
USACE / NAVFAC / AFCEA UFGS-08710 (February 2002)

Preparing Activity: NAVFAC Superseding
UFGS-08710 (August 2001)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags

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DIVISION 08 - DOORS AND WINDOWS

SECTION 08710

DOOR HARDWARE

02/02

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SECTION 08710

DOOR HARDWARE 02/02

NOTE: This guide specification covers the requirements for finish hardware for permanent structures.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: All items of finish hardware necessary for completion of the project and not specified in other sections should be included in this section.

NOTE: On the drawings, show:

1. Location, class, and hourly rating of fire doors;
2. Location and installation details for blocking behind door stops (wall bumpers) mounted on wallboard partitions; and
3. Either hardware set numbers (HW-2, etc.) in the door schedule, or list doors by number in each hardware set.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E 283 (2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM F 883 (2004) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1 (2000) Butts and Hinges

BHMA A156.12 (1999) Interconnected Locks & Latches

BHMA A156.13 (2002) Mortise Locks & Latches, Series 1000

BHMA A156.15 (2001) Closer Holder Release Devices

BHMA A156.16 (2002) Auxiliary Hardware

BHMA A156.17 (2004) Self Closing Hinges & Pivots

BHMA A156.18 (2000) Materials and Finishes

BHMA A156.2 (2003) Bored and Preassembled Locks and Latches

BHMA A156.21 (2001) Thresholds

BHMA A156.22 (2003) Door Gasketing and Edge Seal Systems

BHMA A156.3 (2001) Exit Devices

BHMA A156.4 (2000) Door Controls - Closers

BHMA A156.5 (2001) Auxiliary Locks & Associated Products

BHMA A156.6 (2001) Architectural Door Trim

BHMA A156.7 (2003) Template Hinge Dimensions
BHMA A156.8 (2000) Door Controls - Overhead Holders
and Holders

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2003) Life Safety Code
NFPA 80 (1999) Fire Doors and Fire Windows

STEEL DOOR INSTITUTE (SDI)

SDI 100 (1998) Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 14C (1999) Swinging Hardware for Standard
Tin-Clad Fire Doors Mounted Singly and in
Pairs

UL Bld Mat Dir (2004) Building Materials Directory

1.2 SUBMITTALS

NOTE: Submittals must be limited to those necessary
for adequate quality control. The importance of an
item in the project should be one of the primary
factors in determining if a submittal for the item
should be required.

A "G" following a submittal item indicates that the
submittal requires Government approval. Some
submittals are already marked with a "G". Only
delete an existing "G" if the submittal item is not
complex and can be reviewed through the Contractor's
Quality Control system. Only add a "G" if the
submittal is sufficiently important or complex in
context of the project.

For submittals requiring Government approval on Army
projects, a code of up to three characters within
the submittal tags may be used following the "G"
designation to indicate the approving authority.
Codes for Army projects using the Resident
Management System (RMS) are: "AE" for
Architect-Engineer; "DO" for District Office
(Engineering Division or other organization in the
District Office); "AO" for Area Office; "RO" for
Resident Office; and "PO" for Project Office. Codes
following the "G" typically are not used for Navy
projects.

Submittal items not designated with a "G" are
considered as being for information only for Army
projects and for Contractor Quality Control approval
for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Hardware schedule; G, [_____]

Keying system

SD-03 Product Data

Hardware items; G, [_____]

NOTE: For special hardware items requiring shop drawings, add submittal requirement for SD-04, Drawings. Do not require shop drawings for standard commercial hardware.

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1; G, [_____]

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Key bitting

1.3 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hard- ware Item	Quan- tity	Size	Reference Publi- cation Type No.	Finish	Mfr. Name and Catalog No.	Key Con- trol Symbols	UL Mark (If fire rated and listed)	BHMA Finish Designa- tion
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1.4 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- Complete listing of all keys (AA1, AA2, etc.).
- Complete listing of all key cuts (AA1-123456, AA2-123458).

- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.5 QUALITY ASSURANCE

1.5.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, [pivots,] and closers of one lock, hinge, [pivot,] or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.6 DELIVERY, STORAGE, AND HANDLING

NOTE: Whenever construction master keying is required, permanent keys (and removable cores) should be sent directly to the Contracting Officer.

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown in hardware schedule. [Deliver permanent keys [and removable cores] to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.]

