mm).
 - Closer reinforcements 0.093 in. (2.3 mm)
 - Flush bolt reinforcements 0.093 in. (2.3 mm)
 - Reinforcements for surface applied hardware 0.093 in. (2.3 mm)
 - Reinforcements for hold open arms 0.093 in. (2.3 mm)
 - Reinforcements for surface panic devices 0.093 in. (2.3 mm)

9. Floor Anchors:

- a. Thickness of floor anchors shall be a minimum of 0.067 in. (1.7 mm). Floor anchors shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].
- b. Where applicable, floor anchors shall be provided with two holes for fasteners and shall be fastened inside jambs with at least four (4) welds per anchor.
- c. Where so scheduled, adjustable floor anchors, providing no less than 2 in. (50.8 mm) height adjustment, shall be fastened in places with at least four (4) welds per anchor.
- d. For applications that do not permit the use of a floor anchor, an additional jamb anchor located at the base of the frame can be substituted.

10. Jamb Anchors

- a. Frame anchors shall be [Type 304 stainless steel] [Type 316 stainless steel] [cold-rolled steel, hot-rolled, pickled and oiled (HRPO) steel, or zinc-coated steel].

1. Masonry Type

Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the strap and stirrup or T-strap type not less than 0.053 in. (1.3 mm) thickness or wire type not less than 0.156 in. (4 mm) in diameter. Straps shall be no less than 2 in. x 10 in. (50 mm x 254 mm) in size, corrugated and/or perforated. Anchors shall be placed not greater than 18 in. (457 mm) from top and bottom of openings. The minimum number of anchors spaced at maximum of 32 in. (813 mm) o.c. provided on each jamb based on frame opening height shall be as follows:

- up to 60 in. (1524 mm) 2 anchors
- greater than 60 in. (1524 mm) up to 90 in. (2286 mm) 3 anchors
- greater than 90 in. (2286 mm) up to 96 in. (2438 mm) 4 anchors

- greater than 96 in. (2438 mm)..... 4 anchors plus 1 for each 24 in. (610 mm) or fraction thereof over 96 in. (2438 mm), spaced at 24 in. (610 mm) maximum between anchors.

2. Dry Wall Type

Frames for installation in stud partitions shall be provided with anchors of suitable design, not less than 0.042 in. (1.0 mm) thickness, securely welded inside each jamb. Anchors shall be placed not greater than 18 in. (457 mm) from top and bottom of openings. The minimum number of anchors spaced at a maximum of 32 in. (813 mm) o.c. provided on each jamb based on frame opening height shall be as follows:

- up to 60 in. (1524 mm)..... 3 anchors
- greater than 60 in. (1524 mm) up to 90 in. (2286 mm)..... 4 anchors
- greater than 90 in. (2286 mm) up to 96 in. (2438 mm)..... 5 anchors
- greater than 96 in. (2438 mm)..... 5 anchors plus 1 for each 24 in. (610 mm) or fraction thereof over 96 in. (2438 mm), spaced at 24 in. (610 mm) maximum between anchors.

3. Compression Type

Slip on frames shall be provided with one or more adjustable compression anchors in each jamb and provision for secure attachment of each jamb base to stud runners.

4. Expansion Bolt Type

Frames for installation in existing masonry or concrete walls shall be prepared for expansion bolt type anchors. The preparation shall consist of a countersunk hole for a 3/8 in. (9.5 mm) diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and spaced a maximum of 6 in. (152 mm) from the top and bottom of the door opening, with intermediate spacing at a maximum of 26 in. (660 mm) o.c. Fasteners for such anchors shall be provided by others.

5. Other Anchor Types

Frames to be installed in pre-finished concrete, masonry or steel openings, shall be constructed and provided with anchoring systems of suitable design as shown on the approved submittal drawings. Stainless steel fasteners for such anchors shall be provided by others.

Note: A pre-finished opening may be one that is constructed as part of another assembly or system (e.g., precast concrete panel) and which requires anchors similar in performance to those covered by 2.03.B.10.a, b, and c.

11. When the frame head is to be grouted and the door opening width exceeds 4'0" (1219mm) in width, it shall be reinforced. A steel channel or angle shall be welded into the head at the factory. Such stiffeners shall be not less than 0.093 in. (2.3 mm) in thickness and not longer than the opening width, and shall not be used as lintels or load bearing members.
12. Plaster guards not less than 0.016 in. (0.4 mm) thick shall be attached at all hardware mortises on frames to be set in masonry or concrete openings.

13. Welded frames shall be provided with a temporary steel spreader welded or mechanically attached to the feet of the jambs to serve as bracing during shipping and handling and which shall not be used for installation.
14. Loose Glazing Stops
 - a. Removable glass channel stops shall be stainless steel, not less than 0.032 in. (0.8 mm), butted or mitered at corner joints and secured to the frame using #6 minimum countersunk sheet metal screws.

