

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.

1.02 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

- a. Swinging doors.
- b. Sliding doors.
- c. Other doors to the extent indicated.

B. Intent of Hardware Schedule

1. The following schedule of hardware sets shall be considered a guide only, and the supplier is cautioned to refer to general conditions, special conditions, and the preamble of this section. It shall be the hardware supplier's responsibility to furnish all required hardware.
2. Where items of hardware aren't definitely or correctly specified and are required for completion of the Work, a written statement of such omission, error, or other discrepancy shall be sent to the owner, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
3. Adjustments to the Contract Sum will not be allowed for omissions of items of hardware not clarified prior to bid opening.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

1. Cabinet Hardware except for locksets that may be specified in this section.
2. Signs.

1.03 REFERENCES:

A. Use date of standard or code in effect as of Bid date.

B. Local applicable codes.

C. American National Standards Institute

1. ANSI A156

- D. NFPA – National Fire Protection Association
 - 1. NFPA 80 – Fire Doors and Windows
 - 2. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
 - 4. NFPA 101 – Life Safety Code.
- E. UL – Underwriters Laboratories
 - 1. UL10C – Fire Tests of Door Assemblies (Positive Pressure)
 - 2. UL 1784 - Air Leakage Tests of Door Assemblies
- F. ANSI A117.1 – Specifications for making buildings and facilities usable by physically handicapped people.
- G. ADA – Americans with Disabilities Act of 1990
- H. BHMA – Builders Hardware Manufacturers Association
- I. DHI – Door and Hardware Institute
- J. SDI – Steel Door Institute

1.04 LEED SUBMITTALS:

- A. General:
 - 1. Submit material cost breakdowns for all products used as part of this work.
 - 2. Submit additional materials information (e.g. recycled content, manufacturing location) as requested by the Architect.
 - 3. Submit Letters of Certification, Product Cut Sheets, Material Safety Data Sheets, or other items to support the information provided.
 - 4. Submit Material Safety Data Sheets for all applicable products. If the MSDS does not show the product's Volatile Organic Compound (VOC) content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification (on the manufacturer's letterhead) from the product manufacturer.
- B. Local/Regional Materials:
 - 1. Submit location of manufacturing facility including name, address and distance between manufacturing facility and the project site. Provide manufacturer's documentation indicating location where the base materials were extracted, mined, quarried, harvested, etc. and the distance between this location and the project site. Also, include material costs (excluding costs of installation).
- C. Recycled Content Materials:
 - 1. Submit product data or other published information indicating total weight of product to be provided for the Project, percent of post-consumer recycled material by weight and percent of post-industrial recycled material by weight. Include material costs (excluding cost of installation).
- D. Environmental Requirements:

1. Submit product data or MSDS indicating compliance with emissions and VOC content of products specified to be provided for the Project. Highlight or circle applicable VOC content on submittal and indicate specified limit to be complied with.

1.05 SUBMITTALS

- A. Submit copies of the finish hardware shop drawings in accordance with Division 01.
- B. Product Data: Submit manufacturer's complete product literature for specified hardware items, detailed installation diagrams and instructions, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures, may, after final check of operation, be used in the work, within limitations of keying coordination requirements.
- D. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
- E. Keying Schedule: Prepared by or under the supervision of the supplier's Architectural Hardware consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations. Keying Schedule: Per DHI manual "Keying Procedures, Systems, and Nomenclature".
- F. Electronic hardware systems:

1. Provide point-to-point wiring diagrams prepared by an authorized factory employee for each opening requiring electronic hardware, except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted after approval.
 2. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval.
 3. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval.
- G. Qualification Data: For Installer, Supplier, and Architectural Hardware Consultant. Compliance with this Section shall include letters of certification. Certifications shall be submitted for approval with and be incorporated with hardware schedule submittal. SUBMITTALS WILL NOT BE CONSIDERED WITHOUT THE CERTIFICATIONS.
- H. Warranties: Special warranties specified in this Section.
- I. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- J. Operations and maintenance manuals:
1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
 - a. Approved hardware schedule, catalog cuts and keying schedule.
 - b. Hardware installation and adjustment instructions.
 - c. Manufacturer's written warranty information.
 - d. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
 2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act and ANSI A117.1.
- B. Installer Qualifications: An experienced installer with five (5) years documented experience who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance. Factory trained and certified by the lock, closer and panic hardware manufacturers. Alternative: can demonstrate suitably equivalent competence and experience.

