

Appendix IV Door Hardware

Caltech Master Specification

July 2011

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware for aluminum, metal and wood doors.
2. Thresholds, weather-stripping, coordinators, astragals and door seals.
3. Electrified hardware, including power supplies, power-operated door openers, and card access controllers.
4. Miscellaneous accessories and trim, including toilet hardware.

Note: Add or delete Sections as necessary.

B. Related Sections:

1. Section 08 11 00 "Metal Doors and Frames."
2. Section 08 41 13 "Aluminum-Glazed Entrances and Storefronts."
3. Section 08 14 00 "Wood Doors."
4. Section 10 28 00 "Toilet, Bath, and Laundry Accessories."
5. Division 26 – Electrical.

1.2 REFERENCE STANDARDS

A. Refer to appropriate section for information concerning availability and use of references.

Note: Items listed in this article have been referenced with in other portions of this section. Delete items as deemed appropriate.

1. ADA - American Disabilities Act- Public Accommodations- Title III
2. ANSI-A 117.1 - Accessible and Useable Building and Facilities
3. ANSI/BHMA A 156 - Product Listing
4. ASTM E 152 - Methods for Fire Tests of Door Assemblies
5. ASTM E 283 - Test Methods for Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors
6. CBC - California Building Code and Local Jurisdiction having Authority.
7. CCR - California Code of Regulations Title 24
8. DHI - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
9. ITS - Intertek Testing Services (Warnock Hersey)
10. NFPA 80 - Fire Doors and Windows
11. NFPA 101 - Safety to Life from Fire in Buildings and Structures
12. NFPA 105 - Installation of Smoke-Control Door Assemblies
13. NFPA 252- Fire Test of Door Assemblies
14. NWWDA: - I.S.1-A National Wood Window and Door Association

Caltech Master Specification

July 2011

15. SDI - 107 Hardware on Steel Doors (Reinforcement/Application)
16. UL - Underwriters Laboratories 305 Panic Hardware
17. UL10B - Fire Tests of Door Assemblies
18. UFAS - Uniform Federal Accessibility Standards

1.3 SUBSTITUTIONS

- A. References are used to establish minimum standards of utility and quality. Unless approved furnish only the specified products.
 1. Requests for substitutions to be in accordance with Division 1 - General Requirements, and are to be in writing and hand-delivered and approved by Caltech Lockshop. Approvals will be issued in an Addendum at least ten days prior to bid opening.
 2. All requests to be accompanied by two copies of the manufacture's brochures and a physical sample of each item in appropriate design and finish.
- B. Items listed with "no approved equal" are requested by the Caltech Lockshop to match existing building standards. Substitutions will not be considered
- C. Should the Contractor make substitutions without written consent of the Design Professional and Caltech Lockshop, Contractor shall remove substituted hardware, replacing same with the specified hardware and at no additional cost to Caltech.

1.4 SUBMITTALS

- A. Products Data: Submit manufacturer's technical product data for each item of hardware. Show finishes, sizes, catalog numbers and pictures, instructions for installation and maintenance.
- B. Hardware Schedule: Submit typewritten copies of hardware schedule organized into "hardware sets" which shall conform to DHI's "Recommended Procedure for Processing Hardware Schedules and Templates." Schedule shall reflect complete designations of every hardware item required for each door or opening and other miscellaneous hardware. Include the following information:
 1. Type, style, function, size, quantity and finish of each hardware item.
 2. Name, part number and manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Locations of Hardware set cross-referenced to location on drawings both on floor plans and in door schedule.
 5. Explanation of all abbreviations, symbols, and codes contained in hardware schedule.
 6. Mounting locations for Hardware.
 7. Door and Frame sizes and materials.
 8. Include a list of all manufacturers used and they're nearest representative, with contact name, address and phone number.
 9. Unless requested, metal and wood doors to be specified with internal blocking and/or metal reinforcing for surface hardware.
 10. Keying Schedule: Submit separate detailed schedule indicating clearly how the Campus Lockshop's final instructions on keying of Locks has been fulfilled, subject to Campus Lockshop's instructions.

