

**HOLLOW
METAL
MANUAL**

AMERICAN NATIONAL STANDARD

**ANSI/
NAAMM**

HMMA 867-16

0 8 11 13 Hollow Metal Doors and Frames

**GUIDE SPECIFICATIONS
FOR LAMINATED CORE
HOLLOW METAL
DOORS AND FRAMES**

**SECOND EDITION
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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 specification and use of commercial laminated core hollow metal doors and frame product. This standard contains advisory information only and is published as a public service by NAAMM and its HMMA Division.

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

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FOREWARD

These specifications have been prepared in accordance with the CSI recommended format with Part 1 - General, Part 2 - Product, and Part 3 - Execution. Guide specifications are intended to be used as the basis for developing project specifications and must be edited to suit specific project requirements. Inapplicable provisions should be deleted, appropriate selections should be made where there are choices, and provisions applicable to the project should be added where necessary. Options are shown in brackets. Notes, recommendations and instructions to specifiers are given in italics directly following or at the start of the sections 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 applicability to this guide prior to its inclusion. *While the CSI Section Format locates Delivery, Storage and Handling in Part 1, NAAMM Standards include them under Part 3 - Execution.*

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

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

This guide specification addresses the requirements for commercial, laminated core, steel doors, and appropriate frame products, and reflects the growing choices of steel door and frame constructions available from member manufacturers.

For welded steel stiffened doors in similar applications, refer to HMMA 860, "Guide Specifications for Hollow Metal Doors and Frames". For commercial steel doors expected to be subjected to a more rigorous level of use, it is recommended that ANSI/NAAMM HMMA 861, "Guide Specifications for Commercial Hollow Metal Doors and Frames", be used. If security is a factor there are two hollow metal standards available; ANSI/NAAMM HMMA 862, "Guide Specifications for Commercial Security Hollow Metal Doors and Frames", and ANSI/NAAMM HMMA 863, "Guide Specifications for Detention Security Hollow Metal Doors and Frames". For acoustic applications consideration may be given to ANSI/NAAMM HMMA 865, "Guide Specification for Swinging Sound Control Hollow Metal Doors and Frames". For situations where corrosion resistance, beyond that of typical commercial steel door and frame applications, or where specialized aesthetic appearance are significant design criteria, consideration should be given to ANSI/NAAMM HMMA 866, "Guide Specifications for Stainless Steel Hollow Metal Doors and Frames".

Section 08 11 13 is the new CSI location for hollow metal doors and frame products in accordance with the 2012 CSI MasterFormat.

In preparing this revision changes were indicated by a red stripe in the margin. Every effort has been made to identify all changes, but individual provisions should be coordinated with previous editions. The standard has been edited to delete "should", "should be" and "shall" from the text. These edits are considered non-substantive and are not indicated with a stripe in the margin.

CSI SECTION 08 11 13 COMMERCIAL LAMINATED CORE HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

This section includes hollow metal products, including doors, panels, frames, transom frames, sidelight and window assemblies as shown in the contract documents.

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

- A. Commercial, laminated core, hollow metal doors, swinging type, flush or embossed faces, including [glass moldings and stops] [louvers] [louver inserts] [other], as shown in the approved submittal drawings.
- B. Commercial hollow metal panels, fixed or removable, flush or rabbeted, similar in construction to hollow metal doors.
- C. Commercial hollow metal frames, transom frames, sidelight and window assemblies, including [glass moldings and stops] [louvers] [louver inserts] [hollow metal in-fill panels] [other], as shown in the approved submittal drawings.

1.03 RELATED SECTIONS

- A. Section 01 56 00 - Site Protection of Materials
- B. Section 01 66 00 - Site Storage of Materials
- C. Section 05 10 00 - Lintels, Posts, Columns or Other Load Bearing Elements
- D. Section 06 10 00 - Installation of Commercial Hollow Metal Doors and Frames into Other than Steel Stud Partitions
- E. Section 08 11 19 - Stainless Steel Hollow Metal Doors and Frames
- F. Section 08 34 53 - Commercial Security Hollow Metal Doors and Frames
- G. Section 08 34 73 - Swinging Sound Control Hollow Metal Doors and Frames
- H. Section 08 71 00 - Builders Hardware
- I. Section 08 71 00 - Weather Stripping and Seals
- J. Section 08 80 00 - Glass and Glazing Material
- K. Section 09 20 00 - Installation of Commercial Hollow Metal Doors and Frames into Steel Stud Partitions
- L. Section 09 90 00 - Field Painting
- M. Section 11 19 00 - Detention Security Hollow Metal Doors and Frames
- N. Section [] - Assembly of Knocked-Down or Slip-On Hollow Metal Frames
- O. Section [] - Field Measurements

This specification covers only those products listed in Section 1.02. Not included in Section 08 11 13 are builders or rough hardware of any kind, weather-stripping, gaskets, items furnished by others, field painting, or protection at the building site of products furnished under this Section.

1.04 REFERENCES

The Standards listed in this Guide are referenced by basic designation only. The edition of a Standard is deemed as that in affect on the publication date of this Guide, unless specifically noted otherwise. If a more recent standard is available, the Specifier should verify its applicability to this Guide prior to its inclusion.

- A. ANSI/SDI A250.4-, Test Procedure and Acceptance Criteria for Physical Endurance for Doors, Frames and Hardware Reinforcings
- B. ANSI/SDI A250.10-, Standard Test Procedure and Acceptance Criteria for Prime-Painted Steel Surfaces for Steel Doors and Frames
- C. ANSI/NAAMM HMMA 801, Glossary of Terms for Hollow Metal Doors and Frames
- D. ANSI/NAAMM HMMA 866, Guide Specifications for Stainless Steel Hollow Metal Doors and Frames
- E. ANSI/NFPA 80, Standard for Fire Doors and Other Opening Protectives
- F. ANSI/NFPA 105, Standard for the Installation of Smoke Door Assemblies
- G. ANSI/NFPA 252, Standard Methods of Fire Tests of Door Assemblies
- H. ANSI/NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies
- I. ANSI/UL 9, Fire Tests of Window Assemblies
- J. ANSI/UL 10B, Fire Tests of Door Assemblies
- K. ANSI/UL 10C, Positive Pressure Fire Tests of Door Assemblies
- L. ANSI/UL 1784, Air Leakage Test of Door Assemblies and Other Opening Protectives
- M. ASTM A 653/A 653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- N. ASTM A 1008/A 1008M, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- O. ASTM A 1011/A 1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- P. ASTM C 143/A 143M, Test Method for Slump of Hydraulic-Cement Concrete
- Q. ASTM C 578, Specification for Rigid, Cellular Polystyrene Thermal Insulation
- R. ASTM C 591, Specification for Unfaced Preformed Rigid Polyisocyanurate Thermal Insulation
- S. ASTM C 1289, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- T. ASTM D 1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics
- U. CAN4-S104, Standard Method for Fire Tests of Door Assemblies
- V. CAN4-S106, Standard Method for Fire Tests of Window and Glass Block Assemblies
- W. NAAMM HMMA 802, Manufacturing of Hollow Metal Doors and Frames
- X. NAAMM HMMA 803, HMMA Steel Tables
- Y. NAAMM HMMA 810, Hollow Metal Doors
- Z. NAAMM HMMA 810 TN01-03, Defining Undercuts
- AA. NAAMM HMMA 820, Hollow Metal Frames
- AB. NAAMM HMMA 820 TN01, Grouting Hollow Metal Frames
- AC. NAAMM HMMA 830, Hardware Selection for Hollow Metal Doors and Frames

- AD. NAAMM HMMA 831, Recommended Hardware Locations for Hollow Metal Doors and Frames
- AE. NAAMM HMMA 840, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames
- AF. NAAMM HMMA 850, Fire-Rated Hollow Metal Doors and Frames

The following standards are used only for 'traditional' (neutral pressure) fire test methods and should be deleted from project specifications when 'positive pressure' is required by the governing building code: UL 10B (J), CAN4-S104 (U) and CAN4-S106 (V).

Conversely, the following standards are used for 'positive pressure' fire tests, and should be deleted from project specifications requiring 'traditional' (neutral pressure) fire tests: NFPA-252 (G), NFPA-257 (H), and UL 10C (K)

UL 9 (I) and ANSI/NFPA-257(H) references both 'traditional' (neutral pressure) and 'positive pressure' fire test methods, and as such should be included in all project specifications, except those requiring compliance with Canadian Building Codes.

Only project specifications requiring compliance with Canadian Building Codes should include CAN4-S104 (U) and CAN4-S106 (V).

Refer to Appendix 6 for a list of the Standards Writing Organizations referenced in Section 1.04.

