SECTION 087100 - DOOR HARDWARE

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

Retain or delete this article in all Sections of Project Manual.

* + - 1. SUMMARY
         1. Section Includes:

Mechanical door hardware for the following:

Swinging doors.

Sliding doors.

Folding doors.

Cylinders for door hardware specified in other Sections.

Electrified door hardware.

* + - * 1. References

NFPA 80 Fire Doors and Windows

NFPA 101 Life Safety Code.

Building Code of New York State.

ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities.

ANSI/BHMA Standard A156.1 Butts and Hinges.

ANSI/BHMA Standard A156.4 Door Controls – Closers.

ANSI/BHMA Standard A156.6 Architectural Door Trim.

ANSI/BHMA Standard A156.7 Template Hinge Dimensions.

ANSI/BHMA Standard A156.8 Door Controls – Overhead Stops and Holders.

ANSI/BHMA Standard A156.13 Mortise Locks and Latches Series 1000.

ANSI/BHMA Standard A156.16 Auxiliary Hardware.

ANSI/BHMA Standard A156.18 Materials and Finishes.

ANSI/BHMA Standard A156.22 Door Gasketing Systems.

ANSI/BHMA Standard A156.26 Continuous Hinges.

DHI - Door and Hardware Institute.

NAAM Standard HMMA 800-96- Hollow Metal Manufacturers Association.

NAAM Standard HMMA 831-97 Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.

2010 Standards for State and Local Government Facilities: Title II.

* + - 1. DEFINITIONS
         1. Architectural Hardware Consultant (AHC): A Door and Hardware Institute certified expert in complex architectural openings requiring advanced knowledge of model building codes and safety standards, ADA requirements, access control knowledge and installation expertise.
         2. Architectural Hardware Distributor: A company that regularly purchases architectural hardware from manufacturers and specializes in the sale, service and support of that hardware to contractors and/or end users.
         3. Company Field Advisor(s): Hardware manufacturers’ representatives who are certified in writing by manufacturer to be technically qualified in design, installation, and servicing of products.
         4. Installation Supervisor: Designated supervisor/installer, who has a minimum three years experience in finish hardware installation, and is qualified and responsible to ensure approved finish hardware is installed, adjusted, and operates properly.
      2. COORDINATION

Retain "Floor-Recessed Door Hardware" paragraph below if required.

* + - * 1. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.

Cast anchoring inserts into concrete.

Retain "Installation Templates" paragraph below for factory-prepared doors and frames.

* + - * 1. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
        2. Security: Coordinate installation of door hardware, keying, and access control with Director’s Representative’s security consultant.
        3. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
        4. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
      1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

Retain "Keying Conference" paragraph below if keying is extensive or complex.

* + - * 1. Keying Conference: Conduct conference at [**Project site**] <**Insert location**>.

Conference participants shall include Installer's Architectural Hardware Consultant[**and Director’s Representative’s security consultant**].

Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:

Flow of traffic and degree of security required.

Preliminary key system schematic diagram.

Requirements for key control system.

Requirements for access control.

Address for delivery of keys.

<**Insert requirements to suit Project**>.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Retain "Shop Drawings" paragraph below for electrified door hardware.

* + - * 1. Shop Drawings: For electrified door hardware.

Include diagrams for power, signal, and control wiring.

Include details of interface of electrified door hardware and building safety and security systems.

Retain "Samples" paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples. Revise if Samples are only required for certain products.

* + - * 1. Samples: For each exposed product in each finish specified, in manufacturer's standard size.

Tag Samples with full product description to coordinate Samples with door hardware schedule.

* + - * 1. Samples for Initial Selection: For each type of exposed finish.
        2. Samples for Verification: For each type of exposed product, in each finish specified.

Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.

Retain first subparagraph below unless Samples are delivered to Owner as extra materials.

Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

Tag Samples with full product description to coordinate Samples with door hardware schedule.