Caltech Master Specification

July 2011

C. Project Closeout Submittals:

1. Two copies of factory bitting list and keying schedule.
2. Two copies of manufacturer's product data for each type of hardware product.
3. One copy of approved door and door hardware shop drawings and schedules.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Hardware: At job completion, supply to Caltech Lockshop:

1. One percent extra of each item of hardware furnished for the Project, but not less than one of each item.
2. One-hundred key blanks of each section (keyway) furnished.

B. Tools: Provide one set of installation and adjustment tools, 1 set of maintenance manuals for locksets, door closures, panic devices and electrical components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. The Hardware sets listed in the Hardware Schedule are prepared to establish typical door hardware requirements. Should any door or item be omitted from schedule, provide such door or item same as required for similar application.
2. Supplier Qualifications: Must be recognized Southern California based factory_direct contract distributor with a minimum five years experience specializing in institutional hardware of the type specified herein. Supplier must employ, on a full time basis, a certified "Architectural Hardware Consultant" (AHC). The resident consultant shall be available for consultation and service to Design Professional, Contractor, and Caltech Lockshop during construction and on an ongoing consulting service to the Campus Lockshop following job completion.
3. A supplier, who does not maintain personnel, including a resident consultant, in a permanent facility, and within reasonable driving radius of the project area for consultation and service with the Design Professional, Contractor and Campus Lockshop, will not be acceptable.

B. Preinstallation Conference: Prior to the installation of hardware, Contractor shall arrange a conference between hardware supplier, door supplier(s), installers and related trades to review materials, procedures, and hardware mounting locations, electrical components and related work.

C. Installation Exercise: Installer is required to install one complete exterior opening hardware set and the respective hollow metal door and frame, to establish both knowledge and skill, as required by the Project. Door, frame and hardware installation practice will be coordinated with the Design Professional and Caltech Campus Lockshop. Typical hardware set to be comprised of hinges, panic device, trim, door closure, overhead stop if detailed, flat goods, threshold, sweep, drip cap and perimeter jamb seals, or as specified for the Project.

Caltech Master Specification

July 2011

- D. Errors resulting in replacement material or repair, including labor, shall be absorbed by the Contractor/Installer.
- E. Post-Installation Policing: Hardware Specification writer, Hardware Distributor, Contractor, Caltech Lockshop, and Design Professional to determine compliance with the hardware specifications and campus standards.
- F. Regulatory Requirements:
1. Exit Doors: Operable at all times from the inside without use of key or any special knowledge or effort.
 2. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with the California Code of regulations (CCR) Title 24 part 2, California Building Code and NFPA Standard No.80. This requirement takes precedence over other requirements for such hardware.
 3. Provide only hardware, which has been tested and listed by Underwriters' Laboratories or other testing agency acceptable to the State Fire Marshall for the type and size of each door required and complies with the requirements of the door and door frame labels. Provide latching hardware, door closures, bearing hinges, and seals whether listed in the Hardware Schedule or not as required by the respective rated opening.
 4. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door label indicating "Fire Door to be Equipped with Fire Exit Hardware" and provide label on exit device indicating "Fire Exit Hardware." Exit devices in non-labeled openings to be listed for panic.
 5. Fire-Rated Openings: Provide hardware that is in compliance with the accessibility requirements of CCR Title 24, Part 2.
 6. Closers are to have opening force adjusted so as to comply with current applicable handicapped accessibility requirements as follows: interior doors 5 pounds maximum pressure to operate; exterior doors 8.5 pounds maximum pressure; fire doors 15 pounds maximum pressure.
 7. Hardware Locations: All hardware to be mounted between 30 inches and 44 inches. In general, refer to DHI's "Recommended Hardware Locations. Prior to issuing hardware templates, Contractor and hardware suppliers shall review locations with the Design Professional and Campus Lockshop.
- G. General Requirements:
1. Coordinate as necessary with other trades to insure proper and adequate provision in the work of those trades for interface with work of this section.
 2. All hardware shall be new and free from defects affecting both serviceability and appearance. Working parts shall be properly fitted, smooth operation and without excessive play.
- H. Electronic Hardware and Systems:
1. All electrical components, hardware, switches, power supplies, operating as a system, to be supplied from a single manufacturer (to insure compatibility) unless otherwise specified in the hardware schedule.
 2. Electrified hardware to be as specified. Specifications requiring electrified products shall be coordinated with the approval and assistance of the Caltech Lockshop and Caltech Security Department.