1.05 TESTING AND PERFORMANCE

- A. Physical Endurance Performance Test for Commercial Laminated Core Hollow Metal Doors
 1. Test a 3 ft. x 7 ft. (914 mm x 2134 mm), 1-3/4 in. (44 mm) thick nominal size door, representative of the construction and material to be provided.
 2. Test in accordance with the ANSI/SDI A250.4 Cycle and Twist Test procedures.
 3. Provide test reports or Certificates of Compliance which include a description of the test specimen, procedures used in testing, and indicate compliance with the contract document specified acceptance criteria.
- B. Provide labeled Fire-Rated and/or Smoke and Draft Control Doors and Frame Product
 1. Provide doors, frames, transom and sidelight assemblies for openings requiring fire protection, temperature rise and/or smoke and draft control which are listed and/or classified, and bear the label of a recognized testing agency having a factory inspection service. Test in accordance with [ANSI/NFPA 252 or ANSI/UL 10B or CAN4-S104] [UL 10C] [UL 1784 or ANSI/NFPA 105] and construct as listed or classified for labeling. The architect determines and schedules the fire, temperature rise and/or smoke and draft control ratings to satisfy the design and code requirements.
 2. Provide window frames for openings requiring fire protection which are listed and bear the label of a recognized testing agency having a factory inspection service. Test in accordance with ANSI/UL 9 or [ANSI/NFPA 257 or CAN4-S106] and construct as listed for labeling. The architect determines and schedules fire and/or smoke and draft control ratings to satisfy the design and code requirements.

UL 10C, UBC 7-2; Part 1, and UBC 7-4 provide for positive pressure testing to accommodate the requirements of some jurisdictions and should be included only for such.

UL 1784, UBC 7-2; Part 2 and ANSI/NFPA 105 provide for smoke and draft control assembly testing to accommodate these specific requirements, and should be included only when required.

Include CAN4-S104 and CAN4-S106 only for projects requiring conformance with Canadian Building Codes

3. Advise the architect in the submittal documents if any door or frame product specified to be fire-rated cannot qualify for labeling because of design, hardware or any other reason. Advise the architect of hardware, glazing or other options that affect the fire-rating and that were unknown at the time of submittal document preparation.

For additional information refer to NAAMM HMMA 850, "Fire-Rated Hollow Metal Doors and Frames".

C. Prime Paint Performance (ANSI A250.10)

1. Test sheet steel specimens with the product manufacturer's production primer replicating finish 'as shipped' in accordance with ANSI/SDI A 250.10.
2. Meet the Acceptance Criteria described in ANSI/SDI A250.10.
3. Provide test Reports or Certificates of Compliance which include a description of the test specimen, procedures used in testing, and indicate compliance with the specified acceptance criteria.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame product of the types specified.
2. Provide evidence of having a written quality control system in place.

B. Quality Criteria

1. Meet the requirements of Section 1.05 of these specifications.
2. Fabricate assemblies in strict accordance with the approved submittal drawings.
3. Meet fabrication methods and product quality standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Metal Manufacturers, NAAMM, as set forth in the contract documents and NAAMM's HMMA 800 through 850 Series documents.

1.07 SUBMITTALS

A. Submittal Drawings

1. Show dimensioned door and frame product elevations and sections.
2. Show listing of opening descriptions including locations, material thickness, and anchors.
3. Show location and details of openings.

B. Samples (if required)

1. Door: 1 ft. x 1 ft. (305 mm x 305 mm) corner section with hinge preparation showing top and internal construction.
2. Frame: 1 ft. x 1 ft. (305 mm x 305 mm) section showing assembled corner joint at head and jamb. Include hinge reinforcement [and grout guard] in one rabbet. When glazed frame product is specified, apply glazing stop in the opposite rabbet to both head and jamb sections to show their intersection.
3. All samples submitted must represent, in all respects, the minimum quality of work to be furnished by the manufacturer. Do not fabricate any work represented by the samples until the samples are approved. Any degradation of fabrication quality, compared to the samples, is cause for the rejection of the work.

- C. It is the responsibility of the installation contractor to;
1. Verify and provide to the manufacturer, actual opening sizes and site conditions by field measurement before fabrication. Reflect the provided measurements and conditions in the submittal drawings. Coordinate field measurements with fabrication and construction schedules to avoid delays.
 2. Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the architect's drawings, and are acceptable for product installation in accordance with the manufacturer's instructions.
- D. The manufacturer is not to proceed with fabrication without receipt of approved submittal drawings and approved hardware schedules.
- The approved submittal drawings and the approved hardware schedules are the versions that have been provided to the hollow metal manufacturer at the time of release for fabrication. These drawings and schedules are considered part of the project contract documents.*
- E. The contractor responsible for the coordination of procuring products provided under this Section and Section 1.03 - Related Sections, is instructed to comply with the hollow metal door and frame manufacturer's ordering instructions and lead time requirements to avoid delays.

PART 2 - PRODUCTS

2.01 HOLLOW METAL DOORS

A. Materials

1. Steel

ANSI and ASTM Standards no longer utilize 'gage' to define steel thickness. In this Specification steel is expressed in terms of minimum decimal inch (millimeter) thickness. Dimensions or sizes traditionally expressed in fractional inches are shown in decimal inches (millimeters). HMMA has developed a series of Tables, (NAAMM/HMMA 803), included as Appendix 1 of this Specification, to summarize the imperial standards and their corresponding metric values.

- a. Manufacture doors from cold-rolled steel conforming to ASTM A1008/A 1008M CS Type B, or galvaneal steel conforming to ASTM A 653/A 653M CS Type B Coating Designation A25 (ZF75), or hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M CS Type B free of scale, pitting, coil breaks, surface blemishes, buckles, waves or other defects.
- b. Interior Doors: Provide face sheets [0.032 in. (0.8 mm)] [0.042 in. (1.0 mm)] [0.053 in. (1.3 mm)] minimum thickness.

For interior doors subject to corrosive conditions it is recommended that zinc-coated face sheets, as specified in 2.01.A.1.c, be used.

- c. Exterior Doors: Provide face sheets [0.042 in. (1.0 mm)] [0.053 in. (1.3 mm)] minimum thickness zinc-coated steel conforming to ASTM A 653/A653M CS Type B, Coating Designation A60 (ZF180) or G60 (Z180).

For doors subject to severely corrosive conditions it is recommended that stainless steel products, as detailed in NAAMM's ANSI/NAAMM HMMA 866, "Guide Specifications for Stainless Steel Hollow Metal Doors and Frames", be utilized.

2. Door Cores

- a. Honeycomb: "kraft" paper hexagonal cells
- b. Polyisocyanurate: Rigid, pre-formed, closed cell board, conforming to ASTM C 591 (unfaced) or ASTM C 1289 (faced).
- c. Polystyrene: Rigid, extruded, closed cell board, 1 pound per cubic foot (16 kilograms per cubic meter) density minimum, conforming to ASTM C 578, Type 1.

- d. Polyurethane: Rigid, cellular type, board conforming to ASTM D 1622, or foamed-in-place, 1.8 pound per cubic foot (29 kilograms per cubic meter) density minimum, containing no urea formaldehyde resins.
- e. Steel Stiffened: Continuous vertical formed steel sections, 0.026 in. (0.6 mm) minimum thickness, spaced with interior webs not more than 6 in. (152 mm) apart, which upon assembly, span the full thickness of the interior of the door. Fill voids between stiffeners with fiberglass or mineral rock-wool batt-type material.
- f. Temperature Rise Rated (TRR) Fire Doors: Internal construction in accordance with the individual manufacturer's listings.
- g. Alternate proprietary laminated core materials, engineered, tested and meeting the performance and quality requirements of Sections 1.05 and 1.06 are permitted.

B. Construction

- 1. Fabricate doors of the types, sizes and construction, in accordance with the contract documents and meet the performance requirements of Section 1.05. Prior to shipment, mark each door with an identification number indicated on the approved submittal drawings.

- 2. Visible seams on door faces are not acceptable.

3. Door Edges

- a. Join door face sheets at their vertical edges by a continuous weld extending the full height of the door, filled and sanded, with no visible seam at their vertical edges.]

See "Welded, Continuously" in ANSI/NAAMM HMMA 801, "Glossary of Terms for Hollow Metals Doors and Frames"

[or]

- b. Join door face sheets at their vertical edges by a continuous interlocking or lock-tab seam the full height of the door, with [a visible] [no visible] seam at their vertical edges.]

[or]

- c. Join door face sheets by projection, spot or tack welds at their vertical edges, 6 in. (152 mm) on center maximum spacing, such that there are no visible welds or weld markings on the exposed door edges, presenting a visible vertical seam at both door edges.]

Not all doors edges are available with all core materials, or from all member manufacturers. Specifiers should consult member manufacturers to determine availability.

- 4. Fabricate doors with 1-3/4 in. (44 mm) nominal door thickness. Bend edges true, straight, and of minimum radius for the thickness of metal used.

5. Cores

- a. Stiffen interior doors with a [honeycomb] [or] [polyisocyanurate] [or] [polystyrene] [or] [polyurethane] [or] [steel stiffened] [or] [other] core, spanning the full thickness of the interior of the door, laminated to each face sheet.

- b. Stiffen exterior doors with a [honeycomb] [or] [polyisocyanurate] [or] [polystyrene] [or] [polyurethane] [or] [steel stiffened] [or] [other] core, spanning the full thickness of the interior of the door, laminated to each face sheet.

Refer to Appendix 4 for additional information on the thermal insulating values of door cores.

- c. Where determined and scheduled by the Architect, insulate temperature rise rated (TRR) fire doors to limit the temperature rise on the "unexposed" side of the door, as required by the governing building code.

