

# 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 drawings and specifications for vertical transportation systems that are intended for standalone and multiple building sites that include the following:
  - 1.1 Provide acceptable levels of elevator service.
  - 1.2 Provide safe, reliable, and convenient transport of passengers and material.
  - 1.3 Provide systems that meet all current applicable code and accessibility requirements.
  - 1.4 Provide reliability and achieve desired lifecycle service and cost.
  - 1.5 Prohibit installation of control equipment that requires adjustment or troubleshooting with proprietary diagnostic instruments.
  - 1.6 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 A/E shall include a Pre-Design report prepared by the consultant as part of the Pre-Design deliverables. The elevator consulting firm shall have an office in Minnesota with a minimum of five years of experience as an elevator consultant.
    - 1.6.1 The Consultant's Pre-Design report shall include recommendations for elevator quantities, types, speeds, capacities and platform sizes based on the anticipated building population and specific usage. This report is optional at the Owner's discretion for the following:
      - 1.6.1.1 Modernization projects in existing buildings provided the building's population or occupancy type is unchanged.
      - 1.6.1.2 Projects that require an elevator solely for compliance with building or accessibility code requirements.
  - 1.7 During the Design Development phase the Consultant shall provide the Architect with a list of related building work, outside the scope of Division 14, required to comply with prevailing elevator code requirements. The Architect shall distribute this list to their design

team and verify that the necessary work is included in the Construction Documents.

## 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 may be considered in buildings that have a concentrated flow of traffic such as sport facilities, auditoriums and bookstores.

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

### 2.3 Service Elevator

2.3.1 Include a service elevator in all buildings that are two stories or higher. Locate the service elevator adjacent to the service entrance or loading dock if applicable. In smaller buildings the service elevator may also serve as a passenger elevator.

2.3.2 The service elevator shall provide direct service to all floors in the building, including floors dedicated to mechanical and electrical equipment.

2.3.3 Service elevator cab interiors shall be a minimum of 5'-8" wide, 7'-5" deep, and 10'-0" high.

2.3.4 Service elevator entrances shall be a minimum of 4'-0" wide by 7'-6" high.

2.3.5 A door hold feature activated by a momentary pushbutton in the car operating panel shall be provided.

2.3.6 Service elevators that open directly into mechanical rooms or building service areas shall be equipped with means to restrict access to authorized personnel.

### 2.4 Hydraulic Elevators

2.4.1 **PROHIBITED:** Hydraulic elevators in parking ramps.

2.4.2 Hydraulic passenger elevators may be used for light-duty applications. They shall be limited to a maximum travel of 24 feet or three stops.

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

### 2.5 Traction Elevators

2.5.1 Traction elevators shall be used for all applications that exceed 24 feet of travel or three stops.

- 2.5.2 Traction elevators shall be used in parking ramps regardless of travel or number of stops. Elevators in parking ramps must include hall floor indicators on every level.

### **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:

- 3.2.1 No. 4 finish: Satin finish

- 3.2.2 No. 8 finish: Mirror finish

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

### **4. Elevator 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 specified to meet requirements based on the Schematic Design report in regards to the following:

- 4.1.1 Overall performance time—measured from when the doors begin to close, the elevator travels to the next floor and the doors are three-quarters of the way open.
  - 4.1.2 Floor stopping accuracy— $\pm 1/4$ " of level regardless of load up to rated capacity.
  - 4.1.3 Running speed—maintained within 3 percent of specified speed under all load conditions for traction elevators and within 10 percent of specified speed for hydraulic elevators.
  - 4.1.4 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.
  - 4.1.5 Ride quality for new installations shall be such that there are no excessive horizontal or vertical vibrations. The maximum peak-to-peak vibration shall not exceed 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—measured from when the doors begin to open until the doors are fully open.
  - 4.3 Door closing time—measured from when the doors begin to close until the doors are fully closed.