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware to be applied to metal [or to prefinished doors] shall be made to template. Promptly furnish template information or templates to door and frame manufacturers. Template hinges shall conform to BHMA A156.7. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." [Swinging hardware for tin-clad fire doors shall conform to UL 14C.] Such hardware shall bear the label of Underwriters Laboratories, Inc., and be listed in UL Bld Mat Dir or labeled and listed by another testing laboratory acceptable to the Contracting Officer.

2.3 HARDWARE ITEMS

NOTE: It is essential for the specifier to have current editions of the BHMA standards, available from Builders Hardware Manufacturers Association, 60 East 42nd Street, New York, New York 10165. The specifier should also have publications of the Door and Hardware Institute (DHI), 7711 Old Springhouse

Road, McClean, Virginia 22102-3474, for guidance in selecting and scheduling finish hardware.

NOTE: For projects at Camp Lejeune:

1. Specify Series 4000, Grade 1, locks and latches with 70 mm 2 3/4 inch backset.
2. Specify interchangeable cores with seven pin tumblers.
3. Specify "All locks shall have interchangeable cores by Best Lock Corp., Arrow Lock Corp., Falcon Lock, or Eagle."
4. For offices, entrances, classrooms, and maintenance shops, specify lock function F81, unless F82 or F84 is more appropriate.
5. For mechanical rooms and pipe chases, specify lock function F86 (storeroom lock, outside knob always rigid).
6. For sleeping room doors, specify one deadbolt, E2151, with concealed mounting screws, and one latchset, F75.
7. For BEQs, require a separate master keying system for each floor of each building.

Hinges, pivots, locks, latches, exit devices, bolts, and closers shall be clearly and permanently marked with the manufacturer's name or trademark where it will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

NOTE: Use full-mortise (butt) hinges except where special types are required. Use swing-clear hinges where necessary to keep door opening completely clear when door is opened 90 to 95 degrees. Use wide-throw hinges where necessary to keep door leaf clear of wall, casings, jambs, or reveals. Use antifriction-bearing hinges on high-frequency or extra-heavy doors, and on doors equipped with closers. Use plain-bearing hinges on low-frequency doors up to 900 mm 3 feet wide and without closers. Use hospital tips in neuropsychiatric areas of medical facilities. In general, full-mortise hinges for interior doors should be steel with BHMA 600 finish (primed for painting). Hinges on natural wood or plastic surfaced interior doors should be steel with BHMA 652 finish (satin chromium plated) or BHMA 639 finish (satin bronze plated) to match finish of other door hardware. Hinges for exterior

doors should be stainless steel with BHMA 630 finish or solid brass or bronze with BHMA 626 finish. Plated steel hinges may rust if used on exterior doors. Use two hinges for doors [1500 mm] [60 inches] or less in height and one additional hinge for each additional 750 mm 30 inches (or fraction thereof) of door height.

Hinge Sizes Chart

Thickness of Doors in Millimeters	Width of Doors in Millimeters	Height of Hinge (Length of Joint) in Millimeters
22 to 29 screen	To 915	76
35	To 815	89
35	Over 815 to 940	102
44	To 915	114
44	Over 915 to 1220	127 Heavy Weight
44	Over 1220	152 Heavy Weight
51, 57, and 64	To 1065	127 Heavy Weight
51, 57, and 64	Over 1065	152 Heavy Weight

Hinge Sizes Chart

Thickness of Doors in Inches	Width of Doors in Inches	Height of Hinge (Length of Joint) in Inches
7/8 to 1 1/8 screen	To 36	3
1 3/8	To 32	3 1/2
1 3/8	Over 32 to 37	4
1 3/4	To 36	4 1/2
1 3/4	Over 36 to 48	5 Heavy Weight
1 3/4	Over 48	6 Heavy Weight
2, 2 1/4 and 2 1/2	To 42	5 Heavy Weight
2, 2 1/4 and 2 1/2	Over 42	6 Heavy Weight

1. Select and size hinges for lead-lined, unusually heavy, and high-frequency doors on an individual basis.

2. The 114 by 114 mm 4 1/2 by 4 1/2 inches listed is for 44 mm 1 3/4 inch doors up to 915 mm 3 feet wide and with up to 20 mm 3/4 inch trim projection, and covers the majority of openings. For other doors, determine hinge width in accordance with:

Twice the door thickness plus trim projection, minus 13 mm 1/2 inch, or $2(t+p) - 1/2$. If answer falls between regular hinge sizes, use nearest larger size. Formula is for hinges set back 6 mm 1/4 inch from edge of door.