6. Close top and bottom edges with a continuous steel channel not less than 0.053 in. (1.3 mm) thickness spot welded or laminated to both face sheets.
7. Close the top edge flush of exterior doors and where otherwise scheduled by the architect. Where required for the attachment of weather-stripping, provide a flush steel closure channel at the bottom edge. Provide openings in the bottom closure channel of exterior doors to permit the escape of entrapped moisture.
8. Provide edge profiles on both vertical edges of doors as follows, unless hardware dictates otherwise:
 - a. Single acting doors;
 - i. Hinge edge; beveled 1/8 in. in 2 in. (3.1 mm in 50.8 mm) or square edge
 - ii. Lock edge; beveled 1/8 in. in 2 in. (3.1 mm in 50.8 mm) or square edge
 - b. Double acting doors; rounded on 2-1/8 in. (54 mm) radius
9. Hardware Reinforcements and Preparations
 - a. Mortise, reinforce, drill and tap doors at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware apply, reinforce doors only, with drilling and tapping done by others in the field.
 - b. Fabricate reinforcements from steel of minimum material thickness as follows::
 - i. Full mortise hinges and pivots; 0.167 in. (4.2mm) or 0.123 in. (3.1 mm) angle or channel shaped type
 - ii. Lock fronts and strikes; 0.067 in. (1.7 mm) or 0.053 in. (1.3 mm) unitized reinforcement with extruded tapped holes that provide equivalent number of threads as 0.067 in. (1.7 mm)
 - iii. Concealed holders; 0.093 in. (2.3 mm)
 - iv. Reinforcements for other surface applied hardware ;0.053 in. (1.3 mm)
 - c. Where electronic hardware is indicated on the approved hardware schedule, provide access from hinge edge to device in accordance with the templates provided.
10. Glazing Moldings and Stops
 - a. Where specified or scheduled, provide doors with steel moldings to secure glazing materials, furnished and installed in the field by others, in accordance with glazing sizes and thickness shown in the contract documents.
 - b. Provide fixed moldings or integral stops, not less than 0.032 in. (0.8 mm) thickness, provide on the secure side of the door.
 - c. Provide removable or snap-on stops not less than 0.032 in. (0.8 mm) thickness, with tight fitting butt or mitered corners.
 - d. Design snap-on moldings with a non-removable stop on the secure side of the door after glazing installation.
 - e. Treat metal surfaces to which glazing stops are applied, and the inside of the glazing stops, for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door, or fabricate from zinc-coated steel conforming to ASTM A 653, A40 (ZF120) for interior doors, A60 (ZF180) or G60 (Z180) for exterior openings.
11. Where specified in the contract documents, provide doors with louvers.
 - a. For non-fire rated doors, provide doors with louvers that are welded inverted V type, Y type, face pierced construction or louver inserts.

- b. Fabricate inverted V, Y and Z type vanes from 0.042 in. (1.0 mm) minimum material thickness steel. Material type must be the same as the door face sheets.
- c. Prepare fire-rated doors for listed fire door louvers.
- d. Provide louvers for exterior doors with insect and/or birdscreens.

2.02 HOLLOW METAL PANELS

- A. Fabricate hollow metal panels, 1-3/4 in. (44 mm) nominal thickness, of the same materials and construction as specified in Section 2.01 of this specification.
- B. Finish hollow metal panels as specified in Section 2.06 of this specification.

2.03 HOLLOW METAL FRAME PRODUCT

Provisions of Section 2.03 are applicable to frames, transom frames, sidelight and window assemblies, unless indicated otherwise.

A. Materials

- 1. Manufacture frame product from cold-rolled steel conforming to A1008/A 1008M CS Type B, or galvanized steel conforming to ASTM A 653/A 653M CS Type B Coating Designation A25 (ZF75), or hot-rolled and pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M CS Type B.
- 2. Interior Frame Product: Fabricate profiles from minimum 0.053 in. (1.3 mm) thickness for frame product that receive hollow metal or solid core wood doors [, 0.042 in. (1.0 mm) for frames that receive hollow core wood doors].

For interior areas subject to corrosive conditions and for interior masonry frame product or specifically identified frame product that is subject to other moderately corrosive conditions it is recommended that galvanized frame product, having a coating designation of A40 or greater be used.

- 3. Exterior Frame Product: Fabricate profiles from minimum 0.053 in. (1.3 mm) thickness, zinc-coated steel conforming to ASTM A 653/A 653M CS Type B, Coating Designation A60 (ZF180) or G60 (Z180).

For frame product subject to severely corrosive conditions it is recommended that stainless steel products, as detailed in NAAMM's ANSI/NAAMM HMMA 866, "Guide Specifications for Stainless Steel Hollow Metal Doors and Frames", be utilized.

B. Construction

- 1. Fabricate door frames as [welded] [or] [knocked-down] [or] [slip-on]. Fabricate transom, multi-opening, sidelight and window assemblies as welded units. Fabricate all frame product of the sizes and types shown on the approved submittal drawings. Prior to shipment, mark each frame product with an identification number indicated on the approved submittal drawings. Construct frame product in accordance with the contract documents and meet the performance criteria specified in Sections 1.05.B and 1.05.C. Construct frame product in accordance with NAAMM HMMA 820 with regard to joint designs and welding techniques.
- 2. Fabricate frame product neat in appearance, square, and free of defects, warps or buckles. Press or roll form steel members straight and of uniform profile throughout their lengths.
- 3. Fabricate jamb, header, mullion and sill profiles in accordance with the frame schedule and as shown on the approved submittal drawings.
- 4. Fabricate Corner joints with all contact edges closed tight, with faces mitered and stops mitered or butted.

a. Welded Frame Product

- 1. Perimeter face joints (flush or indented): Continuously welded internally or externally with flush face joints finished smooth with seamless faces. Continuously weld internally the rabbets and soffits.

2. Internal flush face joints: Continuously welded and finished smooth with seamless faces.
3. Members at internal indented intersections: Securely welded to concealed reinforcements, and have hairline face seams.
4. All other intersection elements: Hairline seams

See NAAMM HMMA 820, "Hollow Metal Frames", and Figure 1 of this guide, for further details on frame welding.

b. Knocked-Down and Slip-On Frames.

Slip-on frames are installed after the partition is in place.

- i. Furnish components unassembled.
- ii. Factory prepare flush corner joints with steel reinforcing gussets not less than 0.032 in (0.8mm) thickness, and/or integral tabs and slots which securely interlock upon assembly.
- iii. Design corner joint design to assure component profile alignment and frame performance, when field assembled by others, in accordance with the manufacturer's installation instructions.

5. Thermally Broken Frame Product

- a. Where indicated in the contract documents, provide thermally broken frame product.
- b. Separate interior and exterior sections by a continuous thermal break.
- c. Factory insulate closed sections.
- d. The installer provides insulation for open sections.

Thermally broken frame products are utilized in applications where energy conservation and extreme temperature differences between the building interior and exterior are design factors. The use of insulated hollow metal doors and glazing materials are recommended.

6. Fabricate frame product with stop heights of 0.625 in. (15.8 mm) minimum.
7. Cap cut-off stops, at heights as shown on the approved submittal drawings. Weld and finish smooth so that there are no visible seams.

It is recommended that cut-off stops not be used at exterior, lead-lined, double egress or gasketed openings.

8. When shipping limitations or site access so dictate, or when advised by the contractor responsible for coordination or installation, fabricate frame product for openings in sections designated for assembly in the field by others. Install alignment plates or angles at each joint. Fabricate such components of the same material and thickness as the frame. Fabricate field joints in accordance with approved submittal drawings and for field welding by others.

9. Hardware Reinforcements and Preparations

- a. Prepare, mortise, reinforce, drill and tap frame product at the factory for all templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware apply, reinforce frame product, with drilling and tapping done by others in the field.

- b. Furnish frame product that receives 1-3/8 in. (35 mm) thick hollow core wood doors:
 - [i. Furnish with one (1) pair of 3-1/2 in. (89 mm) welded-on hinges. One leaf to be welded to frame with door leaf and pin shipped loose for installation on the wood doors by others.]
 - [or]
 - [ii. Factory mortised and reinforced, drilled and tapped for templated hinges furnished by others.]
 - c. Fabricate reinforcements from steel of minimum material thickness as follows:
 - i. Full mortise hinges and pivots 0.167 in. x 1.25 in. x 10 in. length (4.2 mm x 31.7 mm x 254 mm) or 0.123 in. (3.1 mm) thickness angle or channel shaped type
 - ii. Strikes; 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)
 - iii. Flush bolts, closers, hold open arms and other surface applied hardware 0.093 in. (2.3 mm)
10. In cases where electrically or electronically operated hardware is required, and indicated on the approved hardware schedule, provide conduit, hardware enclosures and/or junction boxes. Fabricate access plates, where required from the same material and thickness as the frame product and fasten with not less than four (4) #8-32 machine screws or #6 sheet metal screws at a spacing not to exceed 12 in. (305 mm) on center.