## **5. Approved Equipment and Contractor Qualifications**

- 5.1 Elevator systems and individual components shall be designed to allow for routine maintenance, troubleshooting, and code-required testing to be completed by any qualified elevator maintenance provider without the need for any external diagnostic devices or software.
- 5.2 All products must include all UL/CSA labels required by the State of Minnesota and be acceptable for use by the Minnesota Elevator Inspections Division.
- 5.3 The installation contractor shall have an office in Minnesota and have a minimum of five years of experience installing elevator equipment.
- 5.4 See Item 19 for a list of approved manufacturers and equipment.

## **6. Control and Operation**

- 6.1 Motor Drives and Motor Control

- 6.1.1 Provide solid state AC motor drives on all new traction installations and modernizations.
  - 6.1.1.1 Provide regenerative motor drives when possible. Verify requirements and limitations with the Owner or Electrical Engineer.
- 6.1.2 Provide solid state reduced voltage motor starters on all hydraulic applications.

## 6.2 Elevator Controls

- 6.2.1 Provide Selective Collective Simplex operation for single elevators.
- 6.2.2 Provide Selective Collective Duplex or Group Automatic Operation for two-car groups.
- 6.2.3 Provide Group Automatic Operation using a current ETA algorithm for groups of three or more elevators.
- 6.2.4 Provide all elevator control features required by prevailing code requirements and the requirements of the Owner. Optional features that should be reviewed with the Owner and Design Team during the design process include:
  - 6.2.4.1 Card reader security
  - 6.2.4.2 In car security cameras
  - 6.2.4.3 Key activated security
  - 6.2.4.4 Swing car operation
  - 6.2.4.5 Priority service operation

## **7. Equipment in Hoistways, Controller Spaces, Control Rooms, Equipment Spaces, and Equipment Rooms.**

### 7.1 General

- 7.1.1 Equipment shall be designed and installed so it is easily removed for maintenance and repair. Consultant shall notify the A/E at any point in the design process if the building design appears to prohibit future replacement of any elevator equipment.

### 7.2 Traction Elevators

- 7.2.1 Traction hoist machines in new buildings shall be geared or gearless with motor, brake, drive sheave and deflector sheave mounted on a common structural frame. The machines shall be located in the equipment room, hoistway or equipment space.

- 7.2.2 Provide new gearless traction machines when replacing existing geared traction machines where feasible and cost effective. Any modernization design shall require replacement of geared traction machines that have existing DC hoist motors or that have been in operation more than 20 years.
- 7.2.3 Selectors shall be solid-state or steel hoist way tape that uses magnets mounted on the tape for car position, slowdown and leveling. Provide digital closed loop selector systems for all elevators with speeds of 300 fpm or higher.
- 7.2.4 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.

### 7.3 Hydraulic Elevators

- 7.3.1 **PROHIBITED:** Submersible pump units in applications with pump motors greater than 30 horsepower.
- 7.3.2 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.
- 7.3.3 Provide a muffler on hydraulic elevators.
- 7.3.4 Provide a gate or shutoff valves 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.
- 7.3.5 Locate the hydraulic control valve in the oil reservoir above the level of oil when the car is at the lowest landing.
- 7.3.6 Run hydraulic piping aboveground/overhead. Buried oil line or couplings is prohibited.
- 7.3.7 To return oil back to the hydraulic pump unit reservoir, provide a Wagner or University-approved equal scavenger pump in each pit.
- 7.3.8 Provide at least one isolation coupling in the oil line to reduce vibration and noise.

## 8. Hoistway Equipment

- 8.1 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.
- 8.2 Hydraulic cylinder hole: Drill cylinder hole for hydraulic elevators per Minnesota state code.

8.3 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 all required conductors in the traveling cable for security and other Owner control and signal fixture requirements.

## **9. Entrance Equipment**

9.1 Frames shall be of hollow metal, bolted construction with a permanently attached and raised cast Braille plate.

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

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

9.4 Sills

9.4.1 Passenger elevators shall have extruded aluminum or nickel silver sills.

9.4.2 All service elevators and elevators that have a capacity of 5000 pounds or greater shall have extruded nickel-silver sills.

