HOLLOW METAL MANUAL

AMERICAN NATIONAL STANDARD

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METAL DOORS & FRAMES

GUIDE SPECIFICATIONS FOR DETENTION SECURITY HOLLOW METAL DOORS AND FRAMES

FIFTH EDITION

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January 26, 2005
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METAL DOORS & FRAMES

HMMA
HOLLOW METAL MANUFACTURERS ASSOCIATION

A Division of
NAAMM
NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

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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 detention security hollow metal doors and frames. This standard contains advisory information only and is published as a public service by NAAMM and its HMMA Division.

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National Association of Architectural Metal Manufacturers
8 South Michigan Avenue
Chicago, Illinois 60603
Tel: 312-332-0405 • Fax: 312-332-0706
www.naamm.org

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INTRODUCTION

HOLLOW METAL DETENTION SECURITY SYSTEMS

Detention security hollow metal doors and frames have been successfully used in detention and correctional facilities throughout the world. Architects, specifiers and end users understand the advantages of using Detention Security Hollow Metal in these applications.

HARDWARE INSTALLATION AND MAINTENANCE

To understand the advantages of hollow metal construction, consider first the hardware installation for the swinging door of a typical bar-grille cell front. The security hinges and lock encasement are actually accessible to the inmate since he is able to reach through the bars. Therefore, in many cases, the lock encasement must be continuously welded assemblies with cover plates welded in place to prevent inmate tampering. This situation makes repairs and maintenance both difficult and expensive. For example, to repair a lock it is necessary to cut the cover plate loose with a torch, repair or replace the lock, then weld a new cover plate back in place.

In the hollow metal assembly, the lock is mounted in a reinforced pocket, inside the door or frame and is protected by a heavy gauge cover plate fastened with security screws. The flush type detention hollow metal door, examples shown in Figure 1, severely limit the inmate's access and visibility in any attempts to tamper with the cover plate and lock. Since inmate tampering is limited by the flush hollow metal design, cover plates and access panels can be mounted with tamper resistant screws in most cases rather than welding, thereby reducing the cost of installation, repair and maintenance.

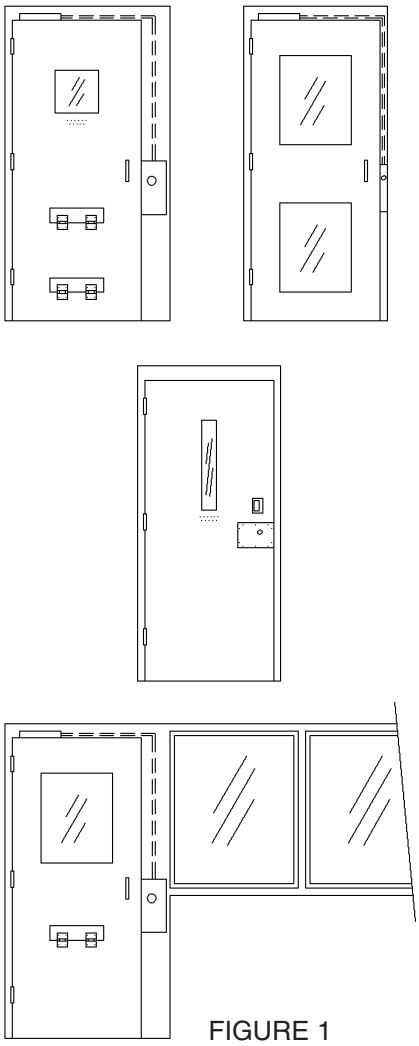


FIGURE 1
Typical Door Elevations

HOLLOW METAL VERSUS BAR-GRILLE CONSTRUCTION

Bar-grille assemblies are manufactured by a variety of methods. However, regardless of the method used, the end result must be an assembly, which has been "hardened" against attack or tampering. By its design, bar-grille allows access by the inmate to the outside of the enclosure and thereby access to lock and position switch encasement, as well as conduit casements. Also, the bars themselves must be made resistant against tool attack, again because they are accessible to the inmate. The security of bar-grille assemblies is accomplished by various means depending upon the manufacturer's philosophy and methods; however, the bottom line is that the heavy material, heat treating processes, and assembly processes necessary are expensive.

On the other hand, consider typical detention hollow metal assemblies as shown in Figure 1. The frame is fabricated of pressed steel sections with integral doorstops and is fully grouted after installation. It is prepared for the appropriate security hardware including conduit routed internally, junction boxes and access openings with cover plates as necessary for wiring installations. The door can be a typical detention security type, prepared for security hinges, electrical or mechanical detention security lock, and position switch indicator. The door preparation can include conduit routed internally to suit electrically operated hardware when applicable. When confined, the inmate has no access to the outside of the enclosure because there are no grille openings except where desired in the design. This means that security can be obtained by limited accessibility to sensitive areas of the opening such as locks, hinges and position indicators. Heat treatment is not required for the steel used in the detention hollow metal construction. Because of the materials and manufacturing processes used, the hollow metal construction costs in most cases are considered economical.

SAFETY, SECURITY, AND WELFARE

The safety, security and welfare of staff, as well as inmates, are enhanced by hollow metal construction. In the typical bar-grille cell front, the inmate not only has access to all of the hardware, as mentioned previously, but also has numerous opportunities to abuse or injure a staff member or other inmates by throwing objects or bodily fluids or by grabbing them through the bars. Blood and fluid borne diseases such as tuberculosis and the HIV virus accentuate this risk. Although the installation is secure, the dangers to people passing by in corridors are still considerable. When bar grille is used, corridors often must be wider to help minimize these problems. Also, bar installations do not inhibit an inmate from rattling the door, clanging the bars and generally making life miserable for other inmates and staff.

The advantages of the hollow metal cell front are evident. As shown in Figure 1, there are no openings through which an inmate can reach and harm passers-by. The only openings are staff controlled openings, such as a food-pass. The reduction of visibility, which can occur in a hollow metal assembly, is offset by the proper placement of security glass, perforated plate, wire mesh screen or grille. Any combination of these options can be incorporated into a hollow metal door or frame to provide adequate visibility for the purpose of staff observation. Cell fronts can be designed using side-light frames for better visibility into cells.

Caution: It is not advisable to locate glass preparations in close proximity to hardware preparations at the door edge, since this can be detrimental to door stiffness.

The door construction itself also reduces, even though it cannot completely eliminate, the opportunity for making noise and creating a disturbance. Because of the internally stiffened, insulation filled construction of the door, the inmate will only be able to make a dull, thudding noise if he chooses to beat and kick the cell front. Also the full grouted jambs and mullions are highly effective for noise control.

DESIGN VERSATILITY WITH HOLLOW METAL

Hollow metal construction provides the Architect with a great deal of freedom in the design of cell fronts as well as security window walls, guard enclosures and control stations while keeping costs within reasonable limits. The Architect can also take advantage of the expertise acquired by those hollow metal manufacturers who have had experience in detention security work. Over the years NAAMM/HMMA manufacturers have developed advanced methods and equipment enabling them to efficiently manufacture hollow metal assemblies, which address today's difficult detention applications. These applications include working with the latest in electronic hardware, security glazing and detention screening. A number of these manufacturers offer proven economical and functional designs of their own for cell fronts, hardware preparations, security windows with shutters, vision panels, security vent grilles, speaking devices, food passes, access doors, sound retardant doors and panels, observation windows and gun ports, hollow metal wall systems, and other items. Some manufacturers also have the capability of producing heavy-duty prison furniture such as cell bunks, desks, shelves, mess hall tables, benches, etc. Typical security window and guard control station installations are shown in Figures 2 and 3 respectively.

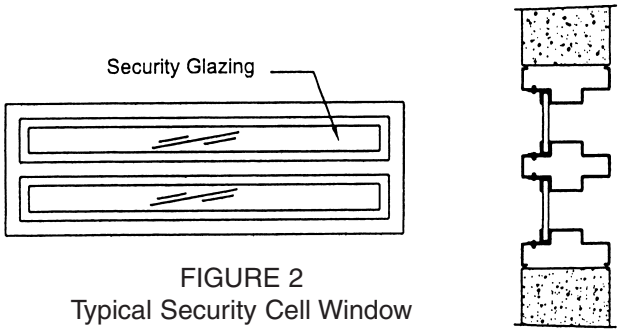
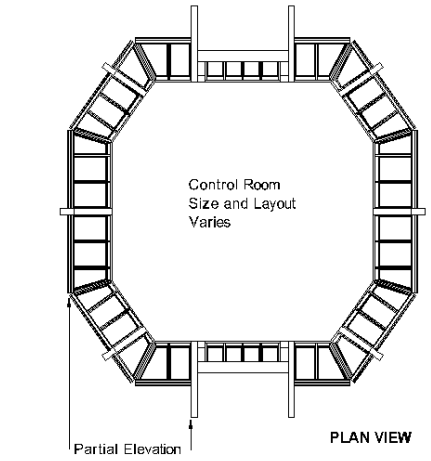
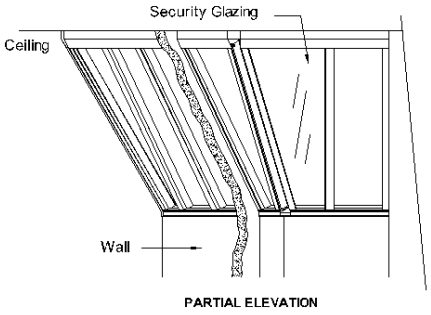


FIGURE 2
Typical Security Cell Window





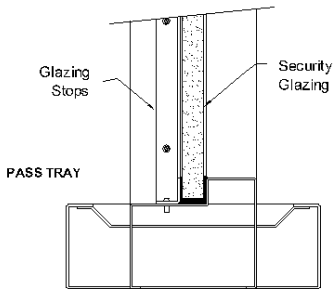


FIGURE 3
Typical Control Room Details

EVALUATING DETENTION SECURITY DOORS

In order to evaluate the performance of detention security doors it has been necessary to develop testing methods which simulate in the laboratory the use and abuse to which such doors can be subjected when in use in correctional facilities. One objective of this development work is to provide standardized methods of measuring performance, which the Architect can call for in their specifications. Another objective is to provide manufacturers standardized means of testing and inspecting their products, improving their designs and maintaining high quality construction. Finally, maintenance of rigorous standards and methods of testing construction and performance give assurance of protection to the public, the prison employees and the inmates themselves. The performance requirements and methods of testing set forth in this voluntary standard should go a long way towards realizing the stated objectives.

