HOLLOW METAL MANUAL

AMERICAN NATIONAL STANDARD

ANSI/ NAAMM

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0 8 11 13 Hollow Metal Doors and Frames

GUIDE SPECIFICATION FOR HOLLOW METAL DOORS AND FRAMES

INCLUDES GUIDE SPECIFICATIONS FOR
LAMINATED HOLLOW METAL DOORS AND FRAMES

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Approved American National Standard
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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 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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Foreword

This guide specification addresses the requirements for hollow metal doors, frames and related products and reflects the growing choices of steel door and frame constructions available.

This specification has been prepared in accordance with the CSI recommended Section Format 2009 with Part 1 - General, Part 2 - Products and Part 3 - Execution. While the CSI Section Format locates Delivery, Storage and Handling in Part 1, NAAMM Standards include them under Part 3 - Execution. CSI Master Format 2016 locates Hollow Metal Doors and Frames in Section 08 11 13.

Guide specifications are intended to be used as the basis for developing project specifications and must be edited to fit specific project requirements. Within this document, options on construction and/or performance requirements are shown in [brackets]. Appropriate selections of options should be made with additional provisions applicable to the project added. Inapplicable options should be deleted. Bracketed options remaining in the project specification, will be selected at the discretion of the manufacturer. Notes, recommendations, and instructions to specifiers are given in italics at the start of the section or directly following the text to which they apply. Notes that contain permissive language are not considered part of the standard.

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, verify its applicability to this guide prior to its inclusion.

Material and fabrication methods called for in this specification are not intended to restrict the use of other materials and methods, where it can be demonstrated through specific testing that the construction is equal to, or exceeds, the performance requirements specified in Section 1.05 and the Quality Assurance requirements of Section 1.06, or when acceptable to the Architect/Specifier.

The values stated in inch-pounds units are to be regarded as the standard. Corresponding metric values are included in parentheses for reference purpose only.

For hollow metal doors and frames in similar applications, refer to:

ANSI/HMMA 861, "Guide Specification for Commercial Hollow Metal Doors and Frames".

ANSI/HMMA 862, "Guide Specification for Commercial Security Hollow Metal doors and Frames".

ANSI/HMMA 863, "Guide Specification for Detention Security Hollow Metal doors and Frames".

ANSI/HMMA 865, "Guide Specification for Swinging Sound Control Hollow Metal doors and Frames".

ANSI/HMMA 866, "Guide Specification for Stainless Steel Hollow Metal Doors and Frames".

CSI SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

This Section includes hollow metal door and frame products as shown in the contract documents and approved shop drawing.

The term "frame products" is used to define, as a group; three sided single and pair frames, transom frames, sidelights, and window assemblies, (borrowed lights).

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

A. Hollow metal doors, swinging type, including [glass moldings and stops] [louvers] [louver inserts] [panels][in-fill panels] [*other*] as shown in the approved submittal drawings.

B. Hollow metal panels, fixed or removable, [flush] or [rabbeted bottom edge], [glass moldings and stops], similar in construction to hollow metal doors.

C. Hollow metal frame products, including [glass moldings and stops] [louvers] [louver inserts] [hollow metal panels] [in-fill panels] [*other*] as shown in the approved submittal drawings.

1.03 RELATED SECTIONS

A. Section 01 66 00 - Product Storage and Handling Requirements

B. Section 03 30 00 – Cast in Place Concrete

C. Section 04 20 00 – Unit Masonry

D. Section 05 10 00 - Structural Metal Framing

E. Section 06 10 00 - Rough Carpentry

F. Section 06 11 00 - Wood Framing

G. Section 08 11 19 - Stainless Steel Doors and Frames

H. Section 08 34 53 - Security Doors and Frames

I. Section 08 34 73 - Sound Control Door Assemblies

J. Section 08 71 00 - Door Hardware

K. Section 08 80 00 - Glazing

L. Section 09 20 00 - Plaster and Gypsum Board

M. Section 09 90 00 - Painting and Coating

N. Section 11 98 12 - Detention Doors and Frames

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

1.04 REFERENCES

Documents referenced within this specification

The Standards listed in this Guide are referenced by basic designation only. The edition of a standard is deemed as that in effect 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 the Guide prior to its inclusion.

A. ANSI/NAAMM HMMA 841, Tolerances and Clearances for Commercial Hollow Metal Doors and Frames

B. ANSI/SDI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors

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

D. ANSI/NFPA 80 , Standard for Fire Doors and Other Opening Protectives

E. ANSI/NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives.

F. ANSI/NFPA 252, Standard Methods of Fire Tests of Door Assemblies

G. ANSI/NFPA 257, Standard on Fire Test for Windows and Glass Block Assemblies

H. ANSI/UL 9, Standard for Fire Tests of Window Assemblies

I. ANSI/UL 10B, Standard for Fire Test of Door Assemblies

J. ANSI/UL 10C, Standard for Positive Pressure Fire Tests of Door Assemblies

K. ANSI/UL 1784, Standard for Air Leakage Tests of Door Assemblies

L. ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

M. ASTM A 1008/A 1008M, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy, and High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

N. ASTM A 1011/A 1011M, Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy, and High Strength Low-Alloy with Improved Formability and Ultra High Strength

O. ASTM C 143/A 143M, Standard Test Method for Slump of Hydraulic-Cement Concrete

P. CAN/ULC-S104, Standard Method for Fire Tests of Door Assemblies

Q. CAN4/ULC-S106, Standard Method for Fire Tests of Window and Door Assemblies

Documents used in the development of this specification, not referenced.

R. ANSI/NAAMM HMMA 801, Glossary of Terms for Hollow Metal Doors and Frames

S. NAAMM HMMA 802, Manufacturing of Hollow Metal Doors and Frames

T. NAAMM HMMA 803, Steel Tables

U. NAAMM HMMA 805, Recommended Selection and Usage Guide for Hollow Metal Doors and Frames

V. NAAMM HMMA 810, Hollow Metal Doors

W. NAAMM HMMA 820, Hollow Metal Frames

X. NAAMM HMMA 830, Hardware Selection for Hollow Metal Doors and Frames

Y. NAAMM HMMA 831, Recommended Hardware Locations for Hollow Metal Doors and Frames

Z. NAAMM HMMA 840, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames
AA. NAAMM HMMA 841, Tolerances and clearances for Commercial Hollow Metal Doors and Frames
AB. NAAMM HMMA 850, Fire-Rated and Smoke Control Hollow Metal Door and Frame Products

1.05 TESTING AND PERFORMANCE

A. Physical Endurance Test - ANSI/SDI A250.4, "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors"

1. Test a 3 ft. x 7 ft. (914 mm x 2134 mm), 1.75 in. (44 mm) thick nominal size door and frame assembly representative of the construction and material to be provided.

2. Provide Performance Report, or Certifcate of Compliance, from an Independent 3rd party which indicate compliance with the acceptance criteria of the standard for the level of duration required:

[Level A - 1,000,000 cycles] [Level B - 500,000 cycles] or [Level C - 250,000 cycles].

B. Labeled Fire-Rated and/or Smoke Control Door and Frame Product

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, CAN4-S104 and CAN4-S106.

Conversely, the following standards are to be used for 'positive pressure' fire tests, and should be deleted from project specifications requiring 'traditional' (neutral pressure) fire tests: NFPA-252, NFPA-257, and UL10C.

UL9 and ANSI/NFPA-257 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 and CAN4-S106.

Refer to appendix for list of the Standards Writing Organizations referenced in this section.

1. Where determined and scheduled by the Architect.

The architect determines and schedules the fire, temperature rise and/or smoke and draft control ratings to satisfy design and code requirements.

a. Provide doors, panels, frames, transom frames, sidelight, borrowed light, and window assemblies bearing the label of a testing agency; having a factory inspection service for openings requiring fire protection and/or smoke control ratings.

b. Test doors, panels, frames, transom frames, and sidelight assemblies in accordance with [ANSI/NFPA 252] [CAN/ULC-S104] [ANSI/UL 10B] [ANSI/UL 10C] [and/or] [ANSI/UL 1784].

c. Test borrowed light and window assemblies in accordance with ANSI/UL9 or [ANSI/NFPA 257 or CAN4-S106].

UL 10C, UBC 7-2; Part 1, and UBC 7-4 provide for positive pressure testing to accomodate 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.

2. Advise the architect in the submittal documents of any door or frame product specified to be fire-rated, which cannot qualify for labeling.

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

C. Prime Paint Performance, ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames".

1. Test a sheet steel specimen, replicating finish 'as shipped' with the product manufacturer's production primer.
2. Provide Verification of Compliance from an Independent 3rd party which indicates compliance with the acceptance criteria of the standard.