* + - * 1. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

Submittal Sequence: Submit door hardware schedule [**after**] [**or**] [**concurrent with**] submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.

Format: Use same scheduling sequence and format[**and use same door numbers**] as in door hardware schedule in the Contract Documents.

Content: Include the following information:

Identification number, location, hand, fire rating, size, and material of each door and frame.

Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.

Retain first subparagraph below for electrified door hardware.

Description of electrified door hardware sequences of operation and interfaces with other building control systems.

Fastenings and other installation information.

Explanation of abbreviations, symbols, and designations contained in door hardware schedule.

Mounting locations for door hardware.

List of related door devices specified in other Sections for each door and frame.

* + - * 1. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Director’s Representative’s final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
        2. Qualification Data: For [**Installer**] [**and**] [**Architectural Hardware Consultant**].

Retain "Product Certificates" paragraph below to require submittal of product certificates from electrified door hardware manufacturers.

* + - * 1. Product Certificates: For each type of electrified door hardware.

Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

Retain "Product Test Reports" paragraph below if retaining "Accessibility Requirements" paragraph in "Performance Requirements" Article.

* + - * 1. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control inspecting.

* + - * 1. Field quality-control reports.
        2. Sample Warranty: For special warranty.
      1. CLOSEOUT SUBMITTALS
         1. Maintenance Data: For each type of door hardware to include in maintenance manuals.
         2. Schedules: Final [**door hardware**] [**and**] [**keying**] schedule.
      2. MAINTENANCE MATERIAL SUBMITTALS

See "Maintenance Materials" Article in the Evaluations for discussion of extra materials.

* + - * 1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Door Hardware: <**Insert detailed descriptions and specific numbers of units**>.

Electrical Parts: <**Insert detailed descriptions and specific numbers of units**>.

* + - 1. QUALITY ASSURANCE
         1. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor and Director’s Representative about door hardware and keying.

Warehousing Facilities: In Project's vicinity.

Scheduling Responsibility: Preparation of door hardware and keying schedule.

Retain "Engineering Responsibility" subparagraph below for electrified door hardware.

Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

DHI Architectural Hardware Consultants (AHCs) are not trained in electrified hardware. Electrified Hardware Consultants (EHCs) and Architectural Opening Consultants (AOCs) are trained in electrified hardware; require one of these DHI certifications for projects that include electrified hardware. AOCs are also trained in the construction and application of doors. See the "Door Hardware Consultants" Article in the Evaluations.

* + - * 1. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an [**Architectural Hardware Consultant (AHC)**] [**Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC)**] [**Architectural Openings Consultant (AOC)**].
      1. DELIVERY, STORAGE, AND HANDLING
         1. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
         2. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

Retain one of two paragraphs below or revise to suit Project. Retain second paragraph for high-security cylinders.

* + - * 1. Deliver keys to manufacturer of key control system for subsequent delivery to Director’s Representative.
        2. Deliver keys[**and permanent cores**] to Director’s Representative by registered mail or overnight package service.
      1. WARRANTY

When warranties are required, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures including excessive deflection, cracking, or breakage.

Faulty operation of doors and door hardware.

Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

Verify available warranties and warranty periods for door hardware units and components.

Warranty Period: [**Three**] <**Insert number**> years from date of Substantial Completion unless otherwise indicated below:

Retain applicable subparagraphs below.

[**Electromagnetic**] [**and**] [**Delayed-Egress**] Locks: [**Five**] <**Insert number**> years from date of Substantial Completion.

Exit Devices: [**Two**] <**Insert number**> years from date of Substantial Completion.

Manual Closers: [**10**] <**Insert number**> years from date of Substantial Completion.

Concealed Floor Closers: [**Five**] [**10**] [**25**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. MANUFACTURERS
         1. Source Limitations: Obtain each type of door hardware from single manufacturer.

Retain subparagraph below if applicable.

Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

* + - 1. PERFORMANCE REQUIREMENTS

Retain "Fire-Rated Door Assemblies" paragraph below if required. Revise to allow neutral pressure testing if required and as acceptable to authorities having jurisdiction. Revise if some door hardware items do not require listing and labeling.

* + - * 1. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

Retain "Smoke- and Draft-Control Door Assemblies" paragraph below if required. The International Building Code requires fire door assemblies to comply with smoke- and draft-control requirements in corridors, smoke barriers, and smoke partitions.

* + - * 1. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

Revise "Air Leakage Rate" subparagraph below to suit Project.

Air Leakage Rate: Maximum air leakage of [**0.3 cfm/sq. ft.**] <**Insert rate**> at the tested pressure differential of [**0.3-inch wg**] <**Insert value**> of water.

* + - * 1. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
        2. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

Verify accessibility requirements of authorities having jurisdiction. Some projects may require compliance with multiple accessibility regulations. See "Accessibility Guidelines, Codes, and Standards" Article in the Evaluations.

* + - * 1. Accessibility Requirements: For door hardware on doors in an accessible route, comply with [**the USDOJ's "2010 ADA Standards for Accessible Design"**] [**the DOT's "ADA Standards for Transportation Facilities"**] [**the ABA standards of the Federal agency having jurisdiction**] [**ICC A117.1**] [**HUD's "Fair Housing Accessibility Guidelines"**] [**and**] <**Insert regulation**>.

Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

Comply with the following maximum opening-force requirements:

Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

Sliding or Folding Doors: 5 lbf applied parallel to door at latch.

Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

* + - 1. HINGES

Retain option in "Hinges" paragraph below for hinges installed in hollow-metal doors and frames.

* + - * 1. Hinges: BHMA A156.1.[**Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.**]
      1. SELF-CLOSING HINGES AND PIVOTS

Spring hinges for labeled fire-rated assemblies must be single acting and Grade 1 and are available in full-mortise or half-surface mounting.

* + - * 1. Self-Closing Hinges and Pivots: BHMA A156.17.
      1. CENTER-HUNG AND OFFSET PIVOTS

BHMA A156.4, "Door Controls - Closers," includes requirements for types of pivots specified in this article.

* + - * 1. Center-Hung and Offset Pivots: BHMA A156.4.
      1. CONTINUOUS HINGES
         1. Continuous Hinges: BHMA A156.26; minimum 0.120-inch thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
         2. Pin-and-Barrel-Type Hinges:
         3. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
      2. CONCEALED HINGES
         1. Concealed Hinges: Fully concealed within mortises in the door edge and frame and allowing door to swing open 180 degrees.
      3. MECHANICAL LOCKS AND LATCHES
         1. Lock Functions: As indicated in door hardware schedule.
         2. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

Bored Locks: Minimum 1/2-inch latchbolt throw.

Mortise Locks: Minimum 3/4-inch latchbolt throw.

Deadbolts: Minimum [**1-inch**] [**1.25-inch**] <**Insert dimension**> bolt throw.

* + - * 1. Lock Backset: 2-3/4 inches unless otherwise indicated.

Revise "Lock Trim" paragraph below if more than one type of lock trim is required.

* + - * 1. Lock Trim:

Description: [**As indicated on Drawings**] <**Insert description or manufacturer's design designation**>.

Levers are most often cast.

Levers: [**Wrought**] [**Forged**] [**Cast**].

<**Insert model number and description**>.

Escutcheons (Roses): [**Wrought**] [**Forged**] [**Cast**].

Dummy Trim: Match lever lock trim and escutcheons.

* + - * 1. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

Retain "Flat-Lip Strikes," "Extra-Long-Lip Strikes," "Aluminum-Frame Strike Box," and "Rabbet Front and Strike" subparagraphs below if applicable.

Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

Series 4000 locks are installed in round, bored openings in edge and face of door.