TESTING

Six tests are required by this specification, which are conducted in accordance with ASTM F 1450, “Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention Facilities”, and ASTM F 1592, “Standard Test Method for Detention Hollow Metal Vision Systems”.

A. Door Assembly Impact Load Test – ASTM F 1450

B. Sidelight and Multi-Light Assembly Impact Test – ASTM F 1592

C. Door Static Load Test – ASTM F 1450

D. Door Rack Test – ASTM F 1450

E. Door Edge Crush Test – ASTM F 1450

F. Bullet Resistance Test – ASTM F 1450, ASTM F 1592 & UL-752

Under the **static load and rack tests** a completely fabricated door, including hardware and vision light, is subjected to specified loads. In the case of the **static load test** the performance standard requires that the door not exceed a specified maximum deflection when a specified load is centrally applied at the quarter points of the door. In the case of the **rack test**, one corner of the door is left unsupported and must not exceed a specified maximum deflection when a specified concentrated load is applied at the unsupported corner.

Static load and rack tests are prerequisites to all other testing. They provide the basis for checking integrity of construction methods, quality of welds, strength of materials and rigidity of the door assembly. However, these two tests alone are not considered adequate measurements of performance. The **static load test** does not simulate the punishment a door can receive when it is installed in a prison. It only evaluates how well the door performs as a simply supported beam. The **rack test** does evaluate the resistance of a door to end torque, which provides some indication of the ability of the door to resist an attempt to pry open the door at the top or bottom corner. Furthermore, the two tests lead one to believe that the greater the rigidity the better the performance. This can be misleading in as much as there are definite performance advantages associated with the qualities of limited flexibility and resilience in a door exposed to field conditions. So while these two tests are valuable in the evaluation of the basic design and construction, additional testing is needed to better evaluate how the door will perform under conditions, which can occur in a prison.

The **impact load test** provides a much more realistic measure of a door's ability to withstand the treatment it can receive under riot conditions. For this test a door complete with hardware is mounted in its frame with the entire assembly in the vertical position so that the door and locking hardware are operable. The door is then subjected to a series of impact loads from a pendulum ram. The repetitive impact load specified in this standard was established by experimentation that determined what a person with a sledgehammer or several persons with a battering ram could develop in the way of impact energy per blow. From consultations with prison officials the time usually required to restore order in a major riot situation was ascertained. It was assumed that a person or persons could assault a door throughout this period of time and based on this assumption the total number of impacts to which the door would be subjected was determined. Upon completion of the impact testing it is required that the door still be operable. This is indeed a rigorous test and one which when added to the bullet resistance test gives a good indication as to the performance, which can be expected of a door under riot conditions. The sidelight, window and multi-light tests are also done with impact loads. Their purpose is to assure that the frame construction and the removable glass stops used in the frame, are at least equal to the strength of the doors and security glazing they support.

The **bullet resistance test** is conducted in accordance with UL Standard 752, Level 3. In this test a super power rated handgun is used. A rifle, which is more powerful than a handgun is not addressed because the possibility of an inmate obtaining a rifle is very remote, and a rifle is more difficult to conceal and smuggle into public or secure areas. The term “bullet-resisting” as used in the UL standard signifies protection against complete penetration, passage of fragments of projectiles, or spalling (fragmentation) of the protective material to the degree that injury would be caused to a person standing directly behind the bullet-resisting barrier.

CONSTRUCTION

The parts of this standard which cover construction specify the types of steel to be used and the minimum acceptable thickness for different applications. The products covered are doors, frames, fixed windows, hardware reinforcements, glass moldings and stops, louvers, speaking devices, food pass openings, floor anchors, jamb anchors, plaster guards, and removable glazing stops. Construction requirements are very prescriptive and describe how doors can be welded, how stiffeners can be formed and fastened to the face sheets, how vertical edges can be reinforced, what is required for top and bottom closing channels and how they can be welded, and what can be used for hardware reinforcements and how such reinforcements can be applied. The same kind of detailed prescriptive requirements are given for all of the other products covered. This has been done to provide the Architect with designs for detention security products, which have been proven by testing and by historical performance in correctional facilities. Such prescriptive requirements are not intended to restrict innovative design, but NAAMM recommends that any alternative construction be subjected to the performance and testing requirements set forth in this standard before being accepted for detention security installations.

CONCLUSION

This standard will prove very useful to architects concerned with the design of correctional facilities. NAAMM members who manufacture detention security hollow metal products stand ready to assist Architects in their design and specification of these products. Send questions and/or comments on this standard to the NAAMM office.

FOREWORD

These specifications have been prepared in accordance with CSI Section Format: Part 1 - General, Part 2 - Product and Part 3 - Execution. Guide specifications are intended to be used as the basis for developing job specifications and must be edited to fit specific job requirements. Inapplicable provisions shall be deleted, appropriate selections shall be made where there are choices, and provisions applicable to the job shall be added where necessary. Optional items or requirements are shown in brackets. **Notes and instructions to specifiers are given in italics directly following the paragraphs to which they apply. Notes that contain permissive language are not considered part of the standard.** Dates given with ASTM and other standards were current at the time this specification was published, and define the specific standards referenced herein. When a more recent standard is available, the specifier should verify its 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 frames 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 sound guide, are not meant to restrict the use of other materials and methods where it can be demonstrated through the specified 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 shall 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 parentheses for reference purposes only.

Security grades were added in the 5th Edition in response to input from members of the architectural community, particularly those who are regularly involved in the design of Detention and Correctional Facilities and are also involved in ASTM standards development efforts for these facilities. The four (4) security grade levels cited in the specification refer not only to the HMMA performance requirements for detention hollow metal, but also to related ASTM standards that have been recently developed for detention hollow metal, locks, and sliding door devices. These grade levels provide a quick reference to performance standards outside HMMA, which are coordinated with this HMMA specification and can be easily used when writing project specifications.

The CSI Master Format ’95 which placed detention products in Sections 08000 and 11190 has been relocated in Master Format 2004. Section 08 34 63.13 is the new CSI location for steel detention doors and frames, and Section 11 19 13 is designated for detention pass-through doors. Specifiers can use either the old or new numbers in their contract documents to incorporate specifications for detention doors and frames. **However, the Specifier shall not utilize both systems within the same set of construction documents.**

This standard indicates both CSI Section 11190 (or 08320) and [11 19 00 (or 08 34 63.13)] for detention security hollow metal doors and frames until all specifiers have switched to the new Format.

CSI SECTION 11190 (or 08320) (11 19 00 (or 08 34 63.13))
DETENTION SECURITY HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

This Section includes detention security hollow metal [bullet resistant] products as shown in the contract documents and as specified herein.

1.02 PRODUCTS PROVIDED UNDER THIS SECTION

A. Detention security hollow metal [bullet resistant] doors with [3 hour] [1½ hour] [3/4 hour] [1/3 hour] fire rating, [swinging type] [and/or] [sliding type] as shown in the approved submittal drawings and as specified herein.

B. Detention security hollow metal [bullet resistant] doors shall include [glass molding and stops] [louvers] [speaking devices] [food pass openings] [other] as shown in the approved submittal drawings and specified herein.

C. Detention security hollow metal [bullet resistant] panels with [3 hour] [1½ hour] [3/4 hour] [1/3 hour] fire rating of the same construction as the detention security doors.

D. Detention security hollow metal [bullet resistant] [and/or] [fire rated] frames for [3 hour] [1½ hour] [3/4 hour] [1/3 hour] fire rating with anchors. Transom frames, side-light, multi-light, and window assemblies, including [glass moldings and stops] [louvers] [hollow metal panels] [other], as shown in the approved submittal drawings.

E. Detention security hollow metal [bullet resistant] frames shall include [speaking devices] [pass thru devices] [gun ports] [other] as shown in the approved submittal drawings and specified herein.

Indicate bullet resistant doors, frames and panels only if applicable to the job. If these are to be fire-rated doors, frames and panels, indicate the required rating for each: 3 hour, 1-1/2 hour, 3/4 hour, or 1/3 hour. Also, indicate the type of door operation required (swinging and/or sliding), those items in 1.02.B which are to be included with the doors, and those items in 1.02.D & E which are included with the frames.

1.03 RELATED SECTIONS

A. Section 03300[03 30 00] - - - - Cast in Place Concrete: Item(s)

B. Section 03350[03 35 00] - - - - Concrete Floor Finishing: Item(s)

C. Section 03400[03 40 00] - - - - Pre-cast Concrete: Item(s)

D. Section 04200[04 20 00] - - - - Masonry System: Item(s)

E. Section 05120[05 12 00] - - - - Structural Steel: Item(s)

F. Section 08110[08 11 13] - - - - Hollow Metal Doors and Frames

G. Section 08113[08 34 53] - - - - Security Hollow Metal Doors and Frames

H. Section 08130[08 11 19] - - - - Stainless Steel Hollow Metal Doors and Frames

I. Section 08348[08 34 73]- - Swinging Sound Control Hollow Metal Doors and Frames

J. Section 08580[08 56 00] - - - - Operable Windows

K. Section 08720 (or 11190) [08 71 63] - - Gaskets and Weather-strip

L. Section 08740[08 74 00] - - - - Detention Locking Control Systems: Item(s)

M. Section 08800 (or 11190) [08 88 53] - - Security Glazing

N. Section 09900[09 90 00] - - - - Painting and Coating: Item(s)

O. Section 11190 (or 08780) [08 71 63] - - Detention Hardware

P. Section [ ] - - - Installation of Detention Security Hollow Metal Doors and Frames

Not included in section 11190 (08320) [11 19 00 (08 34 63.13)] are installation of doors, frames, panels, door hardware or rough hardware of any kind, weather-stripping, gasketing, operable windows, items furnished by others, field painting, or protection at the building site of products furnished under this Section.