- C. **Supplier Qualifications:** Company specializing in the supply of door hardware with five (5) years documented experience and an Architectural Hardware Consultant (AHC) to properly handle, detail and service hardware in a satisfactory manner. Architectural Hardware Consultant shall be available during the course of the Work to consult with Contractor, Architect, Hardware Consultant, and Owner about door hardware and keying.
1. **Scheduling Responsibility:** Preparation of door hardware and keying schedules.
 2. **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.
 3. Hardware supplier shall be a certified direct distributor and be a full sales and service organization for the manufacturer's listed. Compliance with this Section shall include letters of certification from the manufacturers stating the hardware supplier is a factory direct authorized distributor. Certifications shall be submitted for approval with and be incorporated with hardware schedule submittal. Submittals will not be considered without the certifications.
 4. Supplier shall have warehousing facilities in Project's vicinity.
- D. **Architectural Hardware Consultant Qualifications:** A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and 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.
1. **Electrified Door Hardware Consultant Qualifications:** A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- E. **Source Limitations:** Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
1. 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.
- F. **Fire-Rated Door Assemblies:** Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 and UL10C. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, plus resilient and required intumescent seals if not furnished with wood door.
- G. **Templates:** Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.
- H. **Keying Conference:** Conduct conference at Project site to comply with requirements in Division 01. In addition to Owner, Construction Manager, Contractor, and Architect,

conference participants shall also include Suppliers Architectural Hardware Consultant and Owner's security or low voltage consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Review of all lock functions.
2. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
3. Preliminary key system schematic diagram.
4. Requirements for key control system.
5. Address for delivery of keys.

I. Pre-installation Meeting:

1. Before hardware installation, General Contractor/Construction Manager will request a hardware installation seminar be conducted on the installation of hardware; specifically that of locksets, closers, and exit devices. The hardware supplier for the project and the manufacturer's representative of locksets, closers, and exit devices shall present the seminar. Seminar to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Seminar to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.
2. Before electronic hardware installation, arrange conference between supplier, installers, Colorado of Mines (CSM) lock shop and related trades to review materials, procedures and coordinating related work. Coordinate with electrical engineer and electrician to ensure that line voltage and low voltage wiring is coordinated to provide a complete and working system.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Supplier shall notify participants at least five (5) working days before meeting.
5. Failure to hold the pre-installation conference may affect the product warranty.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Marking and packaging:

1. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.
2. Packaging of door hardware is the responsibility of the supplier. As hardware supplier receives material from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set and door numbers to match the approved hardware schedule. Two or more identical sets may be packed in same container.

B. Delivery:

1. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Inventory door hardware jointly with

representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.

2. No keys, other than construction master keys and/or temporary keys are to be packed in boxes with the locks.

C. Storage:

1. Provide secure lock-up for door hardware delivered to the Project, but not installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.08 SEQUENCING AND COORDINATION:

A. Supplier shall coordinate the following items with the General Contractor and related trades.

1. Coordinate work of this Section with other directly affected Sections involving manufacture of any internal reinforcement for door hardware. Furnish hardware templates to door fabricators for factory preparation to receive hardware.
2. Furnish hardware items of proper design for use on doors and frames of thicknesses, profile, swing, security, and other indicated requirements as necessary for proper function.
3. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
4. Coordinate solid blocking between studs of frame construction to support wall mounted items such as stops.
5. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices and access control system. Electro-Mechanical Hardware requires meticulous coordination among:
 - a. Architect.
 - b. Electrical engineer.
 - c. Hardware supplier/contractor.
 - d. Electro-mechanical hardware supplier/contractor.
 - e. Frame supplier/contractor.
 - f. Electrical Contractor.
 - g. Security systems Contractor

1.09 WARRANTY:

- A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.
1. Cylindrical locksets and latchsets: Seven (7) years
 2. Exit Devices: Three (3) years

3. Mortise locksets and latchsets: Three (3) years
4. Door closers: Ten (10) years

1.10 MAINTENANCE SERVICE:

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.11 COMMISSIONING:

A. COMMISSIONING:

1. The General Contractor in conjunction with the lock manufacturer's representative, hardware installer and supplying distributor shall commission hardware. Comply with Division 01 and as follows.
 - a. Test door hardware operation with climate control system at both rest and while in full operation.
 - b. Test electrical and electronic hardware systems for satisfactory operation.
 - c. Test hardware interfaced with fire/life-safety system for proper operation and release.

