

## SECTION 083953 - COMMERCIAL BLAST RESISTANT HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.01 SUMMARY

This Section includes blast resistant hollow metal products as shown in the contract drawings.

#### 1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Blast resistant hollow metal security egress doors, swinging type with specified fire and/or bullet resistant ratings as shown in the door schedule. Doors shall be of the types and sizes shown on the contract drawings and as specified herein <sup>1</sup>.
- B. Blast resistant hollow metal security egress frames with specified fire and/or bullet resistant ratings as shown in the door schedule. Frames shall be of the types and sizes shown on the contract drawings and as specified herein <sup>2</sup>.

*<sup>1,2</sup> Architect's Note: Door designs are performance based. The product and material specifications in this section are minimum guidelines for products under this section. The manufacturer's certified designs are the only designs that are acceptable and these designs take precedence. Some projects of higher blast design loads may require heavier constructions than the minimum constructions described herein.*

#### 1.03 RELATED PRODUCTS FURNISHED BY OTHERS BUT NOT SPECIFIED IN THIS SECTION

- A. Hardware
- B. Security Glass and Glazing
- C. Gaskets and Weatherstripping

#### 1.04 RELATED SECTIONS

- A. Section 03300 - Cast in Place Concrete
- B. Section 03345 - Concrete Floor Finishing
- C. Section 03400 - Pre-cast Concrete
- D. Section 04200 - Masonry System
- E. Section 05120 - Structural Steel
- F. Section 09900 - Painting

#### 1.05 REFERENCES

- A. ASTM A 653 / A 653M-19a, Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot Dip Process.
- B. ASTM A 666-15 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
- C. ASTM A 1008 / A 1008M-18, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- D. ASTM A 1011 / A 1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- E. ASTM F2247-18 Standard Test Method for Metal Doors Used in Blast Resistant Applications

- F. ASTM F2248-19, Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass
- G. ASTM C 143 / C 143M-15a, Standard Test Method for Slump of Hydraulic Cement Concrete
- H. ASTM D 714-02, Standard Test Method for Evaluating Degree of Blistering of Paints
- I. ASTM D 1735-14, Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
- J. ANSI A 250.10 – 2011, Standard Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
- K. ANSI/NAAMM/HMMA 862-13, Guide Specifications for Commercial Security Hollow Metal Doors and Frames
- L. ANSI/NAAMM/HMMA 840-07, Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames
- M. ANSI/NAAMM/HMMA 801-12, Glossary of Terms for Hollow Metal Doors and Frames
- N. ANSI/NAAMM/HMMA 850-00, Fire-Rated Hollow Metal Doors and Frames, Third Edition
- O. ANSI/NAAMM/HMMA 866-12, Guide Specifications for Stainless Steel Hollow Metal Doors and Frames
- P. UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
- Q. PIP STC01018, Blast Resistant Building Design Criteria
- R. ANSI/NFPA 80-19, Fire Doors and Windows
- S. ANSI/NFPA 252-17, Standard Methods of Fire Tests of Door Assemblies
- T. ANSI/NFPA 257-17, Methods for Fire Test Window Assemblies
- U. ANSI/UL 10 (B) 2015, Fire tests of door assemblies, 10<sup>th</sup> edition, 2008
- V. ANSI/UL 10 (C) 2016, Positive pressure fire tests of door assemblies, 3<sup>rd</sup> edition, 2016
- W. ANSI/UL 752 2015, Bullet - Resisting Equipment 11<sup>th</sup> Edition, 2005

ANSI                    American National Standards Institute, Inc.  
                                  11 West 42nd Street  
                                  13th Floor  
                                  New York, NY 10036  
                                  Telephone: 212/642-4900                    [www.ansi.org](http://www.ansi.org)

ASTM                    American Society for Testing and Materials  
                                  100 Barr Harbor Drive  
                                  West Conshohocken, PA 19428-2959  
                                  Telephone: 610/832-9585                    [www.astm.org](http://www.astm.org)

NAAMM                    National Association of Architectural Metal Manufacturers  
                                  800 Roosevelt Rd.