1.04 REFERENCES

The publications listed in this section form a part of this specification to the extent referenced in the specification text. The publications are referenced in the text by basic designation only. When a more recent standard is available, the specifier should verify its applicability to this Guide prior to its inclusion.

A. ANSI A 250.10 – 1998, Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames

B. ANSI / NAAMM HMMA 801-98, Glossary of Terms for Hollow Metal Doors and Frames

C. ANSI / NAAMM HMMA 866-01, Guide Specifications for Stainless Steel Hollow Metal Doors and Frames

D. ANSI / NFPA 80-1999, Fire Doors and Windows

E. ANSI / NFPA 105-2003, Standard for the Installation of Smoke Control Door Assemblies

F. ANSI / NFPA 252-2003, Standard Methods of Fire Tests of Door Assemblies

G. ANSI / NFPA 257-2000, Methods for Fire Test of Window Assemblies

H. ANSI / UL 9-2000, Fire Tests of Window Assemblies, 7th Edition

I. ANSI / UL 10B-2001, Fire Tests of Door Assemblies, 9th Edition

J. ANSI / UL 10C-2001, Standard for Positive Pressure Fire Tests of Door Assemblies, 1st Edition

K. ASTM A 653 / A 653M-03, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dipped Process, (Commercial Steel)

L. ASTM A 666-00, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

M. ASTM A 1008 / A 1008M-03, Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

N. ASTM A 1011 / A 1011M-03, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability

O. ASTM C 143 / C 143M-00, Standard Test Method for Slump of Hydraulic Cement Concrete

P. ASTM F 1450-97, Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities.

Q. ASTM F 1592-01, Standard Test Methods for Detention Hollow Metal Vision Systems

R. CAN4-S104 M80, Standard Method for Fire Tests of Door Assemblies

S. CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

T. ICBO UBC 7-2 (1997), Fire Tests of Door Assemblies

U. ICBO UBC 7-4 (1997), Fire Tests of Window Assemblies

V. NAAMM HMMA 803-98, Steel Tables

W. NAAMM HMMA 820-87, Hollow Metal Frames

X. NAAMM HMMA-820 TN01-03, Grouting Hollow Metal Frames

Y. NAAMM HMMA 840-99, Installation and Storage of Hollow Metal Doors and Frames

Z. NAAMM HMMA 850-00, Fire-Rated Hollow Metal Doors and Frames, Second Edition

AA. UL 752-00, 10th Edition, Bullet Resisting Equipment

AB. UL 1784-2001, Standard for Air Leakage Tests of Door Assemblies, 3rd Edition.

ANSI American National Standards Institute, Inc.
25 W. 43rd Street
New York, NY 10036
Telephone: 212/642-4900 www.ansi.org

ASTM American Society for Testing and Materials
Also known as ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Telephone: 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, California 90601-2298
592-692-4226 www.icbo.org

NAAMM National Association of Architectural Metal Manufacturers
8 South Michigan Avenue
Suite 1000
Chicago, IL 60603
Telephone: 312-332-0405 www.naamm.org

NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269
Telephone: 617-770-3000 www.nfpa.org

UL Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062
Telephone: 708-272-8800 www.ul.com

The following standards are used only for "traditional" negative pressure fire test methods and should be deleted from the project specifications when positive pressure testing is required by the governing building code: NFPA-252 (1.04.F), NFPA-257 (1.04.G), UL-10B (1.04.I), CAN4-S104 (1.04.S) and CAN4-S106 (1.04.T).

Conversely, the following standards are used for positive pressure fire tests, and should be deleted from project specifications requiring negative pressure fire tests: UL-9 (1.04.H), UL-10C (1.04.J), UBC 7-2 (1.04.U) and UBC 7-4 (1.04.V).

Only project specifications requiring compliance with Canadian Building Codes should include CAN4-S104 (1.04.S) and CAN4-S106 (1.04.T).

1.05 TESTING AND PERFORMANCE

Performance grades for each opening shall be as indicated on the contract documents. Performance test requirements for each opening shall be as indicated for individual grade number designations shown in the tables. Test procedures shall be performed on door and frame designs as described in Sections A, B, C, D, and E.

A. Door Assembly Impact Test

Two 3 ft. x 7 ft. (914 mm x 2134 mm) doors shall be constructed in accordance with Section 2.01,

each with 100 square inch (645.2 cm2) clear opening as shown in ASTM F 1450. Test doors and frames shall be installed and tested in accordance with ASTM F 1450, Section 6, "Specimen Preparation" and Section 7.2, "Door Assembly Impact Test". The test assemblies shall meet the acceptance criteria in Section 7.2 in order to qualify under Section 1.05 of this specification.

B. Detention Hollow Metal Vision System Impact Test In Accordance With ASTM F 1592

1. A four (4) equal light multi-light security hollow metal assembly, overall dimensions of 50 in. width x 50 in. height (1270 x 1270 mm), shall be constructed in accordance with this specification, Section 2.03, and shall be impact tested in accordance with ASTM F 1592, Sections 5, 6 and 7.2. The test assembly shall meet the acceptance criteria in Section 7.2 in order to qualify under Section 1.05 of this specification.

2. A single sidelight security hollow metal assembly, door dimensions 3 ft. x 7 ft. (914 mm x 2134 mm) and sidelight dimensions with clear opening size of 28 in. wide x 33 in. high +/- 1 in. (711 mm x 838 mm +/- 25 mm), shall be constructed in accordance with Sections 2.01 and 2.03, and shall be impact tested in accordance with ASTM F 1592, Sections 5, 6, and 7.2. The test assembly shall meet the acceptance criteria in Section 7.2 in order to qualify under Section 1.05 of this specification.

C. Door Static Load Test

Two (2) doors constructed identically to each of the test doors required for Section 1.05.A "Door Assembly Impact Test", 3 ft. x 7 ft. (914 x 2134 mm), with 4 in. x 25 in. (102 mm x 635 mm) vision panel, and with hardware preparations, shall be tested in accordance with ASTM F 1450, Section 7.3, "Door Static Load Test". The test doors shall meet the acceptance criteria in Section 7.3 in order to qualify under Section 1.05 of this specification.

D. Door Rack Test

Two (2) doors constructed identically to each of the test doors required in Section 1.05.A, "Door Assembly Impact Test", 3 ft. x 7 ft. (914 mm x 2134 mm), with 4 in. x 25 in. (102 mm x 635 mm) vision panel, and with hardware preparations shall be tested in accordance with ASTM F 1450, Section 7.4, "Door Rack Test". The test doors shall meet the acceptance criteria in Section 7.4 in order to qualify under Section 1.05 of this specification.

ASTM F 1450, TABLE 1: SECURITY GRADES AND TEST LOAD REQUIREMENTS

Grade No.	Recommended Door Face Sheet and Frame Thickness In. (mm) gage, Minimum	Static Load Test B Lbf. (N)	Rack Load Test C Lbf. (N)	Impact Test A Impact Energy – 200 Ft. Lbf. (271.2 J)			ASTM Reference Standards
				Lock Impacts	Hinge Impacts	Glazing Impacts	
1	0.093 (2.3) 12	14000 (62 272)	7500 (33 360)	600	200	100	F 1450, F 1577 F 1643
2	0.093 (2.3) 12	14000 (62 272)	7500 (33 360)	400	150	100	F 1450, F 1577 F 1643
3	0.067 (1.7) 14	11000 (48 939)	5500 (24 470)	200	75	100	F 1450, F 1577
4	0.067 (1.7) 14	11000 (48 939)	5500 (24 470)	100	35	100	F 1450, F 1577

ASTM F 1592, TABLE 1: IMPACT SERIES FOR FRAME AND GLAZING/PANEL IMPACT TEST MULTILIGHT FRAME						
Sequence[A]	Number of Blows Grade 1	Number of Blows Grade 2	Number of Blows Grade 3	Number of Blows Grade 4	Impact Energy Of Each Blow Ft. Lbf. (J)	Location of Blows
1	600	400	200	100	200 (271.2)	**Frame** On the frame joint between the vertical mullion and the sill or head (test agent to select at time of test).
2	600	400	200	100	200 (271.2)	On the frame joint between the horizontal mullion and the jamb (either side, test agent to select at time of test).
3	600	400	200	100	200 (271.2)	On the frame joint where the vertical and horizontal mullions cross.
4	600	400	200	100	200 (271.2)	On the frame joint between the jamb and sill or head (either side, test agent to select at time of test.
5	600	400	200	100	200 (271.2)	**Glazing** On the glazing/panel at the corner of the glazing/panel within 6 in. (15.2 cm) of the frame stop. Corner selected by the test agent at time of test.
6	600	400	200	100	200 (271.2)	On the glazing/panel at the center of the glazing/panel. Glazing/panel to be selected by the test agent at time of test.
Cyclic Sequence	200	200	100	50		

A. The cyclic sequence of impacts will be as indicated by the grade number, and then move to the next sequence number location. If the testing agent observes a location in the assembly where failure is beginning to occur, the testing agent may alter the test sequence to attack the weakened location.

ASTM F 1592, TABLE 2: IMPACT SERIES FOR FRAME AND GLAZING/PANEL IMPACT TEST SIDELIGHT FRAME						
Sequence[A]	Number of Blows Grade 1	Number of Blows Grade 2	Number of Blows Grade 3	Number of Blows Grade 4	Impact Energy Of Each Blow Ft. Lbf. (J)	Location of Blows
1	600	400	200	100	200 (271.2)	**Frame** On the frame joint between the side-light sill and the strike mullion.
2	600	400	200	100	200 (271.2)	On the frame joint between the strike mullion and the header.
3	600	400	200	100	200 (271.2)	**Glazing** On the glazing/panel at the corner of the glazing/panel closest to the joint between the side-light sill and the strike mullion, within 6 in. (15.2cm) of the frame stop.
4	600	400	200	100	200 (271.2)	On the glazing/panel at the corner of the glazing/panel closest to the joint between the strike mullion and the header within 6 in. (15.2cm) of the frame stop.
5	600	400	200	100	200 (271.2)	On the glazing/panel at the center of the glazing/panel.
Cyclic Sequence	200	200	100	50		

A. The cyclic sequence of impacts will be as indicated by the grade number, and then move to the next sequence number location. If the testing agent observes a location in the assembly where failure is beginning to occur, the testing agent may alter the test sequence to attack the weakened location.