9.5 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.

9.6 Freight doors shall be power-operated and vertical bi-parting.

9.7 The Owner's representative shall select the finish for doors and frames.

## **10. Car Equipment**

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

10.2 Roller guides shall be provided on all Class A passenger and service elevators. Elevators with Class C loading may use slide guides with replaceable inserts.

10.3 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.

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

10.5 Include a set of cab protection pads and hooks with each passenger elevator.

## **11. Car Enclosure**

- 11.1 The design concept of passenger elevator cabs shall be provided by the Architect or Owner. The Consultant shall review to verify selected finishes comply with code requirements and provide opinions of additional cost if finish material weights require the elevator equipment to be of increased capacity and/or equipment size.
- 11.2 The interior of the service elevators shall be constructed of rigid stainless steel walls and stainless steel cab fronts and doors.
- 11.3 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. LED fixtures shall be recessed in the car canopy for lighting, and provide a minimum of 20 foot-candles of illumination at the car floor.

## **12. Warranty Maintenance**

- 12.1 The A/E shall engage the elevator consultant to develop and provide a warranty maintenance service specification in accordance with the following:
  - 12.1.1 The installer shall furnish preventive maintenance and 24-hour callback service on all new elevators and escalators for one year from the date of Substantial Completion. Service shall include systematic examination, adjustment, cleaning, lubrication, repair, and parts replacement.
  - 12.1.2 Response time for callbacks shall be within two hours.
  - 12.1.3 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.
  - 12.1.4 The installer shall hire and supervise competent personnel to work under the maintenance service contract.
  - 12.1.5 In the event of an accident or injury, the installer shall conduct an inspection and submit a report to the University Elevator program within one working day. The Elevator Program shall then submit the report to the state elevator authority, as required per Minnesota Rule 1307.0040. All parts shall be retained for the inspector to examine.
  - 12.1.6 The maintenance service contract shall specify that the installer is to test and repair all elevator emergency systems, including firefighters' emergency recall, emergency telephones and standby power as part of regularly scheduled testing at the university.



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

12.2 Frequency:

12.2.1 The minimum frequency of service shall be determined by the current Maintenance Control Program, but in no cases shall be less than one (1) one hour visit per month.

12.3 Reporting:

12.3.1 Copies of all service, repair, and callback tickets shall be delivered via email or hard copy to the University Elevator Program.

12.4 Inspection:

12.4.1 At least 45 days prior to expiration of the warranty maintenance service contract, the installer shall schedule a final inspection with the University Elevator Program or their designated representative as part of the warranty maintenance contract. All deficiencies shall be corrected prior to expiration of the contract.

12.5 Assignment of Warranty and Maintenance:

12.5.1 The A/E shall provide a line item on the bid form for the Contractor to provide a monthly dollar amount for the completion of the 12 months of warranty maintenance by the elevator contractor.

12.5.2 All warranty related claims and actions that occur after substantial completion of the project will be managed by the University Elevator Program directly with the elevator contractor.

12.5.3 A/E shall specify that the 12 months of warranty and warranty maintenance shall commence upon substantial completion of the project. The use of any elevator prior to substantial completion of the project shall not alter this requirement.

### **13. Owner's Information**

13.1 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:

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

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

- 13.1.2.1 Straight-line wiring diagrams of “as-installed” elevator circuits with index of location and function of components. Provide one set reproducible master. Mount one set wiring diagrams on panels, racked, or similarly protected, in elevator machine room. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser’s property.
- 13.1.2.2 Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
- 13.1.2.3 Provide any necessary interface cards required for equipment maintenance, code mandated testing, and troubleshooting.
- 13.1.2.4 Lubrication instructions including recommended grade of lubricants.
- 13.1.2.5 Parts catalogs for all replaceable parts including ordering forms and instructions.
- 13.1.2.6 Four sets of keys for all switches and control features properly tagged and marked.
- 13.1.2.7 Neatly bound instructions explaining all operating features including all apparatus in the car and lobby control panels.
- 13.1.2.8 Neatly bound maintenance and adjustment instructions explaining areas to be addressed, methods and procedures to be used, and specified tolerances to be maintained for all equipment.
- 13.1.2.9 Diagnostic equipment complete with access codes, adjusters’ manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system, and performance of routine safety tests.

