DESIGN GUIDELINE 087100
FINISH HARDWARE

Scope

Requirements for finish hardware on all doors, including aluminum entrance, fire rated doors, glass doors, and coordination with card readers.

For University of Michigan Hospitals and Health Centers projects refer to Design Guideline 08710-H.

Related Sections

U-M Design Guideline Sections:
1.0 Codes and Regulatory Agencies
3.2 Energy and Water Conservation
4.7 Building Access Control
084113 Aluminum Framed Entrances and Storefronts
8.2 Architectural Preferred Manufacturer List

UM Master Specifications:
Section 087100 Door Hardware
Section 281600 Security System General Requirements
Section 281300 Access Control & Monitoring System

Design Requirements

General:

• Do not use cash allowance provisions for hardware.

• Include a hardware schedule on drawings or in specifications. Note key side on door schedule.

• Egress:

  • Do not specify locks of any type on fire egress stair doors without approval from Design Manager.

  • Where required stairway door locks that restrict re-entry onto any floor without an exit discharge door will need a fail-safe electrically controlled lever that are connected to the fire panel.

  • Configure doors and select hardware to mitigate the risk of chaining doors together, thus preventing egress and emergency responder access. (e.g. same handing of
entrance door banks, flush mounted panic devices, etc…). Review approach with Design Manager.

- In areas of new construction, locate hardware in accordance with Door and Hardware Institute (DHI) "Recommended Locations for Architectural Hardware for Wood Flush Doors" and "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames." In renovated areas, obtain direction from Design Manager concerning whether to match existing hardware locations or whether to follow DHI recommendations for new construction.

- Trim Styles: Unless otherwise approved by the Design Manager, trim styles used in renovation work should match hardware currently in the building. Contact the Design Manager for information regarding existing hardware.

- Finishes: Unless otherwise approved by the Design Manager, comply with the following:
  
  - Specify standard uniform hardware finishes throughout the project. Obtain Design Manager approval for custom finishes.
  
  - For renovation work, match hardware finish of existing units.
  
  - For aluminum entrances, match the finish color of the door.

- Do not connect door hardware to fire alarm system unless required by code or UMHHC operating procedures.

- Where an interconnection with building fire alarm system is required, comply with the following:
  
  - Provide interposing interlocks using fire alarm system control modules. Program the control modules to change state only when the fire alarm system actuates.

  - Fire door hold-open devices and door operators: Provide normal (non-battery backed) power from fire alarm system. Upon a fire alarm system actuation or upon the loss of normal power to the fire alarm system, the door hold-open devices and door operators shall be de-energized. Held open doors shall close. Power operator doors shall operate by manual means only. Changes to operation described will also occur during a fire alarm 24 hour battery test. Review operational impacts with Design Manager.

  - Electrically operated access control door hardware: Provide power from access control system. When required, fire alarm system shall provide output relays or control modules to interrupt normal power to the door hold open devices upon a fire alarm system actuation. This means the status of door hardware devices shall remain unchanged during a fire alarm 24 hour battery test, but will change upon a fire alarm system actuation. The sequences of operation for door hardware devices upon fire alarm system actuation shall be defined in the design documents and executed by the
door access control system. Card access control system shall permit the card reader to function for access during a fire alarm condition. Card access control system shall have battery back up power for a minimum of 4 hours.

- Access Control: Provide operational narrative for all electrified door openings, include within hardware set in specifications.

**Mechanical Hardware Requirements**

**Hinges:**

- Interior doors (wood and hollow metal): 5 knuckle heavy duty ball bearing hinges with non-removable pins with set screw, not merely non-rising type with knurled pin. Specify steel base material unless there is an expected corrosive environment.

- Exterior doors (hollow metal): 5 knuckle heavy duty brass base metal or stainless steel ball bearing hinges with non-removable pins with set screw.

- Aluminum entrances: Heavy-duty continuous gear hinges.

- Do not specify pivot hinges.

  - Exception: pivot hinges are permitted for use on lead lined and interior all glass doors.

**Closers:**

- Specify surface mounted units only; concealed closers are not permitted (including aluminum entrance doors).

  - Exception: concealed closers are acceptable at interior all glass applications. Head closers are preferred.

- Door closers shall be cast iron body construction.

- Require closers to be mounted on least public room side of doors.

- Never specify hold-open function in conjunction with exterior building entrances and vestibules.

- Provide closers, adjustable to meet field conditions and barrier free requirements for opening force. Installation requirements shall require that closers be installed and adjusted to meet barrier free opening force requirements.