Caltech Master Specification

July 2011

3. Before electrically controlled or operated hardware is ordered; voltages and wiring details shall be coordinated with the contractor and all related trades.
4. Wiring Diagrams: Provide complete wiring diagrams for each opening requiring electrified hardware, including openings where only magnetic hold-opens are specified. Provide a copy with each hardware schedule submitted for approval. Provide other copies with delivery of hardware to jobsite and to Caltech Lockshop at job completion.
5. All electrical components to be listed by opening in the hardware submittals.
6. Operational Descriptions: Provided complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions with the opening incorporating all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval. Supply another copy with delivery of hardware to jobsite and a duplicate to Caltech Lockshop at job completion.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Acceptance at site: individually package each unit of finish hardware, complete with proper fastenings, fittings, and other devices, clearly marked on the outside to indicate contents and specific locations for installation.
- B. Delivery: Deliver Hardware items to job site, except all MEDECO lock hardware and supplies to be delivered directly to Caltech Lockshop.
- C. Contactor to make available a secure location protected from weather and theft.
- D. Contractor is fully responsible for hardware until job completion and sign off.

1.8 PROJECT CONDITIONS

- A. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
- B. Upon request, check the shop drawings for doors and entrances to confirm the adequate provisions will be made for the proper installation of hardware.

1.9 EXISTING BUILDINGS (RETROFIT)

- A. Coordination and Design of Existing Buildings: Locks, panics, closures, and other related hardware (in addition to keying) shall be directed- approved by Caltech Lockshop.
- B. Building Survey:
 1. Contractor is responsible for field survey of doors, frames and hardware to determine compatibility of specified hardware, including but not limited to: locksets, panic devices, strikes, flushbolts, overhead stops, coordinators, closures, threshold/seals, all electrical hardware, and hinge sizes & weights.

Caltech Master Specification

July 2011

2. Existing doors and frames to be modified for hardware as permitted by UL, WHI, and authorities having jurisdiction. Where required, Contractor shall cut and weld reinforcements to existing jamb, and doors if reused, for listed hardware as applicable and required. Contractor to patch, sand and repaint/stain door/frame surfaces affected by the removal of existing hardware. Related costs to field modify existing frames and/or doors shall be part of the Contractor's base bid.
 3. Intertek Testing Service inspection and certification required for the modification of labeled door and frame. Contractor is responsible for contracting and coordinating this required labeling service.
 4. Unless directed otherwise, Contractor to modify all exterior opening to meet ADA elevation threshold requirements. Contractor to survey and where necessary, apply concrete, or pavement where applicable and approved by the Design Professional. Work shall comply with minimum ADA specifications as well as create a flat sub-surface for specified thresholds.
- C. Existing Hardware: Contractor shall deliver all removed/existing hardware to the Caltech Lockshop.
- D. Unused Hardware at New Construction: Contractor shall deliver all unused hardware to Caltech Lockshop.

1.10 WARRANTY

- A. In addition to the two-year general guarantee required by the General Conditions, furnish to the Campus a guarantee against defects in materials and workmanship for the periods of time specified below from the "Date of Acceptance". The Guarantee shall be signed by an authorized representative of hardware manufacturer and the Contractor.
1. Closures: 10 years.
 2. Exit Devices: 1 year.
 3. Locks: 1 year (5 years for FW10L).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Note: Hardware items specified are typical items used in institutional construction and establish the minimum acceptable standards of quality. Add, modify or delete items as necessary to cover special door functions, large or heavy doors, unusual head, jamb or sill conditions, or other special considerations. Follow manufacturer's recommendations and take special care to ensure that items selected are appropriate for size, weight, frequency of use, type of door and head jamb, and sill conditions; will meet the project requirements for sound control, vandal resistance, energy conservation; comply with CCR Title 24 regulations regarding fire and smoke control, handicapped accessibility, and emergency exiting; and will correctly operate as an assembly. Hardware to be selected by a certified Architectural Hardware Consultant (AHC) or by person having equivalent knowledge of architectural hardware.

- A. Items of door hardware required for each door are indicated in the Hardware Schedule at the end of this Section and the door schedule on the Drawings.