E. Door Edge Crush Test

One (1) door constructed identically to either of the test doors required in Section 1.05.A, “Door Assembly Impact Test”, 3 ft. x 7 ft. (914 x 2134 mm), with 4 in. x 25 in. (102 x 635 mm) vision panel, and with hardware preparations, shall be tested in accordance with ASTM F 1450, Section 7.7 “Door Edge Crush Test”.

F. Bullet Resistance Test

1. Where specified for individual openings, bullet resistance shall be certified by a materials testing laboratory acceptable to the Authority Having Jurisdiction (AHJ), and the doors and frames shall bear the laboratory bullet resistance rating labels indicating compliance with the testing procedure described in UL Standard 752, and consistent with ASTM F 1450, Section 6, “Specimen Preparation” and Section 7.1, “Bullet Penetration”.

The .44 Magnum Revolver is used in this specification because it is the most powerful commonly available handgun. According to prison officials, high powered rifles, if any are kept on the premises, would be securely locked in an armory. Handguns, however, could be obtained in a riot situation or can be concealed and smuggled into public or secure areas. For this reason it is recommended that all doors which are indicated on the door schedule to be bullet resistant be certified for the .44 Magnum Revolver.

OR

2. A sample door, frame, and hardware assembly shall be constructed, tested, and certified by a qualified independent testing laboratory in accordance with the test procedure outlined in ASTM F 1450, Section 6 “Specimen Preparation” and Section 7.1 “Bullet Penetration”. In this case test reports shall include complete descriptions of the test procedure and results. Firearms and ammunition used shall be certified as being correct with respect to bullet caliber, weight, muzzle velocity, and muzzle energy.

G. Labeled Fire Rated and/or Smoke and Draft Control Doors and Frames

1. Doors, frames, transom frames and side light assemblies provided for openings requiring fire protection, temperature rise, and/or smoke and draft control shall be listed and/or classified, and shall bear the label of a recognized testing agency having a factory inspection service. The products shall be tested in accordance with, [ANSI/NFPA-252, or ANSI/UL-10B, or CAN4-S104] [ANSI/UL-10C, or UBC 7-2; Part 1] [UL 1784 or UBC 7-2; Part 2, or ANSI/NFPA 105] and shall be constructed as listed and/or classified by a recognized testing agency having a factory inspection service.

2. Window frames shall be provided for those openings requiring fire protection ratings shall be listed and/or classified, and shall bear the label of a recognized testing agency having a factory inspection service. Such frames shall be tested in accordance with [ANSI/NFPA 257 or ANSI/UL 9 or CAN4-S106] [UBC 7-4] and constructed as listed by a recognized testing laboratory having a factory inspection service.

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

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

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

Doors for certain applications may be provided to meet maximum temperature rise criteria under the test standards cited in Section 1.05.G.1 depending upon jurisdiction.

3. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, hardware, or any other reason, the Architect shall be so advised in the submittal documents or prior to manufacture of the product if hardware, glazing or other options affecting the fire rating are unknown at the time of submittal document preparation.

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

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualification

1. Manufacturer shall provide evidence of having personnel and plant equipment capable of fabricating hollow metal door and frame assemblies of the type specified herein.

2. Manufacturer shall provide evidence of having a written quality control system in place.

B. Quality Criteria

1. All door and frame construction shall meet the requirements of Section 1.05 of these specifications. Fabricate assemblies in strict accordance with approved submittal drawings.

2. Fabrication methods and product quality shall meet standards set by the Hollow Metal Manufacturers Association, HMMA, a Division of the National Association of Architectural Metal Manufacturers, NAAMM, as set forth in these specifications.

3. Job Site Door Check

At the owner's option, a door at the job site shall be selected at random and sawed in half or otherwise taken apart as deemed necessary, for verification that construction is in accordance with these specifications and testing documentation in accordance with Section 1.07.C.1. The manufacturer shall include the cost of the replacement door in the quotation. If the door construction does not conform to these specifications the non-conforming doors shall be repaired or replaced at the manufacturer's expense.

1.07 SUBMITTALS

A. Submittal Drawings

1. Show door and frame elevations and sections.

2. Show listing of opening descriptions including locations, material thicknesses, and anchors.

3. Show location and details of all openings.

4. Indicate performance grade levels on the submittal as they are shown on the contract documents.

B. Samples (if required)

1. Door: 1 ft. x 1 ft. (305 mm x 305 mm) corner section with hinge mortise and reinforcement showing internal construction.

2. Frame: 1 ft. x 1 ft. (305 mm x 305 mm) corner section showing welding of head to jamb. Include hinge mortise, reinforcement and grout guard in one rabbet, and glazing stop applied as specified in the opposite rabbet. Glazing stop shall be applied in both head and jamb section to show their intersection.

3. All samples submitted shall be of the production type and shall represent in all respects the minimum quality of work to be furnished by the manufacturer. No work represented by the samples shall be fabricated until the samples are approved, and any degradation of fabrication quality compared to the samples is cause for rejection of the work.

C. Test Report

1. Manufacturer shall submit to the Architect upon request, ten (10) days prior to bid date, an independent testing laboratory report certifying that door and frame assemblies meet the performance requirements of Section 1.05 and are constructed in accordance with Sections 2.01, 2.02 and 2.03 of these specifications. Test reports shall comply with the reporting requirements outlined in ASTM F1450 and F1592.

2. The manufacturer shall not 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.

D. Qualifications

1. Manufacturer shall submit to the Architect upon request, ten (10) days prior to bid date, their qualifications as required by Section 1.06.

PART 2 - PRODUCTS

2.01 DETENTION SECURITY HOLLOW METAL DOORS

A. Materials

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, to summarize the imperial standards and their corresponding metric values.

1. Doors shall be manufactured of commercial quality, level, cold-rolled steel conforming to ASTM A 1008 / A1008M CS type B or hot-rolled, pickled and oiled steel conforming to ASTM A 1011 / A 1011M CS type B. The steel shall be free of scale, pitting, coil breaks, buckles, waves or other surface blemishes or defects.

2. Interior doors: Face sheets shall be [for Grades 3 and 4; 0.067 in. (1.7 mm)] [for Grades 1 and 2; 0.093 in. (2.3 mm)] minimum thickness.

For interior doors subject to corrosive conditions it is recommended that zinc coated steel face sheets, as specified in 2.01.A.3, be used.

3. Exterior Doors: Face sheets shall be [for Grades 3 and 4; 0.067 in. (1.7 mm)] [for Grades 1 and 2; 0.093 in. (2.3 mm)] minimum thickness and shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M Commercial Steel (CS type B), coating designation A60 (ZF180) or G60 (Z180).

4. For severely corrosive conditions and where specified for individual openings, either interior or exterior: Face sheets shall be [0.067 in. (1.7 mm)] [0.093 in. (2.3 mm)] minimum thickness. Face sheets and components shall be stainless steel conforming to ASTM A 666, Type [304] [316]. Finishes for steel stiffened stainless steel detention doors shall comply with ANSI/NAAMM HMMA 866, required polish not to exceed #4.

If the Architect determines that zinc coated components for zinc coated face sheets and stainless steel components for stainless steel face sheets are needed in addition to zinc coated or stainless steel face sheets, 2.01.A.3 and 2.01.A.4 are the appropriate locations to specify that requirement.

B. Construction:

1. All doors shall be of the types, sizes and construction in accordance with these specifications, and shall meet the performance requirements of Section 1.05, where applicable. Alternate materials and methods of construction which meet the aforementioned performance criteria shall be permitted.

2. Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door.

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

3. Minimum nominal door thickness shall be 2 in. (50.8 mm) to accommodate detention hardware. Doors shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight and of minimum radius for the thickness of material used.

4. The door shall be stiffened by continuous vertically formed steel sections which upon assembly, shall span the full thickness of the interior space between door faces. These stiffeners shall be 0.042 in. (1.0 mm) minimum thickness, spaced so that the vertical interior webs shall be no more than 4 in. (102 mm) apart and securely fastened to both face sheets by spot welds spaced a maximum of 3 in. (76 mm) o.c. vertically. Spaces between stiffeners shall be filled with fiberglass or mineral rock wool batt-type material.

   An acceptable option shall be a welded-in-place structurally shaped steel core. This core shall have vertical webs that are spaced not more than 4 in. (102 mm) apart, and which shall span the full thickness of the interior space between door face sheets. This core shall extend continuously over the inside width and height of the door, and shall be securely fastened to both face sheets by spot welds spaced a maximum of 3 in. (76 mm) o.c. vertically. Internal hollow spaces shall be filled with fiberglass or mineral rock wool batt-type material.

5. The vertical edges shall be reinforced by a continuous steel channel, not less than 0.123 in. (3.1 mm) thickness extending the full height of the door. The top and bottom edges shall be closed with a continuous steel channel, not less than 0.123 in. (3.1 mm) thickness, spot welded to face sheets a maximum of 4 in. (102 mm) o.c. The closing end channel shall be continuously welded to the vertical edge reinforcing channel at all four corners producing a fully welded perimeter reinforcing channel.

6. The top end channel shall be fitted with an additional flush closing channel of not less than 0.053 in. (1.3 mm) thickness. The flush closing channel shall be welded in place at the corners and at the center.

   a. Where specified, exterior doors shall be sealed at the top closing channel assembly in order to provide weather resistance.