2.04 CLEARANCES AND TOLERANCES

Note: The manufacturer of the doors and frames is responsible only for the manufacturing tolerances listed in 2.04.B. The final clearances and relationships between door and frame depend on the setting of the frame and the hanging and adjustment of the door and hardware. If everything is perfect in the setting of the frames and the manufacturing of the doors and frames, the clearances should be as shown in 2.04.A. However, if the frame is set to its maximum allowable tolerances, and doors and frames are manufactured to their maximum allowable tolerances, the clearances could be greater. See Notes in 3.02.

- A. Edge clearances for swinging doors shall not exceed the following:
 1. Between doors and frames at head and jambs 3/16 in. (4.7 mm)
 2. Between edges of pairs of doors 3/16 in. (4.7 mm)
 3. At door sills where a threshold is used 3/8 in. (9.5 mm)
from bottom of door
to top of threshold
 4. At door sills where no threshold is used 3/4 in. (19.0 mm)
above floor
 5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in ANSI/NFPA 80 1/2 in. (12.7 mm)

Note: Floor is defined as the top of the concrete slab or structural floor. Where resilient tile, hardwood or other floor coverings are used, undercuts must be increased in order to accommodate those floor coverings.

- B. Manufacturing tolerances shall be maintained within the following limits:
 1. Frames for single door or pair of doors:
 - Width measured between rabbets at the head: Nominal opening width
+ 1/16 in. (1.5mm), - 1/32 in. (0.8mm)
 - Height (total length of jamb rabbet): Nominal opening height + 3/64 in. (1.2 mm)
 - Cross sectional profile dimensions (see Figure 1):
 - Face + 1/32 in. (0.8 mm)
 - Stop + 1/32 in. (0.8 mm)
 - Rabbet + 1/32 in. (0.8 mm)
 - Depth + 1/32 in. (0.8 mm)
 - Throat + 1/16 in. (1.5 mm). Frames overlapping walls to have throat dimension 1/8 in. (3.1 mm) greater than dimensioned wall thickness to accommodate irregularities in wall construction.

- 2. Doors
 - Width + 3/64 in. (1.2 mm)
 - Height + 3/64 in. (1.2 mm)
 - Thickness..... + 1/16 in. (1.5 mm)

- 3. Hardware
 - Cutout dimension template dimensions + 0.015 in. (0.38 mm), - 0
 - Location..... + 1/32 in. (0.8 mm)

- 4. Bow/Flatness..... + 1/16 in. (1.5 mm)

2.05 HARDWARE LOCATIONS

A. The location of the hardware on doors and frames shall be as listed below. All dimensions except the hinge locations are referenced from the floor as defined in Paragraph 2.04.A.

Note to Architect: When stainless steel frames are specified for use with doors to be furnished by others, hardware preparation on the doors is normally governed by its location on the frames as stated in 2.05.B.

B. Hinges:

- Top 5 in. (127 mm) from frame head to top of hinge
- Bottom 10 in. (254 mm) from floor to bottom of hinge
- Intermediate centered between top and bottom hinges
- On dutch doors 5 in. (127 mm) from head of frame to top of hinge;
10 in. (254 mm) from floor to bottom of bottom hinge;
5 in. (127 mm) from split line to top and bottom respectively
of lower and upper intermediate hinges.

Unit and integral type locks

- and latches 38 in. (965 mm) to centerline of knob
- Deadlocks 46 in. (1168 mm) to centerline of cylinder
- Panic hardware 38 in. (965 mm) to centerline of cross bar or as shown on
hardware template
- Door pulls 42 in. (1066 mm) to center of grip
- Push/pull bars 42 in. (1066 mm) to centerline of bar
- Arm pulls 46 in. (1168 mm) to centerline
- Push plates 46 in. (1168 mm) to centerline of plate
- Roller latches..... 45 in. (1143 mm) to centerline of plate

Note: See NAAMM/HMMA 830 and 831 for additional information.

2.06 FINISH

A. After fabrication, all tool marks and surface imperfections shall be finished to make face sheets, vertical edges and weld joints free from irregularities. All exposed surfaces of doors and frames shall then be finished in accordance with NAAMM HMMA 802 Manufacturing of Hollow Metal Doors and Frames "Finishes for Stainless Steel," No. [2B] [4] [8] as described in Table 1 (below). All grained finishes applied to faces of doors shall be vertical. All grained finishes applied to frame jambs shall be vertical. Finishes applied to the frame header shall be [horizontal] [vertical].

Note to Architect: No. 2B-mill finish is an unpolished mill finish. Weld marks and other fabrication marking will be exposed. If No. 2B-mill finish is specified, doors and frames are normally furnished unprimed. This finish is usually specified for applications where appearance is of little concern and durability is of primary consideration i.e. chemical plants, food processing plants and water treatment plants.

