GUIDE SPECIFICATIONS
FOR COMMERCIAL LAMINATED CORE
HOLLOW METAL DOORS AND FRAMES

Draft 5 –February 08, 2016
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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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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 format.

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.
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 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 Fire Windows
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, 8\textsuperscript{th} Edition
J. ANSI/UL 10B, Fire Tests of Door Assemblies, 9\textsuperscript{th} Edition
K. ANSI/UL 10C, Positive Pressure Fire Tests of Door Assemblies, 1\textsuperscript{st} Edition
L. ANSI/UL 1784, Air Leakage Tests of Door Assemblies, 3\textsuperscript{rd} Edition
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
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/SDIA250.4 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.

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.

UL 10C.

UL 1784 and ANSI/NFPA 105 provide for smoke and draft control assembly testing to accommodate these specific requirements.

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.
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 A 250.10.

2. Meet the Acceptance Criteria described in ANSI 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 contract document 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, 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 galvanneal 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 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. (4.2 mm) 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, doors shall be provided 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. Fixed moldings or integral stops, not less than 0.032 in. (0.8 mm) thickness, shall be provided on the secure side of the door.
   c. Removable or snap-on stops shall be not less than 0.032 in. (0.8 mm) thickness, with tight fitting butt or mitered corners.
   d. Snap-on moldings shall be designed with a non-removable stop on the secure side of the door after glazing installation.
   e. Metal surfaces to which glazing stops are applied, and the inside of the glazing stops, shall be treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door, or shall be fabricated 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 bird screens.

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 galvanneal 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 galvanneal 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.


*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 receive 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, d 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. Existing masonry 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 Flatness ............................................................. 1/16 in. (1.5 mm) maximum
   e. Surface Flatness ......................................................... 1/8 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 shall remove wraps or covers upon delivery at the building site and shall 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 shall ensure that materials are properly stored on planks or dunnage in a dry location. Doors and frame product shall be stored in a vertical position, spaced by blocking. Figure 3 of NAAMM/HMMA 840 illustrates the recommended storage positioning. Materials shall be covered 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 shall be 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.

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.

10. Promptly finish smooth and clean all exposed 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 [09900]. 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 doors................................................0.125 in (3.1 mm) +/- 0.0625 in (1.5 mm)

B. Floor clearance for swinging hollow metal doors shall not exceed the following:

1. At bottom of door where a threshold is used......................... 3/8 in. (9.5 mm) from bottom of door to top of threshold

2. At bottom of door where no threshold is used..................... 3/4 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 80 .................................................. 3/4 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
APPENDIX 7
(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