Bldg. C, Suite 312  
 Glen Ellyn, IL 60137  
 Telephone: 630/942-6591      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  
 333 Pfingsten Road  
 Northbrook, Illinois 60062  
 Telephone: 847/272-8800      www.ul.com

ITS      Intertek / Architectural Testing Incorporated (ATI)  
 130 Derry Court  
 York, PA 17406-8405  
 Telephone 717/764-7700      www.intertek.com

**1.06 TESTING AND PERFORMANCE**

- A. Blast resistant security hollow metal doors and frames included in this specification section shall be designed and manufactured to meet the blast load criteria as defined in this specification section.
- B. Blast Load Criteria:
  - 1. The blast load criteria shall be (\_\_\_\_) psi [(\_\_\_\_) kPa] Peak Reflected Pressure with an Impulse of (\_\_\_\_) psi.msec [(\_\_\_\_) kPa.msec] <sup>1</sup>.
  - 2. The required performance shall be Response Category [III-LLOP] [II-MLOP] [I-HLOP] in accordance with [ASTM F2247 Paragraph 11] and [PIP STC01018] [UFC 4-010-01] as follows <sup>2</sup>.

<b>Standard</b>	<b>Response Category</b>	<b>Ductility Limit</b>	<b>End Rotation Limit</b>
PIP STC01018	I	1.0	1.2 deg
	II	3.0	2.0 deg
	III	10.0	8.0 deg
	IV	20.0	12.0 deg
UFC 4-010-01	High LOP	1.0	-
	Medium LOP	-	3.0 deg
	Low LOP	-	6.0 deg
	Very Low LOP	-	10.0 deg

*<sup>1, 2</sup> Architect's Note: Blast loading is based on charge weight and threat stand-off distance for antiterrorism UFC 4-010-01, or based on locations of identified hazards for Petrochem PIP STC 01018, design code and therefore may vary depending on location around the perimeter of a building. The architect may elect to include a load table based on each door tag, or threat levels between column lines, or direction facing facades.*

- C. Evidence of performance shall be demonstrated by physical testing by static pressure difference in accordance with ASTM F2247 for low to medium levels of blast pressure or ASTM E330 for low levels of blast pressure, or through engineering evaluation of dynamic blast loading as specified in Paragraphs B.1 and B.2 of this section.

1. Engineering reports shall be prepared by a reputable engineering laboratory qualified to evaluate the blast resistance of hollow metal doors and frames. Engineering reports shall be prepared and sealed by a Professional Engineer.

D. Prime Paint Performance

1. Sheet steel specimens, with the product manufacturer's production primer, replicating Finish "as shipped", shall be tested in accordance with ANSI A 250.10.
2. Performance shall meet the Acceptance Criteria described in ANSI A 250.10.
3. Test Reports or Certificates of Compliance shall include a description of the test specimens and procedures used in testing.

**1.07 QUALITY ASSURANCE**

Approval as a Qualified Manufacturer shall require, as a minimum, substantiation of the following requirements no less than ten (15) days prior to bid date: No substitutions will be allowed thereafter.

A. Manufacturer's Qualifications

1. Qualified manufacturers shall have personnel, plant equipment, and capacity capable of fabricating hollow metal door and frame assemblies of the types and quantities required for this project. These capabilities shall be substantiated by current documentation of number of employees, a current listing of production equipment, and production space.
2. Qualified manufacturers shall employ production welders qualified to weld material types, thicknesses, and joint types typical for the hollow metal doors and frames on this project. These qualifications shall be substantiated by a copy of "Welders Certification" in accordance with AWS QC-3, D1.3, for employees performing welding operations on hollow metal for this project.
3. Qualified manufacturers shall have a minimum of ten (10) consecutive years of experience regularly and successfully producing hollow metal of the type required for this project. This experience shall be substantiated by a list of representative projects for which the manufacturer has supplied security hollow metal including dates of the project completion.
4. Qualified manufacturers shall have tested frame and door construction specified in sections 2.01 and 2.03 within the last two (2) years, in accordance with Section 1.06 "Testing and Performance" and successfully met the performance criteria of the same. This qualification shall be substantiated by an independent laboratory test report in accordance with Section 1.06 "Testing and Performance" as specified herein.
5. Qualified manufacturers shall present a copy of their "Certificate of Registration" certifying that the manufacturer's Quality System is in conformance with, and functions as required under ISO-9001: 2015. The manufacturer's registrar shall be a nationally recognized, independent and accredited registrar, which provides periodic factory follow up surveillance audits assuring the manufacturer's continuing compliance with their certified Quality System.