1.12 EXTRA MATERIALS

- A. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Ten (10) percent of all parts used for specific project.
 2. The following maintenance equipment shall be supplied.
 - a. Von Duprin 98/99 maintenance kit, 050046.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Only manufacturers as listed below shall be accepted.

2.02 MATERIALS:

A. GENERAL HARDWARE REQUIREMENTS:

1. Provide hardware materials and products of the best quality, free from imperfections and flaws in appearance, finish, or operational function.
2. Refer to Hardware Schedule below for specific hardware items, designs, functions, sizes, and finishes.

2.03 HINGES

A. Manufacturers:

1. Equal product of any BHMA member.

B. General: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel or brass/bronze, with stainless-steel non-removable pin.
2. Interior Hinges: Steel, with steel pin
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

D. Hinges shall be five-knuckle design, ball bearing as specified with NRP (non-removable pin) feature, at all reverse bevel doors.

1. Quantity, regardless of quantities specified in the hardware schedule provide the following:
 - a. 2 - hinges per leaf for openings through 60 inches (1524 mm) high.
 - b. 1 - additional hinge per leaf for each additional 30 inches (762 mm) in height or fraction thereof.
 - c. 4 - Dutch doors up to 90 inches (2289 mm) in height.
2. Size, regardless of size shown provide the following:
 - a. Doors up to 3'6": 2 ball bearing, standard weight, 0.134 gage, 4-1/2 inch by 4-1/2 inch (114 mm by 114 mm).
 - b. Doors 3'-6" and over: four ball bearing, heavy weight, 0.190 gage, 5 inches x 4-1/2 inches (127 mm by 114 mm).
3. Options: NRP (non-removable pin) feature, furnish at all reverse bevel doors with locksets.
4. Where necessary to maintain proper swing and door clearance at jamb trim, frame conditions, door reveals, door thickness and similar conditions, provide wide throw hinges.
5. Provide shims and shimming instructions for proper door adjustment.

6. Electric Hinges (allowed for retrofit only, use Electric Power Transfer for new construction): Panic bar only.
 - a. Manufacturers:
 - 1) Command Access Technologies
 - b. Transfer power from door frame to edge of door.
 - c. Provide monitor hinge as directed by CSM.
 - d. Provide sufficient number of concealed wires to accommodate electric function of specified hardware.
 - e. Locate electric hinges at second hinge from bottom.
 - f. Provide mortar guard for each electric hinge scheduled.
7. Electric Power Transfer:
 - a. Manufacturers:
 - 1) Von Duprin EPT-10, no substitution
 - b. Transfer power from door frame to edge of door.

2.04 CONTINUOUS HINGES

- A. Manufacturers:
 1. Ives
 2. Markar
- B. Restricted to aluminum doors and frames.
- C. Pin and barrel continuous hinges shall be certified to exceed six million, 6,000,000, full load-operating cycles by a recognized independent testing laboratory.
- D. Fabricate units from heavy-duty 14 gage, Type 304 stainless steel. Hinges shall be rated at 600-pound weight capacity.
- E. Manufacture units for proper door thickness, height, custom screw patterns and electrical modifications.

2.05 DOOR BOLTS

- A. Manufacturers:
 1. Equal product of any BHMA member.
- B. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.
- C. Manual Flush Bolts: designed for mortising into door edge.
- A. Automatic and Self-Latching Flush Bolts: designed for mortising into door edge. Use of automatic or self-latching bolts requires prior approval by CSM lock shop. Automatic flush bolts shall only be used with hollow metal doors.
- D. Locate centerline of manual top bolt not more than 78 inches (1981 mm) from finished floor.
- E. Dust Proof Strikes - furnish with all flush bolts.

2.06 COORDINATORS

- A. Manufacturers:
 1. Ives
 2. Rockwood
 3. Trimco
- B. Provide coordinator for labeled pairs of doors equipped with automatic flush bolts. Use of coordinators requires prior approval by CSM lock shop.