TABLE 1 – ASTM FINISH NOS.

Unpolished Finishes:

No. 1 A	comparatively rough dull surface produced by hot rolling to the specified thickness, followed by annealing and descaling.
No. 2D	A dull cold rolled finish produced by cold rolling to the specified thickness, followed by annealing and descaling. May also be accomplished by a final light pass on dull rolls.
No. 2B	A bright cold rolled finish commonly produced in the same way as No. 2D finish, except that the annealed and descaled sheet receives a final cold roll pass on polished rolls. This is a general purpose cold rolled finish, and is more readily polished than the No. 1 or No. 2D finishes.

Polished Finishes:

No. 3	A polished finish obtained by finishing with an approximately 100 grit abrasive. Generally used where a semi-finished polished surface is required for later finishing following fabrication.
No. 4	A general purpose bright polished finish obtained by finishing with a 120-150 mesh abrasive, following initial grinding with coarser abrasives.
No. 6	A soft satin finish having lower reflectivity than the No. 4 finish. It is produced by Tampico brushing the No. 4 finish, using a medium abrasive.
No. 7	A highly reflective finish produced by buffing a surface which has first been finely ground, but "grit" lines are not removed.
No. 8	The most reflective finish commonly produced. It is obtained by polishing with successively finer abrasives, then buffing with a very fine buffing compound. The surface is essentially free of grit lines caused by preliminary grinding operations.

PART 3 – EXECUTION

3.01 SITE STORAGE AND PROTECTION OF STAINLESS STEEL MATERIALS

- A. The contractor responsible for installation shall not remove wraps or covers from stainless steel doors and frames until time of installation. The contractor responsible for installation shall see that stainless steel doors and frames are unloaded, stored and handled in a manner that will prevent damage to the finish.
- B. The contractor responsible for installation shall see that materials are properly stored on planks or dunnage in a dry location. Doors shall be stored in a vertical position and spaced by blocking. Figure 2 illustrates recommended storage positioning. Materials shall be covered to protect them from damage and shall be stored in such a manner as to permit air to circulate between each door/frame..

3.02 INSTALLATION

Note to Architect: Correct installation is essential to the proper performance of doors and frames. The requirements for proper installation are given in the following paragraphs. However it is important to recognize that installation is not the responsibility of the hollow metal manufacturer. For this reason the requirements for installation of stainless steel hollow metal doors and frames should be in that section of the specifications where installation work is specified. For additional information regarding installation see NAAMM HMMA 840 "Installation and Storage of Hollow Metal Doors and Frames".

A. The Installer shall perform the following:

1. Prior to installation, frames shall be checked and corrected for size, swing, squareness, alignment, twist and plumbness. Permissible installation tolerances shall not exceed the following:
 - Squareness.....+ 1/16 in. (1.5 mm) measured on a line, 90 degrees from one jamb, at the upper corner of the frame at the other jamb.
 - Alignment.....+ 1/16 in. (1.5 mm) measured on the jambs on a horizontal line parallel to the plane of the wall.
 - Twist+ 1/16 in. (1.5 mm) measured at face corners of jambs on parallel lines perpendicular to the plane of the wall.
 - Plumbness.....+ 1/16 in. (1.5 mm) measured on the jamb at the floor.

The above tolerances provide a reasonable guide for proper installation of hollow metal frames. However, it should be noted that the cumulative affect of the tolerances at their maximum levels will 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 more than one dimension is at or near its maximum tolerance.

The details in Figure 3 illustrate methods of measuring the above specified tolerances.

2. Plaster guards and junction boxes are intended to protect hardware mortises and tapped mounting holes from masonry grout of 4 in. (101 mm) maximum slump consistency which is hand troweled in place. If a lighter consistency grout (greater than 4 in. (101 mm) slump when tested in accordance with ASTM C 143/C 143M) is to be used, special precautions shall be taken in the field by the installer to protect the aforementioned.
3. Proper door clearances shall be maintained in accordance with 2.04 of these specifications, except for special conditions otherwise noted. Hinge shims, furnished by installer, are permitted to maintain clearances.
4. Hardware shall be applied in accordance with hardware manufacturer's templates and instructions.
5. Stainless steel surfaces shall be kept free of grout, tar and/or other bonding materials or sealers. Grout, tar, and/or other bonding materials or sealers shall be promptly cleaned off of frames and/or doors.
6. Finished or polished surfaces which have been scratched or otherwise marred during installation (including field welding) and/or cleaning shall promptly be finished smooth and refinished to match the original polish or finish.
7. Labeled fire doors and frames shall be installed in accordance with the terms of their listings, and in accordance with NFPA 803/4" or with local authority having jurisdiction.

END OF SECTION