11. Floor Anchors

- a. For welded and knocked-down frame product that is to be installed prior to wall construction, weld floor anchors inside jambs, and provide with two holes for fasteners supplied and installed by others.
- b. Where specified or scheduled, weld adjustable floor anchors, providing not less than 2 in. (50.8 mm) height adjustment inside jambs.
- c. For applications that do not permit the use of a floor anchor, substitute an additional jamb anchor at a location not to exceed 8 in. (204 mm) from the base of the jamb. For slip-on frames, provide base anchor clips or face screw preparations and screws for base anchoring.
- d. Fabricate floor anchors from 0.042 in. (1.0 mm) minimum material thickness steel.

12. Jamb Anchors

- a. Provide frame product with anchorage appropriate to frame and wall construction.
- b. Masonry Type

Provide frame product for installation in new masonry walls with steel adjustable jamb anchors of the T-strap, stirrup or wire type, not less than 0.053 in. (1.3 mm) thickness or 0.156 in. (3.9 mm) diameter wire. Fabricate straps not less than 2 in. x 10 in. (50.8 mm x 254 mm) in size, corrugated and/or perforated. Place jamb anchors at a maximum of 18 in. (457 mm) from top and bottom of openings. Provide the minimum number, spaced at maximum 32 in. (812 mm) on center, on each jamb, based on the over-all frame height, as follows:

- i. Up to 60 in. (1524 mm) ; 2 anchors
- ii. Greater than 60 in. (1524 mm) up to 90 in. (2286 mm); 3 anchors
- iii. Greater than 90 in. (2286 mm) up to 96 in. (2438 mm); 4 anchors
- iv. Greater than 96 in. (2438 mm); 4 anchors plus one for each 24 in. (610 mm) or fraction thereof spaced at 24 in. (610 mm) maximum between anchors

c. Dry Wall Type

Provide welded and knocked-down frame product for installation in drywall partitions with steel jamb anchors of suitable design, not less than 0.042 in. (1.0 mm) thickness, inside each jamb. Place jamb anchors a maximum of 18 in. (457 mm) from top and bottom of openings. Provide the minimum number, spaced at maximum 32 in. (812 mm) on center, on each jamb, based on the over-all frame height, as follows:

- i. Up to 60 in. (1524 mm)2 anchors
- ii Greater than 60 in. (1524 mm)
up to 90 in. (2286 mm) 4 anchors
- iii Greater than 90 in. (2286 mm)
up to 96 in. (2438 mm) 5 anchors
- iv. Greater than 96 in. (2438 mm) 5 anchors plus one for each 24 in. (610 mm) or fraction thereof spaced at 24 in. (610 mm) maximum between anchors

d. Compression Type

Provide slip-on frames for installation in stud partitions with an adjustable compression anchor in each jamb and provide for secure attachment of each jamb base to stud runners.

e. Expansion Type

Prepare welded or knocked-down frame product for installation in existing masonry or concrete walls for expansion bolt type anchors. Fabricate the preparation such that it consists of a countersunk hole for a 0.375 in. (9.5 mm) diameter expansion bolt, with shields and a spacer within the jamb profile or a 0.25 in. (6.3 mm) countersunk hole for masonry screw anchor. Place preparations for anchors at a maximum of 6 in. (152 mm) from the top and bottom of the frame, with intermediate spacing at a maximum of 26 in. (660 mm) on center. Bolts and shields for installation provided by others.

f. Other Anchor Types

Provide frame product to be installed in pre-finished concrete, masonry or steel openings with anchoring systems of suitable design and quantity, as shown on the approved submittal drawings. Provide fasteners for such anchors for installation by others.

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.14.

- 13. Provide frame product for installation in masonry walls with door openings greater than 48 in. (1219 mm) in width with a steel angle or channel stiffener factory welded into the head, when the head is to be grouted. Fabricate stiffeners from not less than 0.093 in. (2.3 mm) thickness, not longer than the door opening width. Stiffeners are not to be used as lintels or load bearing members.
- 14. Provide grout guards fabricated from not less than 0.016 in. (0.4 mm) thick steel at all hardware mortises on frame product to be grouted.
- 15. Provide all door openings in welded frame product with a temporary steel spreader welded to the feet of the jambs or mullions to serve as bracing during shipping and handling. Temporary steel spreader are not to be used for installation.
- 16. In-Fill Panels
 - a. Where specified or scheduled, provide frame product with in-fill panels secured to frame sections with removable steel stops.

- b. For non-labeled frame product, construct in-fill panels from 0.032 in. (0.8 mm) minimum thick sheet steel, of the same type specified for the frame product, laminated to each face of the manufacturer's standard solid backing.
- c. For fire-rated frame product, construct in-fill panels from 0.032 in. (0.8 mm) minimum thick sheet steel, of the same type specified for the frame product, laminated to each face of a solid approved backing.

Refer to NAAMM HMMA 850, "Fire-Rated Hollow Metal Doors and Frames", for additional information.

17. Removable Glazing Stops

- a. Provide where specified, frame product with removable stops to secure glazing materials or in-fill panels. Glazing materials are furnished and installed in the field by others, in accordance with glazing sizes and thickness shown in the contract documents.
- b. Fabricate removable steel channel glazing stops from not less than 0.032 in. (0.8 mm) thick, butted at corners and secured to the frame section using cadmium or zinc-plated #6 minimum countersunk sheet metal screws.
- c. Treat the frame section underneath the glazing stops and the inside of the glazing stops for maximum paint adhesion and paint with a rust inhibitive primer prior to installation, or fabricate from zinc-coated steel conforming to ASTM A 653/A 653M, A40 (ZF120) for interior applications, A60 (ZF180) or G60 (Z180) for exterior units.
- d. Interior frame product may be provided with snap on glazing stops.

2.04 MANUFACTURING TOLERANCES

The manufacturer of hollow metal door and frame product is responsible only for the manufacturing tolerances listed in 2.04.A. The final clearances and relationship between door and frame depend on the setting of the frame (see Figure 4), and the hanging and adjustment of the door and hardware. See Sections 3.02 and 3.03.

A. Maintain manufacturing tolerances within the following limits:

1. Frame Product for Singles or Pairs of Doors

- 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 ± 3/64 in. (1.2 mm)
- c. Cross sectional profile dimensions (See Figure 2):
 - i. Face± 1/32 in. (0.8 mm)
 - ii. Stop± 1/32 in. (0.8 mm)
 - iii. Rabbet± 1/32 in. (0.8 mm)
 - iv. Depth± 1/32 in. (0.8 mm)
 - v. Throat± 1/16 in. (1.5 mm)

Frame product 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.

2. Doors

Tolerances for actual hollow metal door sizes are as follows:

- 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. Edge Flatness1/16 in. (1.5 mm) maximum
- e. Surface Flatness1/8 in. (3 mm) maximum

*Hollow metal doors are undersized to fit the frame's door opening.
Edge clearances are based upon individual manufacturer's designs.*

3. Hardware

- a. Cutouts Template dimensions, + 0.015 in. (0.38 mm), - 0
- b. Location ± 1/32 in. (0.8 mm)
- c. Between hinge centerlines ± 1/64 in. (0.4 mm)

2.05 HARDWARE LOCATIONS

- A. The required locations of hardware on doors and frame product are listed below. All dimensions, except the hinge locations, are referenced from the floor, as defined in Section 3.03.B.3.

When hollow metal frame products are specified for use with doors to be furnished by others, hardware preparations on the doors are normally governed by the location on the frames, as stated in 2.05.A.

1. Hinges

- a. Top 5 in. (127 mm) from underside frame rabbet at door opening to top of hinge
- b. Bottom 10 in. (254 mm) from floor to bottom of hinge
- c. Intermediate centered between top and bottom hinges
- d. On dutch doors 5 in. (127 mm) from underside of frame rabbet at door opening, to top of upper hinge; 10 in. (254 mm) from floor to bottom of lower hinge and; 5 in. (127 mm) from split line to top and bottom of upper and lower intermediate hinges, respectively

- 2. Locks and latches 38 in. (965 mm) to centerline of knob or lever shaft
- 3. Deadlocks 46 in. (1168 mm) to centerline of cylinder
- 4. Exit hardware 38 in. (965 mm) to centerline of cross bar or as shown on hardware template
- 5. Door pulls 42 in. (1066 mm) to center of grip
- 6. Push/pull bars 42 in. (1066 mm) to centerline of bar
- 7. Arm pulls 46 in. (1168 mm) to centerline
- 8. Push plates 46 in. (1168 mm) to centerline of plate
- 9. Roller latches 45 in. (1143 mm) to centerline of latch

See NAAMM/HMMA 830 and 831 for additional information.

2.06 FINISH

A. After fabrication, fill and sand all tool marks and surface imperfections as required to make face sheets, vertical edges and weld joints free from irregularities and dressed smooth.

B. Fully Primed Surfaces

After appropriate metal preparation to ensure maximum paint adhesion, provide a factory applied rust inhibitive primer coating to all exposed surfaces of door and frame product manufactured from cold-rolled, hot-rolled, A25 (ZF75), or A60 (ZF180) zinc-coated. Meet the performance requirements of Section 1.05.C.