BHMA A156.1, 114 by 114 millimeters 4 1/2 by 4 1/2 inches unless otherwise specified. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.3.2 Pivots

NOTE: For extra heavy doors, pivots are sometimes preferable to hinges, particularly on entrance doors and lead-lined doors. See BHMA A156.4 and manufacturers' literature for types available.

BHMA A156.4.

2.3.3 Spring Hinges

NOTE: Use spring hinges only where closers are not practicable and for gates at counters. Ensure that specified spring hinges are large enough and strong enough to serve their purpose adequately. See BHMA A156.17 for types available. See manufacturers catalogs for recommendations on sizes, quantities, and styles of spring hinges.

BHMA A156.17.

2.3.4 Locks and Latches

NOTE: Specify Series 1000, in paragraph entitled "Mortise Locks and Latches," for hollow metal doors where security is a major factor. See BHMA A156.13, Appendix A, Users' Guide, for guidance on Security Grades.

For Bachelor Enlisted Quarters (BEQ) sleeping room doors, use heavy-duty pushbutton combination locks with keyed cylinder bypass (such as Simplex Securities Systems, Inc., Unican 1000 series); Grade 1 mortise locks (Series 1000), function F13, with removable-core cylinders; or a deadbolt, E2151, with interchangeable core and a latchset, F75. Check with activity housing managers to determine preference.

For doors between sleeping room and shared bath, use a privacy lock, F76, Grade 1, and a deadlock, E0151 (key x thumbturn) keyed like the sleeping room entrance door and with the key on the bathroom side.

NOTE: Choose the applicable paragraph(s) from the following.

2.3.4.1 Mortise Locks and Latches

BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2.

[Provide factory-installed lead lining in locks for lead-shielded doors.]
[Provide mortise locks with escutcheons not less than 178 by 57 mm 7 by 2 1/4 inches with a bushing at least 6 mm 1/4 inch long. Cut escutcheons to suit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges.] Knobs and roses of mortise locks shall have screwless shanks and no exposed screws.

2.3.4.2 Bored Locks and Latches

BHMA A156.2, Series 4000, Grade 1. [Provide factory-installed lead lining in locks for lead-shielded doors.]

2.3.4.3 Residential Bored Locks and Latches

NOTE: For temporary buildings and family housing only. Delete if not applicable. See BHMA A156.2 for types available.

BHMA A156.2, Series 4000, Grade 2. Locks for exterior doors shall have threaded roses or concealed machine screws.

2.3.4.4 [Interconnected Locks and Latches

NOTE: For exterior doors in family housing units only. See BHMA A156.12 and manufacturers' literature for types available.

BHMA A156.12. Provide F96 or F97, unless otherwise specified.]

2.3.4.5 Hospital Latches

Push-pull latchset similar and equal to Glynn-Johnson HL6, 13 mm 1/2 inch throw, [70 mm 2 3/4 inch] [127 mm 5 inch] backset, to fit 161 cutout. Cover approximately 64 by 140 mm 2 1/2 by 5 1/2 inches, handle approximately 38 by 114 mm 1 1/2 by 4 1/2 inches, projection approximately 64 mm 2 1/2 inches, covers and handles of stainless steel, BHMA 630 finish, engraved "PUSH" and "PULL" on handles, push handle pointing up, pull handle pointing down.

2.3.4.6 Auxiliary Locks

NOTE: Delete if not applicable. See BHMA A156.5 for types available.

BHMA A156.5, Grade 1.

2.3.4.7 Combination Locks

Heavy-duty, mechanical combination lockset with five pushbuttons, standard-sized knobs, 20 mm 3/4 inch deadlocking latch, 70 mm 2 3/4 inch backset. Lock shall be operated by pressing two or more of the buttons in unison or individually in the proper sequence. Inside knob shall always operate the latch. Provide a keyed cylinder on the interior to permit setting the combination. [Provide a keyed [removable-core] cylinder on the

exterior to permit bypassing the combination.] [Provide a thumb turn on the interior to activate passage set function, so that outside knob operates latch without using the combination.]

2.3.5 Exit Devices

NOTE: Due to the difficulty in securing exit devices against unauthorized use, they should only be specified where required by NFPA 101. Use single exit doors with locksets in preference to pairs of doors. When pairs are required, specify removable mullions and rim type devices. Vertical rod devices require use of an overlapping astragal and door coordinator for security and fire protection. They should be used only where mullions are unfeasible.

BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. [Touch bars [may] [shall] be provided in lieu of conventional crossbars and arms.] [Provide escutcheons, not less than 178 by 57 mm 7 by 2 1/4 inches.]

2.3.6 Exit Locks With Alarm

BHMA A156.5, Type E0431 (with full-width horizontal actuating bar) for single doors; Type E0431 (with actuating bar) or E0471 (with actuating bar and top and bottom bolts, both leaves active) for pairs of doors, unless otherwise specified. [Provide terminals for connection to remote indicating panel.] [Provide outside control key.]

2.3.7 Cylinders and Cores

NOTE: When an extension of an existing system is required, the manufacturer's name and type of locks should be indicated.

Arrow, Best and Falcon make interchangeable cores which are fully compatible with each other. Corbin, Russwin, Sargent, Schlage, and Yale make locksets which can receive the interchangeable cores made by Arrow, Best, or Falcon. Corbin, Russwin, Sargent, Schlage, and Yale each make their own interchangeable core system which are not compatible with any other manufacturer's system. Specify the system which will best meet the activity's needs without restricting competition.

For projects at Lajes Field, Azores, delete first paragraph; use second paragraph.

For projects in Bermuda, delete first paragraph; use third paragraph.

[Provide cylinders and cores for new locks, including locks provided under other sections of this specification.] Cylinders and cores shall have

[six] [seven] pin tumblers. Cylinders shall be products of one manufacturer, and cores shall be the products of one manufacturer. [Rim cylinders, mortise cylinders, and knobs of bored locksets shall have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.]

[Provide cylinders for new locks, including locks provided under other sections of this specification. Cylinders shall be fully compatible with products of the Best Lock Corporation and shall have interchangeable cores which are removable by a special control key. The cores shall have seven pin tumblers and shall be factory set using the A4 system and F keyway. Submit a core code sheet with the cores. The cores shall be master keyed in one system for this project. Provide construction interchangeable cores.]

[Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Cylinders and cores shall have [six] [seven] pin tumblers. Cylinders shall be interchangeable and fully compatible with products from Best Lock Corp., Arrow Lock Corp., or Falcon Lock which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.]

2.3.8 Keying System

NOTE: Do not require higher levels of master keying than necessary because each level decreases the security of the locks. Specify a construction system where necessary to ensure security after construction is complete.

Provide [a [great] [grand] master keying system] [an extension of the existing keying system. Existing locks were manufactured by [_____] and [do not] have interchangeable cores.] [Provide [a construction master keying system] [construction interchangeable cores].] [Provide key cabinet as specified.]

NOTE: Add the following for Naval Training Center, Orlando, Florida. Coordinate with the lead paragraph.

[Sub-master keying system shall be provided for [the] [each] building, and shall be keyed to the existing Best removable-core master and grand master keying systems. Equipment spaces and mechanical rooms shall be keyed separately from the building systems, and shall be keyed alike to the existing Best master and grand master systems for these doors.]

NOTE: Add the following for Naval Submarine Base, Kings Bay, Georgia. Coordinate with the lead paragraph.

[The Government will provide permanent cylinders with cores and keys for

mortise locksets, auxiliary locks, and exit devices. Cylinders shall be as manufactured by Best Lock Corp., Arrow Lock Corp., or Falcon Lock. The Contractor shall give written notice 90 days prior to the required delivery of the cylinders. Temporary cores and keys for the Contractor's use during construction, and for testing the locksets, shall be provided by the Contractor.]

2.3.9 Lock Trim

NOTE: For facilities which have not been certified as accessible only to able-bodied personnel, specify lever handles for doors which will be accessible to handicapped persons and knurled or abrasive coated knobs and lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

Cast, forged, or heavy wrought construction and commercial plain design.

2.3.9.1 Knobs and Roses

In addition to meeting test requirements of BHMA A156.2 and BHMA A156.13, knobs, roses, and escutcheons shall be 1.25 mm 0.050 inch thick if unreinforced. If reinforced, outer shell shall be 0.89 mm 0.035 inch thick and combined thickness shall be 1.78 mm 0.070 inch, except knob shanks shall be 1.52 mm 0.060 inch thick.