7. Edge profiles shall be provided on both vertical edges of doors as follows unless hardware dictates otherwise:

   Single acting doors - beveled 1/8 in. (3.1 mm) in 2 in. (50.8 mm) profile
   Sliding doors or equivalent - square profile

8. Hardware reinforcements and preparations:

   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier. Where non-templated hardware is to be applied, doors shall be reinforced, with all drilling, tapping, and welding done by others in the field.

   b. Minimum material thicknesses for steel hardware reinforcements shall be as follows:

      - Full mortise hinges and pivots .....0.167 in. (4.2 mm)
      - Surface applied maximum security hinges ....0.214 in. (5.4 mm)
      - Strikes .....0.167 in. (4.2 mm)
      - Slide device hanger attachment - per device manufacturer's recommendations
      - Lock fronts, concealed holders, or surface mounted closer .....0.093 in. (2.3 mm)
      - All other surface applied hardware .....0.093 in. (2.3 mm)

c. In cases where electrically or electronically operated hardware is required, and where shown on approved submittal drawings or the approved hardware schedule, hardware enclosures and/or junction boxes within the door shall be provided, and shall be interconnected using UL approved 0.5 in. (12 mm) minimum diameter conduit and connectors. Also, where shown on the approved submittal drawings, junction boxes with access plates shall be provided to facilitate the proper installation of wiring. Access plates shall be the same material and thickness as the face sheet and fastened with not less than four (4) 1/4 - 20 or 1/4 - 28 tamper resistant security screws, not to exceed 6 in. (152 mm) o.c.

9. 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 thicknesses shown on contract documents.

   b. Fixed glass molding shall be not less than 0.093 in. (2.3 mm), and shall be spot welded to both face sheets 5.0 in. (127 mm) o.c. maximum.

   c. In glass openings where non-security glazing is specified or scheduled, removable glazing stops shall be pressed steel channel not less than 0.067 in. (1.7 mm) thickness with tight fitting butt or mitered corner joints, and secured with #8-32 countersunk, tamper resistant security screws located 2 in. (50.8 mm) maximum from each end and 9 in. (228 mm) o.c. maximum.

   d. In glass openings where security glazing is specified or scheduled, and where shown on the approved submittal drawings, pressed steel angle glazing stops, not less than .093 in. (2.3 mm) thickness, shall be provided. Angle stops shall be mitered or notched and tight fitting at the corner joints, and secured in place using 1/4 - 20 or 1/4 - 28 button head tamper resistant security screws spaced 2 in. (50.8 mm) maximum from each end and 6 in. (152 mm) o.c. maximum. The glazing stop system shall satisfy the performance criteria in Section 1.05.B.

      It is recommended that view window stop heights be specified to provide 1 in. (25.4 mm) glass engagement.

      Advisory: It is not advisable to locate glass preparations in close proximity to hardware preparations at the door edge, since this can be detrimental to door stiffness.

   e. Metal surfaces to which glazing stops are secured shall be treated for maximum paint adhesion and painted with a rust inhibitive primer. The inside of the glazing stops shall be treated for maximum paint adhesion and painted with a rust inhibitive primer, or shall be fabricated from zinc coated steel pursuant to 2.01.A.3.

10. Louvers shall be of the welded inverted “V”or “Y” type construction providing free air delivery as specified. The louver opening shall be flush, fabricated using interior channels 0.093 in. (2.3 mm) minimum thickness, securely welded to the inside of both face sheets. Rectangular louvers exceeding 18 in. (457 mm) in width shall be reinforced at their midpoints by a vertical rectangular steel bar at least 0.25 in. x 1.50 in. (6.4 mm x 38 mm) or a vertical round steel bar at least 0.75 in. (19 mm) diameter. The vanes shall be not less than 0.093 in. (2.3 mm) thickness and shall be spaced so that no rigid flat instrument can be passed through them. Insect screens and flattened expanded metal not less than 0.093 in. (2.3 mm) thickness shall be provided on louvered doors in exterior locations where shown on contract documents. Louvers of other designs which meet the performance requirements in Section 1.05.A, “Door Impact Test”, can be qualified for this application.

11. Speaking devices shall consist of a rectangular pattern of round holes, no more than 0.25 in. (6.3 mm) dia., in both face sheets directly across from each other. The minimum size of the rectangular hole pattern shall be 1 in. (25 mm) high x 4 in. (101 mm) wide with holes spaced no more than 1 in. (25 mm) o.c. vertically and horizontally. The interior of the door between the rectangular hole patterns shall be baffled using pressed steel sections, not less than 0.067 in. (1.7 mm), so that no objects can be passed through.

12. Food Pass / Cuff Port Openings:

    a. The food pass opening shall be a flush opening fabricated using interior channels 0.093 in. (2.3 mm) minimum thickness, securely welded to both face sheets. The four corner seams shall be continuously arc welded and dressed smooth. The finished opening shall be of such construction that it cannot be dismantled or otherwise affected by tampering or scraping.

    b. The food pass shutter shall be constructed from two 0.123 in. (3.1 mm) thickness steel plates spot welded together to produce an inset fit that, when closed, will prevent tampering with the lock and hinges.

    c. The shutters shall be treated for maximum paint adhesion and given a shop coat of rust inhibitive primer. They shall be shipped loose for installation in the field by others.

2.02 DETENTION SECURITY HOLLOW METAL PANELS

A. Hollow metal panels shall be made of the same materials and construction and finished in the same way as specified in Sections 2.01 and 2.06.

B. Hollow metal panels shall meet performance criteria set forth in Section 1.05.B of this Specification.

2.03 DETENTION SECURITY HOLLOW METAL FRAMES

A. Materials

1. Frames shall be constructed from cold rolled steel conforming to ASTM A 1008 / A1008M CS Type B, or hot rolled, pickled and oiled (HRPO) steel conforming to ASTM A 1011 / A 1011M CS Type B. The steel shall be free of scale, pitting, coil breaks or other surface defects.

2. Interior openings: Frame sections shall be [for Grades 3 and 4; 0.067 in. (1.7 mm)] [for Grades 1 and 2; 0.093 in. (2.3 mm)] minimum thickness.

    For interior areas subject to corrosive conditions it is recommended that zinc coated frames as specified in 2.03 A.3 be used.

3. Exterior openings: Frame sections shall be [for Grades 3 and 4; 0.067 in. (1.7 mm)] [for Grades 1 and 2; 0.093 in. (2.3 mm)] minimum thickness and shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M Commercial Steel (CS Type B), coating designation A60 (ZF180) or G60 (Z180).

4. Where specified for severely corrosive conditions and where specified for individual openings, either interior or exterior: Frame sections shall be [0.067 in. (1.7 mm)] [0.093 in. (2.3 mm)] minimum thickness. Frame sections and components shall be stainless steel conforming to ASTM A 666, Type [304] [316]. Finishes for stainless steel detention frames shall comply with ANSI/NAAMM HMMA 866, required polish not to exceed #4.

B. Construction:

1. All frames, with the exception of cased openings such as for sliding doors, shall have integral stops and be welded units of the sizes and types shown on approved submittal drawings. Frames shall be constructed in accordance with these specifications and shall meet performance criteria specified in Sections 1.05.A and 1.05.B where applicable. Alternate materials and methods of construction which meet the aforementioned performance criteria shall be permitted.

2. Finished work shall be neat in appearance, square, and free of defects, warps and buckles. Pressed steel members shall be straight and of uniform profile throughout their lengths.

3. Jamb, header, mullion and sill profiles shall be in accordance with the frame schedule and as shown on the approved submittal drawings.

4. Corner joints shall have all contact edges closed tight with faces mitered and stops either butted or mitered. Corner joints shall be continuously welded and the use of gussets or splice plates are not acceptable.

    For detailed information on continuously welded corner joints, see Tech Note HMMA-820 TN02-03.

5. All other face joints shall be continuously welded and finished smooth.

6. Minimum height of stops in door openings shall be 0.625 in. (15.8 mm). Height of stops on security glazing or panel openings shall be as shown on approved submittal drawings. Cut-off stops, where specified shall be capped at 45 degrees or 90 degrees at heights as shown on approved submittal drawings, and jamb joints below cut-off stops shall be tight fitting, welded and ground smooth so that there are no visible seams.

   In some applications, 3/4 in. (19 mm) frame stops are used with 2 in. (50.8 mm) thick doors.

7. When shipping limitations or site access so dictate, or when advised by the contractor responsible for installation, frames for large openings shall be fabricated in sections designated for assembly in the field by others. Alignment plates or angles shall be installed at each joint. Such components shall be the same material and thickness as the frame. Field joints shall be made in accordance with approved submittal drawings, and shall be field welded by others.

8. Frames for multiple openings shall have mullion members which, after fabrication, are closed tubular shapes conforming to profiles shown on approved submittal drawings, and having no exposed visible seams or joints. All joints between faces of abutted members shall be continuously welded and finished smooth. All joints between stops of abutted members shall be welded along the soffit and shall be left neat and uniform in appearance. The contractor responsible for installation shall provide for welding and finishing all field joints between faces of abutted members.

9. Hardware Reinforcements and Preparation:

   a. Frames shall be mortised, reinforced, drilled and tapped at the factory for all templated hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where non-templated hardware is to be applied, frames shall be reinforced with all drilling, tapping and welding done by others in the field.

   b. Minimum material thickness of steel hardware reinforcements shall be as follows:

      Hinges and pivots .....0.167 in. x 1.5 in. x 10 in. length (4.2 mm x 38 mm x 254 mm)

      Strikes .....0.167 in. (4.2 mm)

      Closers .....0.167 in. (4.2 mm)

      Flush bolts .....0.167 in. (4.2 mm)

      All other surface applied hardware .....0.093 in. (2.3 mm)

   c. In cases where electrically or electronically operated hardware is required, and where shown on approved submittal drawings or approved hardware schedule, hardware enclosures and junction boxes shall be provided, and shall be interconnected using UL approved 0.5 in. (12 mm) diameter minimum conduit and connectors. Where shown on contract documents junction boxes with access plates shall be provided to facilitate the proper installation of wiring. Access plates shall be the same material and thickness as the frame and fastened with not less than four (4) 1/4-20 or 1/4-28 tamper resistant security screws, not to exceed 6 in. (152 mm) o.c.