C. Unprimed Galvanneal Surfaces

Touch-up all exposed surfaces of door and frame product manufactured from A40 (ZF120) or heavier zinc-coated galvanneal steel where zinc coating has been removed during fabrication with a zinc-rich rust inhibitive primer or provide a factory applied full-coat rust inhibitive primer coating.

All primer and finish paint must be formulated for Direct to Metal (DTM) application.

D. Fully cure primer prior to shipment.

PART 3 - EXECUTION

3.01 SITE STORAGE AND PROTECTION OF MATERIALS

Correct site storage and protection are essential to the proper performance of doors and frame product. The requirements for proper storage are given in the following Section. However, it is important to recognize that these are not the responsibility of the hollow metal manufacturer. For this reason the requirements for storage and protection of hollow metal doors and frame product should be included in the Section of the specifications where installation work is specified. For additional information regarding installation see NAAMM HMMA 840, "Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames".

- A. The contractor responsible for receiving hollow metal door and frame product must remove wraps or covers upon delivery at the building site and must ensure that any scratches or disfigurement caused by shipping or handling are promptly cleaned and touched up with a rust inhibitive 'Direct to Metal' (DTM) primer.
- B. The contractor responsible for receiving hollow metal door and frame product must ensure that materials are properly stored on planks or dunnage in a dry location. Store doors and frame product in a vertical position, spaced by blocking. Figure 3 of NAAMM/HMMA 840 illustrates the recommended storage positioning. Cover materials to protect them from damage but in such a manner as to permit air circulation.

3.02 INSTALLATION

Correct installation is essential to the proper performance of doors and frame product. The requirements for proper installation are given in the following Sections. However, it is important to recognize that 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 is the responsibility of the general contractor, using experienced personnel, 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".

- A. The installer is responsible for performing the following:
1. Prior to installation, check the area of floor on which the frame is to be installed, and within the path of door swing, for flatness.
 2. Prior to installation, remove temporary spreaders. Check doors and frame product for correct size, swing, fire-rating, and opening number.
 3. Prior to installation of perimeter frame product sections to be installed in masonry or concrete walls, isolate and protect all interior surfaces from grout and antifreeze agents.

The drawbacks and benefits associated with the use of water based masonry grouts, with or without antifreeze agents, should be carefully weighed during the detailing and specification process. Grouting of mullions and other closed sections is not recommended, and plaster based grouts should not be used. Refer to NAAMM's HMMA TechNote, HMMA-820 TN01-03, "Grouting Hollow Metal Frames", in Appendix 2 for further guidance.

4. During the setting of the frame product check and correct as necessary for opening width, opening height, squareness, alignment, twist and plumbness. Maintain installation tolerances within the following limits:
 - 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)

The above 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.

5. The details in Figure 4 illustrate the method of measuring the above specified tolerances.
6. Grout guards and junction boxes are intended to protect hardware mortises and tapped holes from masonry grout of 4 in. (101 mm) maximum slump consistency that 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 must be taken in the field by the installer to protect the aforementioned.

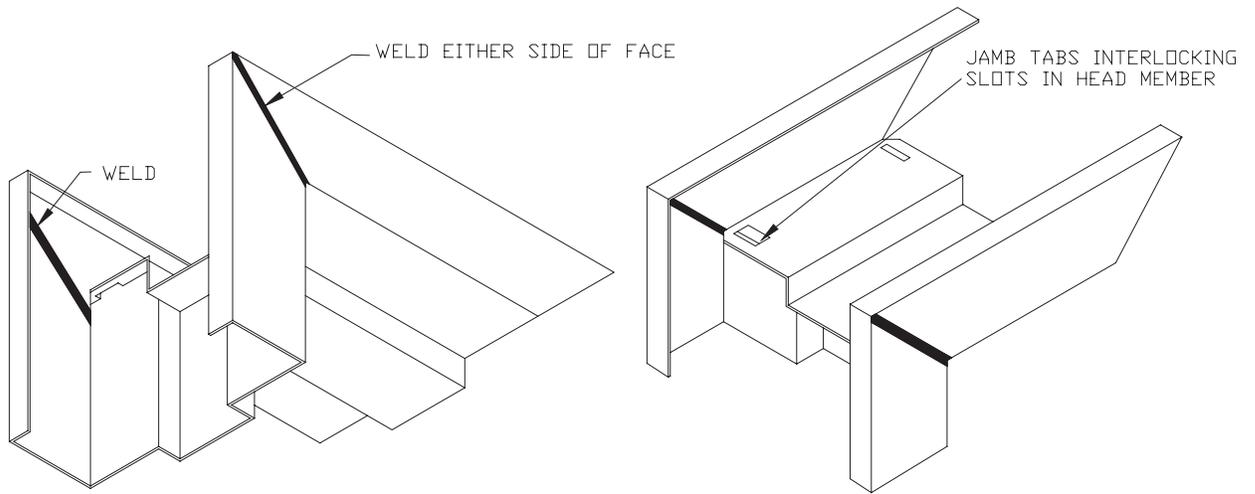
7. Frame products are not intended or designed to act as forms for grout or concrete. Grout of hollow metal sections in “lifts” or take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.
8. Keep hollow metal surfaces free of grout, tar, and/or other bonding materials or sealers. Promptly clean grout, tar, and/or other bonding materials or sealers off of frame product and doors.
9. Finish and touch-up marks caused by spreader removal.
10. Promptly finish smooth and clean all xposed hollow metal surfaces which have been scratched or otherwise marred during installation, cleaning, and/or field welding, for maximum paint adhesion and touch up with a rust inhibitive primer comparable to and compatible with the factory applied primer and finish paint specified in Section 09 90 00. All touch-up primer and finish paint must be formulated for Direct to Metal (DTM) application.
11. Install labeled fire doors and frame product in accordance with the terms of their listings, ANSI/NFPA 80, or the local Authority Having Jurisdiction.
12. Maintain proper door edge clearances in accordance with Section 3.03, except for special conditions otherwise noted. Where necessary, metal hinge shims, furnished by the installer, are permitted to maintain clearances.
13. Apply hardware in accordance with hardware manufacturer’s templates and instructions.
14. Finish paint in accordance with Section 09 90 00 [09900].
15. Install door silencers.
16. Install glazing materials in accordance with Section 08 80 00 [08800].

3.03 CLEARANCES

- A. Ensure that the edge clearance for swinging hollow metal doors provides for the functional operation of the assembly, a minimum of 1/32 in. (0.08 mm) and does not exceed the following:
 1. Between doors and frame product at head and jamb...0.125 in (3.1 mm) +/- 0.0625 in (1.5 mm)
 2. between edges of pairs of doors0.125 in (3.1 mm) +/- 0.0625 in (1.5 mm)
- B. Floor clearance for swinging hollow metal doors must not exceed the following:
 1. At bottom of door where a threshold is used3/8 in. (9.5 mm) from bottom of door to top of threshold
 2. At bottom of door where no threshold is used3/4 in. (19.1 mm) above floor
 3. Between bottom of door and nominal surface of floor coverings at fire-rated openings, as provided in ANSI/NFPA 803/4 in. (12.7 mm)

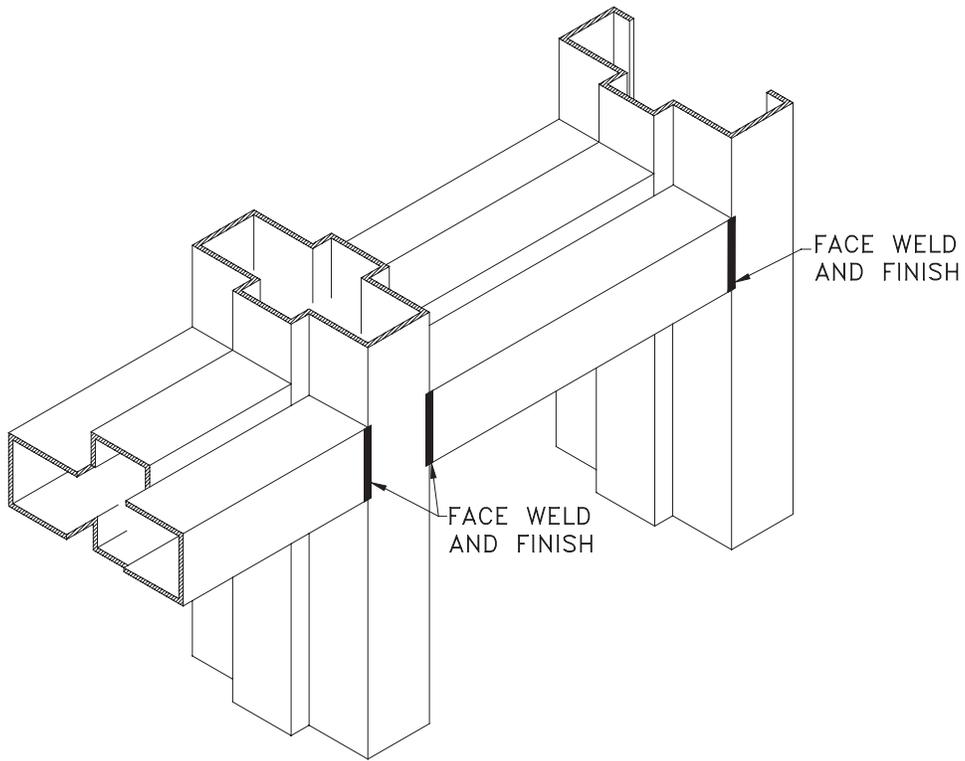
The Architect must define the distance from the top of the floor/finished floor to top of floor covering so appropriate undercuts can be provided. Floor/Finish Floor is defined as the top of the concrete or structural slab. HMMA uses the term ‘top of floor covering’ to describe the NFPA term ‘nominal surface of floor covering’. Refer to HMMA’s TechNote, HMMA-810 TN01-03, “Defining Undercuts”, in Appendix 3 for further guidance.