2.07 Provide filler bars for total opening width and closer mounting brackets where applicable.

2.08 MECHANICAL LOCKS AND LATCHES

- A. Manufacturers:
 1. Sargent - no substitutions
- B. Locksets and Latchsets – Heavy Duty Cylindrical Type:
 1. Sargent 11 line series
 2. Lever Style: L- cast
 3. Independent lab-tested 3,000,000 cycles.
 4. Provide 2-3/4 inch backset.
 5. Electric operation: Manufacturer-installed continuous duty solenoid.
- C. Locksets and Latchsets – Heavy Duty Mortise Type:
 1. Sargent 8200 series
 2. Lever Style: NJ
 3. Independent lab-tested 1,700,000 cycles.
 4. Provide 2-3/4 inch backset.
 5. Electric operation: Manufacturer-installed continuous duty solenoid.
- D. Strikes:

1. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond doorframe trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors. Provide wrought box strikes on all locks.

- E. General Contractor to arrange for a keying meeting, and programming meeting with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements.

2.08 HARDWIRED ELECTRONIC LOCKSETS

A. Manufacturers:

1. Sargent 10 line series and 8200 series no substitute

B. Locksets - Heavy Duty Cylindrical or Mortise Type

1. request to exit (REX), mechanical key override shall be contained in the lockset.

2.09 CYLINDERS, KEYING, AND STRIKES

A. Manufacturers:

1. Small Format Interchangeable core: Schlage – no substitute (Facility Management-maintenance, mechanical rooms, electric, janitorial, IT.)
2. Large Format Interchangeable core: Schlage – no substitute (Student Housing, High Security openings, and as required by CSM).
3. Small Format Interchangeable core: Schlage – no substitute (key switches for elevators, roof hatches and access control panels).

- B. Keying schedule: Hardware Supplier or Factory Authorized Service Center shall meet with Colorado School of Mines (CSM) Lock Shop to finalize keying requirements and obtain keying instructions in writing. All cylinders shall be master keyed by Supplier or Service Center, combined in sets or subsets, master keyed or great grandmaster keyed, as directed by Lock Shop. Permanent keys shall be stamped with the applicable key mark for identification. Permanent keys will also be stamped "Do Not Duplicate". Deliver all permanent keys, security cores, and other security keys direct to Lock Shop's Representative from Supplier or Service Center a minimum of sixty (90) days prior to completion by secure courier return receipt requested.

- C. Cylinders: Interchangeable core type, constructed from brass or bronze, stainless steel, or nickel silver.

- D. Number of Pins: Six or Seven as determined by cylinder type.

1. Cylinders shall have seven pin small format interchangeable core cylinders; this includes mechanical or electrical rooms at Student Housing and all other buildings.
2. Cylinders at Student Housing, exterior doors and high security doors shall have large format six pin interchangeable core cylinders.

- E. Permanent Cores: Manufacturer's standard; finish face to match lockset; interchangeable cores.
 - 1. Stamp core on side with key symbol (Concealed key control "CKC", part #50-216).
- F. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 20 construction master keys and 2 construction control keys.
 - 1. The Owner or Owner's Security Agent in conjunction with the supplying distributor shall remove construction cores and install final cores.
- G. Keying System: Master key system, keyway shall be as determined by the Lock Shop.
- H. Keys: Provide nickel-silver keys permanently inscribed with a visual key control. Furnish keys in the following quantities:
 - 1. Cylinder change keys: Five per keyed cylinder
 - 2. Master Keys: One per keyed cylinder
 - 3. Temporary construction keys: Twenty.
 - 4. Construction control keys: Two
 - 5. Key Blanks: Five Hundred.
- I. Key Control System: Computerized asset-tracking system as manufacturer by Key Systems, Inc., P.O. Box G, Fishers, NY 14453, www.keystorage.com.
 - 1. Furnish one key cabinet at entry of the building, with key capacity of **retaining 64 keys**

2.10 EXIT DEVICES

- A. Manufacturers:
 - 1. Von Duprin 98 series – no substitute
 - 2. Von Duprin XP98 series – no substitute at exterior doors.
- B. Rim and Surface Vertical Rod Type:
 - 1. Exit devices shall be touchpad style, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
 - 2. Exit devices shall have smooth interior body.
 - 3. All exit devices shall incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one-half of the door width. All latchbolts to be dead latching type, with a self-lubricating coating to reduce wear.