B. Quality Criteria

1. All door and frame construction shall be in accordance with construction of assemblies that meet the requirements of Section 1.06 "Testing and Performance".
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. Fire rated doors and frames shall be provided for those openings indicated in the schedule as requiring fire protection ratings. Such doors and frames shall be constructed as tested in accordance with UL-10C or NFPA-252 and labeled by a recognized testing agency having a factory follow up inspection service.
  - a. All stair well doors shall be 1 ½ hour fire rated under UL-10 (C), and shall be additionally rated for 450 degree F. (232 degree C.) maximum temperature rise on the unexposed side for the first 30 min. of fire exposure. This requirement applies to both security and non-security doors.

## **1.08 SUBMITTALS**

### **A. Submittal Drawings**

1. Show door and frame elevations, sections and construction.
2. Show listing of opening descriptions including quantities, gages, locations, and anchors.
3. Identify materials on the submittal such that they may be referenced by markings used on the contract drawings.
4. Indicate Performance Grade levels on the submittal as they are shown on the contract drawings and in the door schedule.

### **B. Submit samples as follows, upon the request of the Architect:**

1. Door: 1 ft. 0 in. x 1 ft. 0 in. (304 mm x 304 mm) corner section with hinge preparation showing top and internal construction.
2. Frame: 1 ft. 0 in. x 1 ft. 0 in. (304 mm x 304 mm) corner section showing weld joint of head to jamb. Include hinge mortise, reinforcement and mortar guard in one rabbet, and glazing stop applied as specified in the opposite rabbet. Glazing stop shall be applied to both head and jamb section to show corner joint.
3. 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 downgrading of quality demonstrated by comparison with the samples may be cause for rejection of the work.

### **C. It shall be the direct responsibility of the hollow metal manufacturer to furnish to the General Contractor guaranteed clear opening sizes where glass and/or panels are indicated on the drawings within 2 weeks after the subject frames/doors have been detailed for production.**

*Architect's Note: 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."*

## **1.09 WARRANTY**

All hollow metal work shall be warranted from defects in workmanship and quality for a period of one (1) year from shipment.

## **1.10 ACCEPTABLE MANUFACTURERS**

Habersham Metal Products, Co. – Cornelia, GA – Phone: 706.778.2212, Fax: 706.778.2769  
Website: [www.habershammetal.com](http://www.habershammetal.com)

## PART 2 - PRODUCTS

### 2.01 HOLLOW METAL DOORS

#### A. Materials

1. Doors shall be constructed of commercial quality, level, cold-rolled steel conforming to ASTM A1008 / A1008M or hot rolled, pickled and oiled steel conforming to ASTM A1011 / A1011M. The steel shall be free of scale, pitting, coil breaks or other surface blemishes. The steel shall also be free of buckles, waves or any other defects caused by the use of improperly leveled sheets.
2. Exterior Doors: Face sheets shall be 14 Ga., 0.067 in., 1.7 mm or 12 Ga., 0.093 in., 2.3 mm minimum thickness as indicated in the schedule, and shall have a zinc coating applied by the hot-dip process conforming to ASTM A 653/A 653M, Coating designation A60.
3. Interior Doors: Face sheets shall be 14 Ga., 0.067 in., 1.7 mm or 12 Ga., 0.093 in., 2.3 mm minimum thickness, as indicated in the schedule. Where scheduled, face sheets of interior doors shall have a zinc coating conforming to ASTM A 653/A 653M, Coating designation A60.
4. For severely corrosive conditions and where specified for individual openings either interior or exterior: Doors shall be 14 Ga., 0.067 in., 1.7 mm or 12 Ga., 0.093 in., 2.3 mm minimum thickness as indicated in the schedule, and shall be stainless steel meeting ASTM A 666, Type #304.