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. Compliance with Section 1.05 is required for all door and frame product provided under this Section.
2. Fabricate in accordance with the contract documents and approved submittal drawings.
3. Meet product quality standards and fabrication methods set by the Hollow Metal Manufacturers Association, HMMA, a division of the National Association of Architectural Metal Manufacturers, NAAMM.

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.
4. Provide manufacturer's recommended installation instructions and procedures.

B. Provide the following samples, upon request:

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 and install glazing stop as specified, in the opposite rabbet. Apply glazing stop to both head and jamb section 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 deviation of fabrication quality, compared to the approved samples, is cause for rejection of the work.

1.08 CONTRACTOR'S RESPONSIBILITY

A. Contractor is responsible for coordination and installation of products covered under this section and is required to:

1. Verify that substrate conditions, whether existing or installed under other Sections, are as detailed in the Architect's drawings.
2. Coordinate procuring products provided under this Section, and Section 1.03 - Related Sections, and comply with the hollow metal manufacturer's ordering instructions, and lead time requirements, to avoid delays.
3. Provide to the manufacturer:

a. Approved submittal drawings, approved hardware schedules, templates and/or template numbers and all pertinent information prior to the fabrication of product.

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.

b. Field measurements and opening conditions of openings when so noted on approved submittal drawings.

PART 2 - PRODUCTS

2.01 STEEL

A. Used in the fabrication of hollow metal door and frame products shall meet one, or more, of the following requirements

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 size traditionally expressed in fractional inches are shown in decimal inches (millimeters). HMMA has developed a Table, NAAMM/HMMA 803 to summarize the imperial standards and their corresponding metric values.

1. Cold-rolled steel conforming to ASTM A1008/A 1008M, "Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable" and ASTM A 568/A 568M "Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low Alloy, Hot-Rolled and Cold-rolled, General Requirements for."
2. Hot-rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011/A 1011M, "Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable" and ASTM A 568/A 568M "Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low Alloy, Hot-Rolled and Cold-rolled, General Requirements for."
3. Zinc-coated steel conforming to ASTM A 653/A 653M, "Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process" and ASTM A 924/A 924M, "Standard Specification for General Requirements for Steel Steet, Metallic Coated by the Hot-dipped Process".

2.02 HOLLOW METAL DOORS

For interior doors subject to corrosive conditions, and for locations identified as subject to moderately corrosive conditions, it is recommended that zinc coated galvannealed steel be used, having a coating of designation of A40 or greater.

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

A. Fabricate types, sizes, and construction in accordance with the contract documents and approved submittal drawing meeting the performance requirements of Section 1.05.

Steel thickness and material type at manufacturer's option, unless specified.

1. Face sheet thickness and steel type

   a. Interior

      i. Face Sheets, steel thickness: [0.032 in. (0.8 mm)], [0.042 in. (1.0 mm)], [0.053 in. (1.3 mm)] or [0.067 in. (1.7 mm)].

      ii. Steel Type, [cold-rolled] [hot-rolled] or [zinc coated min A25 (ZF75)].

   b. Exterior

      i. Face Sheets, steel thickness:[0.042 in. (1.0 mm), [0.053 in. (1.3mm)] or [0.067 in. (1.7 mm)].

      ii. Steel Type, zinc-coated, coating designation: [A40 (ZF120)], [A60 (ZF180)], [(G40 (Z120)] or [(G60 (Z180)].

2. Vertical Edges: Bend edges true and straight, and of minimum radius for the thickness of metal used. Edge profile 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.

      ii. Lock edge, Beveled - 1/8 in. in 2 in. (3.1 mm in 50.8 mm).

      iii. Double acting doors, rounded on 2-1/8 in. (54 mm) radius.

3. Vertical Edge Seams: [continuously welded] [intermittently welded] or [continuously interlocking or lock-tab].

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

   a. Continuously welded, extending the full height of the door. Finished smooth with no visible seam.

   b. Intermittently welded, projection, spot or tack weld 6 in. (152 mm) on center maximum spacing. Finished smooth with no visible welds or weld marks on the exposed edge, presenting either a [visible seam] or [seam filled and finished smooth such that it is not visible at both edges].

   c. Continuous interlocking or lock-tab, extending full height of the door. Results in a visible seam at both edges of the door.

4. Top and Bottom Edges

   a. Interior, close with a flush or inverted steel channel, not less than 0.053 in. (1.3 mm) thick, welded to both face sheets.

At openings with transom panel directly above door. Door top to be either flush with applied astragal on bottom of panel or rabbeted to align with bottom of panel.

b. Exterior locations where scheduled; [provide an additional zinc coated flushing channel] or [provide zinc coated channel, top sealed flush and weep holes in bottom channel to permit the escape of entrapped moisture].

5. Nominal Thickness - 1.75 in. (44 mm)

6. Cores

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

a. Honeycomb: “kraft” paper hexagonal cells, laminated to both face sheets.

b. Polyisocyanurate: Rigid, pre-formed, closed cell board, conforming to ASTM C 591 (unfaced) or ASTM C 1289 faced, laminated to both face sheets.

c. Polystyrene: Rigid, extruded, closed cell board, minimum density 0.7 pound per cubic foot (11.2 kilograms per cubic foot), laminated to both face sheets.

d. Polyurethane: Rigid cellular board laminated to both face sheets or foamed-in-placed, minimum density 1.8 pound per cubic foot (29 kilograms per cubic meter), containing no urea formaldehyde resins.

e. Steel stiffened: One piece formed steel channel, minimum 0.026 in. (0.66 mm) thick spaning the full thickness of the interior of the door. Spaced vertically with interior webs not more than 6 in. (152 mm) apart. Channel laminated to both face sheets. Fill voids between stiffeners with fiberglass or mineral rock wool batt-type insulation.

f. Steel stiffened, welded: One piece formed steel channel, minimum 0.026 in. (0.66 mm) thick spaning the full thickness of the interior of the door. Spaced vertically with the interior webs spaced not more than 6 in. (152 mm) apart. Channel welded to both face sheets maximum5” (127 mm) on center. Fill spaces between stiffeners with fiberglass or mineral rock wool batt-type insulation.

g. Steel stiffened, welded: Two hat shaped formed steel channels, minimum 0.026 in. (0.66 mm) thick, together spaning the full thickness of the interior of the door. Spaced vertically not more than 6 in. (152 mm) apart. Channels welded to both face sheets maximum 5” (127 mm) on center. Fill spaces between stiffeners with fiberglass or mineral rock wool batt-type insulation.

h. Temperature Rise Rated (TRR): Internal construction in accordance with the individual’s manufacturing listings.

i. Alternate proprietary core: Material engineered and tested to meet the performance and quality requirements of Sections 1.05 and 1.06. Submit to Architect for approval during submittal process.

7. Glazing Moldings and Stops

a. Where specified or scheduled, provide 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 glazing molding or integral stops, 0.032 in. (0.81 mm) minimum thickness, as designated on the Architect’s drawings and/or door schedules.

c. Fabricate channel shaped removable glazing stops not less than 0.032 in. (0.81 mm) material thickness, with tight fitting butt or mitered corners, and secure with #6 minimum, corrosion resistant countersunk sheet metal screws.

d. Prepare fire-protection rated product for listed glazing as required in accordance with the manufacturer's fire rating procedure.

8. Louvers

a. Provide doors with louvers where specified in the contract documents.

b. Louvers for non-fire-protection rated doors; welded inverted V, Y, Z type; face sheet pierced construction; or louver inserts.

c. Fabricate welded inverted V, Y, and Z type vanes from 0.042 in. (1.07 mm) minimum thickness steel, matching the type and finish of the door face sheets.

d. Prepare fire-rated doors for listed fire door louvers.

e. Provide louvers for exterior doors with insect and/or bird screens where indicated on the contract documents.

2.03 HOLLOW METAL PANELS

For interior panels subject to corrosive conditions, and for locations identified as subject to other moderately corrosive conditions, it is recommended that zinc coated galvannealed steel be used, having a coating of designation of A40 or greater.

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

A. Construction

1. Fabricate types, size, and construction in accordance with the contract documents and approved submittal drawings.

   a. 1.75 in. (44 mm) nominal thick transom panel, fixed or removable.

      i. Materials and construction equivalent to that specified in Section 2.02 of this specification. Bottom channel [flush with applied astragal] or [rabbeted].

      ii. Material equivalent to that specified in Section 2.02 of this specification and with inverted top and edge constructed interlocking channels, with frame for concealed attachment.

   b. 1.75 in. (44 mm) nominal thickness side panel, fixed or removable.

      i. Materials and construction equivalent to that specified in Section 2.02 of this specification.

      ii. Material equivalent to that specified in Section 2.02 of this specification and with inverted top, bottom, and edge constructed with interlocking channels, with frame for concealed attachment.

      1.75" (44 mm) nominal thick panels as outlined above are available with glazing moldings and stops as outlined in Section 2.02.A.8 of this specification.

   c. In-Fill Panels, thickness as required, fixed in position or removable, held in position with glazing stops. Face sheets laminated to manufacturer's standard solid backing.