* + - * 1. Bored Locks: BHMA A156.2; [**Grade 1**] [**Grade 2**]; Series 4000.
        2. Mortise Locks: BHMA A156.13; [**Operational Grade 1**] [**Security Grade 1**] [**Operational Grade 2**] [**Security Grade 2**]; stamped steel case with steel or brass parts; Series 1000.
        3. Interconnected Locks: BHMA A156.12; [**Grade 1**] [**Grade 2**]; Series 5000.
        4. Roller Latches: BHMA A156.16; Grade 1; rolling plunger that engages socket or catch, with adjustable roller projection.
        5. Push-Pull Latches: [**Bored, BHMA A156.2; Series 4000**] [**Mortise, BHMA A156.13**]; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.

Grade: [**1**] [**2**].

* + - 1. AUXILIARY LOCKS

Locks that are typically used in addition to latch bolts and that are operated by a knob, lever, or thumbpiece are called "auxiliary locks."

* + - * 1. Bored Auxiliary Locks: BHMA A156.36: [**Grade 1**] [**Grade 2**]; with strike that suits frame.
        2. Mortise Auxiliary Locks: BHMA A156.36; [**Grade 1**] [**Grade 2**]; with strike that suits frame.
        3. Narrow Stile Auxiliary Locks: BHMA A156.36; [**Grade 1**] [**Grade 2**]; with strike that suits frame.
        4. Push-Button Combination Locks: BHMA A156.36; cylindrical; Grade 1; lock opens by entering a one- to five-digit code by pushing correct buttons in correct sequence; automatically relocks when door is closed; with strike that suits frame.
      1. ELECTRIC STRIKES
         1. Electric Strikes: BHMA A156.31; [**Grade 1**] [**Grade 2**]; with faceplate to suit lock and frame.
      2. ELECTROMAGNETIC LOCKS
         1. Electromagnetic Locks: BHMA A156.23; electrically powered; with electromagnet attached to frame and armature plate attached to door; full-exterior or full-interior type, as required by application indicated.
         2. Delayed-Egress Electromagnetic Locks: BHMA A156.24, electrically powered, with electromagnet attached to frame and armature plate attached to door; depressing push bar for more than three seconds initiates irreversible alarm and adjustable time delay for egress. When integrated with fire alarm, fire alarm voids time delay.
      3. ELECTROMECHANICAL LOCKS
         1. Electromechanical Locks: BHMA A156.25; [**Grade 1**] [**Grade 2**]; motor or solenoid driven; with strike that suits frame.

Type: [Bored] [Mortise latchbolt] [Mortise deadbolt] [Mortise deadlocking latchbolt].

* + - 1. SELF-CONTAINED ELECTRONIC LOCKS
         1. Self-Contained Electronic Locks: BHMA A156.25, [**bored**] [**mortise**]; with internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zinc-dichromate-plated, wrought-steel case, and strike that suits frame. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock.
      2. EXIT LOCKS AND EXIT ALARMS
         1. Exit Locks and Alarms: BHMA A156.29, Grade 1.
      3. SURFACE BOLTS
         1. Surface Bolts: BHMA A156.16.
      4. MANUAL FLUSH BOLTS

Manual flush bolts are for inactive leaf of a pair of doors. They are available for labeled fire-rated doors but do not meet model code requirements for doors used as a means of egress.

* + - * 1. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
      1. AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

Automatic and self-latching flush bolts are for inactive leaf of a pair of doors. Self-latching bolts are also called "constant-latching bolts."

* + - * 1. Automatic Flush Bolts: BHMA A156.3, Type 25; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge.[**Include wear plates.**]
        2. Self-Latching Flush Bolts: BHMA A156.3, Type 27; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge.[**Include wear plates.**]
      1. EXIT DEVICES AND AUXILIARY ITEMS
         1. Exit Devices and Auxiliary Items: BHMA A156.3.
      2. LOCK CYLINDERS
         1. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.[**Provide cylinder from same manufacturer of locking devices.**]

If retaining option in "Lock Cylinders" paragraph above, delete "Manufacturers" subparagraph.