END OF SECTION



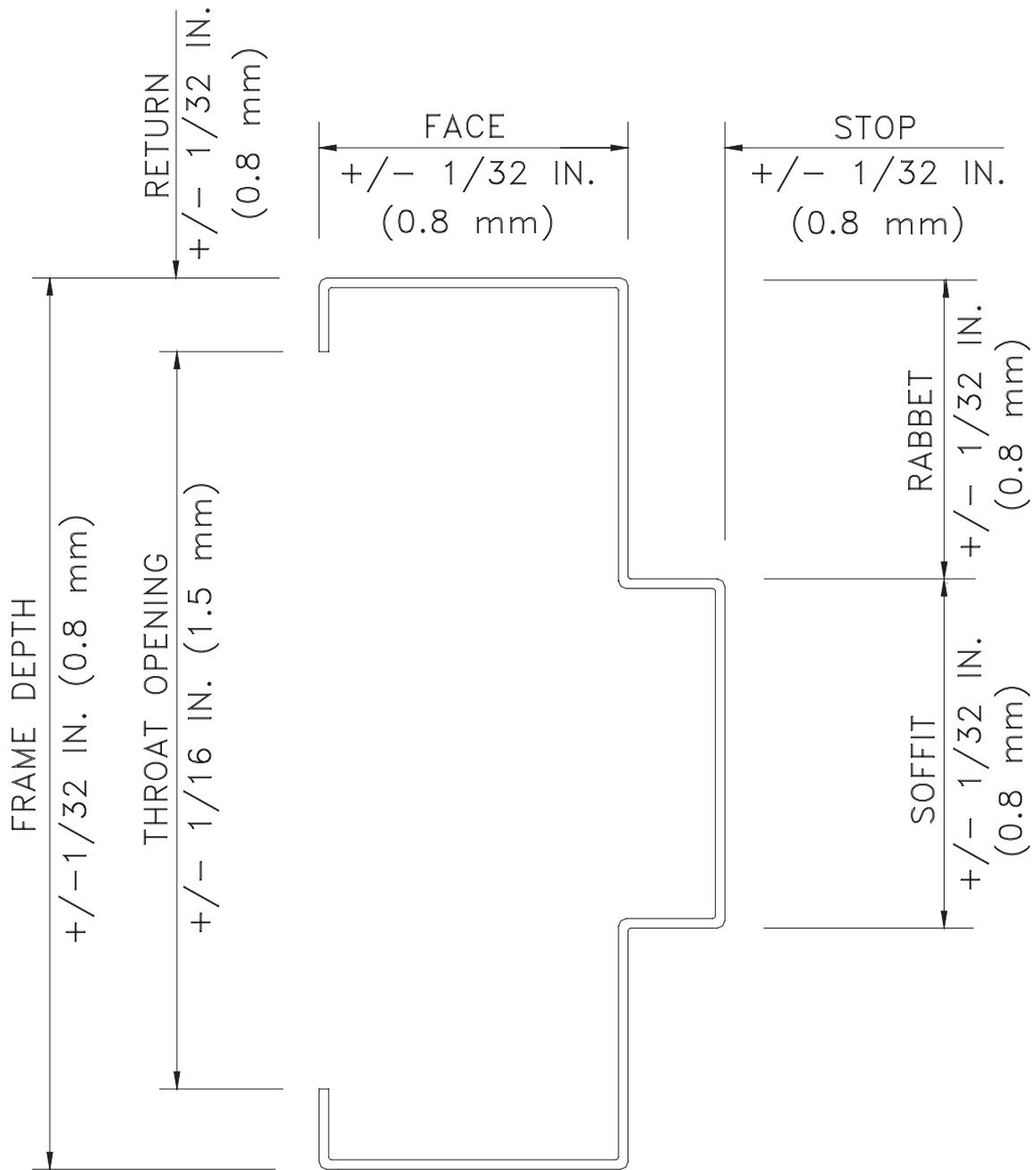
FACE WELDED CORNER JOINT

NOTE: Joint design may vary, see HMMA-820 "Hollow Metal Frames" for representative corner joint details