2. Face sheet thickness and steel type

   a. Interior panels

      i. Face Sheets, steel thickness: [0.032 in. (0.8 mm)], [0.042 in. (1.0 mm)], [0.053 in. (1.3 mm)] or [0.067 in. (1.7 mm)].

      ii. Steel Type, [cold-rolled], [hot-rolled], or [zinc coated min A25 (ZF75)], at manufacturer's option, unless specified otherwise.

   b. Exterior panels

      i. Face Sheets, steel thickness:[0.042 in. (1.0 mm), [0.053 in. (1.3mm)] or [0.067 in. (1.7 mm)].
      ii. Steel Type, Zinc-coated, coating designation: [A40 (ZF120)], [A60 (ZF180)], [(G40 (Z120)] or [(G60 (Z180)].

3. Finish hollowmetal panels as specified in Section 2.07 of this specification.

2.04 HOLLOW METAL FRAME PRODUCTS

For interior frame product subject to corrosive conditions, and for locations identified as subject to other moderately corrosive conditions, it is recommended that zinc coated galvannealed steel be used, having a coating of designation A40 or greater.

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

A. Construction

1. Fabricate all finished work neat in appearance, square, and free of defects, warps and buckles. Pressed steel members shall be straight and of uniform profile throughout their lengths. Product shall be constructed in accordance with the contract documents and approved shop drawing meeting the performance criteria specified in Section 1.05.

   a. Provide jamb, header, transoms, mullion, and sill profiles in accordance with the frame schedule and as shown on the approved submittal drawings.

   b. Mark frame product with an identification number as shown on the approved submittal drawings.

2. Frame Types
   a. 3-sided, transom, multi-openings, sidelight, and window assemblies:

      i. Interior frame product: [welded], [knock-down], [slip-on], or [split-frame].

      ii. Exterior and thermal broken frame product: [welded], [knock-down], or [slip-on].

B. Thickness and Steel Type

Steel thickness and material type at manufacturer's option, unless specified.

1. Interior Frame Products: Fabricate from [0.042 in. (1.0 mm)] [0.053 in. (1.3 mm)] [0.067 in. (1.7 mm)] or [0.093 in. (2.36 mm)] thick steel.

   a. Minimum 0.042 in. (1.0 mm) for frames that receive hollow core wood doors.

   b. Minimum 0.053 in. (1.3 mm) for frames to receive solid wood doors or hollow metal doors of same or less thickness face sheets.

   c. Minimum 0.067 in. (1.7 mm) for frames with single door openings exceeding 4 ft. (1219 mm) in width; pairs with either door exceeding 4 ft. (1219 mm) in width and for nominal door opening height exceeding 10 ft. (3048 mm).

   d. Steel Type: [Cold-rolled], [hot-rolled], or [zinc-coated min A25 (ZF75)].

2. Exterior Frame Products: Fabricate from [0.042 in. (1.0 mm)] [0.053 in. (1.3 mm)] [0.067 in. (1.7 mm)] or [0.093 in. (2.36 mm)] thick steel.

   a. Minimum 0.053 in. (1.3 mm) for frames to receive solid wood doors or hollow metal doors of same or less thickness face sheets.

   b. Minimum 0.067 in. (1.7 mm) for frames with single door openings exceeding 4 ft. (1219 mm) in width; pairs with either door exceeding 4 ft. (1219 mm) in width and for nominal door opening height exceeding 10 ft. (3048 mm).

   c. Steel type: [A40 (ZF120)], [A60 (ZF180)], [G40 (Z120)], or [G60 (Z180)].

3. Stop Height: Fabricate frame profile with stop heights of 0.625 in. (15.8 mm) minimum.

4. Corner Joint

   a. Fabricate with all contact edges closed tight.

      i. Where the two joining members faces are equal; provide faces mitered, and with stops mitered or butted.

      ii. Where the two joining members faces are unequal; faces may be mitered or butted at manufacturers option.

      See NAAMM HMMA 820, "Hollow Metal Frames" for additional details.

5. Corner Joint Connections: [continuously welded] [face welded] or [knock-down / slip-on].

   a. Continuously Welded

      i. 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, stops and soffit.

      ii. Internal flush face joints, continuously welded face joint, and finished smooth with seamless faces.

      For additional information regarding the definition of a continuously welded frame, refer to HMMA's TechNote 820 TN02, "Continuously Welded Frames".

   b. Face Welded

      i. Perimeter face joints (flush or indented): Continuously welded internally or externally with flush face joints finished smooth with seamless faces. Rabbets, stops, and soffit are not welded.

   c. Knock-Down / 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. (0.8 mm) thick, and/or with integral tabs and slots which securely interlock upon assembly.

      iii. Design corner joint to assure component profile alignment and frame performance, when field assembled by others, in accordance with the manufacturer's installation instructions.

6. Thermally Broken Frame Product

   a. Where indicated in the contract documents.

   b. Separate interior and exterior sections by a continuous thermal break.

   c. Factory insulate closed sections.

   d. Installer provide insulation for open sections.

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

7. Mullions and/or Transom Bars

   a. Provide closed members with no visible seams on face. Fabricate from same material of perimeter frame.

i. Attachment to frame: [Continuously welded to cross members by butt welding faces] or removable.

Consult individual manufacturer for design options for removable frame sections and applicable requirements for fire rated frame products.

8. Cut-off Stops: Where specified, at heights and angle as shown on the approved submittal drawings, cap, weld, fill and grind smooth so that there are no visible seams below the cut-off stop.

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

9. Floor Anchors

   a. Minimum same thickness as frame, welded inside jambs. Provide two (2) holes for fasteners supplied and installed by others under Section [06 10 00] [09 20 00].

   b. Where specified or scheduled, provide adjustable floor anchors with no more than 2 in. (50.8 mm) height adjustment.

   c. For applications that do not permit the use of a floor anchor, substitute an additional jamb anchor at a location not to exceed 6 in. (150 mm) from the base of the jamb.

10. Jamb Anchors

   a. Provide frame product with anchorage appropriate to frame and wall construction.

   b. Masonry Type

      Steel adjustable anchors of the strap and stirrup or T-strap type not less than 0.053 in. (1.34 mm) thickness or 0.156 in. (4 mm) diameter wire type, for frame product to be installed in new masonry walls. Straps: 2 in. x 10 in. (50 mm x 254 mm) in size minimum, corrugated and/or perforated. Locate anchors at a maximum of 18 in. (457 mm) from top and bottom of the frame, spaced at maximum of 32 in. (813 mm) on center.

   c. Dry Wall Type

      Steel anchors of suitable design, not less that 0.042 in. (1.06 mm) thickness, welded inside each jamb for frame product installed in drywall partitions. Locate anchors at a maximum of 18 in. (457 mm) from top and bottom of the frame, and spaced at a maximum of 32 in. (812 mm) on center.

   d. Expansion Bolt Type

      Prepare frame product for installation in existing masonry, or concrete walls, for expansion bolt type anchors. Provide a countersunk or dimpled hole for a 0.375 in. (9.5 mm) diameter flat head bolt and a spacer welded within the frame profile. Locate anchors 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 such anchors provided and installed by others under Section 06 10 00.

   e. Other Anchor Types

      Construct and 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. Fasteners for such anchors shall be provided and installed by others under Section [03 30 00] [04 20 00].

      A pre-finished opening may be one that is constructed as part of another assembly (e.g.; precast concrete panel) and which requires anchors similar in performance to those covered by 2.04.B.10.d. above.

11. Head Reinforcements: Frame product installed in masonry walls with door openings greater than 48 in. (1219 mm) in width, provide a steel angle or channel stiffener factory welded into the head. Fabricate stiffeners not less than 0.093 in. (2.3 mm) in thickness, not longer than the door opening width. Stiffeners and frame product are not to be used as lintels or load bearing members.

12. Grout Guards: Fabricated from not less than 0.016 in. (0.4 mm) thick steel at hardware mortises on frame product to be grouted.

    For additional information regarding grout guards for electified hardware, See attached TechNote NAAMM/HMMA 830-01 "Electrified Hardware Preparations".

13. Shipping Spreader: For all door openings in welded frame product provide a temporary steel spreader welded to the base of the jambs or mullions to serve as bracing during shipping, and handling. Spreaders are not to be used for installation.

14. Removable Glazing Stops

    a. Where specified, provide frame product with removable stops to secure glazing material 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 channel glazing stops from not less than 0.032 in. (0.8 mm) thick steel, butted at corners and secured to the frame section using #6 minimum, corrosion resistant countersunk sheet metal screws.

15. In-Fill Panels

    a. Where specified or scheduled, provide frame product with in-fill panels secured to frame sections with removable stops.

    See Section 2.03.A.1.c. for construction of infill panels.