## **14. Telephone**

- 14.1 See Item 5 above “Approved Equipment and Contractor Qualifications”.

- 14.2 Provide an emergency telephone in or adjacent to the car operating panel in each elevator. 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.
- 14.3 The connection from the telephone device to the demarcation point on the elevator car shall be via shielded telephone cable with connection plugs as required by the telephone manufacturer.
- 14.4 A twisted shielded pair of wires in the traveling cable shall connect the telephone systems from the demarcation location on the elevator car to a demarcation location mounted on or adjacent to the elevator controller in the machine room or controller space.
- 14.5 The contractor shall program the telephone to ring at PSECC. Contact the Office of Information Technology for the proper telephone number.

## **15. Fixtures**

- 15.1 Hall and car fixtures shall be vandal-resistant and illuminated with machined positive button stops. The Owner may allow non-vandal resistant fixtures in specific installations. Install at least one hall position indicator panel at the firefighters' designated landing.
- 15.2 Provide fire command panels when required by code. Include all wiring, conduit, cutting and patching required.
- 15.3 For multi-car installations, provide hall lanterns on each floor. For single-car installations, car direction lanterns on both car door jambs may be provided.
- 15.4 Incorporate engraved ASME A17.1 "In Case of Fire" pictograph on each hall push button station faceplate. A separate pictograph is acceptable for modernization projects if necessary to avoid damaging or altering existing wall finishes.
- 15.5 Illuminate signal fixtures with LED lamps. Specify tamper-proof fasteners.
- 15.6 All key switches in car and hall fixtures shall be Adams type blade keys (AE102, MM101, GG101, etc.) with the exception of specific keying required by code.

**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 have the Elevator Consultant prepare specifications based on these manufacturers.

**17. Approved Product Listing: Where specific products are not referenced below, the Elevator Consultant shall verify through the submittal process that the elevator component manufacturers have referenced the correct parameters included in the Division 14 drawings and specifications (speed, capacity, loading, travel, stops, openings, etc.).**

17.1 Gearless Traction Elevator Machines:

- Imperial Electric
- Hollister-Whitney

17.2 Geared Traction Machines:

- Hollister-Whitney

17.3 Hydraulic Power Units:

- Minnesota Elevator
- EECO

17.4 Elevator Controls, Motor Drives, and Landing Systems:

17.4.1 Traction Elevators

- Car speed of 350 fpm or greater and/or three (3) or more elevators in a group:
  - Motion Control Engineering – iControl
- Car speed of less than 350 fpm and/or one (1) or two (2) elevators in a group:
  - Motion Control Engineering – iControl, Motion 4000
  - G.A.L – Galaxy
  - Elevator Controls Corporation – V900 VF-CL

17.4.2 Hydraulic Elevators

- Motion Control Engineering – Motion 2000 w/LS-QUTE
- G.A.L – Galaxy
- Elevator Controls Corporation – H900
- Vertitron Midwest - VHC102 (Simplex Only)

17.5 Door Operators and Related Door Equipment:

- GAL – MOVFR II

17.6 Elevator Cabs and Interior Finishes:

- Hauenstein and Burmeister
- Minnesota Elevator
- Schumacher
- G & R
- Tyler

17.7 Car and Counterweight Roller Guides:

- ELSCO

17.8 Car and Hall Signal Fixtures:

- Innovation Industries

17.9 Emergency Telephones

- Rath Microtech Smartphone

**End of Division 14 - Conveying Systems**

**University of Minnesota Facilities Management**

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