4. End-cap will be sloped to deflect any impact from carts and they shall be flush with the external mechanism case. End caps that overlap and project above the mechanism case are unacceptable. End cap shall utilize a two-point attachment to the mounting bracket.
5. Touchpad shall match exit device finish. Only compression springs will be used in devices, latches, and outside trims or controls.
6. Plastic templates shall be included with each exit device to facilitate a quick, easy and accurate installation.
7. Strikes shall be roller type and come complete with a locking plate to prevent movement.
8. Independent lab-tested 3,000,000 cycles.
9. Provide cylinder dogging on panic exit hardware.
10. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
11. Lever trim for exit devices shall be vandal-resistant type, which will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
12. Outside Trim: Lever with cylinder, Pull with cylinder; material, finish, and design to match locksets and latchsets, unless otherwise indicated. Lever trim shall be convertible to electric operation.
13. Through Bolts: For exit devices and trim on metal doors, non-fire-rated wood doors, fire-rated wood doors and fire-rated metal doors.
14. Rim Exit Device latch bolt at all exterior doors shall have a unique two piece construction providing the following advantages, Von Duprin XP99 series.
 - a. Static load force resistance in excess of 2000 lbs.
 - b. Provides 90-degree latchbolt strike engagement.
 - c. Compensates for deteriorating or weak frame installations by providing greater and longer lasting latch bolt/strike contact.
15. Electrified Breakaway lever trim:
 - a. Provides remote locking and unlocking capabilities the 24VDC solenoid can be energized from a distant controller, thus allowing access control of the opening.
 - 1) Von Duprin E996L.
16. Magnetic Cylinder Protector:
 - a. Shields the cylinder from attack.
 - 1) Securitech "Securiguard", furnish at one exterior door as selected by CSM at exit device cylinder. Model #6300.

2.11 KEYED SECURITY REMOVABLE MULLIONS

A. Manufacturers:

1. Von Duprin – No substitute
 - a. Interior/Exterior, hollow metal or wood, mullion is removable only with building keys. Mullions shall self-lock when re-installed without the use of the cylinder key.
 - b. Provide two-piece interlocking stabilizer set. One piece shall be installed on the mullion and the other piece installed on the door. Provide shims to adjust for door misalignment.

- c. Furnish storage brackets for securely stowing the mullion away from the door when removed.
- d. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

2.12 ELECTRIC STRIKE

- A. Manufacturers:
 - 1. HES
 - a. 4500 Series for cylindrical and mortise locksets.
 - b. 9500 or 9600 Series for rim type panic hardware.
 - 2. Von Duprin
 - a. Model 6300 for rim type panic devices.
- B. Electric strikes shall provide remote release of latchbolts. They shall be designed for use with the type locks shown at each opening where required. Strikes will be UL Listed for Burglary-Resistant Electric Door Strike, and where required, shall be UL listed as electric strikes for Fire Doors or Frames. Faceplates shall be stainless steel with finish as specified for each opening.
- C. Solenoids shall be of the continuous duty type for the voltage specified. Strikes shall have an adjustable backbox to compensate for misalignment of door.
- D. Electric strikes shall be furnished with Command Access CRU2 current reduction module.

2.13 OPERATING TRIM

- A. Manufacturers:
 - 1. Equal product of any BHMA member.
- B. Push-Pull Design: As scheduled.
- C. Operating trim on panic devices to be lever only (996L), no pull trim allowed.

2.14 CLOSERS

- A. Manufacturers:
 - 1. LCN 4040XP series – no substitute. for exterior openings
 - 2. LCN 4041 series – no substitute for interior openings

B. Surface Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall have heat-treated pinion.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
4. Closers installed on exterior doors and interior doors in high traffic areas and lead lined doors, shall be equipped with advanced variable back check, AVB, function and "SCUSH" stop arms.
5. All closers shall have forged steel arms.
6. Only parallel arm installation allowed.
7. Independent lab-tested 3,000,000 cycles.
8. Through Bolts: For closers on metal doors, non-fire-rated wood doors, fire-rated wood doors and fire-rated metal doors.
9. Closers will have Powder coating finish certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
10. Refer to door and frame details and furnish accessories such as drop plates, special templates, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.