* + - * 1. Standard Lock Cylinders: BHMA A156.5; [**Grade 1**] [**Grade 1A**] [**Grade 2**] permanent cores; face finished to match lockset.

Core Type: [**Interchangeable**] [**Removable**].

* + - * 1. High-Security Lock Cylinders: BHMA A156.30; [**Grade 1**] [**Grade 2**] [**Grade 3**] permanent cores that are removable; face finished to match lockset.

Type: [**M, mechanical**] [**E, electrical**].

Retain "Construction Master Keys" paragraph below if permanent cores are installed during construction.

* + - * 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

Retain "Construction Cores" paragraph below if temporary construction cores are required.

* + - * 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
      1. KEYING

Retain option in "Keying System" paragraph below if retaining "Keying Conference" paragraph in "Preinstallation Meetings" Article.

* + - * 1. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.[**Incorporate decisions made in keying conference.**]

Retain "No Master Key System," "Master Key System," "Grand Master Key System," or "Great-Grand Master Key System" subparagraph below.

No Master Key System: Only change keys operate cylinders.

Provide three cylinder change keys.

Master Key System: Change keys and a master key operate cylinders.

Provide three cylinder change keys and five master keys.

Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.

Provide three cylinder change keys and five each of master and grand master keys.

Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.

Provide three cylinder change keys and five each of master, grand master, and great-grand master keys.

Retain "Existing System" subparagraph below if Owner has an existing keying system.

Existing System:

Master key or grand master key locks to existing system.

Re-key existing master key system into new keying system.

Retain "Keyed Alike" subparagraph below if required.

Keyed Alike: Key all cylinders to same change key.

* + - * 1. Keys: [**Nickel silver**] [**Brass**].

Retain "Stamping" subparagraph below if key requires special marking.

Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

Notation: [**"DO NOT DUPLICATE."**] [**Information to be furnished by Director’s Representative.**

* + - 1. KEY CONTROL SYSTEM
         1. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of [**150**] <**Insert number**> percent of the number of locks.

Retain "Multiple-Drawer Cabinet," "Wall-Mounted Cabinet," or "Portable Cabinet" subparagraph below to suit Project. Multiple-drawer cabinets have minimum of 600 or 700 hooks with expansion capacity; wall-mounted cabinets have minimum of 25, 125, or 150 hooks with expansion capacity; portable cabinets have minimum of 14 hooks with expansion capacity.

Multiple-Drawer Cabinet: [**Grade 1**] [**Grade 2**] cabinet with drawers equipped with key-holding panels and key envelope storage, and progressive-type ball-bearing suspension slides. Include single cylinder lock to lock all drawers.

Wall-Mounted Cabinet: [**Grade 1**] [**Grade 2**] cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

Portable Cabinet: [**Grade 1**] [**Grade 2**] tray for mounting in file cabinet, equipped with key-holding panels, envelopes, and cross-index system.

Key lock boxes are used only to provide controlled access for fire and medical emergency personnel into gated communities and apartment complexes. Coordinate requirements with authorities having jurisdiction.

* + - * 1. Key Lock Boxes: Designed for storage of [**two**] [**10**] <**Insert number**> keys.
        2. Key Control System Software: Multiple-index system for recording and reporting key-holder listings, tracking keys and lock and key history, and printing receipts for transactions. Include instruction manual.
      1. OPERATING TRIM
         1. Operating Trim: BHMA A156.6; [**aluminum**] [**brass**] [**bronze**] [**stainless steel**] unless otherwise indicated.
      2. ACCESSORIES FOR PAIRS OF DOORS

Coordinators on pairs of doors prevent the active leaf from closing before inactive leaf.

* + - * 1. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release[**; and with internal override**].

