Design Guideline 087100
Finish Hardware

Scope

Requirements for finish hardware on all doors, including aluminum entrances, fire rated doors/assemblies, all glass doors, and coordination with access control systems.

For Michigan Medicine projects refer to Design Guideline 087100-H.

Related Sections

U-M Design Guideline Sections:

1.0 Codes and Regulatory Agencies
4.7 Building Access Control
6.0 DG 084113 Aluminum Framed Entrances and Storefronts
8.2 Architectural Preferred Manufacturer List

UM Master Specifications: (A digitally accessible version is pending; please email AEC-Digital Accessibility Support if assistance is needed)

7.0 MS 087100 Door Hardware
7.0 MS 281600 Security System General Requirements
7.0 MS 281300 Access Control & Monitoring System

Reference Documents:

ANSI/BHMA Standards
Hollow metal doors and frame hardware locations: ANSI/SDI A250.8
Wood doors: Door and Hardware Institute (DHI) "Recommended Locations for Architectural Hardware for Wood Flush Doors"

General Design Requirements

Specification requirements

- Include a hardware schedule on drawings or in specifications. Note key side on door schedule.
- Do not use cash allowance provisions for hardware.

Coordination with egress / life safety

- Configure doors and select hardware to mitigate the risk of chaining doors together, thus preventing egress and emergency responder access. (e.g. same handling of entrance door banks, flush mounted panic devices, etc…). Review approach with Design Manager.
- Do not specify locked re-entry on egress stair doors without approval from the Design Manager.

Renovation projects

- In limited renovations, match the existing building standards for lever style, finish, and core type. Review with the Design Manager.
- When replacing existing hardware, fill holes with like material. Limit use of screws, bolts, or plates.
- Coordinate DHI mounting height recommendations with existing hardware to remain. If there is a conflict, obtain direction from the Design Manager.

Connection to Building Systems

Fire alarm system

- Do not connect door hardware to the fire alarm system unless required by code or Michigan Medicine operating procedures.
- Where interconnection with the 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 the 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 the Design Manager.
    - Electrically operated access control door hardware: Provide power from the access control system. When required, a 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 System

- Refer to DG 4.7 Building Access Control for minimum functional and technical requirements.
- Provide operational narrative for all electrified door openings. Include it within hardware set in specifications. Request Design Support Information document (DSI 4.7 Building Access Control) from Design Manager for frequently used sequences.
- See Electrified Hardware Requirements section at the end of this document.

Mechanical Hardware Requirements

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 aluminum entrances, match the finish color of the door.

Hinges

- Interior doors (wood and hollow metal): 5 knuckle heavy duty ball bearing full mortise hinges with non-removable pins with set screw. Non-rising type with knurled pin is unacceptable. 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.
- High traffic interior doors, aluminum and FRP entrances: Heavy-duty continuous gear hinges.
- Do not specify pivot hinges. Exceptions:
    - Lead lined doors
    - Acoustical sound transmission doors
    - Interior all glass doors.

Mechanical Locks and Latches

- Specify mortise type with lever trim. In locations of potential abuse, specify vandal resistant free wheeling lever trim.
- For all locksets with thumbturn locking, specify oversize ADA thumbturn
    - Sargent LB thumbturn
    - Schlage EZ turn: L583-363
    - Corbin Russwin Ergonomic Thumbturn: 707F58
- Function: See Appendix A, “Lock/Exit Device Selection Guide” for guidance regarding room type, size, and hardware function. Coordinate final lock/exit device functions with Design Manager and required codes.
    - Classrooms: Provide hardware that allows occupants to lock the door from inside the room without special knowledge or tools. Provide visual indication of door status on classroom side. See selection guide for options and considerations for selection.
- Provide knurled handle surfaces on doors to hazardous areas. Hazardous areas include mechanical rooms, elevator machine rooms, electrical closets and substation rooms, and stairways.
- Cylinder Housings: Furnish mortise and rim cylinder housings from the same manufacturer as the locksets to be furnished for each project.

Strikes

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

Exit Devices

- Style: Push pad style unless matching existing.
- General Type:

- Rim type
    - All single doors
    - Pairs of doors with center mullion (fixed or removable). Note that this is the preferred locking arrangement for maximum security and minimum maintenance.
- Mortise
    - Pairs of doors without mullion and exit device on active leaf only (mechanical flush bolts on inactive leaf).
- Surface vertical rod
    - Pairs of interior doors without mullion. Omit bottom rods for interior locations without security requirements. Where the bottom rod is required, specify ADA compliant rod and latch guard.
- Concealed vertical rod: Do not specify.

- Function: See Appendix A, "Lock/Exit Device Selection Guide" for guidance regarding room type, size, and hardware function. Coordinate final lock/exit device functions with Design Manager and required codes.
- Dogging (non-rated interior doors only): Coordinate dogging type with Appendix A, and Design Manager. Typically specify thumbturn or hex-key, not key cylinder type.
- Trim
    - Exit only: No exterior trim
    - Non-fire rated devices: Specify fixed pulls.
    - Fire rated devices: Specify lever handles to match adjacent trim.