#### B. Construction:

1. All doors shall be of the types, sizes, and grades shown in the contract documents and on the approved submittal drawings. Doors shall be constructed in accordance with these specifications and as tested in accordance with the applicable performance requirements of Section 1.06.
2. Door thickness shall be 2 in. (51 mm) minimum. Doors shall be neat in appearance and free from warpage and buckle. Edge bends shall be true and straight and of minimum radius for the material used.
3. Door face sheets shall be joined at their vertical edges by a continuous weld extending the full height of the door. After welding, edge seams shall be ground, filled and finished flush in order to completely conceal the seams. Edge seam continuous welding shall comply with the definitions in the Glossary of Terms for Hollow Metal Doors and Frames, ANSI/NAAMM/HMMA-801. See “weld, continuous” and “welded, continuously”. Exposed seams on the vertical edges or faces of doors shall not be permitted.
4. Doors shall be stiffened as follows:
  - a. Rolled or formed 18 Ga., 0.042 in., 1.0 mm steel “hat” channels extending from top to bottom of panel and continuous from one face to the other, spaced horizontally not more than 4 in. (102 mm) apart, and shall be spot welded to both panel faces not more than 3 in. (76 mm) O.C. vertically. The use of rolled or formed steel shapes or other core material composed of less than 18 Ga., 0.042 in., 1.0 mm steel is not permitted.
5. A continuous steel channel shall reinforce the vertical edges, not less than 10 Ga., 0.123, 3.1 mm thickness extending the full height of the door. Channel which is notched or broken at the hinge mortises shall not be acceptable. Non-continuous channel at the lock edge shall be acceptable only to accommodate hardware options. In such cases, hardware reinforcements shall be welded to the channel such that they become an integral part of the channel. The top and bottom edges shall be closed with a continuous channel not less than 10 Ga., 0.123, 3.1 mm thickness. The vertical channels shall be spot welded 3 in. (76 mm) o.c. The 10 Ga., 0.123, 3.1 mm closing end channel shall be spot welded to both face sheets 3 in. (76 mm) o.c. maximum and continuously welded to the vertical reinforcing channel at all four corners producing a fully welded perimeter reinforcing channel.

6. The end channels shall be fitted with an additional flush closing channel of not less than 12 Ga., 0.093 in., 2.3 mm thickness. The flush closing channel shall be welded in place at the corners with continuous welds and 1 in. (25.4 mm) long welds, 12 in. (304 mm) o.c. maximum along the length, on both sides. Installation of closing channel using screws, security or otherwise, shall be unacceptable. The end channel and flush closing channel shall be installed so they are permanent and non-removable.
7. Edge profiles shall be provided on both vertical edges of doors as follows:
  - Single acting doors - beveled 1/8 in. (3.2 mm) in 2 in. (51 mm) profile
8. Hardware reinforcements:
  - a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where surface mounted - anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated mortised hardware - is to be applied, doors shall be reinforced and all drilling and tapping shall be done by others in the field.
  - b. Minimum thickness of hardware reinforcements shall be as follows:
    - Full mortise hinges and pivots - 7 Ga., 0.167 in., 4.2 mm
    - Surface applied food pass hinges - 7 Ga., 0.167 in., 4.2 mm
    - Strike reinforcements - 7 Ga., 0.167 in., 4.2 mm
    - Reinforcements for slider device hanger attachment - per device manufacturer's recommendations
    - Reinforcements for lock fronts, concealed holders, or surface mounted closer - 12 Ga., 0.093 in., 2.3 mm
    - Internal reinforcements for all other surface applied hardware - 12 Ga., 0.093 in., 2.3 mm
  - c. Hinge and pivot reinforcements shall consist of a press formed 7 Ga., 0.167 in., 4.2 mm angle which is projection welded in 6 places to the face of the door and additionally plug welded at each end to the opposite door face sheet forming a rigid structural angle reinforcement at each hinge. All reinforcements for mortised hardware occurring in the door edge shall be securely welded to both face sheets of the door. Flat or offset hinge reinforcements welded to the inside edge of the door or to perimeter edge channel which has been notched or cut to accommodate hinge mortise shall be unacceptable.
  - e. Where electrically operated hardware is required, and as shown on approved submittal drawings, hardware enclosures and junction boxes for doors shall be provided and shall be interconnected using U.L. approved ½ in. (13 mm) conduit, elbows, and connectors. Also, where shown on approved submittal drawings, junction boxes with access plates shall be provided to facilitate the proper installation of wiring. Access plates shall be the same gage as the door and fastened with a minimum of four 8-32 torx drive tamper resistant screws, not to exceed 6 in. (152 mm) o.c.
9. Glass moldings and stops:
  - a. Where specified, doors shall be provided with steel moldings to secure glazing by others, in accordance with glass sizes and thicknesses provided by the contractor and shown on approved submittal drawings.