Retain "Carry-Open Bars" paragraph below if automatic or self-latching bolts are not used on the inactive leaves of pairs of doors. Carry-open bars push active leaves open when inactive leaves are opened first and prevent damage to astragals.

* + - * 1. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
        2. Astragals: BHMA A156.22.
      1. SURFACE CLOSERS
         1. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
      2. CONCEALED CLOSERS
         1. Concealed Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
      3. CLOSER HOLDER RELEASE DEVICES
         1. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by [**smoke detection system**] [**loss of power**].
      4. MECHANICAL STOPS AND HOLDERS
         1. Wall- and Floor-Mounted Stops: BHMA A156.16.
      5. ELECTROMAGNETIC STOPS AND HOLDERS
         1. Electromagnetic Door Holders: BHMA A156.15, Grade 1; [**wall-mounted electromagnetic single**] [**floor-mounted electromagnet single**] [**floor-mounted electromagnet double**] unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire-alarm system for labeled fire-rated door assemblies.
      6. OVERHEAD STOPS AND HOLDERS
         1. Overhead Stops and Holders: BHMA A156.8.
      7. DOOR GASKETING
         1. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
         2. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:

Retail applicable subparagraphs below.

Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.

Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.

Gasketing on Double Doors: 0.50 cfm per ft. of door opening.

* + - 1. THRESHOLDS
         1. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
      2. SLIDING DOOR HARDWARE
         1. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
      3. FOLDING DOOR HARDWARE
         1. General: BHMA A156.14; complete sets including overhead rails, hangers, supports, bumpers, floor guides, and accessories indicated.
      4. METAL PROTECTIVE TRIM UNITS
         1. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch thick [**aluminum**] [**brass**] [**bronze**] [**stainless steel**]; with manufacturer's standard machine or self-tapping screw fasteners.
      5. PLASTIC PROTECTION PLATES
         1. Plastic Protection Plates: BHMA A156.6; fabricated with four sides beveled; [**plastic laminate; 1/8 inch thick; NEMA LD 3, Grade HGS**] [**rigid plastic; 0.060-inch thick, PVC or acrylic-modified vinyl plastic**] [**acrylic; 1/8 inch thick**].
      6. AUXILIARY DOOR HARDWARE
         1. Auxiliary Hardware: BHMA A156.16.
      7. AUXILIARY ELECTRIFIED DOOR HARDWARE
         1. Auxiliary Electrified Door Hardware:
      8. FABRICATION

Delete "Manufacturer's Nameplate" paragraph below to save cost or if visibility of manufacturer's name on items is not objectionable.

* + - * 1. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Director’s Representative.

Manufacturer's identification is permitted on rim of lock cylinders only.

* + - * 1. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
        2. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

Retain "Concealed Fasteners" subparagraph below where visual quality is important. Coordinate with Section 081416 "Flush Wood Doors."

Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

NFPA 80 requires locks, latches, surface-mounted top and bottom bolts, and fire-exit hardware to be secured with machine screws or through bolts.

Fire-Rated Applications:

Wood or Machine Screws: For the following:

Hinges mortised to doors or frames[**; use threaded-to-the-head wood screws for wood doors and frames**].

Strike plates to frames.

Closers to doors and frames.

Steel Through Bolts: For the following unless door blocking is provided:

Surface hinges to doors.

Closers to doors and frames.

Surface-mounted exit devices.

Spacers or Sex Bolts: For through bolting of hollow-metal doors.

Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

* + - 1. FINISHES
         1. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
         2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
         3. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1. EXECUTION
   * + 1. EXAMINATION
          1. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

Retain first paragraph below for electrified hardware.

* + - * 1. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
        2. Proceed with installation only after unsatisfactory conditions have been corrected.
      1. PREPARATION

Retain this article for on-site door preparation of hardware if any. NFPA 80 restricts on-site door preparation to that required for surface-applied door hardware, function holes for mortise locks, holes for labeled viewers, undercutting of doors, and protection plates. Hardware for aluminum doors and frames generally is supplied to assembly manufacturer for factory preparation of door and frames for hardware.