Caltech Master Specification

July 2011

- B. Only Grade 1 hardware is acceptable.

2.2 HINGES:

- A. Manufacturers:

Note: Specify heavy-duty hinges for doors weighing over 180 lbs. and for doors subject to abuse, vandalism, and/or high frequency usage. Specify stainless steel hinges (or non-ferrous stainless steel and/or bronze as required) for all outswinging exterior doors. Follow manufacturer's recommendations for selecting material, type, size and quantity of hinges.

CALTECH approved hinge manufacturers:

1. McKinney Products Company; an ASSA ABLOY Group company
2. Stanley Commercial hardware; Div. of The Stanley Works.
3. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
4. Markar Architectural products, Inc.; a subsidiary of Adams Rite Manufacturing Co.

- B. Hinges: BHMA A156.1.

1. Provide full mortise five-knuckle template type, with non-rising loose pins, and flat button tips, unless otherwise scheduled.
2. Hinge size shall be as scheduled, except where necessary to keep door leaf clear of wall, casings, jambs or reveals in door openings, furnish wide throw or swing clear style hinges.
3. Furnish a minimum of three hinges for doors to 90 inches high and one additional hinge for every 30 inches of height or fraction thereof.
4. Exterior Door Hinges: Stainless Steel (or Brass/Bronze as required), oilite or ball bearing with (NRP) non-removable pin at out swinging doors, extra heavy duty, or heavy duty as required. Review with Caltech lockshop.
5. Interior Door Hinges: Steel, oilite or ball bearing type, extra heavy duty, heavy duty, or plain bearings are required.

- C. Continuous Hinges: BHMA A156.26.

1. All hinges to be one manufacturer as hereafter listed for continuity of design and consideration of warranty.
2. All hinges to be non-handed and completely reversible.
3. Hinge Line to be available in concealed flush mount with or without inset, full surface and half surface as specified or required.
4. All concealed hinges to be available in standard, heavy, and extra heavy-duty weights.
5. All full surface and half surface hinges in standard and heavy-duty weights as specified.
6. All hinges to be factor cut for door size.
7. All hinges to be available in clear and dark bronze anodized finishes as required.

2.3 PIVOTS AND OVERHEAD CONCEALED CLOSURES:

Note: Hold open devices for doors to air-conditioned spaces to be reviewed by facilities. Concealed overhead closures to be used only in the even standard surface units cannot meet design requirements.

Caltech Master Specification

July 2011

Floor closers to be used only where design requirements dictate and only then upon review and approval of Caltech Lockshop and or facilities director.

A. Manufacturers:

CALTECH approved pivot and closure manufacturers:

1. LCN Closers; an Ingersoll-Rand company (surface closures and pivots).
2. Rixson Specialty Door Controls; an ASSA ABLOY Group company (floor closures and pivots).
3. SARGENT Manufacturing Company; an ASSA ABLOY Group company. (surface closures).
4. Door-O-Matic; an Ingersoll-Rand company (overhead concealed closures).
5. Horton Automatics; a division of Overhead Door Corporation (Automatic Door Operators for ADA)

B. Overhead Concealed Closures: Single acting unit for use with butt hinges or offset pivots and suitable for concealment within the doors header indicated on the drawings. Furnish center hung (OCH) as required by the respective opening.

C. Pivots: Fully Mortised type of cast bronze with bronze oilite bearings and corrosion protected, hardened steel pins. Pivots shall have a positive stop; factory set to provide for the maximum degree opening permitted by trim of adjacent structure. Furnish special pins and longer spindles as may be required.

1. Pivot Quantities: Furnish a minimum of three pivots for doors to 90 inches high and one additional pivot for every 30 inches of height or fraction thereof.

D. Floor Closures are not to be specified unless approved by Caltech Lockshop in conjunction with the Design Professional.

E. All exterior doors to be specified with overhead doorstops or floor devices and required by the specific opening conditions.

2.4 KEYING REQUIREMENTS

A. Manufacturers:

CALTECH Approved Keying Manufacturer:

1. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.

Attain Caltech Lockshop approval for use of the following two manufacturers.

2. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
3. Schlage Commercial Lock Division; an Ingersoll-Rand company.