- b. Fixed glazing molding shall be not less than 12 Ga., 0.093 in., 2.3 mm, and shall be spot welded to both face sheets 3 in. (76 mm) o.c. maximum.
  - c. Removable glazing stop in hollow metal doors shall be pressed steel angle, not less than 10 Ga., 0.123 in., 3.1 mm thickness. Angle stops shall be notched and tight fitting at the corner joints, and secured in place using 1/4-20, SAE grade #8, button head, tamper resistant screws, spaced 6 in. (152 mm) o.c. maximum. Glazing stops and screws shall satisfy the performance criteria outlined in Section 1.06.B.
  - d. Where glass thickness dictates, 12 Ga., 0.093 in., 2.3 mm offset surface mounted glazing stop shall be used. The corners shall be tight fitting, welded and ground smooth. The glass stop shall be secured to the face of the door using 1/4-20, SAE grade #8, button head, tamper resistant screws, spaced 6 in. (152 mm) o.c. maximum.
  - e. The metal surfaces to which glazing stops are secured and the inside of the glazing stops shall be chemically treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door.
10. Louvers shall be of the welded inverted “V” type construction providing free air delivery as specified. A rectangular louver shall not exceed 18 in. (457 mm) in width without being reinforced at its midpoint by a vertical steel bar not less than 3/4 in. (19 mm) in diameter . The inverted “V” type vanes shall be not less than 12 Ga., 0.093 in., 2.3 mm and shall be spaced so that no rigid flat instrument can be passed through them. Insect screens and/or flattened expanded metal not less than 12 Ga., 0.093 in., 2.3 mm shall be provided on louvered doors in exterior locations where shown on approved submittal drawings.
13. Stainless steel doors and panels shall be manufactured using fabrication and finishing methods outlined in ANSI/NAAMM/HMMA-866, for “moderately corrosive” conditions (P. 2.01.A.3 Note), and using “steel stiffened” construction (P. 2.01.B.4.a). Stainless steel doors and panels shall also be manufactured using the same fabrication methods and material thicknesses outlined in ANSI/NAAMM/HMMA-863 and in this specification, for the security grade levels specified for the individual openings.

## 2.02 HOLLOW METAL FRAMES

### A. Materials

- 1. Frames shall be constructed of commercial quality, cold rolled steel conforming to ASTM A 366/A 366M or hot rolled, pickled and oiled steel conforming to ASTM A 569/A 569M. The steel shall be free of scale, pitting, coil breaks or other surface defects.
- 2. Exterior openings: Steel for these openings shall be 12 Ga., 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, Coating designation A60.
- 5. Interior openings: Steel for these openings shall be 12 Ga., 0.093 in., 2.3 mm minimum thickness. Where scheduled, interior frames shall have a zinc coating conforming to ASTM A 653/A 653M, Coating designation A60.
- 6. For severely corrosive conditions and where specified for individual openings either interior or exterior: frames shall be 14 Ga., 0.067 in., 1.7 mm or 12 Ga., 0.093 in., 2.3 mm minimum thickness as indicated in the schedule, and shall be stainless steel meeting ASTM A 666, Type #304.

B. Construction:

1. All frames shall have integral stops and be welded units of the sizes and types shown in the contract documents and on the approved submittal drawings. Frames shall be constructed in accordance with these specifications and as tested in accordance with applicable performance criteria specified in Section 1.06.
2. All finished work shall be neat in appearance, square, and free of defects, warp or buckle. 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 contract drawings and as shown on the approved submittal drawings.
4. Corner joints shall have all contact edges closed tight with faces mitered and stops butted. Corner joints shall be continuously welded and faces finished smooth. The use of gussets or splice plates shall not be acceptable.
5. Minimum height of stops in door openings shall be 5/8 in. (15.8 mm). Height of stops in security glass or panel openings shall be as shown on approved submittal drawings. Cut-off (sanitary type) stops, where scheduled, shall be capped as detailed on the contract drawings at the heights shown. Meeting edges of jambs below cut-off stops shall be free of burrs and tightly joined to form a smooth hairline joint. Welds shall be concealed.
6. 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 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 height of the stop and shall be left neat and uniform in appearance.
7. When shipping limitations dictate, frames for large openings shall be fabricated in sections designed for assembly in the field by others. Alignment plates or angles shall be installed at the corners of the profile, and shall extend at least 4 in. (102 mm) on either side of the joint. Such components shall be the same gage as the frame. Field joints shall be made in accordance with the approved submittal drawings. The contractor responsible for installation shall provide for welding and finishing all field joints between faces of abutted members.
8. Hardware Reinforcement and Preparation:
  - a. Frames shall be mortised, reinforced, drilled and tapped for all templated mortised hardware only, in accordance with the final approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware - anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated mortised hardware - is to be applied, frames shall be reinforced, and all drilling and tapping shall be done by others in the field.
  - b. Minimum thickness of hardware reinforcing plates shall be as follows:

Hinge and pivot reinforcements - 7 Ga., 0.167 in., 4.2 mm x 1-1/2 in. (38 mm) x 10 in. (254 mm) long

Surface applied maximum security door hinges – 0.240 in., 6.0 mm

Strike reinforcements - 7 Ga., 0.167 in., 4.2 mm

Closer reinforcements - 7 Ga., 0.167 in., 4.2 mm

Flush bolt reinforcements - 7 Ga., 0.167 in., 4.2 mm

Reinforcements for surface applied hardware - 12 Ga., 0.093 in., 2.3 mm

- c. Hinge and pivot reinforcements shall consist of 7 Ga., 0.167 in., 4.2 mm x 1-1/2 in. (38 mm) x 10 in. (254 mm) long straps spot welded in three places in a triangular pattern at each end for a total of six welds per hinge. All hinge reinforcements shall be additionally reinforced by a 7 Ga., 0.167 in., 4.2 mm x 1-1/2 in. (38 mm) wide angle welded in two places to the strap reinforcement and two places to the inside face of the frame to prevent possible twisting and deformation of the reinforcement while in use. Tapped holes in reinforcements shall be protected by a 26 Ga., 0.016 in., 0.4 mm minimum thickness grout guard which is welded in place and made grout tight.
  - d. In cases where electrically operated hardware is required, and as shown on approved submittal drawings, hardware enclosures and junction boxes for frames shall be provided, and shall be interconnected using UL approved 3/4 in. (19 mm) EMT conduit, elbows, and connectors. Also, where shown on submittal drawings, junction boxes with access plates shall be provided to facilitate the proper installation of wiring. Access plates shall be the same gage as the frame and fastened with a minimum of four 8-32 torx drive tamper resistant screws, not to exceed 6" o.c.
  - e. Conduit runs around frame section joints shall be 3/4 in. (19 mm) U.L. approved EMT to facilitate unrestricted wire feed. Where meeting sections permit, conduit shall be bent at a 2 in. (51 mm) minimum radius at turns, and shall provide minimum radius and cross sectional area equivalent to 1/2 in. (13 mm) EMT at every point along the turn. Where narrow profiles prevent bending conduit, turns shall be fabricated using 90-degree sweep elbows. Short 90-degree elbows are permitted only at entrances to junction boxes, which allow adequate hand access and not in conduit runs. Conduit fittings shall be U.L. approved and either compression type or a combination of compression and threaded type.
9. Grout guards shall be provided at all hardware preparations, glazing stop screws and silencer preparations. Grout guards shall be sufficient to protect preparations from grout of a 4 in. (102 mm) maximum slump consistency, which is hand troweled into place.
- a. Grout guards for glazing screws shall be tight fitting plastic caps covering 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 steel grout guards welded in place.
  - b. Silencer preparations shall be protected by steel grout guards where accessible from the frame throat. Where limited access prevents installation of metal grout guards in mullions, silencers shall be factory furnished and installed.
10. Floor Anchors:
- a. Floor anchors provided with two holes for fasteners shall be secured inside jambs with four (4) spot welds per anchor minimum.
  - b. Where scheduled, adjustable floor anchors, providing not less than 2 in. (51 mm) height adjustment, shall be secured inside jambs with four (4) spot welds per anchor minimum.
  - c. Material thickness of floor anchors shall be the same as frame.
11. Jamb Anchors:
- a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the strap and stirrup type made from the same gage steel as the frame. Straps shall be not less than 2 in. (51 mm) x 10 in. (254 mm) in size and perforated. The number of anchors provided on each jamb shall be as required by blast engineering documentation. As a minimum 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 3 ft. 0 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 4 ft. 6 in. (1372 mm), spaced at 18 in. (457 mm) maximum between anchors (fire ratings may require additional anchors).