* + - * 1. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
        2. Wood Doors: Comply with door and hardware manufacturers' written instructions.
      1. INSTALLATION
         1. Mounting Heights: Mount door hardware units at heights [**indicated on Drawings**] [**to comply with the following**] unless otherwise indicated or required to comply with governing regulations.

If retaining second option in "Mounting Heights" paragraph above, retain subparagraphs below and revise to suit Project.

Standard Steel Doors and Frames: ANSI/SDI A250.8.

Custom Steel Doors and Frames: HMMA 831.

Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

* + - * 1. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

* + - * 1. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
        2. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
        3. Lock Cylinders: Install construction cores to secure building and areas during construction period.

Retain one of two subparagraphs below.

Replace construction cores with permanent cores as [**indicated in keying schedule**] [**directed by Director’s Representative**].

Furnish permanent cores to Director’s Representative for installation.

* + - * 1. Key Control System:

Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

Key Lock Boxes: Install where indicated or approved by Director’s Representative to provide controlled access for fire and medical emergency personnel.

Key Control System Software: Set up multiple-index system based on final keying schedule.

Retain "Boxed Power Supplies" paragraph below if electrified door hardware is required. Verify, with authorities having jurisdiction, acceptable location for power supplies.

* + - * 1. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, [**above accessible ceilings**] [**in equipment room**]. Verify location with Director’s Representative.

Configuration: Provide [**one power supply for each door opening**] [**least number of power supplies required to adequately serve doors**] with electrified door hardware.

If thresholds on doors other than exterior doors are set in full bed of sealant, indicate locations in door hardware schedule or on Drawings or revise "Thresholds" paragraph below.

* + - * 1. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

Retain "Stops" paragraph below for default specification of floor stops at every door. Where floor or wall stops are inappropriate, use overhead holders.

* + - * 1. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
        2. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

Do not notch perimeter gasketing to install other surface-applied hardware.

* + - * 1. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
        2. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
      1. FIELD QUALITY CONTROL

Retain first option in "Independent Architectural Hardware Consultant" paragraph below if Owner will engage an independent Architectural Hardware Consultant to perform field inspections. Retain second option if Contractor must engage consultant for field quality control.

* + - * 1. Independent Architectural Hardware Consultant: [**Director’s Representative will engage**] [**Engage**] a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

* + - 1. ADJUSTING
         1. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.

Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

Requirements in "Occupancy Adjustment" paragraph below might be difficult to monitor and will increase cost; however, owners of substantial projects might determine the cost is justified.

* + - * 1. Occupancy Adjustment: Approximately [**three**] [**six**] <**Insert number**> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.
      1. CLEANING AND PROTECTION
         1. Clean adjacent surfaces soiled by door hardware installation.
         2. Clean operating items as necessary to restore proper function and finish.
         3. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.
      2. MAINTENANCE SERVICE
         1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Director’s Representative’s continued adjustment, maintenance, and removal and replacement of door hardware.

Verify with Owner that maintenance service is required for Project.

* + - * 1. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include [**six**] [**nine**] [**12**] <**Insert number**> months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
      1. DEMONSTRATION

Retain this article for projects with complex or atypical door hardware.

* + - * 1. [**Engage Installer to train**] [**Train**] Maintenance personnel to adjust, operate, and maintain door hardware.
      1. DOOR HARDWARE SCHEDULE

Retain this article if inserting schedule below. Otherwise, delete this article and indicate door hardware schedule on Drawings or in another Division 08 Section.

Schedule a door hardware set for each unique door hardware configuration required for Project. Identify each set with a unique number designation. See "Sample Door Hardware Schedules" Article in the Evaluations for additional information.

* + - * 1. Hardware Set 1: Each door to have the following:

<**Insert hardware type**>.

END OF SECTION 087100