2.3.9.2 Lever Handles

Provide lever handles in lieu of knobs [where specified in paragraph entitled "Hardware Schedule"]. Lever handles for exit devices shall meet the test requirements of BHMA A156.13 for mortise locks. Lever handle locks shall have a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when a force in excess of that specified in BHMA A156.13 is applied to the lever handle. Lever handles shall return to within 13 mm 1/2 inch of the door face.

2.3.9.3 Texture

Provide knurled or abrasive coated knobs or lever handles [where specified in paragraph entitled "Hardware Schedule"] [for doors which are accessible to blind persons and which lead to dangerous areas].

2.3.10 Keys

NOTE: For projects at Lejes Field, Azores, delete first paragraph; use second paragraph.

Furnish one file key, one duplicate key, and one working key for each key change [and for each master [and grand master] keying system]. Furnish one additional working key for each lock of each keyed-alike group. [Furnish two additional keys for each sleeping room.] [Furnish [] great grand master keys,] [] construction master keys,] [and [] control keys for removable cores.] [Furnish a quantity of key blanks equal to 20 percent of the total number of file keys.] Stamp each key with appropriate

key control symbol and "U.S. property - Do not duplicate." Do not place room number on keys.

[Furnish seven change keys for each interchangeable core, furnish two control keys, six masters keys, and six construction master keys. [Furnish a quantity of key blanks equal to 20 percent of the total number of change keys.] Stamp each key with appropriate key control symbol and "U.S. property - Do not duplicate." Do not place room numbers on keys.]

2.3.11 Door Bolts

NOTE: Use chain and foot bolts for exceptionally
high doors and where use of flush bolts is
impracticable.

BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: BHMA A156.3, Type 25.

2.3.12 Closers

NOTE: Use closers Type C02011 with o.f. PT 4C for
surface applications, except use parallel arm
closers, C02021, on outswinging exterior doors.
Specify holder arms, C02051 and C02061, where doors
must be held open from 90 degrees to 135 degrees, or
to 180 degrees where desired. Do not use holder
arms for fire-rated doors. Use overhead concealed
closers on main entrance doors of monumental
buildings, double-acting doors, and for other
openings where concealment is necessary. Avoid
overhead concealed closers with wood doors. Where
they can not be avoided, modify section on wood
doors to require a 125 mm 5 inch headrail. Avoid
use of floor-concealed closers, but where required,
ascertain that floor slab design will not interfere
with closer case.

BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, [full size covers, except at storefront mounting,] [pivots,] [cement cases,] and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.12.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation located to be visible after installation.

2.3.13 Overhead Holders

NOTE: Use overhead holders for doors which will not

swing 180 degrees and where there is no adjacent wall to accommodate wall type holder and stop. If holder must be on outside of doors, specify bronze (C12511) with satin chrome finish (626). Overhead holders can be specified as "Stop Only" where the hold-open feature is not desirable.

BHMA A156.8.

2.3.14 Closer Holder-Release Devices

NOTE: For fire doors which must be held open, use electromagnetic holder-release devices.

BHMA A156.15.

2.3.15 Door Protection Plates

NOTE: Use pulls attached to plates. Use 200 by 400 mm 8 by 16 inch push plates where door design permits. Use push bars or push and pull bars on all-glass doors. Use kick plates for push sides of doors equipped with closers. Use armor plates on heavy-duty doors where hand trucks or other heavy objects passing through the door could cause damage.

BHMA A156.6.

2.3.15.1 Sizes of [Armor] [Mop] [and] Kick Plates

NOTE: NFPA 80 requires that door plates be not more than 400 mm 16 inches high. Where wheelchair traffic is anticipated, kick plates should be 400 mm 16 inches high.

Width for single doors shall be 50 mm 2 inches less than door width; width for pairs of doors shall be 25 mm one inch less than door width. Height of kick plates shall be [[200] [250] mm[8] [10] inches for flush doors] [and] [25 mmone inch less than height of bottom rail for panel doors]. Height of armor plates shall be [not less than [900] [1200] [_____] mm [36] [48] [_____] inches for flush doors [and] [shall completely cover lower panels of panel doors, except that armor plates on fire doors shall be 400 mm 16 inches high]]. [Height of mop plates shall be [100] [150] mm [4] [6] inches.]

2.3.16 Edge Guards

NOTE: Edge guards should be detailed on drawings; stipulate material, gauge, dimensions, etc. Use edge guards in addition to armor plates on heavy-duty doors where hand trucks or other heavy objects passing through could damage doors. They

are not required at hinge stiles on doors equipped with "swing clear" hinges.