B. Contractor to arrange a keying conference with Caltech Lockshop, Design Professional, and Hardware Supplier.

Caltech Master Specification

July 2011

- C. Furnish factory master keyed systems in accordance to lock manufacturer's standards.
- D. Keying systems are to be approved and/or designed by Caltech Lockshop in writing.

Note: For work at existing buildings, Caltech Lockshop to determine existing keying system and coordinate information as required by the project.

- 1. Integrate with the existing master key systems as dictated by existing building standards and as directed by Caltech Lockshop.
 - 2. Medeco Lock cylinders are to be 6-pin standard pin tumbler. Keyway to be dictated by Caltech Lockshop as required.
 - 3. Permanently stamp/inscribe each key with number that identifies cylinder Codes and stamped "Do Not Duplicate", as per specifications from Caltech Lockshop.
- E. Key Quantity: Furnish change keys and master keys as required by Caltech Lockshop. Deliver keys to Caltech Lockshop.
 - F. Provide key codes (factory bitting list) to Caltech Lockshop with sufficient expansion to double the size of the original project.

2.5 LOCKSETS

- A. Manufacturers: All lockset, latches, electronic locksets, and trim to be the product of one manufacturer for the continuity of design and consideration of warranty.

CALTECH Approved Manufacturers:

- 1. SARGENT Manufacturing Company
- 2. Schlage Commercial Lock Division; an Ingersoll-Rand company.

Note: Retrofit cylindrical lock with heavy duty type Sargent 10Line levers in lieu of mortise application where existing conditions allow.

- B. Finish, design and function should be Caltech Standards to match existing.
 - 1. US26D, US10B, or to match existing.
 - 2. Lever designs primarily SARGENT LNL design, Schlage LL, to match existing.
 - 3. Entrance functions with toggle standard, storeroom function on mechanical, custodial, etc.
 - 4. No Deadbolt functions unless approved by Caltech Lockshop.
- C. Locksets: Heavy Duty Mortise type, function and trim design as listed or required.
 - 1. Furnish locksets and Latch sets with stainless steel. One-piece 3/4 inch, anti-friction latchbolt, with latch guard protection.
 - 2. Guardbolt and ASA strike to be non-handed. Lock case to be constructed of 12-gage steel.
 - 3. Lock shall be reversible without opening the case, and Functions should be set only at the factory to insure proper operation.

Caltech Master Specification

July 2011

4. Locks to provide full latch bolt retraction with only 30 degrees lever depression.
5. Locks shall exceed all performance specifications of ANSI A156. 13 Grade 1 and meet cycle test of 2.5 million cycles and shall comply with CCR Title 24, Part 2.
6. Lock to have through-bolted trim with floating spindles and wrought box strikes supplied with strikes.

Note: Select trim design appropriate for the building except that levers shall comply with CCR Title 24 accessibility requirements. If Escutcheon trim specified, furnish escutcheon designed to be flush with cylinder head. If rose trim specified provide Cylinder Trim Rings/Collar.

- D. Electrified Hardware: Specifications requiring electrified Hardware shall be coordinated with Caltech Lockshop. (panic devices, mortise and cylindrical locks, and electric strikes)

2.6 AUXILARY DEADLOCKS,STOREFRONT, AND COMBO LOCKS

- A. Manufacturers:

CALTECH Approved Manufacturers:

1. Simplex Unican (Mechanical Combo Locks).
2. Adams-Rite Manufacturing. Co.; an ASSA ABLOY Group Company (Storefront Aluminum Doors).

2.7 EXIT DEVICES:

- A. Manufacturers: All exit devices, electronic exit devices and trim to be the product of one manufacturer for continuity of design and consideration of warranty.

CALTECH Approved Manufacturers:

1. Von Duprin; an Ingersoll-Rand company (Mech. and Electrified).
 2. SARGENT Manufacturing Company; an ASSA ABLOY Group company (Mechanical).
 3. Precision Hardware, Inc.; a division of Stanley Security Solutions, Inc. (Electrified)
- B. Exit devices shall be chassis mounted unit designed for ease of installation and maintenance. Rails to be solid cast material, not to exceed 3 inches in projection. Furnish exit devices with thru bolts unless otherwise specified.
 - C. Exit device dogging: Except on fire-rated doors, equip exit device with cylinder dogging device.
 - D. Removable Mullion: To be heavy Duty steel design acceptable Manufacturer is Von Duprin, with cylinder type release, for security.
 - E. Finish: All exit devices will match existing building finishes. (US10B, US26D, US32D, US5).
 - F. Electrified Exit Hardware to be approved by Caltech Lockshop.