16. Shipping Splice: When shipping limitations or site access so dictate, or when advised by the contractor responsible for coordination or installation, fabricate frame product for large openings in sections designated for assembly in the field. Install alignment plates or angles at each joint of the same material and thickness as the frame in accordance with approved submittal drawings. Assembly of sections, welding, fininshing, and prime painting by others under Section 06 11 00 or 09 20 00.

    It is recommended that field assembly of sections, welding and finishing as required by contract documents, be conducted during the installation process to ensure splice joints are tightly fitted and the frame is installed properly.

2.05 HARDWARE REINFORCEMENTS, PREPARATION AND LOCATIONS

1. Mortise, reinforce, drill, and tap at the factory for templated hardware only; in accordance with the approved hardware schedule and templates provided by the hardware supplier. Anchor hinges, thrust pivots, and pivot reinforced hinges are to be drilled and tapped by others after installation in the field.

   Anchor hinges, thrust pivots, and pivot reinforced hinges are attached to both vertical and horizotal members of a frame and door. Due to the hardware design, adjustment of the door for operating clearance cannot be achieved once the reinforcements are drilled and tapped.

2. Mortise and reinforce only for non-templated hardware or as specified by hardware manufacturer's template instructions,

3. Reinforce for surface mounted hardware or continuous hinges in accordance with hardware template. Drilling and tapping by others.

4. Steel thickness for hardware reinforcements to be the manufacturer's standard as required to adequately support the door and hardware; but not less than:

   a. Full mortise hinges and pivots: 0.167 in. (4.24 mm), or 0.123 in. (3.12 mm) angle or channel shaped type, or full height steel edge channel 0.067 in. (1.7 mm) thick with extruded tapped holes that provide the same number of threads as 0.123 in. (3.1 mm) thick material.

   b. Lock fronts, mortised latching devices and strikes: 0.067 in. (1.7 mm) or 0.053 in. (1.3 mm) unitized reinforcement with extruded tapped holes that provide the equivalent of 3 threads.

   c. Concealed holders and surface mounted closers: 0.093 in. (2.3 mm).

   d. Internal reinforcements for other surface mounted hardware: 0.053 in. (1.3 mm).

   e. Power operated hardware, at mortised hardware only:

      1. Doors, provide access from hinge edge to device.

      2. Frames, provide grout guards with (1) 7/8" knock-out in each end, (Electrical Grout Guard).

5. Hardware Locations: All dimensions, except the hinge locations, are referenced from the floor as defined in Section 3.03.

   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.

A. Hinges:

   a. Top: 5 in. (127 mm) from underside of frame rabbet at door opening to top of hinge.

   b. Bottom: 10 in. (254 mm) from floor to bottom of hinge.

   c. Intermediate: Equally spaced between top and bottom hinges.

   d. 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 lower and upper intermediate hinges, respectively.

B. Locks and latches: 38 in. (965 mm) to centerline of knob or lever shaft.

C. Deadlocks: 46 in. (1168 mm) to centerline of cylinder.

D. Exit hardware: Centerline of cross bar as shown on hardware template or as shown on approved contract documents.

E. Door pulls: 42 in. (1066 mm) to center of grip.

F. Push/pull bars: 42 in. (1066 mm) to centerline of bar.

G. Hospital latch arm pulls: 45 in. (1143 mm) to centerline.

H. Push plates: 46 in. (1168 mm) to centerline of plate.

I. Roller latches: 46 in. (1168 mm) to centerline of latch.

2.06 MANUFACTURING TOLERANCES

The manufacturers of hollow metal door and frame products are responsible only for the manufacturing tolerances listed in 2.06.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 within the following limits and in accordance with ANSI/NAAMM HMMA 841

1. Frame Product for Singles or Pairs of Doors

   a. Width, measured between rabbets at the head: nominal opening width + 0.0625 in. (+ 1.5 mm), - 0.03125 in. (- 0.8 mm)

   b. Height (total length of jamb rabbet): nominal opening height + 0.0625 in. (+ 1.5 mm), 0.03125 in. (- 0.8 mm)

   c. Cross sectional profile dimensions (see Figure 5)

      i. Face ..... ± 0.03125 in. (0.8 mm)

      ii. Stop ..... ± 0.03125 in. (0.8 mm)

      iii. Rabbet ..... ± 0.03125 in. (0.8 mm)

      iv. Depth ..... ± 0.0625 in. (1.5 mm)

      v. Throat ..... ± 0.09375 in (2.3 mm)

      Frame products 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 size are as follows:

   a. Width ..... ± 0.04675 in. (1.2 mm)

   b. Height ..... ± 0.04675 in. (1.2 mm)

   c. Thickness ..... ± 0.0625 in. (1.5 mm)

   d. Edge Flatness ..... 0.0625 in. (1.5 mm) maximum

   e. Surface Flatness ..... 0.125 in. (3.1 mm) maximum

   f. Twist ..... 0.0625 in. (1.5 mm) maximum

   g. Squareness ..... 0.0625 in. (1.5 mm) maximum

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

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 ..... +0.015625 in. (0.4 mm), – 0

   b. Location ..... ± 0.03125 in. (0.8 mm)

   c. Between hinge centerlines ..... ± 0.015625 in (0.4 mm)

   d. Face cutout for hinges ..... + 0.0625 in.(1.5 mm), – 0

   e. Mortise depth of reinforcement ..... ± 0.015625 in (0.4 mm)

2.07 FINISH

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

   1. Glass stops fabricated from zinc-coated steel A25 (ZF75) for interior doors, A40 (ZF120) for exterior openings, need not be primed on the underside.

   2. Product which is specified to be fabricated from zinc coated steel: Touch-up areas where the zinc coating has been removed with zinc-rich primer prior to the coat of rust inhibitive primer.

B. Treat metal surfaces to ensure maximum paint adhesion and coat with a factory applied rust inhibitive direct to metal (DTM) primer on all exposed surfaces of the door and frame product.

C. Primer to meet the performance requirements of Section 1.05.

D. Primer must be cured 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 door and frame product. The requirements for proper storage are given in this Section. 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 door and frame products should be included in the Section of the project specifications where installation work is specified. For additional information regarding installation see ANSI/NAAMM HMMA 840, "Guide Specification for Installation and Storage of Hollow Metal Doors and Frames".

A. Contractor is responsible for receiving hollow metal door and frame products.

1. Upon delivery, cardboard and/or other wrapping should be removed to thoroughly inspect all material for damage.

2. Store materials on planks or dunnage in a dry location. Store doors and frame product in a vertical position, spaced by blocking. Cover materials to protect them from damage and to prevent exposure to adverse environmental elements, but in such a manner as to permit air circulation.

3 Exposed hollow metal surfaces which have been scratched or otherwise marred during jobsite handling, must be promptly cleaned, finished smooth and treated for maximum paint adhesion and touched up with a rust inhibitive primer comparable to and compatible with the shop 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) applications.

3.02 INSTALLATION

Correct installation is essential to the proper performance of doors and frame products. 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. For additional information regarding installation, see ANSI/NAAMM HMMA 840, "Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames".

A. Installer's qualifications: Perform installation with skilled, experienced and trained personnel who have succesful experience in installations of similar size and scope.

1. Prior to installation perform the following:

   a. Check the area of floor on which the frame product is to be installed, and within the path of the door swing, for flatness and correct if nessesary. Permissible installation tolerance shall not exceed +/- 1/16 in..

   b. Check doors and frame product for correct opening number, size, swing, fire rating, material thickness and hardware requirements. If product does not comply with contract documents, do not install and contact the manufacturer.

   c. Isolate and protect all interior surfaces of perimeter frame product sections to be installed in masonry or concrete walls from grout and antifreeze agents.

   d. Remove temporary spreaders.

   e. Refinish any marks caused by spreader removal to match original.

2. During the setting of 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 + 0.0625 in (1.5 mm), – 0.0313 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; ± 0.0468 in. (1.2 mm).

c. Squareness - Measured at rabbet on a line from jamb, perpendicular to frame head; not to exceed 0.0625 in (1.5 mm).

d. Alignment - Measured at jambs on a horizontal line parallel to the plane of the face; not to exceed 0.0625 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 0.0625 in (1.5 mm).

f. Plumbness - Measured at the jambs on a perpendicular line from the head to the floor; not to exceed 0.0625 in (1.5 mm).

The above tolerances provide a reasonable guideline for proper installation of hollow metal products. 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.

3. Grout guards, electrical 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 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 must be taken in the field by the installer to protect the aforementioned.

4. Frame products are not intended or designed to act as forms for grout or concrete. Take precautions otherwise to ensure that frames are not deformed or damaged by the hydraulic forces that occur during this process.

5. Keep steel 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 door and frame products. If the primer is removed, damaged or negatively affected by this process; clean, finish smooth, and treat for maximum paint adhesion. Touch up with a rust inhibitive primer (comparable to and compatible with the shop 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.

