

DIVISION 14 - CONVEYING SYSTEMS

(LINK TO UNIVERSAL DESIGN IN PROGRAM INFO./GENERAL REQ. SECTION)

14200 - ELEVATORS

1. Intent: It is the intent of these standards to provide guidelines in developing vertical transportation systems that:

- A. Provide acceptable levels of elevator service as related to the Average Interval and Handling Capacity.
- B. Provide safe and convenient transport of passengers and material.
- C. Provide systems that meet the highest level of accessibility for people with disabilities.
- D. Incorporate standardized parts for easy maintenance and repair.
- E. Provide reliability and achieve desired lifecycle service and cost.
- F. Prohibit installation of manufacturer standard proprietary control equipment that requires adjustment or troubleshooting with proprietary diagnostic instruments.

2. Design Criteria

2.1. Install elevators in buildings that are two stories and higher. The design shall provide direct service to all floors in the building, including floors where mechanical rooms are located. Escalators shall be installed in buildings that have a concentrated flow of traffic such as sport facilities, auditoriums and bookstores.

2.2. To ensure that elevators comply with specifications and installation procedures in the standards, the A/E shall retain the services of an elevator consulting firm to provide design, specification and construction/inspection services. The elevator consulting firm shall have an office in Minnesota with a minimum of five years of experience as an elevator consultant. The consultant shall be Qualified Elevator Inspector (QEI)-certified, and capable of demonstrating prior experience with projects of similar scope. The consultant also shall be able to have contract documents certified by an engineer who is duly registered under the laws of the State of Minnesota.

2.3. The installation contractor shall have an office in Minnesota and have a minimum of five years of experience installing elevator equipment.

2.4. For an elevator remodeling project, the university shall retain the rights to salvage existing elevator components.

2.5. Hydraulic Elevators

2.5.1. PROHIBITED: Hydraulic elevators in parking ramps.

2.5.2. Hydraulic passenger elevators shall be used for light-duty applications. They shall be limited to a maximum travel of 45 feet or four stops.

2.5.3. Hydraulic freight elevators shall be limited to a maximum travel of 60 feet.

2.6. Geared Traction Elevators

2.6.1. Geared traction elevators shall be used for all medium-duty and heavy-duty applications that exceed 45 feet of travel or four stops.

2.6.2. Geared traction elevators shall be used in parking ramps regardless of travel or number of stops. Emergency power for one elevator, in each group, must be provided. Elevator equipment must include hall floor indicators on every level. Refer to Appendix Q – Design Standards for Parking Structures for complete information on elevators in parking facilities.

3. Materials

3.1. Steel

3.1.1. Commercial-quality carbon steel that is stretcher-leveled and cold-rolled shall be used for exposed work. Such steel must comply with ASTM 366.

3.1.2. Commercial-quality carbon steel that is hot-rolled shall be used for concealed work. Such steel must comply with ASTM 568 and ASTM 569.

3.2. Stainless steel: Type 302 or Type 304 that complies with ASTM 167 shall be chosen as follows:

- A. No. 4 finish: Satin finish
- B. No. 8 finish: Mirror finish
- C. Textured: Patterned type with .050-inch mean pattern depth with satin finish

3.3. Bronze materials shall be constructed of stretcher-leveled sheets with 60 percent copper and 40 percent zinc that are similar to Muntz Metal, Alloy Group #2. After cleaning, spray with one coat of clear lacquer.

3.4. Aluminum extrusions shall comply with ASTM B221 requirements. Sheet and plate shall comply with ASTM B209 requirements.

3.5. Plastic laminate shall comply with ASTM E 84 Class A fire-rated grade (GP-50), and as follows:

3.5.1. The owner's representative shall select the appropriate color for exposed surfaces.

3.5.2. Use the manufacturer's standard for plastic laminate on non-exposed surfaces.

3.6. Fire-rated particleboard panels shall have a minimum of 3/4-inch thick backup for natural veneer or plastic laminated panels.