b. Embedment Masonry Type

1. Frames for installation in pre-finished masonry or concrete openings shall be provided with removable faces at the jambs, and 7 Ga., 0.167 in., 4.2 mm x 2 in. (51 mm) x 2 in. (51 mm) angle anchors 4 in. (102 mm) long spaced as described in Paragraph 2.02B.11.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 7 Ga., 0.167 in., 4.2 mm x 2 in. (51 mm) x 2 in. (51 mm) angle anchors 4 in. (102 mm) long welded in place at locations to match angle anchors in frames as required by blast engineering documentation. The embed plate shall be provided with two #4 re-bar wall anchors 10 in. (254 mm) long minimum, with 2 in. (51 mm) x 90 degree turn down on ends continuously welded in place, and spaced as described in Paragraph 2.03.B.11.a. Embedments shall be prime painted in accordance with Paragraph 2.06.
3. Angle anchors shall each be secured to jamb and to embed plate with two 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 until the frame anchors contact and match the embedded anchors. The contractor responsible for installation shall field weld all anchors and install the jamb faces in place. Embedment anchoring details shall be provided on approved submittal drawings.

c. Expansion Bolt Type

1. Frames for installation in existing masonry or concrete walls shall be prepared for expansion bolt type anchors as required by blast engineering documentation. The preparation shall consist of a countersunk hole for a 3/8 in. (9.5 mm) diameter bolt and a spacer from the unexposed surface of the frame to the wall. The spacer shall be welded to the frame and the preparation spaced as described in Paragraph 2.03.B.11.a.
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.

d. 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. Frames indicated to be installed in prefinished openings and required to have jambs grouted shall be provided with grout holes at each jamb to allow for grouting after installation.

- a. Grout holes shall consist of a 1-1/4 in. (32 mm) square hole in the face of each jamb at the top of the frame. The square hole shall be backed up by a plate with a 1-1/4 in. (32 mm) round hole to allow for grouting. Frames shall be furnished with plugs to be installed by the responsible contractor after grouting. Plugs shall be welded in place and finished smooth.

- b. Precautions shall be taken by the installation contractor to protect all frame preparations from grout leakage resulting from the use of a light consistency grout (greater than a 4 in. (102 mm) slump).
13. All frames shall be provided with two temporary steel spreaders welded to the bottom of the jambs to serve as bracing during shipping and handling. Spreaders shall be removed prior to installation.
14. Removable glazing stops:
- a. Removable glazing stop in hollow metal frames shall be pressed steel angle, not less than 10 Ga., 0.123 in., 3.1 mm thickness. Angle stops shall be notched and tight fitting at the corner joints, and secured in place using 1/4-20, SAE grade #8, button head, tamper resistant screws, spaced 6 in. (152 mm) o.c. maximum. Glazing stops and screws shall satisfy the performance criteria outlined in Section 1.06.B.
  - b. The metal surfaces to which glazing stops are secured and the inside of the glazing stops shall be chemically treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the frame.
15. Stainless steel frames shall be manufactured using fabrication and finishing methods outlined in ANSI/NAAMM/HMMA-866, for “highly corrosive” conditions (P.2.03.A.3-Note). Stainless steel frames shall also be manufactured using the same fabrication methods and material thicknesses outlined in ANSI/NAAMM/HMMA-863, and in this specification, for the grade levels specified for individual openings.

**2.04 CLEARANCES AND TOLERANCES**

A. Edge clearances for swinging doors shall not exceed the following:

- 1. Between doors and frames at head and jambs:.....1/8 in. (3.2 mm)
- 2. Between edges of pairs of doors:..... 1/8 in. (3.2 mm)
- 3. At door sills where a threshold is used:.....3/8 in. (6.4 mm)
- 4. At door sills where no threshold is used:.....3/4 in. (19 mm)
- 5. Between door bottom and nominal surface of floor coverings at fire rated openings as provided in ANSI/NFPA 80..... 1/2 in. (13 mm)

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

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

1. Frames for single or pair of doors:

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

Height (total length of jamb rabbet):.....Nominal opening height +/- 3/64 in. (1.1 mm)

Cross sectional profile dimensions:

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

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

Rabbet.....	+/- 1/32 in. (0.8 mm)
Depth .....	+/- 1/32 in. (0.8 mm)
Throat.....	+/- 1/16 in. (1.6 mm)

Frames overlapping walls to have throat dimension 1/8 in. (3.2 mm) greater than dimensioned wall thickness to accommodate irregularities in wall construction.