6. Install labeled fire doors and frame product in accordance with the terms of their listings, ANSI/NFPA 80 or the local Authority Having Jurisdiction.

7. 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.

8. Exposed hollow metal surfaces which have been scratched or otherwise marred during installation and/or field welding, shall be promptly cleaned, finished smooth, and treated for maximum paint adhesion. Touch up with a rust inhibitive primer (comparable to and compatible with the shop 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.

9. Install hardware and glazing material in accordance with individual manufacturer's instructions.

10. Finish paint in accordance with Section 09 90 00.

3.03 OPERATING CLEARANCES

A. Ensure that the edge clearancs for swinging hollow metal doors provides for the functional operation of the assembly and does not exceed the following:

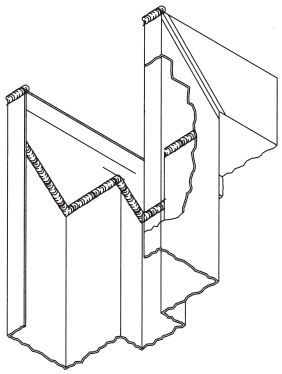
1. Between door and frame products at head and jambs ..... 0.125 in (3.1 mm) +/- 0.0625 in (1.5 mm)

2. Between edges of pairs of doors ..... 0.125 in (3.1 mm) +/- 0.0625 in (1.5 mm)

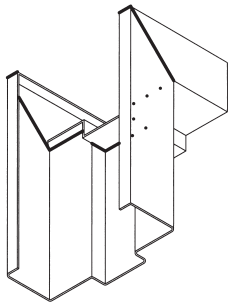
B. Floor clearance for fire-protection rated swinging hollow metal doors shall not exceed 0.75 in (19.0 mm). Floor clearance shall be provided for the functional operation of all swinging hollow metal doors and shall not be less than 0.125 in (3.1 mm).

The Architect must define the distance from the top of the floor/finished floor to top of floor covering so appropriate undercuts can be provided. Floor/Finished 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 for further guidance.