BHMA A156.6, stainless steel, of same height as armor plates. Apply to [hinge stile] [lock stile] [meeting stiles].

2.3.17 Door Stops and Silencers

NOTE: Specify wall bumpers Type L02251 wherever practical, except where they would be mounted on stud walls or partitions. Use floor stops only where necessary to prevent doors from hitting towel bars or similar items, as they create stumbling hazards and interfere with floor cleaning equipment.

BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.18 Padlocks

NOTE: See referenced specification for types, grades and options available.

ASTM F 883.

2.3.19 Thresholds

NOTE: Where vertical rod exit devices are used, and for other outswinging exterior doors, BHMA A156.21, type J35100, is recommended.

BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.20 Weather Stripping Gasketing

NOTE: Weather stripping is also specified in Section 08110, "Steel Doors and Frames," Section 08120, "Aluminum Doors and Frames," and Section 08210, "Wood Doors." Coordinate requirements to avoid conflict and duplication. Do not use interlocking type or spring tension type on metal doors and frames.

NOTE: Maximum air leakage rates are 2.19 x 10⁻⁵ cms per sq m 0.5 cfm per sq. ft. of door area for residential swinging doors and 5.48 x 10⁻⁵ cms per sq m 1.25 cfm per sq. ft. of door area for non-residential swinging doors.

BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". A set shall include head and jamb seals[, sweep strips,] [and, for pairs of doors, astragals]. Air leakage of weather stripped doors shall not exceed [2.19 x 10⁻⁵] [5.48 x 10⁻⁵] cms [0.5] [1.25] cubic feet per minute of air per square meter foot of door area when tested in accordance with ASTM E 283. Weather stripping shall be one of the following:

2.3.20.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 1.25 mm 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Aluminum shall be [clear (natural)] [bronze] anodized.

2.3.20.2 Interlocking Type

Zinc or bronze not less than 0.45 mm 0.018 inch thick.

2.3.20.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.20 mm 0.008 inch thick.

2.3.21 [Lightproofing] [and] [Soundproofing] Gasketing

BHMA A156.22. A set shall include adjustable doorstops at head and jambs and an automatic door bottom, both of extruded aluminum, [clear (natural)] [bronze] anodized, surface applied, with vinyl fin seals between plunger and housing. Doorstops shall have solid neoprene tube, silicone rubber, or closed-cell sponge gasket. Door bottoms shall have adjustable operating rod and silicone rubber or closed-cell sponge neoprene gasket. Doorstops shall be mitered at corners. Provide the type and function designation where specified in paragraph entitled "Hardware Sets".

2.3.22 Rain Drips

NOTE: These items are not covered by federal specifications or BHMA standards. For types available, see manufacturers' catalogs.

Extruded aluminum, not less than 2.03 mm 0.08 inch thick, [clear] [bronze] anodized. Set drips in sealant conforming to Section 07920 JOINT SEALANTS and fasten with stainless steel screws.

2.3.22.1 Door Rain Drips

Approximately 38 mm high by 16 mm 1 1/2 inches high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.22.2 Overhead Rain Drips

Approximately 38 mm high by 64 mm 1 1/2 inches high by 2 1/2 inches projection, with length equal to overall width of door frame. Align bottom with door frame rabbet.

2.3.23 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Fasteners exposed to weather shall be of nonferrous metal or stainless steel. Provide fasteners of type necessary to accomplish a permanent installation.

2.5 FINISHES

NOTE: Choose one of the following options. Choose the first option for new buildings. Choose the second option only where necessary to match the finish on existing hardware.

[BHMA A156.18. Hardware shall have BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except surface door closers which shall have [aluminum paint] [prime coat] finish, and except steel hinges which shall have [BHMA 652 finish (satin chromium plated)] [BHMA 600 finish (primed for painting)]. Hinges for exterior doors shall be stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Exit devices may be provided in BHMA 626 finish in lieu of BHMA 630 finish [except where BHMA 630 is specified under paragraph entitled "Hardware Sets"]. Exposed parts of concealed closers shall have finish to match lock and door trim. Hardware for aluminum doors shall be finished to match the doors.]