10. Floor Anchors:

    a. Where applicable, floor anchors shall be provided with two (2) holes for fasteners and shall be fastened inside jambs with at least four (4) spot welds per anchor.

    b. Where so scheduled, adjustable floor anchors, providing not less than 2 in. (50.8 mm) height adjustment, shall be fastened in place with at least four (4) spot welds per anchor.

    c. Thickness of floor anchors shall be the same as frame.

11. Jamb Anchors:

    a. Anchor Spacing

The number of anchors provided on each jamb shall be as follows:

Borrowed lite frames	2 anchors plus 1 for each 18 in. (457 mm) or fraction thereof over 36 in. (914 mm), spaced at 18 in. (457 mm) maximum between anchors
Door frames	2 anchors plus 1 for each 18 in. (457 mm) or fraction thereof over 54 in. (1372 mm), spaced at 18 in. (457 mm) maximum between anchors (fire ratings can require additional anchors)

b. Masonry Type

Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the strap and stirrup type made from the same thickness steel as frame. Straps shall be no less than 2 in. x 10 in. (50.8 mm x 254 mm) in size, corrugated and/or perforated.

c. Embedment Masonry Type

1. Frames for installation in pre-finished masonry or concrete openings shall be provided with removable faces at the jambs, and 0.187 in. x 2 in. x 2 in. (4.7 mm x 50.8 mm x 50.8 mm) angle anchors 4 in. (102 mm) long spaced as described in Section 2.03.B.10.a. The frame anchors shall be located to coincide with matching embedded anchors to be provided for installation in the wall.

2. Embedded wall anchors shall consist of a 0.187 in. x 4 in. wide x 6 in. long (4.7 mm x 102 mm wide x 152 mm long) plate with 0.187 in. x 2 in. x 2 in. (4.7 mm x 50.8 mm x 50.8 mm) angle anchors 4 in. (102 mm) long welded in place at locations to match angle anchors in frames. The embedded plate shall be provided with two (2) #4 re-bar wall anchors 10 in. (254 mm) long minimum, with 2 in. (50.8 mm) x 90 degree turn down on ends continuously welded in place, and spaced as described in Paragraph 2.03.B.10.a. Embedments shall be prime painted in accordance with Section 2.06.

3. Angle anchors shall each be fastened to jamb and to embedded plate with two (2) 1 in. (25.4 mm) long arc welds at each end of the anchor. Anchors shall be shipped loose.

4. The complete anchorage system shall provide that the jamb faces be removed from the frames in the field by the contractor responsible for installation, and the frames be moved into the opening. Using the 0.187 in. x 2 in. x 2 in. x 4 in. (4.7 mm x 50.8 mm x 50.8 mm x 102 mm) long angles, the installer shall weld one edge of the angle to the embedded anchor and the other edge to the frame mounted anchor forming a rigid connection between the frame and the embedded plate. The procedure shall be repeated for all anchor positions. The installer shall field weld all anchors and install the jamb faces in place. Embedment anchoring details shall be provided on approved submittal drawings.

d. Expansion Bolt Type

1. Frames for installation in existing masonry or concrete walls shall be prepared for expansion bolt type anchors. The preparation shall consist of a countersunk hole for a 0.5 in. (12.7 mm) diameter bolt and a conduit spacer from the unexposed surface of the frame to the wall welded within the jamb profile. The preparation shall be spaced as described in Section 2.03.B.10.a. Fasteners for such anchors shall be provided by others.

2. After sufficient tightening of the bolt, the bolt head shall be welded by the installation contractor so as to provide a non-removable condition. The welded bolt head shall be ground, dressed and finished smooth.

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

12. Grout guards shall be provided at all hardware preparations, glazing stop screws and silencer preparations on frames to be set in masonry or concrete openings. Grout guards shall be sufficient to protect preparations from grout of a 4 in. (102 mm) maximum slump consistency which is hand troweled in place. If pump grout that exhibits slump values of higher than 4 in. (102 mm) is used, additional precautions shall be taken in the field by the contractor to seal grout guards to prevent leakage and to brace frame sections to prevent deformation. (Ref. HMMA-820 TN01-03, "Grouting of Hollow Metal Frames")

    a. Grout guards for glazing stop screws shall be factory installed and shall cover the exposed portion of the screws inside the frame throat, around the perimeter. Where mullions are required to be grouted, screws inside mullions shall be protected with grout guards.

    b. Silencer preparations shall be protected by steel grout guards where accessible from the frame throat. Silencers shall be furnished and installed by the contractor responsible for frame installation except where limited access prevents installation of the metal grout guards in mullions, in which cases silencers shall be factory furnished and installed.

    For detailed information on grouting of hollow metal frames, see Tech Note HMMA-820 TN01-03.

13. All door openings shall be provided with two (2) temporary steel spreaders welded to the bottom of the jambs or mullions to serve as bracing during shipping and handling. The installation contractor shall be responsible for finishing and touch-up of marks caused by spreader removal.

14. Removable glazing stops:

    a. In openings where non-security glazing is specified, loose channel type glazing stops shall be cold rolled steel, not less than 0.067 in. (1.7 mm) thickness, butted at corner joints and secured to the frame using #8-32 countersunk tamper resistant security screws, spaced 2 in. (50.8 mm) maximum from each end and 9 in. (228 mm) o.c. maximum.

    b. In openings where security glazing is specified and where shown on the approved submittal drawings, pressed steel angle glazing stops, not less than 0.093 in. (2.3 mm) thick, shall be provided. Angle stops shall be mitered or butted and tight fitting at the corner joints, and secured in place using 1/4 - 20 or 1/4 - 28 tamper resistant security screws spaced 2 in. (50.8 mm) maximum from each end and 6 in. (152 mm) o.c. maximum. The glazing stop system shall satisfy the performance criteria in Section 1.05.B.

        It is recommended that view window stop heights be specified to provide 1 in. (25.4 mm) glass engagement.

    c. The frame section underneath the glazing stops shall be treated for maximum paint adhesion and painted with a rust inhibitive primer. The inside of the glazing stops shall be treated for maximum paint adhesion and painted with a rust inhibitive primer, or shall be fabricated from zinc coated steel pursuant to Section 2.03.A.3.

2.04 MANUFACTURING TOLERANCES

The manufacturer of the doors and frames is responsible only for the manufacturing tolerances listed in Section 2.04. The final clearances and relationships between door and frame depends on the setting of the frame and the hanging and adjustment of the door and hardware. (See Sections 3.02 and 3.03).

A. Manufacturing tolerance shall be maintained within the following limits:

    1. Frames for single doors or pairs of doors:

        a. Width, measured between rabbets at the head: Nominal opening width + 1/16 in.(1.6 mm), - 1/32 in. (0.8 mm).

        b. Height (total length of jamb rabbet): Nominal opening height +/- 3/64 in. (1.2 mm).

2. Cross sectional profile dimensions (see Figure 4):

   a. Face.....+/- 1/32 in. (0.8 mm)

   b. Stop.....+/- 1/32 in. (0.8 mm)

   c. Rabbet.....+/- 1/32 in. (0.8 mm)

   d. Depth.....+/- 1/32 in. (0.8 mm)

   e. Throat .....+/- 1/16 in. (1.6 mm)

   Frames overlapping walls to have throat dimension 1/8 in. (3.1 mm) greater than wall thickness to accommodate irregularities in wall construction.

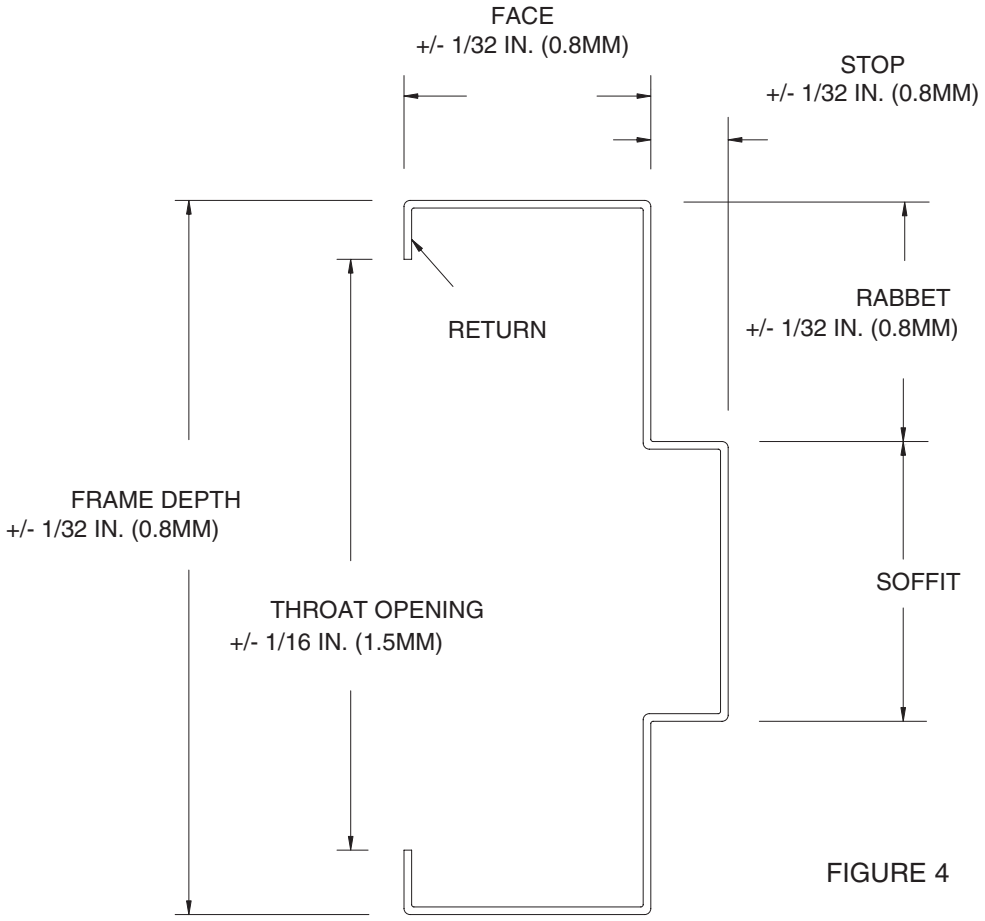


FIGURE 4

3. Flatness of large frames .....1/8 in (3.1 mm) in 10 ft (3048 mm) of length or width

4. Doors Tolerance on actual 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. Bow/flatness .....+/- 1/16 in. (1.5 mm) in 7 ft. (2134 mm)

   Doors are undersized to fit the frame. Edge clearances are based upon individual door manufacturer's designs.