- For doors that are part of the primary entrance and discharge, and are on an accessible path for which the closer force must exceed 5 pounds to allow positive latching,
consider the installation of a power assisted door operator in lieu of a pneumatic closer.

- All parallel arm closers shall be provided with manufacturer’s heavy duty parallel arm bracket. Regular duty parallel arm brackets are not permitted.
- Doors that are part of the primary entrance and discharge, and are on an accessible, and are connected to the lobby, and for which the closer force must exceed 5 pounds to allow positive latching, then consider the installation of a power assisted door operator in lieu of a pneumatic closer.

### CLOSERS SCHEDULE

<table>
<thead>
<tr>
<th>Typical Usage</th>
<th>Maximum Size Interior Door</th>
<th>Maximum Size Exterior Door</th>
<th>LCN Catalog Number</th>
<th>Sargent - Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior Doors: closer mounted on <strong>pull</strong> side of door.</td>
<td>Up to 54 inches</td>
<td>n/a</td>
<td>4011 REG</td>
<td>281 O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4011 H (hold open)</td>
<td>281 H</td>
</tr>
<tr>
<td>Interior Doors: closer mounted on <strong>push</strong> side of door.</td>
<td>Up to 54 inches</td>
<td>n/a</td>
<td>4110 EDA</td>
<td>281 P10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4110 H-EDA (hold open)</td>
<td>281 PH10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>41110 CUSH (stop arm)</td>
<td>281 PS</td>
</tr>
<tr>
<td>Exterior doors, or interior doors where the closer cannot be mounted on the door side of the frame. This closer mounts on the room side of the frame. It requires four inches or more clearance above the door opening.</td>
<td>Up to 54 inches 60 inches</td>
<td>Up to 48 inches</td>
<td>4021 REG 4021 LONG</td>
<td>281 OZ 281 OZA</td>
</tr>
</tbody>
</table>
Exterior doors, or interior doors where the closer cannot be mounted on the door side of the frame and the mounting space on the frame is less than four inches. Design the door header to avoid this closer when possible.

<table>
<thead>
<tr>
<th>Exterior doors and interior doors where hold open is required.</th>
<th>Up to 54 inches</th>
<th>Up to 48 inches</th>
<th>4111 H-CUSH</th>
<th>281 PSH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>4111 SH-CUSH</td>
<td>281 CPSH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4111 SCUSH</td>
<td>281 CPS</td>
</tr>
</tbody>
</table>

Pulls: Through-bolt all pulls. Do not specify offset pulls on doors unless needed to match existing.

Locksets:

- Specify lever handles on each new lockset. In locations of potential abuse, specify vandal resistant free wheeling lever trim. For locksets with thumbturn locking, specify ADA compliant thumbturns.

- Specify the following standard functions by space type:
  - Offices, laboratories, small conference rooms and other non-classrooms occupied spaces: Office lockset with thumb turn inside (ANSI F04). Specify thumb turn installation that provides vertical orientation for locked / horizontal for unlocked.
  - Classrooms: All classrooms should be lockable from inside the room and provide visual indication of door status on classroom side. Review required function with Design Manager.
  - Mortise lockset type M1 (When locked, door remains locked except by key outside or thumb turn inside): Schlage L9050 with indicator: 09-611 x XL12-431.
  - Mortise lockset type M2 (When locked, door reverts to unlocked when door is opened): Schlage L9056 with indicator: 09-611 x XL12-431.
  - Gender Inclusive restrooms: Privacy lockset with "Occupied" indicator and keyed override. Schlage L9496
• Service areas: Service/store lockset (ANSI F07)

• Provide knurled handle surfaces on doors to hazardous areas. Hazardous areas include mechanical rooms, elevator machine rooms, electrical closets and substation rooms, and stairways.

• Strikes: Specify curved-lip strikes; flat (reversible) strikes are not acceptable. Require extended lip strikes where required to protect door frame from being marred by latch bolt (frequently needed at wood door frames). Specify 7/8 inch lip to center strikes for pairs of doors with an overlapping metal astragal.

• Cores: Specify 7-pin small format interchangeable cores (SFIC). Refer to "Architectural Preferred Manufacturers List" for manufacturers. In limited renovations of existing buildings, match existing core type. Review with Design Manager.

• Construction Keying: For project security, provide a construction core as determined by the Design Manager. Always include construction cores for building entrance doors with cylinders.

• Keying: Include keying and master keying. Specify that keying and master keying will be coordinated with the University Key Office. Indicate keyed side on door schedule.

• Cylinder Housings: Furnish mortise and rim cylinder housings from the same manufacturer as the locksets to be furnished for each project.