Caltech Master Specification

July 2011

2.8 FLUSH BOLTS AND COORDINATORS

A. Manufacturers:

CALTECH Approved Manufacturers:

1. Glynn-Johnson; an Ingersoll-Rand company.
2. IVES Hardware; an Intersoll-Rand company.
3. Trimco.
4. Builders Brass Works (BBW).

B. Manual Flush Bolts: Brass or bronze assemblies having a spring snap action lever, which will manually retract and project the bolt when moving to the proper position. The bolt shall have not less than 5/8-inch throw and shall have at least a 7/8-inch vertical adjustment. Provide extension rods of lengths required to position centerline of the operating lever 12 inches above the bottom of the door for bottom bolts and 72 inches above the bottom of the door for top bolts.

C. Automatic Flush Bolts: Brass or bronze assemblies that will automatically retract the bolts when the active door is open and project into the head frame when the active door is closed. Bolts shall have an effective throw not less than 3/4-inch and a minimum vertical adjustment of 1-1/2 inches.

D. Dustproof Strikes: Brass or bronze assemblies with spring-loaded plunger that returns to floor or threshold level anytime the flush bolt is retracted.

E. Coordinators shall prevent the active door from closing before the inactive door by means of a lever and trigger mechanisms. Provide unit of length recommended by the manufacturer for the width of the door.

2.9 OVERHEAD SURFACE MOUNTED CLOSERS:

A. Manufacturers: All surface closers to be the product of one manufacturer for the continuity of design and consideration of warranty

CALTECH Approved Manufacturers:

1. LCN Closers; an Ingersoll-Rand company (surface closures and pivots).
2. SARGENT Manufacturing Company; an ASSA ABLOY Group company. (surface closures).

Note: Provide heavy-duty arms for all parallel arm closers, with compression cushion stop where required at outswinging mechanical, electrical, storage, etc.

B. Closers shall be heavy-duty, surface mounted, hydraulic type, with high strength cast case. Full rack and pinion constructed of heavy steel. Closers to be reversible with arm and brackets of heavy forged steel. Provide thru bolts and grommets for mounting closers.

Caltech Master Specification

July 2011

- C. Closers to have adjustable spring power, which allows for closer sizing. Closers to have separate tamper resistant, non-critical regulating screw valves for closing speed, latching speed, and backcheck control features. Adjustable delay action available as an operation feature.
- D. Closers shall have removable full size, non-corrosive, and high impact resistant covers with a maximum projection of 2-3/16 inches.
- E. Closers, including covers, arms and fasteners shall all have finish to match other door Hardware.
- F. Closer arms to be forged steel, interchangeable with all closers specified on the project, for simplification of future owner maintenance considerations.
- G. Supply appropriate arm assembly for each closer so that closure body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the schedule.
 - 1. All parallel arm mounted closers to be factory indexed to insure proper installation.
 - 2. Furnish heavy-duty cold forged parallel arms for all exterior outswinging openings.
- H. Adjustable Closing Force: Closers shall be fully adjustable over a full range of sizes; except where closers are required to be accessible to the physically disabled, provide adjustable units complying with provisions for opening force and delayed action closing of CCR title 24 and ADA Accessibility Guidelines for Buildings and Facilities. Pressure required to open doors shall not exceed the following:
 - 1. Fire-Rated Doors: 15 Pounds
 - 2. All other exterior doors: 8.5 Pounds
 - 3. All other interior doors: 5 Pounds
- I. Where indicated and/or possible, doors are to swing to 180 degrees.
- J. Unless requested, metal and wood doors to be specified with internal blocking and/or metal reinforcing for surface hardware. (Or thru bolts are to be used).