3.7. Paint

3.7.1. Clean exposed surface of oil, grease and scale.

3.7.2. Apply one coat of rust-resistant mineral paint and one coat of finish enamel.

3.7.3. Paint pit floor and machine floor room with Rust-oleum 6000 water-based epoxy.

3.8. Laminated safety glass shall comply with ANSI Z.97.1 and CPSC 16 CFR, part 1201.

4. Car Performance

4.1. Elevators that are of the same make and model shall perform the same way. Each elevator shall be adjusted for optimum performance and shall be within the following maximum limits:

4.1.1. Brake-to-brake time for contiguous floors of not more than 12 feet of travel shall be less than 4.8 seconds for car speeds of 500 feet per minute (fpm) or faster and for gear-less applications.

4.1.2. Overall performance time from when the doors begin to close, the elevator travels to the next floor and the doors are three-quarters of the way open shall not be more than 9.5 seconds for 42-inch center opening doors and 10.5 seconds for 48-inch, two-speed, side-opening doors. In any case, elevators that are installed in buildings with contiguous floors shall not exceed 12 feet of travel at a speed of 300 fpm or faster.

4.1.3. Floor stopping accuracy for traction elevators shall be maintained within 1/4 inch of level. Leveling accuracy shall be maintained within 1/4

inch through load and unload conditions. For hydraulic elevators, the accuracy shall be within 3/8 inch.

4.1.4. Running speed shall be maintained within 3 percent of specified speed under all load conditions for traction elevators and within 10 percent of specified speed for hydraulic elevators.

4.1.5. The noise level shall not exceed 60 Dba inside of the car under any condition, including with the fan running and when the door is operating.

4.1.6. Ride quality shall be such that there are no excessive horizontal or vertical vibrations. The maximum peak-to-peak vibration shall not exceed 15 to 20 milli-g=s within the band specified in ISO 8041 for whole body X, Y and Z. These measurements shall be taken with an accelerometer sensing unit that is placed in the center of the platform. There shall be no sound or vibration absorption material between the unit and the platform. All elevators that have readings in excess of the allowable limit shall be readjusted or realigned to an acceptable vibration level.

4.2. Door opening time shall be measured from when the doors begin to open until the doors are fully open. The doors shall open at a minimum of 2 feet per second average.

4.3. Door closing time shall be measured from when the doors begin to close until the doors are fully closed. The doors shall close at approximately 1 foot per second depending upon code compliance.

4.4. Door open/close times based upon medium-speed operators shall be in accordance with the following table:

Door Width	Door Open Time		Door Close Time (approximate times)	
	Side Open	Center Open	Side Open	Center Open
36 inches	2.8 seconds	1.9 seconds	3.4 seconds	2.2 seconds
42 inches	3.1 seconds	2.1 seconds	4.0 seconds	2.4 seconds
48 inches	3.5 seconds	2.2 seconds	4.5 seconds	2.9 seconds

4.5. The speed and pressure of elevator doors must comply with applicable codes and the American with Disabilities Act (ADA). The kinetic energy of the doors closing shall be reduced to 2-1/2 feet per pound or less when the door protective device is rendered inoperative.

5. Control and Operation

5.1. The elevator controller shall be a non-proprietary microprocessor, SCR-DC drive or variable frequency AC drive, manufactured by Motion Control Engineering or Virginia Controls. The controller shall be capable of continuous operation in ambient temperatures between 65 degrees F and 90 degrees F.

5.2. Specialized diagnostic devices used to check the operation of the microprocessor that are not permanently attached to the controller shall be provided as part of the contract, and shall become university property.

6. Machine Room Equipment

6.1. General

6.1.1. Provide a minimum of 18 inches of clearance around all equipment for working. For controllers and electrical switches, clearance for working shall be in accordance with the National Electric Code.