Panic Hardware: Either cross bar or push pad type crash bars are acceptable, provided the type selected will meet the requirements of the application. Dogging, where provided, should be hex-key wrench type as opposed to key cylinder type. Exit devices with concealed vertical rods are not permitted in any application. In addition, comply with the following:

• Cross bar type panic devices are only permitted for use on non-electrified applications.

• Single doors: Select rim-type panic hardware; do not specify mortise units.

• Double doors with mullions: Provide rim-type, center latching devices. Preferred locking arrangement for maximum security and minimum maintenance.

• Double doors without mullions: Provide the following exit device types for each indicated application:
  • Aluminum Entrance Doors:
    • Applications without mullions are not permitted.
    • Medium or Wide Stile doors are encouraged. If narrow stile doors are preferred, verify compatibility with required hardware.
• Typically specify a pair of surface vertical rod devices. Omit bottom rods for interior locations without security requirements. Where bottom rod is required, specify ADA compliant rod and latch guard.

• For applications where the doors are required to be both latching and securable, doors with rim and mortise type panic device applications (requiring an active lever handle), provide an exterior-side cylinder that retracts the latch bolt (but will not unlock outside trim) in conjunction with an interior-side, separately keyed cylinder, mounted in the latch head, that will unlock the outside trim.

• Specify pulls in conjunction with panic hardware, except where levers are required for fire-rated devices, or are necessary to match adjacent trim. Do not specify lever handles on public entrance doors to buildings.

**Coordinators:** Review locking options for pairs of doors to determine if a coordinator is required. Locking configurations that do not require a coordinator are preferred.

**Removable Mullions:** On double doors, where a fixed mullion is not included, provide a removable mullion. Steel key operated mullions are preferred for durability and security. Aluminum mullions are also acceptable in aluminum entrance systems where preferred for aesthetics. Where provision of a mullion is not considered feasible, provide special exit device hardware indicated above.

**Thresholds:** Require that aluminum thresholds be cut-in, scribed, around mullions, frame members, and stops, not simply butted to them, to provide a continuous surface across the full width of the opening from jamb to jamb.

**Stabilizers:** Require stabilizer sets on all aluminum entrance doors and frames.

Door surface protection: Consider kickplates on push side of all doors with closers and armor plates on doors that are in the path of cart traffic. Coordinate the armor plate height with the user’s specific cart requirements. Consider providing hardware protection/shield on doors in the path of cart traffic.

**Electrified Hardware Requirements** (connected to campus central access control system):

• General:
  
  • Do not specify magnetic locks or delayed egress devices without prior approval of the Design Manager. For BFS buildings, special locking arrangements require separate submittal to the State.

  • Where feasible, request to exit (REX) switches that are integral in hardware devices in lieu of passive infrared REX devices

• Hardware types / components:
• Electric strikes: Only specify for doors that are equipped with barrier free operators where latching is required.

• Electric mortise lockset: Specify with built-in request to exit switches.

• Electric panic device: Specify with built-in request to exit switches.

• At all exterior door applications and interior locations where latching is not required, specify devices with motorized electrical latch retraction in lieu of devices that control the locking and unlocking of lever trim.

• At interior and exterior applications with banks of doors that will be unlocked on a schedule via the access control system, furnish electrified devices for every door leaf in the bank.

• Interior applications where latching is required, specify devices that control the locking and unlocking of lever trim.

• Specify devices that can be powered from lock power supply at access control panel assembly in lieu of local power supply.

• Electric power transfer (EPT): Provide heavy duty mortise type only. Electrified hinges and door cords are prohibited without prior approval of the Design Manager.

• Power Supplies: Specify power supplies for all electrified hardware to be furnished and installed by the security system integrator. Power supplies are to be located adjacent to the access control panel. DO NOT LOCATE POWER SUPPLIES AT THE DOOR.

• Door contacts: Specify 1" recessed door contacts where possible to be furnished and installed by the security system integrator. Coordinate with Div. 28 specifications. Generally, specify a door contact for every exterior door and every door equipped with a card reader. Specify at other locations as directed by the Design Manager.

**All Glass Entry Systems**

• All Glass Door systems are acceptable for select interior applications and prohibited in exterior entry applications

• Special attention is required for security applications, card readers and room schedulers. Review with security and operations Design Manager and Key office.

• Closers preferred location is at head of door.
Fully Integrated Door Systems – NOT Allowed

- Fully Integrated Door Systems are not acceptable for cross corridor and area separations.

- University of Michigan Key Shop does not support or repair Fully Integrated Doors Systems.