2.10 OVERHEAD DOOR CONTROL DEVICES (HOLDERS)

- A. Manufacturers:

CALTECH Approved Manufacturers:

- 1. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 - 2. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
 - 3. Glynn-Johnson; an Ingersoll-Rand company.
- B. Overhead control devices may be surface or concealed type consisting of extruded brass or bronze channels, arms and brackets with heavy tempered steel shock absorbing springs. Provide heavy duty units with positive stop and hold open functions as scheduled. Furnish control device sized in accordance with the Manufacturer's recommendation for widths of doors.

Caltech Master Specification

July 2011

2.11 FIREGUARD SMOKE DETECTOR/MAGNETIC DOOR HOLDERS

A. Manufacturers:

CALTECH Approved Manufacturer:

1. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
 2. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
- B. Multi and/or Single point hold-open units, adjustable range of 85 to 110 degrees, with trim permitting.
- C. Where detector is required use integral photoelectric type with LED indicator.
- D. Voltage to be specified per job requirements (12-24 VDC).

2.12 MISCELLANEOUS HARDWARE

A. Manufacturers:

CALTECH Approved Manufacturers (Floor stops, wall bumpers, door holders, push pull units, protection plates, silencers, etc.):

1. Quality
 2. Trimco.
 3. Trimco/BBW
 4. IVES Hardware; an Ingersoll-Rand company.
 5. MAG
 6. Don-Jo Mfg., Inc.
- B. Bumpers, stops, and holders: Stainless steel or Brass/Bronze casting of types scheduled and required.
- C. Push and Pull Plates: Stainless steel or wrought brass/bronze. Provide manufacturers standard fasteners for installation, thru bolted for matched pairs and for wood doors of particle core construction.
- D. Door Protection Plates: Armor, kick, and mop plates shall be stainless steel or brass/bronze as required to match door Hardware, not less than 0.050 inch thick, with beveled edges. Height shall be 36 inches for Armor Plates, 10 inches for kick plates, and 4-inch mop plates.
- E. Lock protectors shall be fabricated of stainless steel or brass/bronze as required to match existing building finish. All exterior-outswinging doors shall be protected with either a lock protector or full length astragal(s).
- F. Silencers: Grey/Black rubber type for use in frames.

Caltech Master Specification

July 2011

2.13 WEATHERSTRIPPING AND SEALS

A. Manufacturers:

CALTECH Approved Manufacturer:

1. National Guard Products.
 2. Pemko Manufacturing Co.; a ASSA ABLOY Group company.
- B. Seals and Inserts: Brush seals shall consist of densely compressed nylon filaments incased in high quality aluminum retainers. All brush seals shall provide a 98 percent airtight seal, reducing the infiltration of light, air and elements.
- C. Where required, furnish closed cell sponge silicone, dense neoprene, polyprene, polyurethane, silicone or vinyl for each assembly. Review with Caltech Lockshop.
- D. Weather-Stripping: Provide exterior doors with door bottoms, head and jamb seals and threshold as scheduled. Air leakage rate of weather-stripping for exterior doors shall not exceed 0.5 cubic feet per minute per lineal foot of crack when tested in accordance with ASTM E 283 at 0.57-psff differential air pressure.
- E. Fire- and Smoke-Rated Doors: Provide with door bottom, head and jamb seals that have been tested in accordance with UL 1784 and comply with performance criteria for allowable air leakage specified in NFPA 105. In addition assemblies shall have been tested in accordance with ASTM E 152 and certified by Underwriters laboratories to have no adverse affect on the fire rating of the door.
- F. Sound Retardant Doors: Provide with automatic door bottoms and adjustable head and jamb seals that have been tested in accordance with ASTM E 90 in conjunction with doors of construction indicated, and will provide an STC rating of [____] or greater when evaluated in accordance with ASTM E 413.
- G. All thresholds must be in accordance with the requirements of ADA and ANSI A117.1.

2.14 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible. Match items to the manufacturer's standard finish for hardware for color and texture.
- B. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum.
- C. The finish designations used in the Hardware Schedule are those specified in ANSI A156.18.

Project requires material to be supplied in BHMA Standards a dictated by Caltech Lockshop (US26D, US10B, US32, US5.) for Building Standards.