5. Hardware

   a. Cutout and template dimensions.....+ 0.015 in. (0.38 mm) - 0 in.

   b. Location.....+/- 1/32 in. (0.8 mm)

   c. Between Hinge Centerlines.....+/- 1/64 in. (0.4 mm)

2.05 HARDWARE LOCATIONS

The location of hardware on doors and frames shall be as listed below. Note that all dimensions except the hinge locations are referenced from the finished floor as defined in Section 3.03.

A. Hinges:

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

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

Intermediate.....equally spaced between top and bottom hinges

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 .....38 in. (965 mm) to centerline of cross bar or as shown on hardware template

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

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

G. Arm pulls .....46 in. (1168 mm) to centerline

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

I. Intercoms .....48 in. (1219 mm) to centerline of intercom push button

2.06 FINISH

After fabrication, all tool marks and surface imperfections shall be filled and sanded as required to make face sheets, vertical edges and weld joints free from irregularities. After appropriate metal preparation, all exposed surfaces of doors and frames shall receive a rust inhibitive primer, which meets or exceeds ANSI A 250.10, “Test Procedures and Acceptance Criteria for Prime Painting Steel Surfaces for Steel Doors and Frames”. For stainless steel finishes refer to ANSI/NAAMM/HMMA 866.

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

PART 3 - EXECUTION

Note to Architect: Proper storage and protection is essential to the proper performance of doors and frames. The requirements for proper storage are given in the following sections. However, it is important to recognize that proper storage is not the responsibility of the hollow metal manufacturer. For this reason, the requirements for storage and protection of detention hollow metal doors and frames shall be referenced in that section of the specifications where installation of work is specified. (Reference: HMMA 840 “Installation and Storage of Hollow Metal Doors and Frames”).

3.01 SITE STORAGE AND PROTECTION OF MATERIALS

A. The contractor responsible for installation shall remove wraps or covers from doors and frames upon delivery at the building site. The contractor responsible for installation shall ensure that any scratches or disfigurement caused in shipping or handling are promptly sanded smooth, cleaned and touched up with a compatible rust inhibitive Direct to Metal (DTM) primer.

B. The contractor responsible for installation shall ensure that materials are properly stored on planks or dunnage in a dry location. Doors and frames shall be stored in a vertical position and spaced by blocking. Figure 5 illustrates recommended storage positioning. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

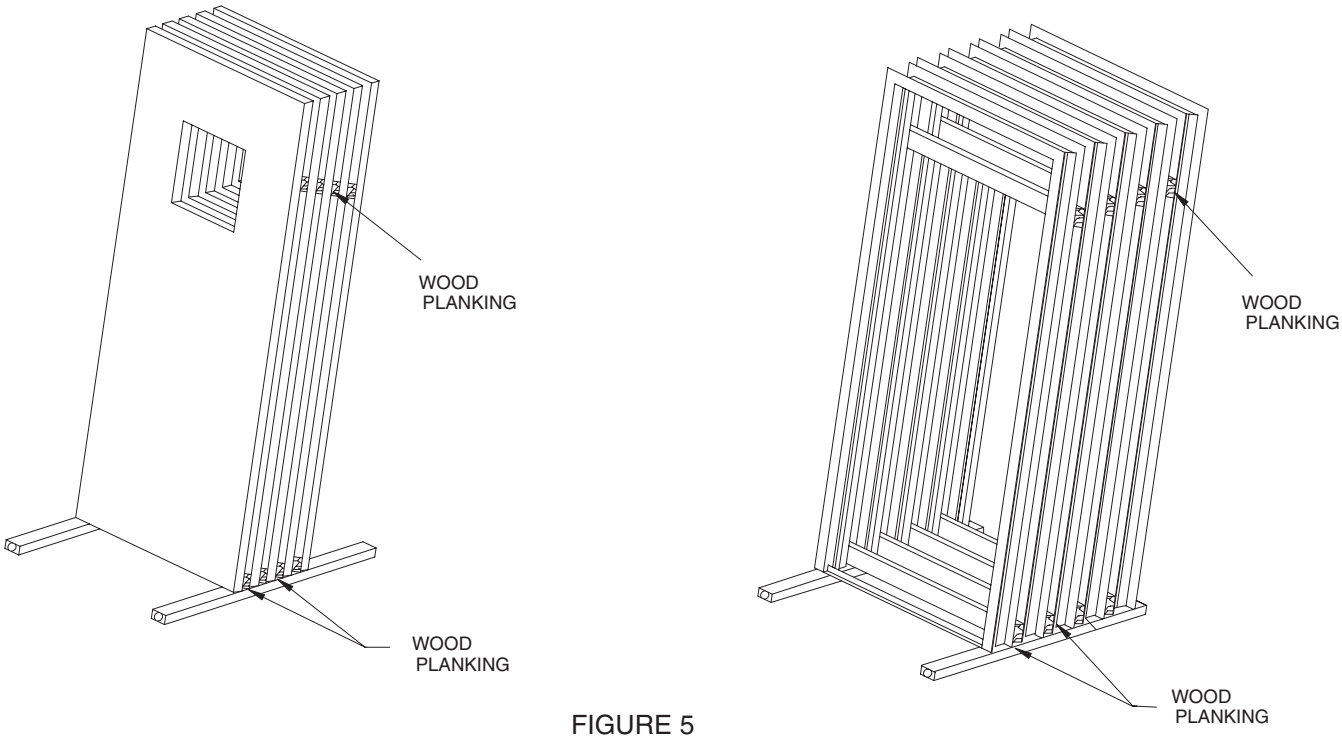


FIGURE 5
Recommended Storage

3.02 INSTALLATION

Note to Architect: Correct installation is essential to the proper performance of detention doors and frames. 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 detention hollow metal manufacturer. For this reason, the requirements for installation of detention hollow metal doors and frames shall be referenced in that section of the specifications where installation of work is specified. It is the responsibility of the general contractor using experienced personnel to perform the work outlined in this section. (Reference: HMMA 840 "Installation and Storage of Hollow Metal Doors and Frames")

The Contractor responsible for installation shall perform the following:

A. Prior to installation, all frames shall be checked for correct size, and swing, and with temporary spreaders removed, corrected for squareness, alignment, twist and plumb. Permissible installation tolerances shall not exceed 1/16 in. (1.5 mm):

Squareness .....measured at rabbet on a line from jamb, perpendicular to frame head.

Alignment .....measured at jambs on a horizontal line parallel to the plane of the face.

Twist .....measured at opposite face corners of jambs on parallel lines, perpendicular to the plane of the door rabbet.

Plumbness .....measured at jambs on a perpendicular line from the head to the floor.

During the setting of the frames, check and maintain these tolerances for squareness, alignment , twist and plumbness.

The details in Figure 6 illustrate methods of measuring the above specified tolerances.

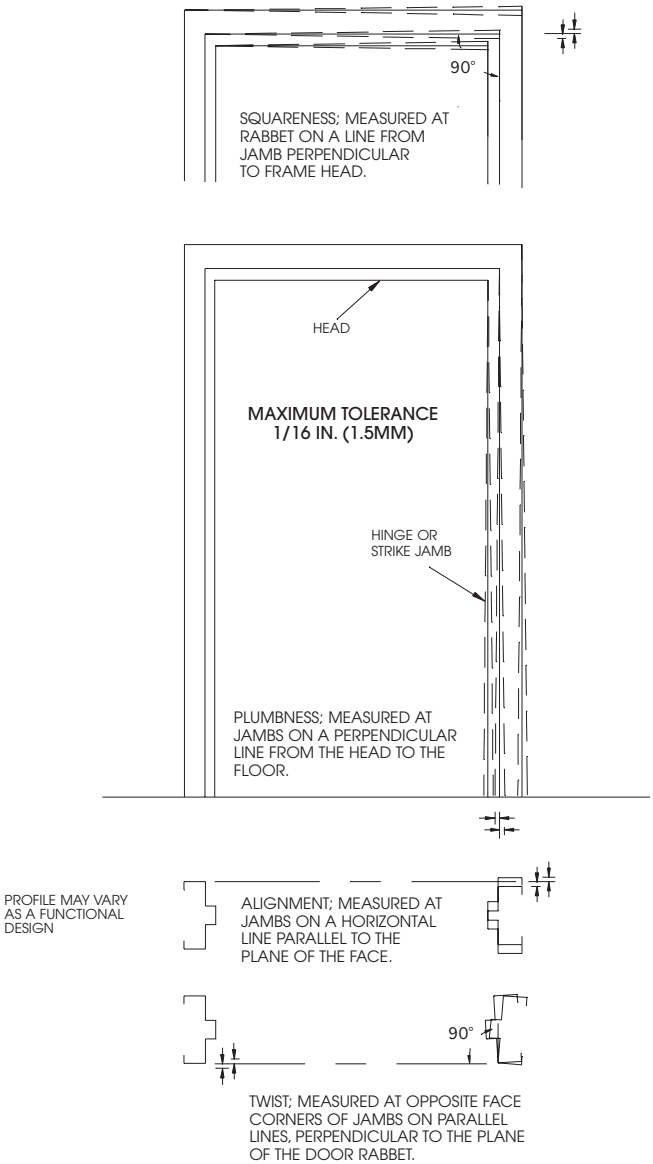


FIGURE 6
Installation Tolerances

The above tolerances provide a reasonable guideline for proper installation of hollow metal frames. However, it should be noted that the cumulative affect 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 an installation tolerance buildup. Tolerance buildup occurs when several dimensions are at or near their maximum tolerance.