C. ADA Special Closers (Electric)

1. Manufacturers:
 - a. LCN 4640 Series, – no substitute
2. Where "Low Energy Power Operated Door" is indicated for doors required to be accessible to the disabled, provide electrically powered operators complying with the ADA requirements for opening force and time to close standards.
3. Full closing force shall be provided when the power or assist cycle ends.
4. Modular design, adjustments easily accessible from the front, UL listed for use on labeled doors.
5. Shall have "Second Chance" function to accommodate momentary resistance, "Breakaway" function in the electronically controlled clutch, "Soft Start" motor control function and "Maintain Hold-Open Switch" to hold the door open at 90 degree.
6. Shall have built in 12V and 24V power supply for actuators, card readers, electric strikes and magnetic door locks, inputs for both swing and stop side sensors and available to accept either 120VAC or 220VAC input power. All wiring connections between operator modules made by easy-to-handle electrical connectors. Shall comply with both UL and NEC requirements for Class 1 and Class 2 wiring by providing separate conduits for each.
7. Shall have seven independent electronic adjustments to tailor the operator for specific site conditions. Opening speed, holding force at 90 deg., sequential trigger and time delay, hold-open time at 90 deg., opening force, clutch "breakaway" force setting, electric strike trigger and time delay.
8. Shall have separate and independent adjustments for back check, main speed and latch speed.
9. Furnish actuators and other controls as shown in Hardware Sets.
10. Hardware supplier shall provide point-to-point wiring diagrams for automatic operator(s) to general and electrical contractor prior to electrical rough in. Electrical contractor shall

provide 120VAC to operator and provide and install wiring low voltage wiring from operator to actuators.

2.15 PROTECTIVE TRIM UNITS

A. Manufacturers:

1. Equal product of any BHMA member.

B. Protective Trim Units: Furnish .050 inches thick 10" high x door width less 2". Where glass or louvers prevent this height, supply with height equal to height of bottom rail less 2". Fasten with exposed machine or self-tapping screws.

C. Material: Metal.

2.16 STOPS AND HOLDERS

A. Manufacturers:

1. Equal product of any BHMA member.

B. Stops and Holders: Provide wall stops for doors, unless other type stops are scheduled or indicated. Where wall stops are not appropriate, provide overhead stops.

C. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

2.17 OVERHEAD STOPS/HOLDERS

A. Manufacturers:

1. Equal product of any BHMA member.

B. Where specified, overhead stops as shown in the hardware sets are to be provided. Overhead stops shall be of non-handed design.

C. When the overhead holder or stop is installed with a surface closer, template closer to work with the stop or holder. Provide mounting plates with closer as required.

2.18 DOOR GASKETING AND THRESHOLDS

A. Manufacturers:

1. Equal product of any BHMA member.

- B. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.
- C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled based on testing according to UL 1784.
- E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled based on testing according to UL 10C.
- F. Thresholds: $\frac{1}{4}$ or higher in compliance with accessible codes at all interior and exterior openings.

2.19 SLIDING DOOR HARDWARE

- A. Manufacturers:
 - 1. Equal product of any BHMA member.
- B. Sliding Door Hardware: Of type scheduled or indicated.
- C. Sliding Door Hardware: Provide complete sets consisting of rails, hangers, supports, bumpers, floor guides, and accessories indicated.

2.20 LOCKGUARD

- A. Manufacturers:
 - 1. Equal product of any BHMA member. Use at exterior doors with cylindrical locks where indicated by CSM , typically mechanical and electrical rooms.

2.21 FIRE DEPARTMENT LOCK BOX:

- A. Provide Knox Model No. 4400 Knox Vault (recessed or surface mount as required by Owner) with dual lock configuration or other lock box as required by local fire department, in quantity and location as directed by the fire department and approved by the Architect. Recessed mount shall be furnished with recessed mounting kit (RMK) for new concrete or masonry construction.

2.22 CABINET LOCKSETS

- A. Manufacturers:

1. As selected by Architect

- B. Cabinet locks shall accept Schlage small format interchangeable core.

2.23 POWER SUPPLIES AND ENCLOSURES.

- A. Lenel - LNL-AL600ULXB with the following items installed

1. AL600ULXB

2. AL600ULPD8

3. All models are UL listed and incorporate integral battery charging capability which keeps the sealed lead acid gel/cell at full charge for instantaneous stand-by power in case of line voltage failure. All models in the series are Class 2 rated by UL which means that output wiring need not be run in conduit. Power supply shall incorporate a fused AC input and a regulated DC output.