2. Doors:

Width .....	+/- 3/64 in. (1.1 mm)
Height .....	+/- 3/64 in. (1.1 mm)
Thickness .....	+/- 1/16 in. (1.6 mm)
Hardware Cutout Dimensions -Template Dimensions + 0.015 (0.38 mm), “-0”	
Hardware Location .....	+/- 1/32 in. (0.8 mm)
Edge Flatness .....	+/- 1/16 in. (1.6 mm)
Surface Flatness .....	+/- 1/8 in. (3.1 mm)

**2.05 HARDWARE LOCATIONS**

A. The location of hardware on doors and frames shall be as listed below. All dimensions except the hinge locations are referenced from the finished floor as defined in Paragraph 2.04.A. When hollow metal frames only are specified for use with doors to be furnished by others, the hardware preparation on the door is to be governed by its location on the frame. The door supplier is responsible for coordinating hardware locations.

B. Hinges:

Top.....5 in. (127 mm) from frame head to top of hinge

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

Intermediate.....Centered between top and bottom hinges

Locks and latches.....40-5/16 in. (1024 mm) to centerline of strike

Deadlocks.....48 in. (1219 mm) to centerline of strike

Exit hardware.....38 in. (965 mm) to centerline of cross bar

Door pulls.....42 in. (106 mm) to centerline of grip

Push/pull bars.....42 in. (106 mm) to centerline of bar

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

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

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

**2.06 FINISH**

After fabrication, all tool marks and surface imperfections shall be filled and sanded as required to make exposed surfaces smooth and free from irregularities. After appropriate metal preparation, all exposed surfaces of doors and frames shall receive a factory applied rust inhibitive primer which meets or exceeds the performance requirements of Section 1.06.E. Primer must be fully cured prior to shipment.

**PART 3 - EXECUTION**

**3.01 SITE STORAGE AND PROTECTION OF MATERIALS**

The Contractor responsible for storage and installation shall perform the following in accordance with HMMA-840 “Installation and Storage of Hollow Metal Doors and Frames.”

- A. The contractor responsible for storage and installation shall remove wraps or covers from doors and frames upon delivery at the building site. The contractor responsible for installation shall see that any scratches or disfigurement caused in shipping or handling are promptly sanded smooth, cleaned and touched up with a compatible rust inhibitive primer.
- B. The contractor responsible for storage and installation shall see that materials are properly stored on planks in a dry location. Doors shall be stored in a vertical position and spaced by blocking. Materials shall be covered to protect them from damage but in such a manner as to permit air circulation.

**3.02 INSTALLATION**

The Contractor responsible for installation shall perform the following in accordance with HMMA-840 “Installation and Storage of Hollow Metal Doors and Frames.”

- A. Prior to installation, all frames shall be checked for size, swing, and with temporary spreaders removed, corrected for squareness, alignment, twist and plumbness. Permissible installation tolerances shall not exceed the following:

Squareness ..... +/- 1/16 in. (1.6 mm) measured on a line, 90 degrees from one jamb, at the upper corner of the other jamb

Alignment ..... +/- 1/16 in. (1.6 mm) measured on jambs on a horizontal line parallel to the plane of the wall.

Twist: ..... +/- 1/16 in. (1.6 mm) measured on jambs on horizontal lines perpendicular to the plane of the wall.

Plumbness: ..... +/- 1/16 in. (1.6 mm) measured on the jamb from the head to floor.

These tolerances provide a guideline for proper installation of hollow metal frames. The cumulative affect of the tolerances at their maximum levels will result in sufficient misalignment to prevent the door from functioning properly. Installers should take care not to create a tolerance buildup. Tolerance buildup occurs when more than one dimension is at or near its 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, glazing stop screws, and junction boxes are intended to protect hardware mortises, tapped mounting holes, and exposed removable screws 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 when tested in accordance with ASTM C 143) is to be used, special precautions shall be taken in the field by the installation contractor to provide protection from grout.

*Architect’s Note: Frames shall not be used as forms for grout or concrete. Grouting of hollow metal frames shall be done in “lifts”, or precautions shall be otherwise taken by the contractor to insure that frames are not deformed or damaged by this process.*

- C. Proper door clearances shall be maintained in accordance with 2.04 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. Hollow metal surfaces shall be kept free of grout, tar, or other bonding material or sealer.

- F. Primed or painted surfaces which have been scratched or otherwise marred during installation (including field welding) and/or cleaning shall promptly be finished smooth, cleaned, treated for maximum paint adhesion and touched up with a rust inhibitive primer.

**END OF SECTION**