6.1.2. Install equipment so it is easily removed for maintenance and repair.

6.2. Traction Elevators

6.2.1. PROHIBITED: Wedge clamp drum-operated type B safeties on new installations.

6.2.2. Geared hoist machines shall be of the worm-gear type with motor, brake, drive sheave and deflector sheave mounted on a common structural frame. The machines shall be located in the machine room.

6.2.3. Selectors shall be solid-state or steel hoist way tape that uses magnets mounted on the tape for car position, slowdown and leveling.

6.2.4. To prevent injuries to service personnel, provide guards around all hoist cables, sheaves and/or any cable pinch points.

6.2.5. Mechanically and electrically isolate elevator equipment from the building structure. Isolate unit to minimize noise and vibration transmission. Provide isolation transformers, filter networks and choke inductors.

6.2.6. Wedge clamp drum-operated type B safeties shall be replaced on all remodeled projects.

6.3. Hydraulic Elevators

6.3.1. PROHIBITED: Submersible pump units.

6.3.2. Install dry-type pump units on hydraulic elevators. Equip pump units with guards and sound isolation panels. To maintain a constant oil temperature, provide thermal and/or external cooling units in the oil reservoir as necessary.

6.3.3. Provide a muffler on hydraulic elevators.

6.3.4. Provide a gate or globe-type shutoff valve in hydraulic piping for all pump units. One valve shall be in the machine room and one valve shall be in the pit area, near the hydraulic jack.

6.3.5. Locate the hydraulic control valve in the oil reservoir above the level of oil when the car is at the lowest landing.

6.3.6. Run hydraulic piping aboveground/overhead where practical. If hydraulic piping is run underground, components and piping shall be protected against corrosion by installing the pipe inside an 8-inch minimum PVC pipe.

6.3.7. Motors that are more than 20 hp shall have soft-start circuits.

6.3.8. To return oil back to the hydraulic pump unit reservoir, provide a Wagner or university-approved equal scavenger pump in each pit.

6.3.9. Provide at least one isolation coupling in the oil line to reduce vibration and noise.

7. Hoistway Equipment

7.1. Guide rails shall be planed steel t-sections of suitable size and weight for the application. Fasten the rails to the building structure with brackets at intervals that do not exceed the span required by code.

7.2. Buffers shall be spring-type for a speed of 200 fpm or slower, and oil-type for a speed faster than 200 fpm.

7.3. Hydraulic cylinder hole: Drill cylinder hole for hydraulic elevators per Minnesota state code. Protect cylinders with PVC casing around the exterior of the cylinders.

7.4. All electrical wiring shall be run in labeled duct, conduit or flexible conduit. Provide 10 percent of spare wires on hoistway wiring. Label spares in the controller. Provide two RG59 coaxial CCTV cables in the traveling cable.

7.5. Provide counterweights that are installed in a steel frame and guided by ELSCO roller guides in traction elevators. Provide a steel counterweight guard in pit, unless compensation ropes or chains are required.

8. Entrance Equipment

8.1. Passenger, service and freight elevators shall be equipped with 1-1/2 hour fire-treated, B label entrances.

8.2. Frames shall be of hollow metal, bolted construction with a permanently attached and raised cast Braille plate that is supplied by Stencil Cutting and Supply or Entrada. Place a Braille plate on each jamb that is centered at 60 inches above the finished floor.

8.3. Door panels shall be made of 16-gauge steel with two gibs per door panel.

8.4. Sight guards shall be made of 14-gauge steel with the same finish as door panels.

8.5. Sills

8.5.1. Passenger elevators shall have extruded aluminum sills.

8.5.2. All service elevators and elevators that have more than a 6,000-pound capacity shall have extruded nickel-silver sills.

8.6. Sill support angles shall be constructed of steel and designed to support elevator sills fastened to a building structure at a maximum of 18 inches on center.