END OF SECTION

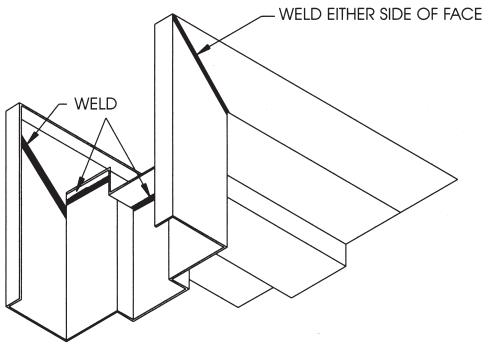


SAW MITERED

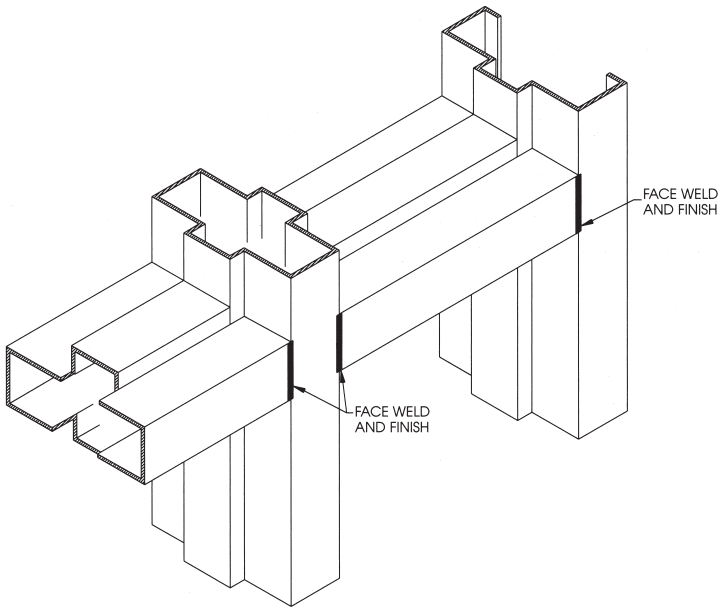


PUNCH MITERED

CONTINUOUSLY WELDED CORNER (PERIMETER) JOINT

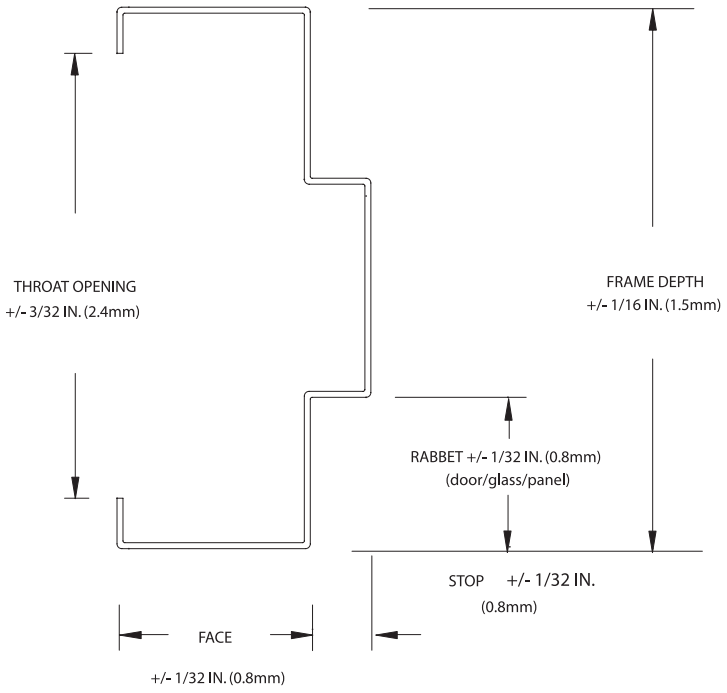


CORNER, PERIMETER JOIN
PUNCHED MITERED

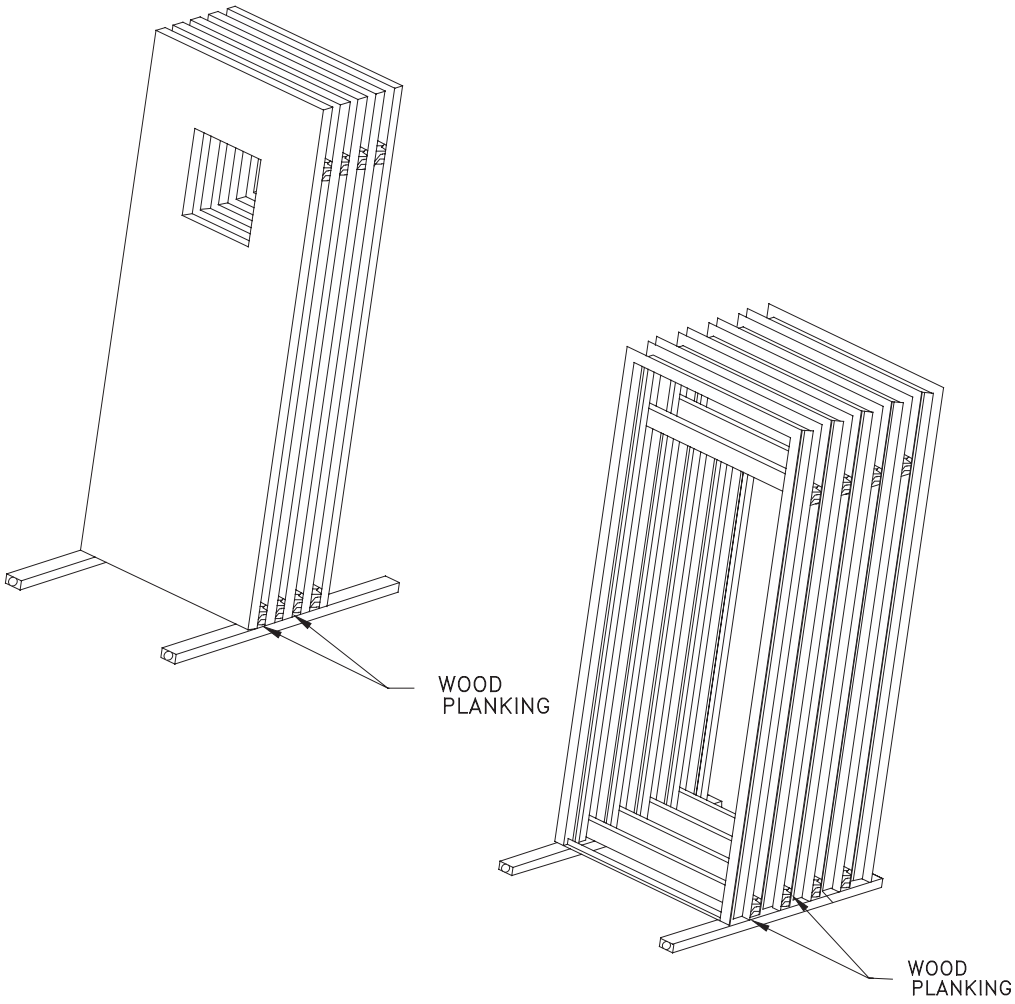


INTERNAL BUTTED JOINT

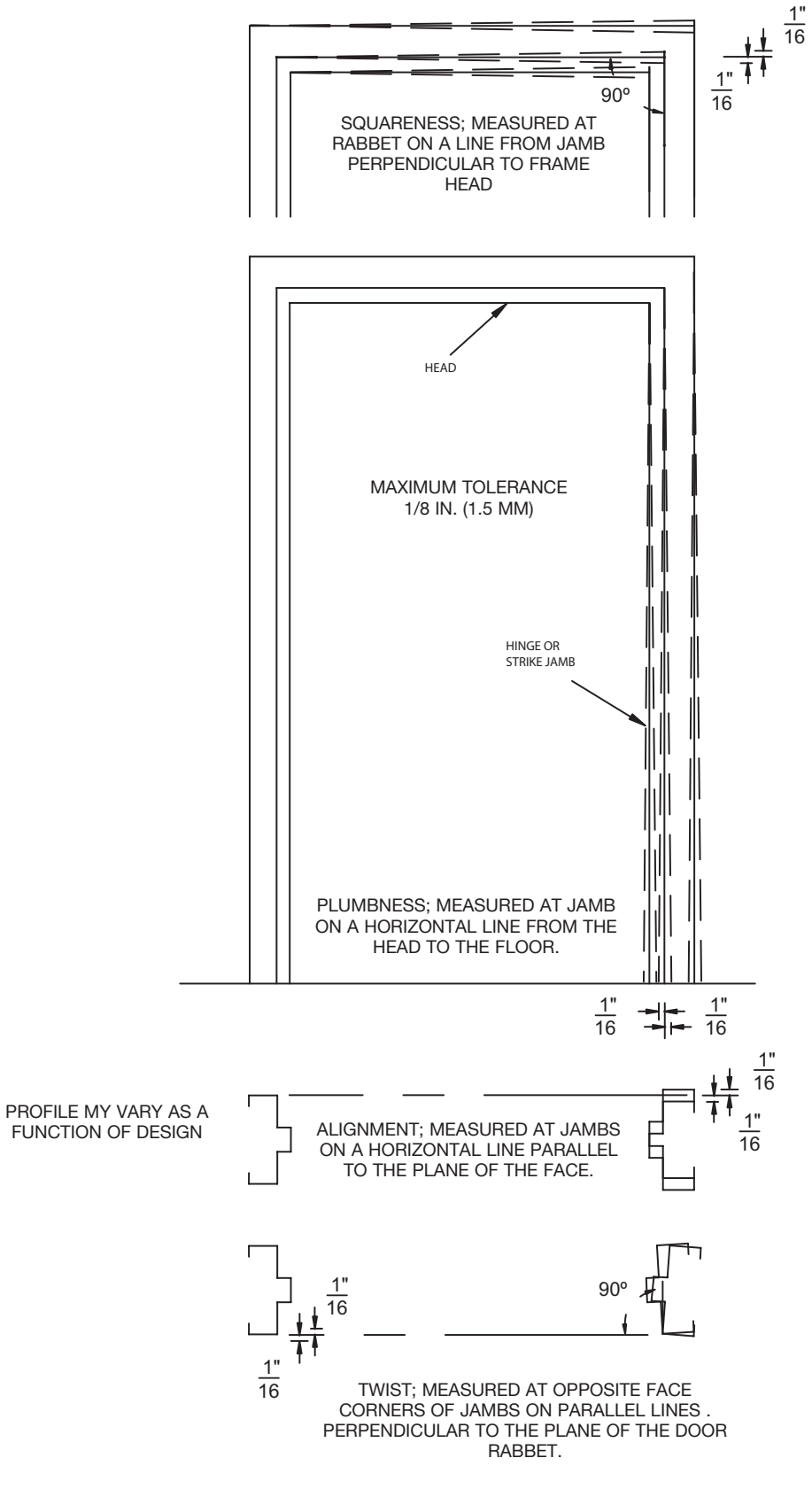
FACE WELDED JOINT



SECTIONAL PROFILE TOLERANCES



RECOMMENDED STORAGE



FRAME INSTALLATION TOLERANCES

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 decimal inch values shown were taken from the Underwriters Laboratories, Inc. publication for gage number and equivalent thickness. Corresponding metric values are included for reference purposes only.

MINIMUM THICKNESS		
Uncoated Steel Sheet		
Gage	Decimal	mm
4	0.214	5.43
5	0.199	5.05
6	0.184	4.67
7	0.167	4.24
8	0.152	3.86
10	0.123	3.12
12	0.093	2.36
14	0.067	1.70
16	0.053	1.34
18	0.042	1.06
20	0.032	0.81
22	0.026	0.66
24	0.020	0.50
26	0.016	0.40
28	0.013	0.33

CONVERSION		
Fraction	Decimal	mm
	1.000	25.40
15/16	0.937	23.81
7/8	0.875	22.22
13/16	0.812	20.63
3/4	0.750	19.05
11/16	0.687	17.46
5/8	0.625	15.87
9/16	0.562	14.28
1/2	0.500	12.70
7/16	0.437	11.11
3/8	0.375	9.52
5/16	0.312	7.93
1/4	0.250	6.35
3/16	0.187	4.76
1/8	0.125	3.17
1/16	0.062	1.58

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 corresponding metric equivalents used for holllow metal doors and frames. This sheet contains advisory information only and is published as a public service by the HMMA Division. NAAMM and its HMMA DIVISION DISCLAIM ALL LIABILITY OF ANY KIND FOR THE USE, APPLICATION OR ADAPTATION OF MATERIAL SHOWN ON THIS SHEET.

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

Continuously Welded Frames

Also called Full, Fully and or Full Profile Welded.

Established definitions and nomenclature:

1. FRAME MEMBER – A part of a frame such as a head, jamb, mullion or sill, also called frame profile, see Figure #1.

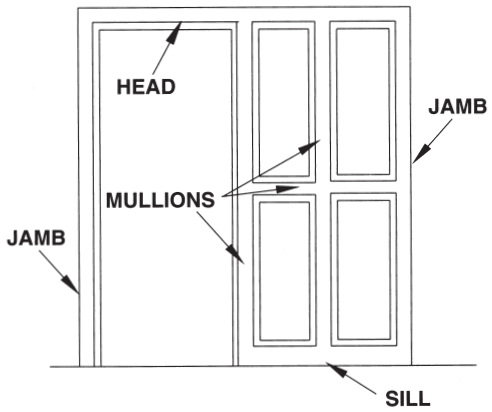


Figure #1

2. FRAME ELEMENTS – Specific parts of a frame member such as soffit, stop, rabbet, face and return. See Figure #2. A double rabbeted frame shown for illustration purposes only; alternate designs use the same nomenclature.

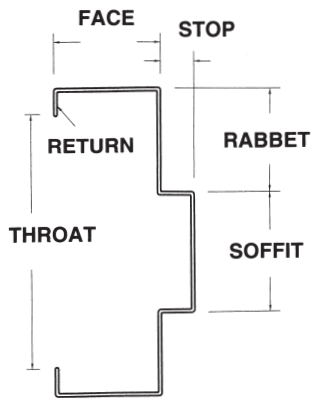
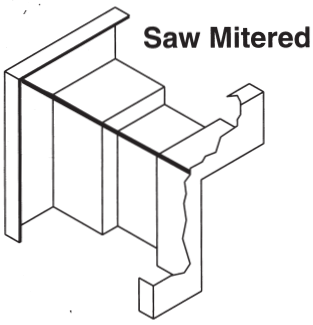


Figure #2

3. PERIMETER JOINT – The intersection of two or more frame members or elements that are accessible through the throat or from the unexposed side of the frame member. As perimeter applies, this is the outside boundary of the frame.

Perimeter joints of a continuously welded frame shall have all elements of the frame member continuously welded; soffits, stops, rabbets, faces and returns. Faces and returns may be welded either internally or externally. Soffits, stops, and rabbets shall be welded internally. Figures #3A – #3D illustrates typical perimeter joints; Figure #3A illustrates a saw and punched mitered corner joint.



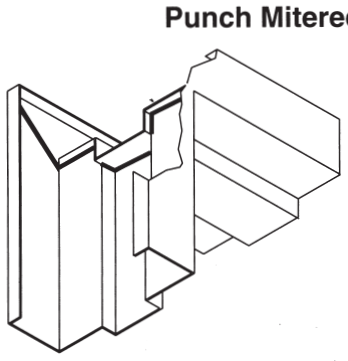


Figure #3A

With many frame configurations the frame perimeter may not be square or rectangular, permitting a mitered corner. Figures #3B – #3D illustrate butted flush perimeter joints.