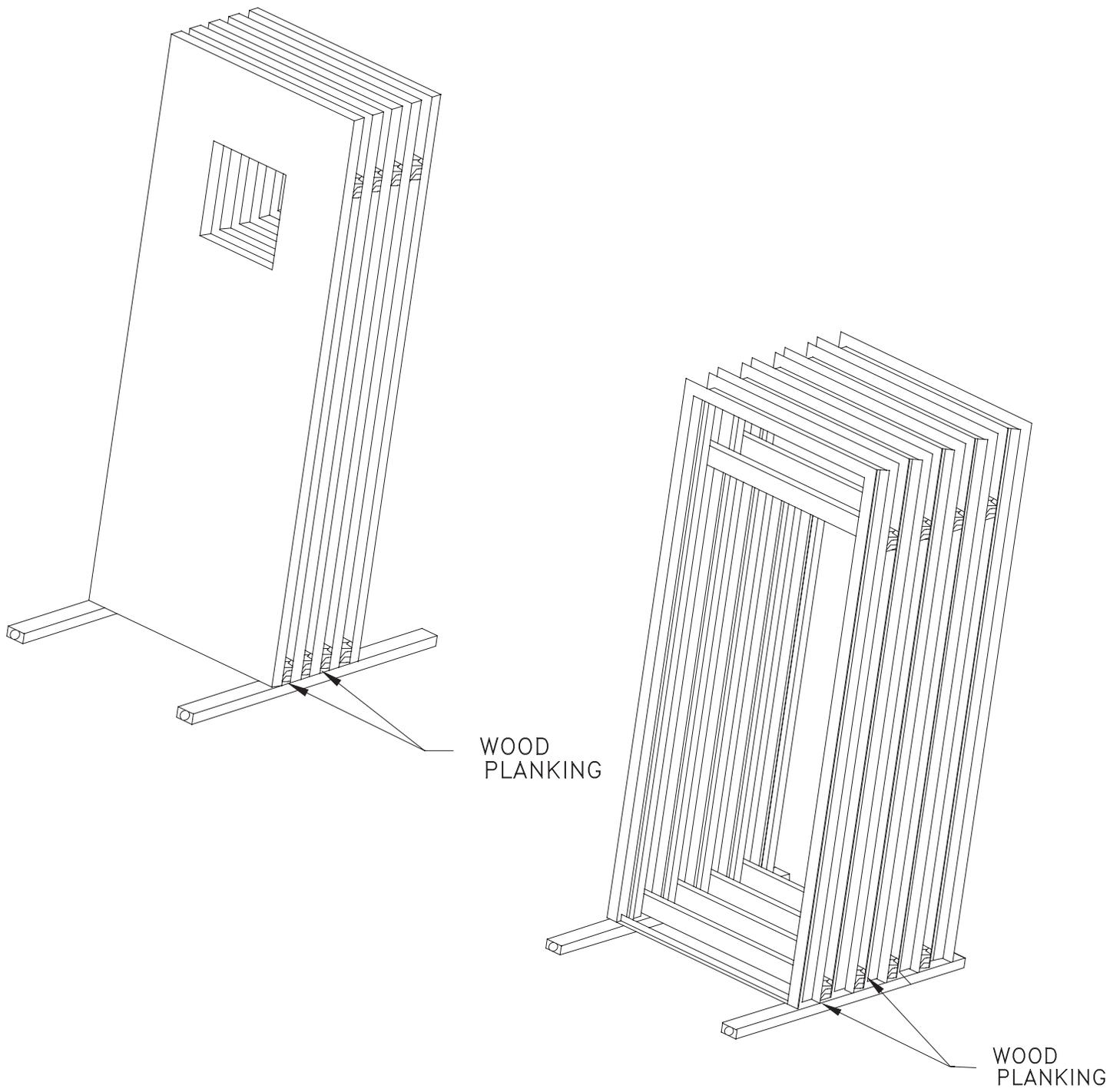
BUTTED AND FACE WELDED JOINTS

Figure 1



SECTIONAL PROFILE TOLERANCES

Figure 2



RECOMMENDED STORAGE

Figure 3

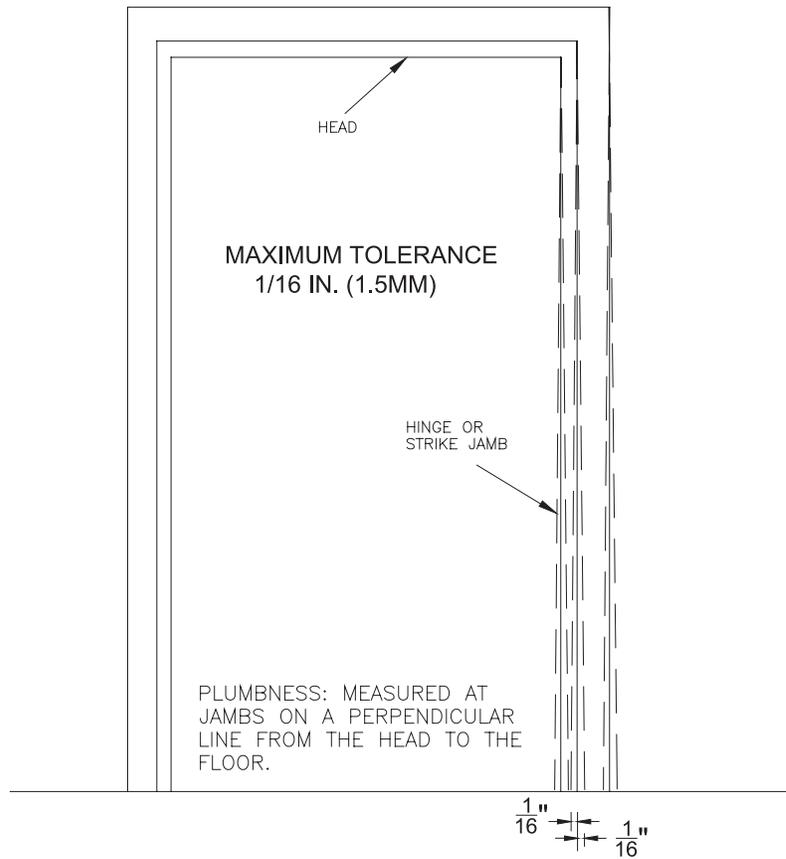
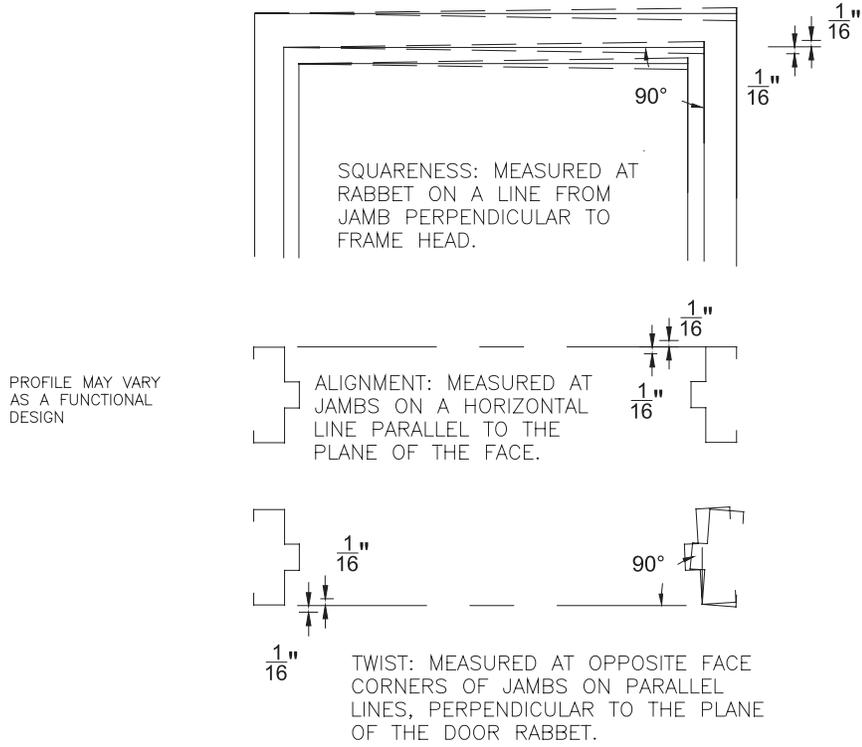


Figure 4

APPENDIX 1
(Not part of the Standard)

NAAMM/HMMA 803-97 - STEEL TABLES

Prior to 1970, sheet steel was referred to by gage. ASTM and ANSI currently do not list gage numbers in their standards. Like many generic terms, gage (or gauge) is ingrained in many vocabularies and is misunderstood as a term for thickness. NAAMM is publishing this Minimum Thickness Table to be used instead of discontinued gage numbers.

The values shown were taken from the Underwriters Laboratories, Inc. publication for gage number and equivalent thickness.

MINIMUM THICKNESS		
Uncoated Steel Sheet		
Gage	Decimal	mm
4	0.214	5.4
5	0.199	5.0
6	0.184	4.6
7	0.167	4.2
8	0.152	3.8
10	0.123	3.1
12	0.093	2.3
14	0.067	1.7
16	0.053	1.3
18	0.042	1.0
20	0.032	0.8
22	0.026	0.6
24	0.020	0.5
26	0.016	0.4
28	0.013	0.3

CONVERSION		
Fraction	Decimal	mm
	1.000	25.4
15/16	0.937	23.8
7/8	0.875	22.2
13/16	0.812	20.6
3/4	0.750	19.0
11/16	0.687	17.4
5/8	0.625	15.8
9/16	0.562	14.2
1/2	0.500	12.7
7/16	0.437	11.1
3/8	0.375	9.5
5/16	0.312	7.9
1/4	0.250	6.3
3/16	0.187	4.7
1/8	0.125	3.1
1/16	0.062	1.5

DISCLAIMER

This sheet 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 minimum thickness and metric equivalents used for hollow metal doors and frames. This sheet contains advisory information only and is published as a public service by the HMMA Division.

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HMMA Hollow Metal Manufacturers Division of the
National Association of Architectural Metal Manufacturers **NAAMM**

APPENDIX 2
(Not part of the Standard)
GROUTING HOLLOW METAL FRAMES
HMMA-820 TN01-03

Grout, when used in accordance with industry guidelines, can improve frame durability, sound deadening and, depending on wall construction, increases frame anchorage strength. Grouting of the frame does not increase door durability, nor is it required for fire-rated frames. For most commercial applications, grouting of mullions and other closed sections is not recommended.

For applications covered by ANSI/NAAMM HMMA 862, "Guide Specifications for Commercial Security Hollow Metal Doors and Frames", and ANSI/NAAMM HMMA 863, "Guide Specifications for Detention Security Hollow Metal Doors and Frames", the standards require that "frame jambs shall be fully grouted to provide added security protection against battering, wedging, spreading, and other means of forcing open the door".

Grout is a water-based product. If not used properly, it can destroy the opening in a very short time. Grout can be either "mortar", which is a masonry mixture of lime, cement, sand and water, or "plaster", a gypsum-based product.

Plaster grout dries with exposure to air. When a frame member is filled solid with plaster grout, only those areas exposed to air will dry and harden, while the center remains wet (uncured). The water remaining in the plaster grout can rust the frame from the inside.

Mortar grout cures by chemical reaction and hardens throughout. Use mortar grout.

Frames are not designed to act as forms for grout. Grout must have a maximum 4 in. slump and be hand troweled in place. Bracing of the frame may be necessary prior to grouting to prevent sagging of the header or bowing of the jamb due to weight or pressure of the grout. Grout should not be installed after gypsum wallboard is installed, as the liquid within the grout will deteriorate the wallboard.

When dictated by temperatures, anti-freezing agents for mortar may be recommended by specifications. These agents can adversely affect metal and all surfaces in contact with grout must be coated with a corrosion resistant material.

It is recommended that the contractor be responsible for the grouting and for any additional barrier coating. It is also the contractor's responsibility to use care in the application of the grout.

APPENDIX 3 (Not part of the Standard) DEFINING UNDERCUTS HMMA-810 TN01-03

Review of established definitions.

1. **“ACTUAL DOOR HEIGHT”** - The door opening height minus top clearance and undercut.
2. **“DOOR OPENING HEIGHT”** - The distance measured vertically between the frame head rabbet and top of floor or bottom of frame minus jamb extension.
3. **“FINISHED FLOOR”** - See “Floor”
4. **“FLOOR”** - The top of the concrete or structural slab.
5. **“FLOOR CLEARANCE”** - The distance between the bottom of the door and the top of the material directly below the door. This varies with application, such as concrete, any floor covering and/or a threshold.
6. **“FLOOR COVERING”** - Any material applied on top of the floor that extends under the door in its closed position or under the door as it swings to its fully open position.
7. **“UNDERCUT”** - The distance between the bottom of door and the bottom of frame. The formula in which to determine Undercut is derived by adding the total sum of the following (Floor Clearance + Floor Covering Thickness + Threshold Height (assuming the threshold is mounted on top of the floor covering) + Jamb Extensions Height).
8. **“JAMB EXTENSIONS”** - That portion of a jamb or mullion which extends below the level of the floor.

Typically frames are intended to be installed directly on the floor. When no floor coverings or thresholds are used, the dimension for “Undercut” is the same as for “Floor Clearance”. See Figure # 1.