8.7. Freight doors shall be power-operated and vertical bi-parting with a 1-1/2 hour fire label.

8.8. The owner's representative shall select the finish for doors and frames.

9. Car Equipment

9.1. Car and/or counterweight safeties shall be of instantaneous type for car speeds of 150 fpm or slower. Such safeties shall be Type B with flexible guide clamp for car speeds faster than 150 fpm.

9.2. Roller guides shall be manufactured by ELSCO, and use spring action with adjustable stops for passenger elevators. For elevators that have more than a 6,000-pound capacity, slide guides may be used.

9.3. The owner shall determine whether passenger elevators shall have tile or carpet flooring. Service elevators shall have 1/4-inch aluminum checker plate flooring. Freight elevators shall have 1/4-inch steel checker plate flooring.

9.4. Car sills shall be made of extruded aluminum or extruded nickel silver (to match hoistway sills).

9.5. GAL Corp. shall be the manufacturer of the door operators and related equipment for passenger elevators, model MOVFR-VVVF. Courion Industries or Peele Door Co., EMS Power Doors shall be the manufacturer of the door operators and related equipment for freight elevators.

9.6. Fixture Co. shall manufacture reopening devices for passenger elevator doors, model FCU 47+ or Adams Gatekeeper 2000. Equip freight elevators with infrared detectors that project across the entire opening width for gate reversal.

9.7. Provide work lights and GFCI convenience outlets on the top and the bottom of the elevator car.

10. Car Enclosure

10.1. The design of passenger elevators shall include the following items:

- A. Plastic laminate panels on side and rear walls
- B. Satin stainless steel car doors and transom
- C. Fluorescent lights above a suspended ceiling
- D. Stainless steel handrails on side and rear walls
- E. Ventilation provided by Morrison model AA or O E 90

10.2. The interior of the service elevator shall be constructed of rigid stainless steel walls and doors.

10.3. The interior of freight elevators shall have painted steel walls with two rows of 2-inch by 12-inch oak bumpers on the side and rear walls. Fluorescent fixtures shall be recessed in the car canopy for lighting, and provide a minimum of 20 foot-candles of illumination at the car floor.

11. Maintenance

11.1. The A/E shall specify a maintenance service contract in accordance with the following:

11.1.1. The installer shall furnish preventive maintenance and 24-hour callback service on the conveying system described herein for one year from the date of Substantial Completion. Service shall include systematic examination, adjustment, cleaning and lubrication of all equipment. Response time for callbacks shall be within two hours.

11.1.2. The installer shall repair and replace electrical and mechanical parts using standard parts produced by the manufacturer of installed equipment. The installer shall maintain an adequate stock of parts in the equipment room for repair and replacement. Submit an inventory list of stocked parts for the owner's approval.

11.1.3. The installer shall hire and supervise competent personnel to work under the maintenance service contract.

11.1.4. In the event of an accident or injury, the installer shall conduct an inspection and submit a report to the University Elevator Shop within one working day. The shop shall then submit the report to the state elevator authority, as required per Minnesota Rule 1307.0040. Defective parts shall be retained for the inspector to examine.

11.1.5. The maintenance service contract shall specify that the installer is to operate, maintain and service all elevator emergency circuits, including the firefighters emergency recall and standby power as part of regularly scheduled testing at the university.

11.1.6. Maintenance and testing shall be conducted in accordance with the ASME A17.1 Elevator Safety Code.

11.2. Frequency

11.2.1. The minimum frequency of service shall be as follows:

- A. Hydraulic elevators: One preventative-maintenance inspection per month
- B. Traction elevators: Two preventative-maintenance inspections per month
- C. Escalators: Two preventive-maintenance inspections per month
- D. Dumbwaiters: One preventive-maintenance inspection per month

11.2.2. The minimum preventative-maintenance time shall be one hour per inspection.

11.3. Reporting

11.3.1. Copies of all service, repair and callback tickets shall be delivered to the University Elevator Shop. If the shop is closed, documents can be faxed or mailed. If a signature is required, submit all copies, and the original will be returned to the installer.