4. Furnish all power supplies with 8Ah back up batteries as manufactured by ELK.

5. Power supplies shall be connected to building CPU, emergency power and shall have a 120-volt isolation switch installed in the line voltage circuit ahead of the equipment.

2.24 SECURITY CONDUCTORS & CABLES

- A. Furnish wiring as listed below as required for electrified hardware.

1. Maximum wire run shall be 300'. Request to exit and door contact circuits shall be supervised.

2. 22/6 plenum shielded cable shall be green.

3. 18/4 shall have one red, one black, one white, and one green wire.

4. 22/6 shall have one red, one black, one white, one blue, one brown, and one green wire.

- B. All cable installations shall follow the requirements outlined within the campus standards division 16 section 16700.

2.25 MISCELLANEOUS DOOR HARDWARE

- A. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

2.26 FINISHES

- A. Generally, Satin Bronze, US10 / BHMA 612/639. Provide finish for each item as indicated in sets or Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS:

- A. Factory trained and certified by the lock, closer and panic hardware manufacturers. Alternative: can demonstrate suitably equivalent competence and experience.
- B. Automatic operator installer shall be factory trained, certified by AAADM, and experienced to perform the work.

3.02 EXAMINATION

- A. The General Contractor in conjunction with the hardware installer and supplying distributor shall examine doors and frames as follows.
 - 1. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Ensure that walls and frames are square and plumb before hardware installation.
 - 2. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Beginning of installation means acceptance of existing conditions.

3.03 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
- B. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI/SDI A250.6-97.
- C. Wood Doors: Comply with DHI A115-W series.

3.04 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable requirements of SDI, WDMA, NFPA 80, BHMA, and DHI.
- B. Install each door hardware item to comply with manufacturer's written instructions. NOTE: NO POWER DRIVEN TOOLS SHALL BE USED FOR INSTALLATION OF LOCKSETS AND HARDWARE ON DOORS.
 - 1. Installer may leave hardware items in place during finishing work provided such items are fully masked and protected. Remove finish materials that may penetrate masking, without damage to hardware or its finish or replace as required.
- C. Use the templates provided by hardware item manufacturer.
- D. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Conform to ANSI A117.1 for positioning requirements for the handicapped.
- E. Process hardware for aluminum doors in accordance with DHI handbook, Processing Hardware for Custom Aluminum Doors and Frames.
- F. Wherever cutting and fitting are required to install hardware on surfaces which are to be painted or finished by others, coordinate removal, storage, and reinstallation or application of surface protections with finishing work specified in other Sections. Do not install surface-mounted items until finishes have been completed on the substrate. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as required for proper installation and operation.
- G. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as required for proper installation and operation.
- H. Drill and countersink units, which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with referenced standards.
- I. Drill pilot holes for fasteners in wood doors and/or frames.
- J. Drawings typically depict doors at 90 degrees; doors will actually swing to maximum allowable. Template hardware for maximum allowable degree of swing.
- K. Cut and fit threshold to profile of door frames. Use single piece units.
- L. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps. Door Jambs must be cleaned of all dirt, grease, oil, solvents or

solvent residue and dust before applying Pressure-Sensitive Adhesive backed Gasketing, Smoke Seal or Weatherstripping.

- M. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- N. Boxed Power Supplies: Locate power supplies at the head end of the access control panels or at the substation for the access control panels.
 - 1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- O. Automatic operator installation:
 - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
 - 2. Mounting: Install door units plumb, level and true to line, without warp or rack of frames with manufacturers prescribed tolerances.
 - 3. Anchor securely in place.
 - a. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - b. Set headers and arms level and true to location with anchorage for permanent support.
 - 4. Install actuators where indicated, wire to operator(s) as required.
 - 5. Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.
 - 6. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants" to provide weather tight installation.
 - 7. General or Electrical Contractor to install all wiring to operator on a separate circuit breaker routed into header. Install low voltage wiring from actuators to operator.

3.05 ADJUSTING

- A. 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.
- B. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.
- C. Make final adjustments and lubrication immediately prior to final acceptance.
 - 1. Door Closers: Closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees should be 5 seconds minimum.
 - 2. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 3. Door control devices backcheck shall be properly located for protection of the door, frame, and applied hardware.

4. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees. Adjust so that from the open position of 70 degrees, the door shall move to the closed position in 1.5 seconds minimum.
 5. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 6. Test door hardware operation with climate control system both at rest and while in full operation.
- D. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
1. Verify levers are free from binding.
 2. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 FINAL ADJUSTMENT

- A. Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Instruct Owner's personnel in proper adjustment and maintenance of and hardware finishes, during the final adjustment of hardware.

3.08 CONTINUED MAINTENANCE SERVICE

- A. Approximately six months after the acceptance of hardware in each area, the Installer, accompanied by the representative of the latch and lock manufacturer, shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items that have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems in the performance of the hardware.

3.09 HARDWARE SCHEDULE:

Found on the following pages

Cylinder Dogging required at all non-fire rated devices.

Removable Mullion

Key Removable Mullion Non-Rated Pair of Doors	Von Duprin	KR4954
Key Removable Mullion – Fire Rated Pair of Doors	Von Duprin	KR9954

†Mullions shall accept small format interchangeable core cylinders only. †

Coordinator

Coordinator	Ives	COR x FL X MB
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Automatic Flush bolts – Hollow Metal Doors only

Metal Door	Ives	FB31P
	Ives (Top Bolt with Auxiliary Fire Latch)	FB32

Constant Latching Flush bolts

Wood Door	Ives	FB61P
	Ives (Top Bolt with Auxiliary Fire Latch)	FB62
Metal Door	Ives	FB51P
	Ives (Top Bolt with Auxiliary Fire Latch)	FB52

Manual Flush bolts

Fire Rated Wood Door	Ives	FB358
Wood Door	Ives	FB358 or FB458
Fire Rated Metal Door	Ives	FB458
Metal Door	Ives	FB458

Dust Proof Strike (at all doors with bottom bolt)

Dust Proof Strike	Ives	DP1 or DP2
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Surface Closer

Exterior Doors	LCN	4040 XP AVB
Exterior Outswing with Stop Arm	LCN	4040XP SCUSH AVB
Interior In swing	LCN	4041 EDA
Interior Outswing	LCN	4041 EDA

-only parallel arm mounting allowed all doors.

Electric Automatic Operator

Pull Side	LCN	4630 Series
Push Side	LCN	4640 Series
†Furnish required hard-wired actuators.†		

Door Stops

Wall	Ives	WS406CCV/CVX
Floor (Interior)	Ives	FS436 or FS438
Floor (Exterior)	Ives	FS18S or FS444

Magnetic Hold Open

Wall	LCN	SEM7850
Floor	LCN	SEM7820

Accessories

Push Plate	Ives	8200 4" x 16"
Pull Plate	Ives	8303-0 4" x 16"
Kick Plate (Single Door)	Ives	8200 10" x 2" LDW
Kick Plate (Pair of Doors)	Ives	8200 10" x 1" LDW
Mop Plate	Ives	8200 4" x 1" LDW
Lock Protector	Ives	LG12
Threshold	Pemko	272A ¼" x 6"
Architect to coordinate with project conditions. Thresholds shall be specified at all interior and exterior doors.		
Smoke Seal	Pemko	S88D Head and Jambs
Weatherstrip at Head	Pemko	2891AS
Weatherstrip at Jambs	Pemko	290AS
Door Sweep	Pemko	345ANB
Rain Drip	Pemko	346C x Frame Width
Astragal Pemko	355CS	
Metal Frame Silencer	Ives	SR64
Wood Frame Silencer	Ives	SR65

Access Control

Electric Strike	HES/Von Duprin	4500, 9500, or 9600 series VD 6300
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All electric strikes shall be furnished with Command Access CRU2 current reduction module.

Heavy Duty Cylindrical Hardwired Access Control Cylindrical Locksets and Latchsets

Cylindrical	Sargent	10 Line RX-G04-LL (Fail secure)
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Heavy Duty Cylindrical Hardwired Access Control Mortise Locksets and Latchsets

Mortise With $\frac{3}{4}$ Bolt	Sargent	8200 series RX-8271-24vdc- L-LW1 (fail secure)
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Electrified Exit Device Trim	Von Duprin	E996L
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END OF SECTION