Figure #3B illustrates a typical sidelight frame where the sidelight does not extend to the floor.

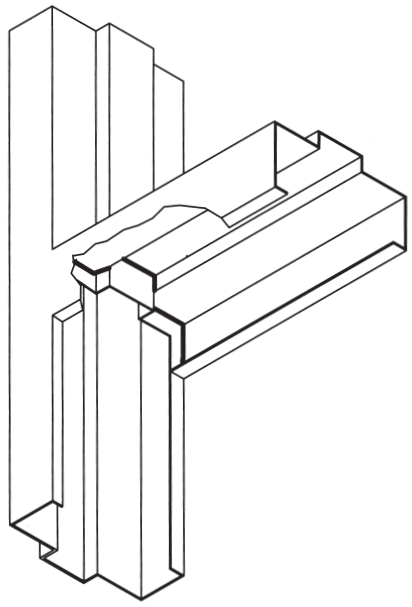


Figure #3B

Figure #3C illustrates a sidelight frame where the sidelight extends to the floor.

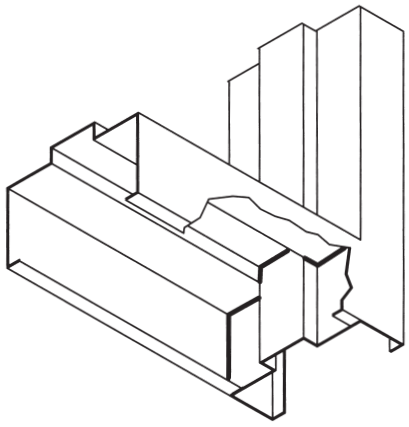


Figure #3C

Figure #3D illustrates a sidelight or smokescreen, where the vertical mullion is designed to extend to the floor.

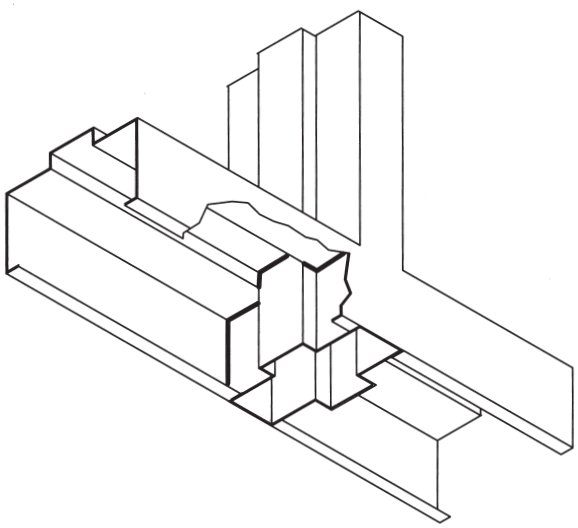


Figure #3D

Occasionally the sill, as with other frame members, is intended to be indented. As this is a perimeter joint, all elements of the frame members should be continuously welded, but due to design and/or construction requirements this is not feasible. Therefore, it is necessary to alter construction methods.

Figure #4A illustrates an indented sill that is continuously welded.

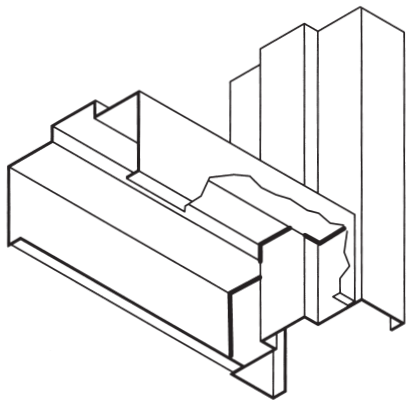


Figure #4A

Figure #4B, although drawn similar to Figure #4A, illustrates an indented sill that is reinforced with angles at the faces in lieu of continuously welding. These angles run the full height of the joint and are welded to both frame members. The rabbets, stops and soffit are continuously welded.

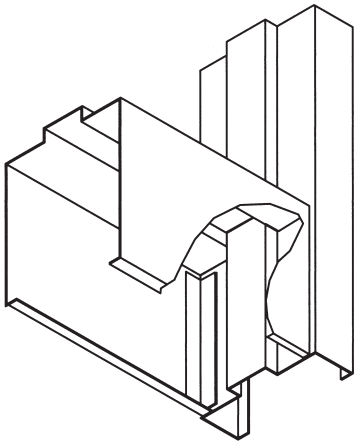


Figure #4B

Referring to Figure #3D, if this same horizontal frame member is not accessible through the throat or from the unexposed side of the frame member then this would be considered an internal joint, see Figure #5A.

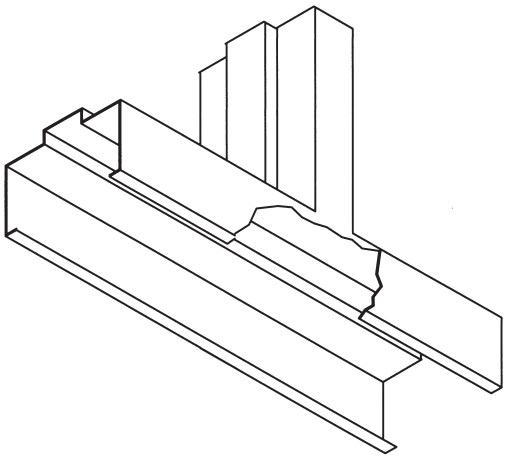


Figure #5A

Internal flush joints shall be face welded only. Joints at soffits, stops and rabbets are not welded and appear as a hairline seam. Figures #5A, #5B and #5C all illustrate internal joints. Note at Figures #5A & #5B that the internal frame member is not accessible from the inside throat of the perimeter frame member. This is the same situation whether it be a mullion and header, two mullions, or mullion and sill as shown in Figure #5C. At Figure #5C the etched line represents where the face joint would be welded. This, of course, would be finished smooth.

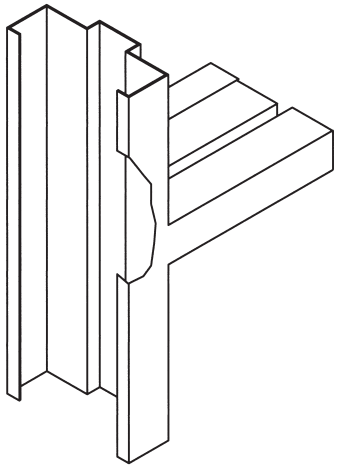


Figure #5B

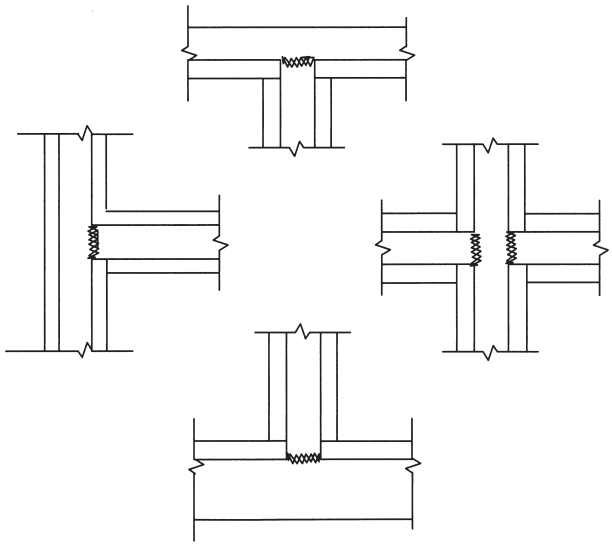


Figure #5C

Indented joints at internal frame members shall be internally reinforced and welded. Joints at faces, soffits, stops and rabbets are not welded and appear as hair line seams. Mullions are constructed with an overlapping seam. This seam is internally connected and appears as a hairline seam. See Figure #6.

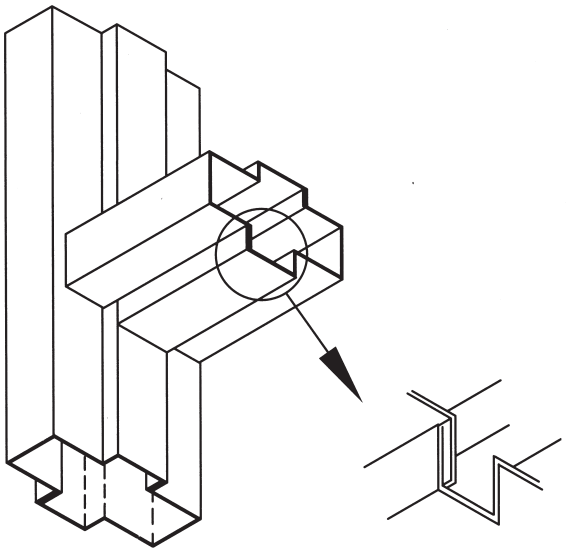


Figure #6

HMMA TechNotes

HMMA-820 TN01-03

NAAMM
National Association of Architectural Metal Manufacturers

Grouting Hollow Metal Frames

Grout, when used in accordance with industry guidelines, can improve frame durability, sound deadening, and, depending on wall construction, increase 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", which is a gypsum-based product.

