HOLLOW METAL MANUAL

AMERICAN NATIONAL STANDARD

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METAL DOORS & FRAMES

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GUIDE SPECIFICATIONS FOR DETENTION SECURITY HOLLOW METAL DOORS AND FRAMES

FIFTH EDITION

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January 26, 2005

8d

METAL DOORS & FRAMES

HMMA
HOLLOW METAL MANUFACTURERS ASSOCIATION

A Division of
NAAMM
NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS

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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.

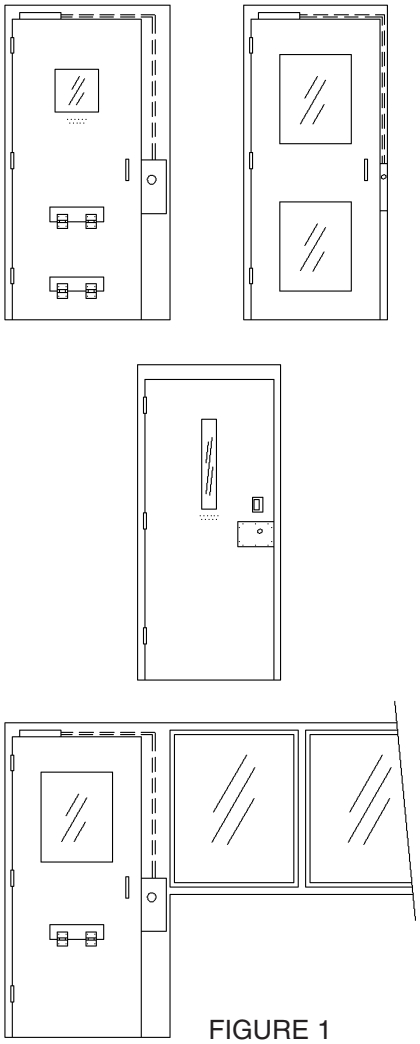

FIGURE 1
Typical Door Elevations

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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.

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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.

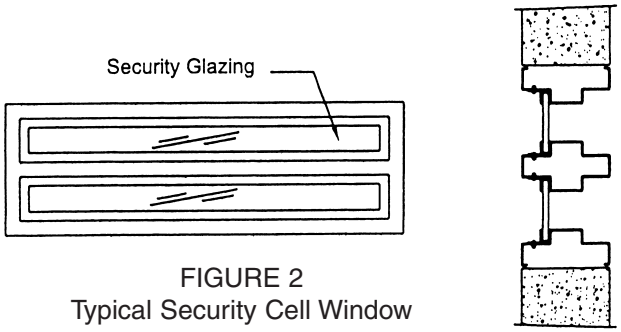

FIGURE 2
Typical Security Cell Window

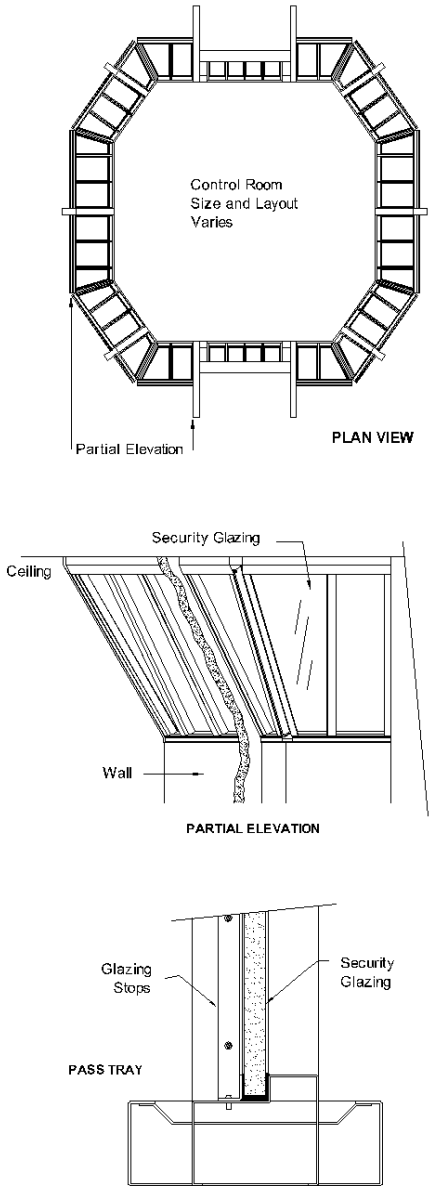

FIGURE 3
Typical Control Room Details

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.

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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.

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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.

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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.

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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] [1 1/2 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] [1 1/2 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] [1 1/2 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

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