11.3.2. Documentation shall be used to substantiate compliance with the specification.

11.4. Inspection: At least 30 days prior to expiration of the maintenance service contract, the installer shall schedule a final inspection with the University Elevator Shop and the owner's representative. All deficiencies shall be corrected prior to expiration of the contract.

12. Owner's Information

12.1. General: Within 30 days after Substantial Completion of the elevator, provide all wiring diagrams, written information, supplemental data and diagnostic tools necessary for proper maintenance and adjustment of the equipment, including the following to the elevator consultant:

12.1.1. Wiring Diagrams: Provide three copies of all wiring diagrams. One copy shall be provided in each machine room on the job site.

12.1.2. Operation and Maintenance Manuals: Provide three neatly bound and indexed sets of O and M manuals that contain the following:

- A. Sequence of operation of the motion and logic control panels
- B. Operation and maintenance instructions for all equipment components
- C. Lubrication instructions for all components
- D. Parts catalog for all replaceable parts
- E. Summary of contract data for each type of equipment furnished
- F. Step-by-step installation and adjustment procedures

13. Electrical Work

13.1. Electrical work shall conform to the requirements of Division 16 - Electrical.

13.2. Provide a single-tube continuous fluorescent light fixture strip (full height of hoistway) with guard. The light shall be operable from a switch located in the pit and at the top floor.

14. Telephone and Building Systems Automation Control (BSAC)

14.1. The telephone shall be a vandal-resistant, ADA-compliant, hands-free, two-way communication system with audible and visual components. It shall not require an individual access door. Rath Microtech, Smartphone II shall be the manufacturer of the telephone that interfaces with the university-wide telephone system. The A/E shall select the model.

14.2. A twisted pair in the traveling cable shall connect the telephone systems.

14.3. To connect the telephone and emergency pushbutton to BSAC, the elevator controller must contain one low current relay connected:

- A. In parallel with the alarm bell.
- B. To one normally closed contact from the relay to the DDC Controller.

14.4. Two additional twisted pairs (for a total of three) shall be provided for BSAC connection.

14.5. The contractor shall program the telephone to ring at BSAC. Contact the Office of Information Technology for the proper telephone number.

15. Fixtures

15.1. Hall and car fixtures shall be Survivor Plus-California style, vandal-resistant and illuminated. The fixtures shall be manufactured by Elevator Products Corporation (EPCO), or university-approved equal. Install at least one hall position indicator panel at the firefighters designated landing.

15.2. Provide panels that indicate lobby status when required by code. Include position indicators that are 2 inches high to designate which floor the elevator is on, the direction of car travel, in service lights, emergency power switches, hoistway venting switches and jewel indicator.

15.3. For multi-car installations, provide hall lanterns on each floor. For single-car installations, car direction signs on the car may be provided.

15.4. Incorporate engraved ASME A17.1 Appendix H pictograph on each hall push button station faceplate.

15.5. Illuminate signal fixtures with LED lamps. Specify tamper-proof fasteners.

15.6. 10404 is the core and barrel key number for the fireman's key box.

16. Escalators and Dumbwaiters: The design of escalators and dumbwaiters shall be handled on a case-by-case basis. Only the manufacturer shall design and install these systems, which the university shall review and approve. The A/E shall coordinate the design of the systems with other building systems. The university shall furnish a list of approved manufacturers, and the A/E shall prepare specifications based on these manufacturers. No proprietary equipment shall be installed.

17. Installation Inspection: The A/E shall specify that the installer inform the elevator shop foreman of the progress during installation, as well as schedule inspection visits.

18. Elevator Control: Elevator control work shall conform to the requirements of Division 16 - Electrical, Section 16722 - Centrally Managed and Hardwired Electronic Security and Access Control Systems.

End of Division 14 - Conveying Systems
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