Plaster grout dries by 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. Plaster grout should not be used.

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 the grout must be coated with a corrosion resistant material.

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

HMMA TechNotes

HMMA-810 TN01-03

NAAMM
National Association of Architectural Metal Manufacturers

Defining Undercuts

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.

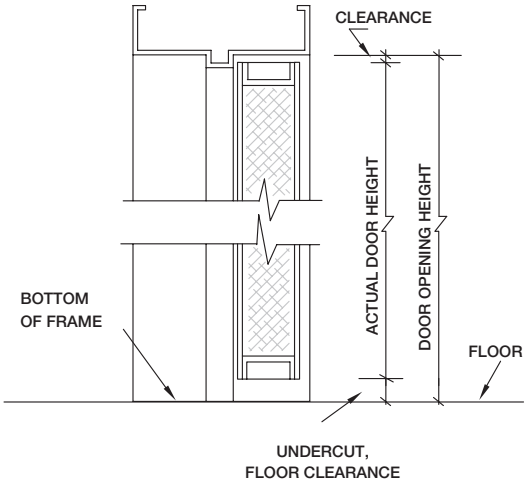


Figure #1

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.

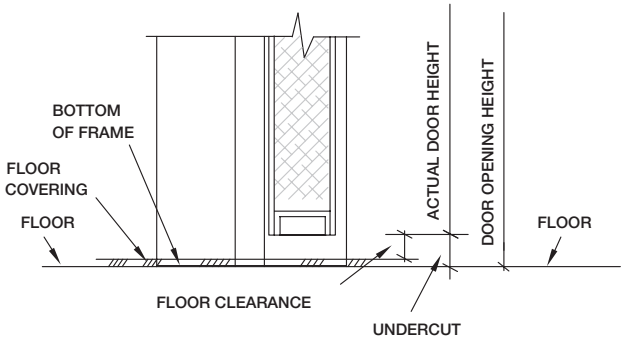


Figure #2

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.

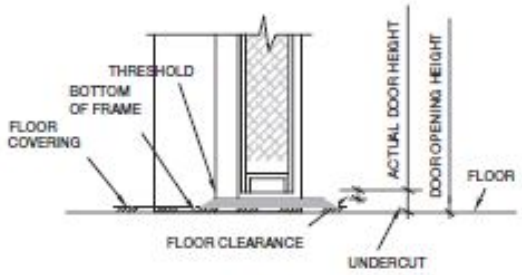


Figure #3

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.

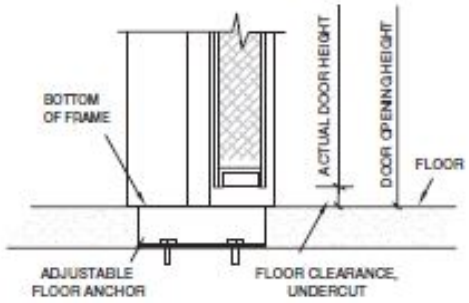


Figure #4A

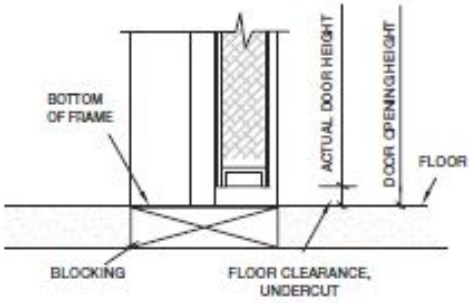


Figure #4B

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

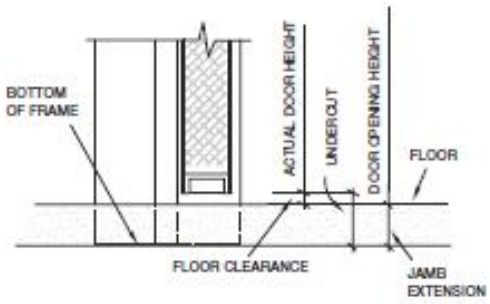


Figure #5A

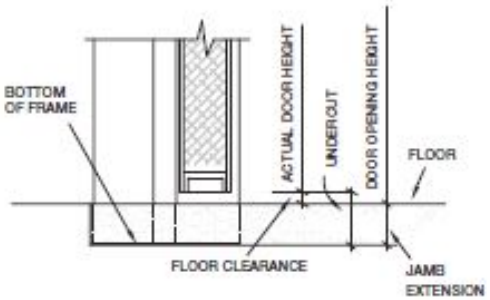


Figure #5B

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.

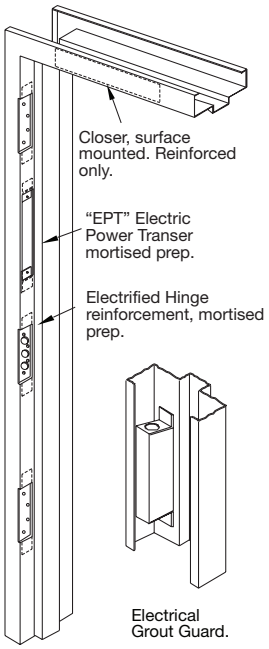
Within the door and frame industry, both the Hollow Metal Manufacturers Association (HMMA) a division of the National Association of Architectural Metal Manufacturers (NAAMM) and the Steel Door Institute (SDI), publish recommended clearances. In addition, the National Fire Protection Association (NFPA) 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 material and the maximum clearance under the bottoms of doors.

HMMA TechNotes

HMMA-830 TN01-18

NAAMM
National Association of Architectural Metal Manufacturers

Electrified Hardware Preparations



Frames requiring mortised electrified hardware (as listed in the approved hardware schedule) shall be prepared with min. 0.016" thick steel grout guard welded at back of hardware reinforcement in frame. Size and depth of grout guard as required per template. Each end of the grout guard to be provided with 7/8" knock-out, "electrical grout guard". Optional junction box may be provided upon request.

Frames requiring surface applied electrified hardware are reinforced only (no preparation for access holes or providing electrical grout guard) unless the frame manufacturer has been requested to prior to, or at the time of release for fabrication. Since surface hardware is only required to be reinforced, itis imperative that the hardware supplier be very specific when requesting which electrified surface applied hardware items are to have additional preparations in an effort to help reduce extra charges and production delays due to the special hardware preparation.

Hardware locations provided to the hollow metal manufacturer shall govern the location of hardware. Shown for clarity, the middle hinge is prepared for mortised electrified hardware, and the mortised "EPT" prepped below the top hinge. Closer is surface mounted and only internal reinforcements are provided.

Doors requiring electrified hardware preparations shall be constructed with internal raceways or prewired between electrified hardware items only. Installation of pull wires or actual low voltage harness should be coordinated between supplier and manufacturer prior to release for fabrication.

NOMENCLATURE (definitions of terms used):

Electrical Grout Guard: A Grout Guard with a 7/8 inch round knock-out provided at each end.

Grout Guard: A metal cover attached to a frame behind reinforcement for mortised or recessed hardware items to prevent grout from entering the mounting holes. Also referred to as Dust Cover Guard, Masonry Guard, Mortar Guard, or Plaster Guard.

Hardware Schedule: Complete listing of all hardware specified for a project, organized by opening numbers including Door Headings, manufactures names, template numbers and special locations.

Junction Box: An Electrical Grout Guard with a removable cover for access to wire connections, prior to build-up of wall.

Mortised: A recess on a minimum of 3-sides of a hardware item closely surrounding the contour of the item allowing its faceplate to finish flush or slightly raised with the door or frame finished surface.

Mortised Hardware: A hardware item which is installed in a recess of a door or frame.

Surface Hardware: A hardware item which is attached to the flush surface of the door or frame. Preparation of this device is intended to be done in the field.

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 (*1)	
	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.

STANDARDS WRITING ORGANIZATIONS

ANSI	American National Standards Institute, Inc. 25 West 43rd Street New York, NY 10036 (212) 642-4900 www.ansi.org
ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 (610) 832-9585 www.astm.org
ICBO	International Code Council – Los Angeles Office Formerly known as International Conference of Building Officials Uniform Building Code 5360 Workman Mill Road Whittier, CA 90601-2298 (562) 692-4226 www.icbo.org
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue Suite 1000 Chicago, IL 60603 (312) 332-0405 www.naamm.org
NFPA	National Fire Protection Association 1 Batterymarch Park P. O. Box 9101 Quincy, MA 02269 (617) 770-3000 www.nfpa.org
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062 (847) 272-8800 www.ul.com