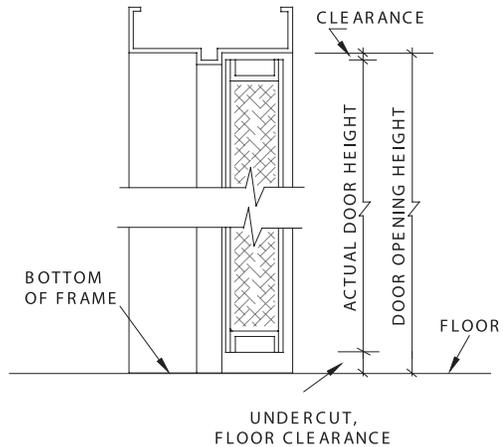


Figure # 1

Floor coverings; such as carpet, resilient or ceramic tile, are typically installed on top of the floor, fitted around the frame, and under the door. In this situation, the formula for figuring Undercut is the total of the Floor Clearance + Floor Covering Thickness. See Figure # 2.

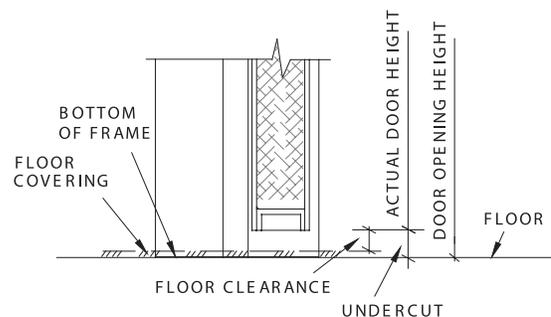


Figure # 2

When a threshold is used, it is installed on top of the floor or floor covering, fitted around the frame and under the door. Again the formula for figuring “Undercut” changes. Undercut is the total of the Floor Clearance + Threshold Height + Floor Covering Thickness. See Figure # 3.

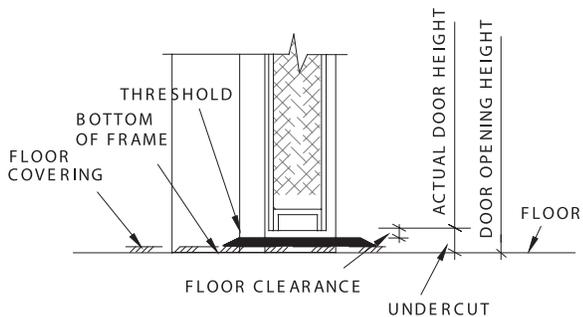


Figure # 3

In situations with specialized floors such as thick ceramic tile or terrazzo, the frame is typically installed prior to the installation of the floor.

One method is to install the frame with adjustable floor anchors or for the frame to be installed on a block or shim. This allows the frame to be positioned, as required, to accommodate the floor height. See Figures # 4A and 4B. Both illustrate a raised frame condition in which the bottom of frame is positioned to be directly on top of the floor after the floor is installed. In this situation, the dimension measured for Undercut is also the same as Floor Clearance.

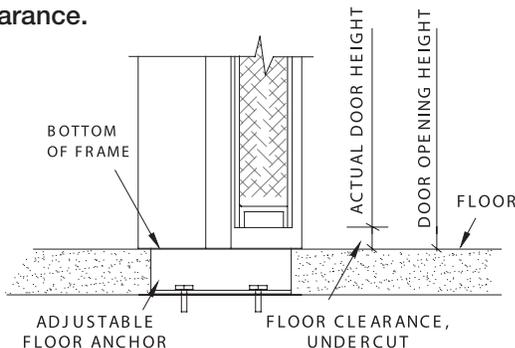


Figure # 4A

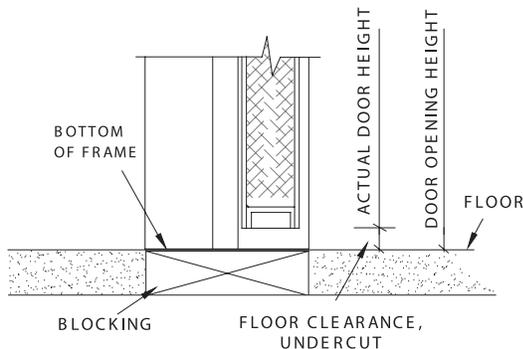


Figure # 4B

Another method, called “below floor installation”, is to install the frame directly on the rough slab. After the frame is installed, the floor is then installed around the frame. That portion of the frame is

covered by the floor and is called jamb extensions. The formula for figuring “Undercut” is the total of the Floor Clearance + Jamb Extensions. See Figures # 5A and 5B.

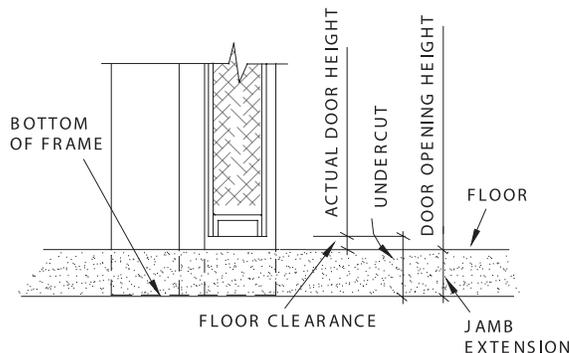


Figure # 5A

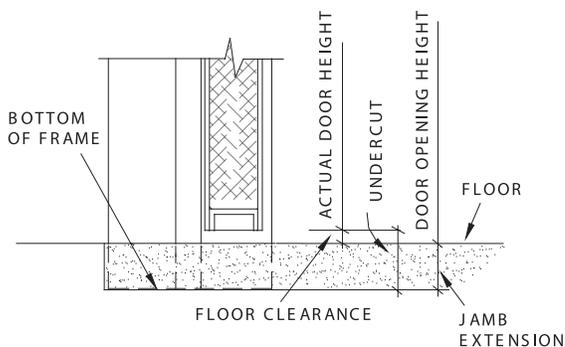


Figure # 5B

The Architect/Designer must be very specific within specifications and contract drawings, which should include detailed drawings illustrating conditions for each floor, including thicknesses and materials. These drawings should designate the height at which the hollow metal frame should be set. Thresholds and hardware items requiring specific floor clearances shall be listed in the hardware schedule, which allows the door and frame manufacturer to properly size each opening.

Within the door and frame industry, both the Hollow Metal Manufacturers Association (HMMA) a division of the National Association of Architectural Metal Manufacturers (NAAMM) and the Steel Door Institute (SDI), publish recommended clearances. In addition, the National Fire Protection Association (NFPA) Publication 80, “Standard for Fire Doors and Fire Windows”, regulates the installation and maintenance of labeled openings, and lists several different scenarios consisting of different floor materials and the maximum clearance under the bottoms of doors.

APPENDIX 4

(Not part of the Standard)

THERMAL INSULATING VALUES FOR DOOR CORE MATERIALS

The following table provides Architects and Specifiers with basic insulating performance values for hollow metal laminated door core materials that may be used in exterior doors. It provides the user with the performance levels of the cores only, at their installed thickness, and cured for 180 days.

Real world installations bring into the equation, a multitude of variables which are beyond the control of the hollow metal door manufacturer, and cannot be reflected in assembly tests performed in the controlled environment of a laboratory.

CORE MATERIAL	MINIMUM DENSITY		MINIMUM R-VALUES		MAXIMUM U-VALUE		MAXIMUM K-VALUE ^(*)	
	Imperial (lbs/ft ³)	Metric (kg/m ³)	Imperial (degrees F x hours x ft ² /BTU)	Metric (degrees K x m ² /W)	Imperial (1/R)	Metric (1/RSI)	Imperial (1/(R ÷ core thickness))	Metric (1/(RSI ÷ core thickness))
Polystyrene	1	16	R 6.0	RSI 1.06	0.167	0.943	0.276	39.7
Polyurethane	1.8	29	R 8.7	RSI 1.54	0.115	0.649	0.190	27.3
Polyisocyanurate	2	32	R 9.9	RSI 1.75	0.101	0.571	0.167	24.0

*1: K-Value is expressed per inch (or millimeter)

The need for added security or other functional priorities may over-ride the thermal performance provided with the use of these cores. In such instances, honeycomb and steel stiffened doors may be specified for exterior applications.

All cores are not available from all manufacturers or in all areas. Users are encouraged to contact member manufacturers to determine availability and applicability for their specific requirements.

APPENDIX 5

(Not part of the Standard)

STANDARDS DEVELOPMENT ORGANIZATIONS

ANSI	American National Standards Institute, Inc. 11 West 42nd Street New York, NY 10036 Tel: (212) 642-4900 Website: www.ansi.org
ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 Tel: (610) 832-9585 Website: www.astm.org
ICC	International Code Council 500 New Jersey Avenue NW 6th Floor Washington, DC 20001-2070 Tel: 1 (888) 422-7233 Website: www.iccsafe.org
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Road Building C, Suite 312 Glen Ellyn, IL 60137 Tel: (630) 942-6591 Website: www.naamm.org
NFPA	National Fire Protection Association 1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269 Tel: (617) 770-3000 Website: www.nfpa.org
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, Illinois 60062 Tel: (847) 272-8800 Website: www.ul.com