B. Frame jambs shall be fully grouted to provide added security protection against battering, wedging, spreading and other means of forcing open the door. Jamb mounted lock preparations, grout guards for hardware preparations and glazing stop screws, and junction boxes are intended to protect hardware mortises, exposed removable screws, and tapped mounting holes from masonry grout of 4 in. (102 mm) maximum slump consistency which is hand troweled in place. If a light consistency grout (greater than 4 in. (102 mm) slump in accordance with ASTM C 143 / C 143M) is to be used, special precautions shall be taken in the field by the installation contractor to protect tapped holes, electrical knock-outs, lock pockets, grout guards, junction boxes, etc. in the frames.

   Large frame sections, such as lock columns and lock jambs, are not intended or designed to act as forms for grout or concrete. Grouting of large hollow metal sections shall be done in “lifts” or precautions shall be otherwise taken by the contractor to insure that frames are not deformed or damaged by the hydraulic forces that occur during this process.

   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. Plaster based grouts should not be used under any circumstances. Refer to NAAMM’s HMMA TechNotes HMMA-820 TN01-03, “Grouting Hollow Metal Frames”, in Appendix 2 for further guidance.

C. Proper door clearances shall be maintained in accordance with 3.03 of these specifications, except for special conditions otherwise noted. Where necessary, metal hinge shims, furnished by the Contractor responsible for installation, are acceptable to maintain clearances.

D. Hardware shall be applied in accordance with hardware manufacturer's templates and instructions.

E. Any grout or other bonding material shall be cleaned off of frames or doors immediately following installation. Exposed hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.

F. Exposed field welds shall be finished smooth and touched up with a rust inhibitive primer.

G. Primed or painted surfaces which have been scratched or otherwise marred during installation, cleaning, and/or field welding, including marks caused by spreader removal, shall promptly be finished smooth, cleaned, treated for maximum paint adhesion and touched up with a rust inhibitive Direct to Metal (DTM) primer comparable to and compatible with the shop applied primer and finish paint specified in Section 09900 [09 90 00]. All touch-up primer and finish paint must be formulated for DTM application.

H. Finish paint in accordance with Section 09900 [09 90 00].

I. Install door silencers.

J. Install glazing materials in accordance with Section 08800 (or 11190 [08 88 53]).

3.03 CLEARANCES

A. Edge clearances for swinging doors shall provide for the functional operation of the assembly and shall not exceed the following:

   1. Between doors and frames at head and jambs: 3/16 in. (4.7 mm)
   2. Between edges of pairs of doors: 3/16 in. (4.7 mm)
   3. At doorsills where a threshold is used: 3/8 in. (9.5 mm)
   4. At doorsills where no threshold is used: 3/4 in. (19.1 mm)
   5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in ANSI/NFPA 80, 1/2 in. (12.7 mm).

B. Clearances for detention sliding doors shall be in accordance with the approved slider device drawings furnished as part of the approved hardware schedule.

Floor is defined as the top of the concrete slab or structural floor. Where resilient tile, hardwood or other floor coverings are used, undercuts must be increased in order to accommodate those floor coverings. The Architect must define the distance from the top of the floor/finished floor to the top of the floor covering so that appropriate undercuts can be provided. Refer to NAAMM's HMMA TechNotes HMMA-810 TN01-03, "Defining Undercuts", in Appendix 3.

The final clearances and relationship between door and frame depends upon the setting of the frame and hanging and adjusting of the door and hardware. If everything is perfect in the setting of the frame, and the manufacturing of the doors and frames, the clearances should be as shown in 3.03. However, if the frame is set to its maximum allowable tolerances, and the doors and frames are manufactured to their maximum allowable tolerances, the clearances could be greater.

All clearances are subject to change depending upon the requirements of the specified hardware.

APPENDIX

(Not part of the Standard)

NAAMM HMMA 803 STEEL TABLES

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

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

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

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

DISCLAIMER

This sheet was developed by representative members of the Hollow Metal Manufacturers Association Division (HMMA) of the National Association of Architectural Metal Manufacturers (NAAMM) to provide their opinion and guidance on minimum thickness and metric equivalents used for hollow metal doors and frames. This sheet contains advisory information only and is published as a public service by the HMMA Division. 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

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.

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.

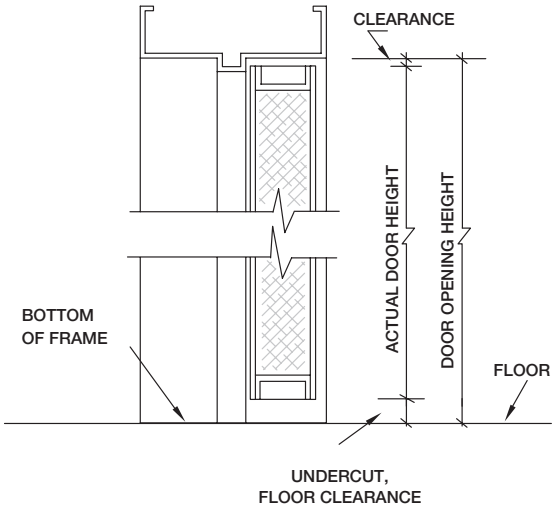


Figure #1

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.

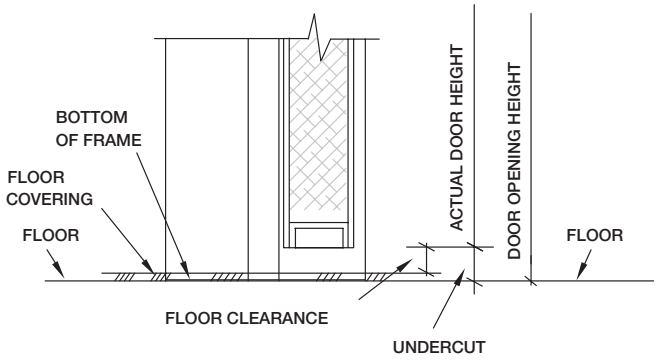


Figure #2

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.

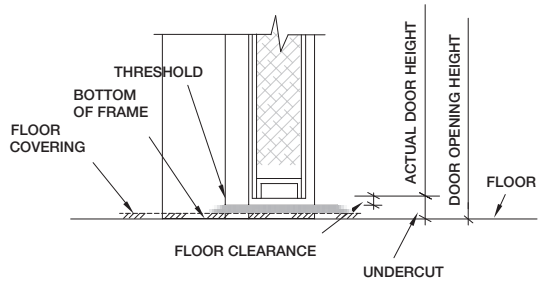


Figure #3

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.

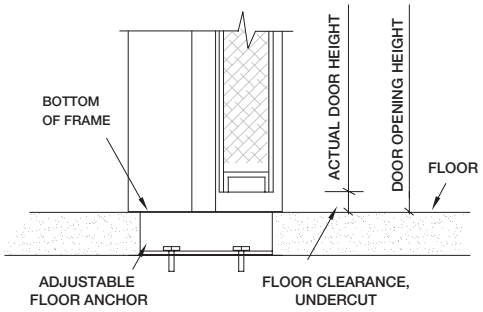


Figure #4A

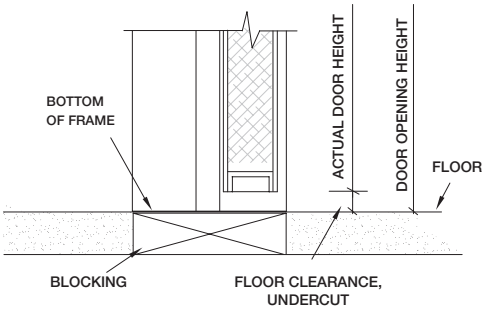


Figure #4B

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.

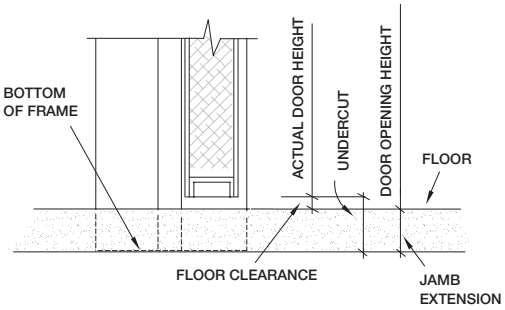


Figure #5A

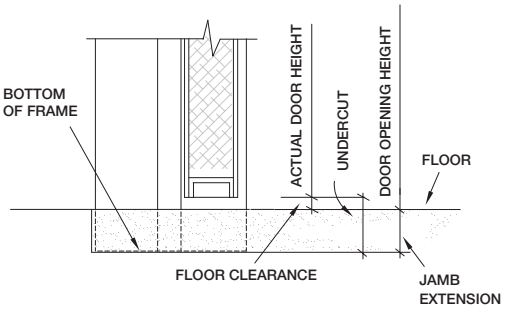


Figure #5B

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.

RECOMMENDED USAGE GUIDE FOR HMMA HOLLOW METAL DOORS AND FRAMES

HMMA 860 — Hollow Metal Door and Frames
Apartment Buildings; Dormitories; Military Barracks; and Motels

ANSI/NAAMM
HMMA 861 — Commercial Hollow Metal Doors and Frames
Schools; Hospitals; Industrial Buildings; Office Buildings; Hotels; Nursing Homes; Airports; and Convention Centers

ANSI/NAAMM
HMMA 862 — Commercial Security Hollow Metal Doors and Frames
Exterior Doors to Schools: Warehouses. Industrial Buildings; or Strip Stores

ANSI/NAAMM
HMMA 863 — Detention Security Hollow Metal Doors and Frames
Jails; Prisons; Detention Centers and Secured Areas in Hospitals; or Courthouses

ANSI/NAAMM
HMMA 865 — Swinging Sound Control Hollow Metal Doors and Frames
TV; Radio, Recording and Sound Studios; Theaters; and Music Rooms

ANSI/NAAMM
HMMA 866 — Stainless Steel Hollow Metal Doors and Frames
Type 304 or 316 Stainless Steel for highly corrosive, moderately corrosive or aesthetic applications