<u>Lock Cylinders, Cores, and Keying</u>

- Master key systems are developed, managed and installed by the University Key office.
- Specification requirements:
    - Locking hardware with cylinder housing to accept 7-pin small format interchangeable cores (SFIC).
    - SFIC compatible with building standards. Coordinate with the 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.
- Note that these requirements apply to all fixed construction with keys including key switches, access panels, and hatches.

<u>Push/Pull Operating Trim</u>

- Specify straight pulls for durability. If offset pulls are recommended to match existing, review with the Design Manager.
- Through-bolt all pulls.

<u>Closers</u>

- Type: Surface mounted pneumatic closer units only. Field adjustable to meet field conditions and barrier free requirements for opening force. Specify installation requirements requiring closers be

installed and adjusted to meet barrier free opening force requirements.
    - Exception: For interior all glass doors, specify overhead concealed closers.
- See Appendix B, “Closer Selection Guide” for product selection guidance. Coordinate final selections with specified doors to ensure compliance with code required operating force requirements.
- Location: Mount on the least public room side of doors. For exterior doors, mount on the interior side.
- Additional Considerations
    - Specify hold open function for interior locations only. Do not specify hold-open function on exterior building entrances, vestibules, or doors connected to the access control system.
    - For doors that are part of the primary building entrance and discharge and are on an accessible path, consider the installation of a power assisted door operator in lieu of a pneumatic closer.
    - When selecting doors and closers, review feasibility of meeting code required minimum opening force requirement.
    - For doors that are part of the primary building entrance and discharge and are on an accessible path, consider a power assisted door operator in lieu of a pneumatic closer.

Door and Trim Protection

- Door surface protection: Coordinate heights with glazing, louvers, and hardware. Provide in the following locations:
    - Kickplates on push side of all doors with closers
    - Armor plates on doors that are in the path of cart traffic. Coordinate armor plate height with cart dimensions.
- Trim protector bars: Consider stainless steel units where trim is susceptible to damage from cart traffic.

Stops and Holders

- Wall bumpers: Specify in conjunction with in-wall blocking
- Wall stops: Locate at top of door. Specify in conjunction with in-wall blocking
- Hold-opens: Specify hold open function as part of door closer or mechanical wall holder. Do not specify door mounted spring loaded (step-on) or level (flip-down) door holders.

Door Gasketing

- Specify door gasketing that can be replaced without removing the door.

Thresholds

- Specify 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.

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 they are preferred for aesthetics. Where provision of a mullion is not considered feasible, provide exit device types indicated in the exit device section.

Stabilizers

Require stabilizer sets on all aluminum entrance doors and frames.

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 submission to the State.
- Where feasible, specify request to exit (REX) and door position switches (DPS) that are integral in hardware devices in lieu of passive infrared REX or magnetic contact 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 and door position switches.
- Electric panic device: Specify with integral 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.
    - 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**.**

All Glass Entry Systems

- All Glass Door systems are acceptable for select interior applications and prohibited for exterior entry applications.
- Special attention is required for applications with security, access control, and room scheduling requirements. Review Design Manager and Key office.

Fully Integrated Door Systems – NOT Permitted

- Fully Integrated Door Systems are not acceptable for cross corridor and area separations.
- University of Michigan Key Office does not support or repair Fully Integrated Doors Systems.

Appendix A Lock/Exit Device Selection Guide				
Space Type	**Occupant Count**	**Hardware Function**	**Hardware Details**	**Comments**
Offices Laboratories Small conference rooms Other non-classroom occupied spaces	<50	Mechanical: Office lockset with thumbturn (ANSI F04)	Sargent 8205* Schlage L9050* Corbin Russwin ML2054*	
		Digital: Stand alone battery powered digital lockset - Keypad access - Classroom Function	Schlage CO-100-MS-70-KP (not programmable) or Schlage AD-200-MS-70-KP (programmable)	If thumbturn locking is desired, use digital lock listed for small classrooms.
		Electromechanical type hardware, typically fail secure	Electromechanical lockset Schlage L9492 with RX/DM thumb turn* functions inside indicator L283-417 for sectional trim inside indicator L283-437 for escutcheon trim	1. Intended for manual locking with card reader
Small Classrooms & Class Lab (mortise lock)	<50 fixed setting OR <100 loose seating (renovation)	Mechanical: Office lockset with thumbturn (ANSI F04) Door remains locked except by key or thumbturn.	Schlage L9050* Locked/unlocked indicator on room side L283-711 (or equal by Sargent or Corbin Russwin)	Coordinate desired lock function with Design Manager and user operations/classroom management.
		Mechanical: Office lockset with automatic unlocking Reverts to unlocked when the door is opened.	Schlage L9056* Locked/unlocked indicator on room side L283-711 (or equal by Sargent or Corbin Russwin)	
		Digital: Stand alone battery powered digital lockset - Keypad access - Card reader for future use - Privacy function - Deadbolt thumbturn**	Schlage AD-200-MD-40-KP	1.Lockset can be scheduled to electronically lock/unlock and provide keypad access. 2.Department or user group is responsible for programming and battery replacement. 3. Deadbolt activates the privacy function (locks out keypad). 4. Coordinate potential “future”