Caltech Master Specification

July 2011

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Door clearance: Unless otherwise indicated or specified, provide the following floor clearances.
 - 1. Floor Clearance:
 - a. No Threshold: 5/8-inch maximum above floor finish.
 - b. Threshold: 1/8-inch above threshold.
 - 2. Between Door/Frame at Head/Jambs: 1/8-inch (3/32 at hollow metal hinge and strike jambs).
 - 3. At Meeting Edges of Pairs of Doors: 3/16-inch (1/8 when "Z" astragal is furnished).
 - 4. At Transom Panels without Bars: 1/8-inch
- B. Hardware Mounting Heights: All hardware to be mounted between 30 and 44 inches and as indicated in the following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Design Professional.
 - 1. Steel Doors and Frames (DHI): "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" as applicable.
 - 2. Door Top Rails: Minimum dimension of 7-3/4 inches.
 - 3. Door Stiles: Minimum dimension of 6 inches.
- C. Hardware shall be installed by a qualified tradesman skilled in the application of institutional grade hardware.
- D. Care should be exercised not to mar or damage adjacent work. Damaged work will be repaired or replaced to the satisfaction of the Design Professional and/or Building Owner. (Campus Lockshop)
- E. Provide adequate backing in stud partitions for the attachment of all respective hardware with special focus when installing wall stops.
- F. Install each hardware item in accordance with Manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been complete on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. Pre-drill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal. Set hinge leaves snug and flat in mortises, turn screws to flat seat (do not drive).
- H. Mount door closers and overhead stops and holders in accordance with the manufacturer's template for the degree of swing indicated on the drawings. Adjust closers, strikes and stops after silencers, seal and pressurization are complete. Drive hinge pins down and tighten set screws. Provide through bolts for mounting closers on wood doors.
- I. Install locks and panics with cylinder keyways in proper position, and levers, roses and/or escutcheons firmly affixed.

Caltech Master Specification

July 2011

- J. Set thresholds in waterproof sealant and secure with lead shields and countersunk screws of same finish as threshold.
- K. Except for hinges, do not install hardware until completion of painting and finishing work.
- L. Electrical Components:
 - 1. All wiring runs from one hardware electrical component to another electrified component to have shielded wiring.
 - 2. All electrical components mounted on doors to be capable of operation by 12 to 24 VDC current carried by means of continuous concealed circuit hinge, power transfer hinge or loop. (Per Caltech Lockshop's specifications)
 - 3. Power Supply: To be compatible with hardware manufacturer (regulated and filtered)
 - 4. Installation of Electronic Hardware: Comply with manufacturer's instructions for wiring, grounding and shielding.
 - 5. Field Quality Control of Electronic Hardware: Manufacturer's field representative of electronic hardware to make visit to job site at the request of the Design Professional, Contractor or Campus Lockshop for the purposes of monitoring compliance with manufacturer's installation requirements.

3.2 FIELD QUALITY CONTROL

- A. During the installation of hardware, conduct periodic inspections in company with Design Professional and the hardware supplier. Remove and reinstall hardware improperly installed. At the completion of the work, conduct a final inspection.

3.3 ADJUSTING

- A. Check and adjust each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace material that cannot be adjusted to operate freely and smoothly.
- B. Adjust hardware so that moving parts operate freely without bind, or excessive play. Installed hardware shall be free from paint, corrosion or damage.
- C. Perform final adjustments of locking devices/door strikes, door closer closing speed, latching speed, and back check, and related hardware to be completed after silencers and seals have been installed, and after building pressurization has been complete.
- D. Upon completion of installation and adjustment, provide required dogging keys, closer valve keys, lock spanner wrenches, and other factory furnished installation aids, instructions and maintenance guides.
- E. Contractor is responsible for the proper protection of all items of hardware until Caltech accepts the Project as complete.

3.4 HARDWARE SCHEDULES

- A. Schedule Of Hardware SetS: The Hardware Sets listed below list the items typically required to be installed on each door as scheduled on the Drawings.

Caltech Master Specification

July 2011

Note: The following shows the typical format for each hardware schedule. Select hardware from Part 2 - Products. Copy table for each hardware set.

HARDWARE SET #					
DESIGNATION	QTY.	DESCRIPTION	ITEM	FINISH	MFR.

END OF SECTION 08 71 00