[BHMA A156.18. Hardware shall have BHMA 612 finish (satin bronze), unless specified otherwise. Surface door closers shall have [bronze paint] [prime coat] finish. Steel hinges shall have [BHMA 639 finish (satin bronze plated)] [BHMA 600 finish (primed for painting)]. Exposed parts of concealed closers shall have finish to match lock and door trim. Hardware for aluminum doors shall be finished to match the doors. Hardware showing on interior of [bathrooms] [shower rooms] [toilet rooms] [washrooms] [laundry rooms] [and kitchens] shall have BHMA 629 finish (bright stainless steel) or BHMA 625 finish (bright chromium plated).]

2.6 KEY CABINET AND CONTROL SYSTEM

NOTE: Key cabinets hold keys on panels. Systems include materials and devices for recording and cross-referencing data on use and location of locks and keys. See BHMA A156.5 for description of cabinets and control systems.

BHMA A156.5, [Type [E8331 (25 hooks)] [E8341 (125 hooks)] [E8351 (150 hooks)] [E8311 (600 hooks)] [E8321 (700 hooks)].] [Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.]

PART 3 EXECUTION

3.1 INSTALLATION

Install hardware in accordance with manufacturers' printed instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weather Stripping Installation

Handle and install weather stripping so as to prevent damage. Provide full contact, weather-tight seals. Doors shall operate without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 225 mm 9 inches o.c. after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weather Stripping

Provide interlocking, self-adjusting type on heads and jambs and flexible hook type at sills. Nail weather stripping to door 25 mm one inch o.c. and to heads and jambs at 100 mm 4 inches o.c.

3.1.1.3 Spring Tension Type Weather Stripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze, stainless steel nails with stainless steel. Space nails not more than 38 mm 1 1/2 inches o.c.

3.1.2 [Lightproofing] [and] [Soundproofing] Installation

Install as specified for stop-applied weather stripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws [in expansion sleeves].

3.2 FIRE DOORS AND EXIT DOORS

Install hardware in accordance with NFPA 80 for fire doors, NFPA 101 for exit doors [, and UL 14C for swinging tin-clad fire doors].

3.3 HARDWARE LOCATIONS

SDI 100, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.
- b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where [directed] [indicated]. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Furnish complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, as directed, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

NOTE: Coordinate this section with Section 08120,
"Aluminum Doors and Frames."

Either list hardware set numbers on the drawings or list doors by number in each hardware set. List hardware sets in the following format:

SAMPLE LIST OF HARDWARE SETS

HW-1 (Doors 1 and 2, each pair)

3 Pair Hinges	A2111 x 623 x NRP
1 Three-Point Lock	E8271
2 Closers	C02021
2 Wall Bumpers	L02251
2 Pulls	Extruded aluminum with decorative panels
2 Push Bars	Extruded aluminum with decorative panels
1 Threshold	Type 26

HW-2 (Doors 3 and 4, each pair)

3 Pair Hinges	A2112 x 626 x NRP
2 Exit Devices	Type 1-05 x 630
1 Removable Mullion	Type 22
2 Closers	C02021
2 Kick Plates	J102 x 630
2 Wall Bumpers	L02251
1 Threshold	Type 26 x insert
1 Set Weatherstripping	R0D165

HW-3 (Doors 5, 7, 9, each leaf)

1 1/2 Pair Hinges	A2112 x 626 x NRP
1 Lockset	F04 x 630
1 Closer	C02021

1 Kick Plate	J102 x 630
1 Wall Bumper	L02251
1 Threshold	Type 26 x insert
1 Set Weatherstripping	R0D165

HW-101 (Doors 6, 8, 10, each leaf)

1 1/2 Pair Hinges	A8112 x 652
1 Lockset	F82
1 Closer	C02011
1 Kick Plate	J102 x 630
1 Wall Bumper	L02251

HW-102 (Doors 11 and 12, each leaf)

1 1/2 Pair Hinges	A8112 x 652
1 Pull Plate	J405 x 630
1 Push Plate	J301 x 630
1 Closer	C02011
1 Kick Plate	J102 x 630
1 Wall Bumper	L02101

HW-103 (Doors 13 and 14, each leaf)

1 1/2 Pair Hinges	A8133 x 652
1 Latchset	F75
1 Wall Bumper	L02251

[Hardware for aluminum doors shall be provided under this section. Deliver Hardware templates and hardware, except field-applied hardware to the aluminum door and frame manufacturer for use in fabricating the doors and frames.]

-- End of Section --