Appendix A Lock/Exit Device Selection Guide				
Space Type	**Occupant Count**	**Hardware Function**	**Hardware Details**	**Comments**
				functionality with DM and Key Office.
		<u>Digital:</u> Stand alone battery powered digital locket - Keypad access - Card reader for future use - Privacy function - Deadbolt thumbturn**	Schlage AD-400-MD-40-MTK	
Small classroom & Class Lab		Electromechanical type hardware, typically fail secure	<u>Electromechanical lockset</u> Schlage L9492 with RX /DM thumb turn* functions inside indicator L283-417 for sectional trim inside indicator L283-437 for escutcheon trim	1. Intended for manual locking with card reader
Medium Classroom & Class Lab (exit device)	50 to 100 with loose seating	<u>Mechanical:</u> Exit device with thumbturn locking and security indicator	Non-Rated: VonDuprin 98 series -NL function with pull -Thumbturn dogging (Schlage 09-904) -CDSI indictor (or equal by Corbin Russwin)	1. If room has card reader access use large lecture hall interconnected hardware
			Rated: VonDuprin 98 series - L function - Thumbturn locking (Schlage XB11-797) - 2SI indictor (or equal by Corbin Russwin)	1. 2SI indicator and thumb turn locking available on von duprin 98/99 series locking devices, except xp/99 series, 98/99 52 series or 98/99 5WDC series. 2. Indicator shows locked and unlocked status 3. If room has card reader access use large lecture hall interconnected hardware
Large lecture Hall or Auditorium OR Adjoining classrooms that rely on adjacent	50 to 100 with fixed seating OR > 100 any seating type	<u>System function:</u> Interconnected door locking system connected to campus CCure access control system. Minimum functionality includes card reader access, electronically	<u>Small rooms (both rated and non-rated)</u> Schlage L9092 with RX / DPS functions, fail secure <u>Medium to Large rooms (non-rated)</u>	1. Reference Access Control Design Guideline 4.7 Building Access Control 2. Change function to fail safe if required by code. Note: exemption required to use this

Appendix A Lock/Exit Device Selection Guide				
Space Type	**Occupant Count**	**Hardware Function**	**Hardware Details**	**Comments**
spaces as part of an egress pathway OR Other space types with increased risk factors		managed doors, and lockdown buttons. <u>Hardware function:</u> Electromechanical type hardware, typically fail secure	<u>Electromechanical exit device</u> VonDuprin QEL-type with RX function, fail secure <u>Medium to Large rooms (rated) Electromechanical exit device</u> VonDuprin E-type with RX function, fail secure	type of locking in rooms other than the space type noted in this document. Exemption required from DPSS and Provost Office.
Gender Inclusive or other single occupant restrooms or personal rooms	N/A	Privacy lockset "Occupied" indicator Coin turn override.	Schlage L9044 with L283-722 "occupied" indicator (or equal by Sargent or Corbin Russwin)	Review function override options with DM.
		Privacy lockset "Occupied" indicator Keyed override.	Schlage L9496 Privacy with L283-722 "occupied" indicator (or equal by Sargent or Corbin Russwin)	
		Privacy with low energy door operator	Schlage L9044 or L9496 with deadbolt monitor (DM) Electric strike and LCN 4600 series operator - selections vary depending on field conditions or new work. Coordinate with hardware specialist.	
		Electromechanical type hardware, typically fail secure	<u>Electromechanical lockset</u> Schlage L9492 with RX/DM thumb turn* functions Outside indicator L283-414 Sectional Trim Outside indicator L283-430 Escutcheon trim	1. Intended for manual locking with card reader

Notes

* Specify with oversize ADA thumbturn

** Deadbolt specified to provide visual indication of lock status

General Note: Reference Access Control Design Guideline 4.7 Building Access Control

Appendix B Closer Selection Guide		
Typical usage	**LCN Catalog Number**	**Sargent Catalog Number**
Interior Doors: closer mounted on the pull side of the door.	4011 REG	281 O
	4011 H (Hold open)	281 H
Interior and Exterior Doors: closer mounted on the push side of the door.	4110 EDA (Extra Duty Arm)	281 P10
	4110 H-EDA (Extra Duty Arm with Hold Open)	281 PH10
	4110 SCUSH (Stop Arm)	281 CPS
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.	4021 REG	281 OZ
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.	4021 with 18G plate	281 OZ with 281-B plate
Interior doors where hold open is required.	4111 H-CUSH	281 PSH
	4111 SH-CUSH	281 CPSH
	4111 SCUSH	281 CPS

*When selecting doors and closers, review feasibility of meeting code required minimum opening force requirement.