

PART VIII: CONVEYING SYSTEMS DESIGN

1. SCOPE:

1.1. This part outlines the minimum requirements for the design procedures for conveying systems, for new buildings, and repair and alteration projects for existing buildings on the UMB campus.

2. UMB OVERVIEW:

2.1. **Overview:** The University operates and maintains approximately one hundred (100) elevators and lifts of almost every conceivable type, configuration and age. A trained staff capable of trouble-shooting and repair of the equipment is employed. The size and complexity of this component of the physical plant necessitates cost-effective procedures which range from stocking parts and training to requiring that each new or replacement conveyance meets the standards outlined in, or reasonably inferred from, the requirements of this part.

2.2. **Reviews:** Review of design and construction is undertaken by University personnel as local building permits are not obtained for projects under State jurisdiction. The A/E, builder and equipment manufacturer shall be responsible for a design and installation which will comply with state elevator certification standards and testing requirements.

3. CODES AND STANDARDS:

3.1. **Code of Maryland Regulations (COMAR):** This code includes provisions that require elevators serving three or more floors to have a minimum clear interior car dimensions large enough to accommodate a stretcher six (6) feet – eight (8) inches long by two (2) feet – zero (0) inches wide (minimum six (6) feet – eight (8) inches wide x five (5) feet – five (5) inches inside cab) and a three thousand five hundred (3,500) lb. capacity. See other requirements in this part for projects with a single elevator.

3.2. **Standards:** Elevator standard ASME/ANSI A17.1, latest edition adopted by the State Department of Licensing and Regulation, Division of Labor, “Regulations Governing Elevators, Dumbwaiters and Moving Walks” (including supplement A17.1a “Safety Code for Elevators and Escalators”);

3.3. Current ADA Accessibility Guidelines.

4. ELEVATOR TRAFFIC ANALYSIS STUDY:

4.1. As part of the Basic A/E Design Service, at the Schematic Design Phase furnish a complete analysis of elevator demand and compliance for the project. The analysis shall be up-dated at each succeeding design phase submittal. If the complexity of the project warrants, a qualified elevator consultant shall be employed to conduct the analysis.

4.2. The analysis shall be based on the interval of a five (5) minute handling capacity, projected population for the building type, the total area to be served, including impact of adjoining buildings, if any, and any other special requirements of the building program. Except as otherwise directed by the University, service elevators shall not be included in the calculation of pedestrian traffic and exiting.

- 4.3.** The analysis shall provide hoistway dimensions to accommodate a minimum of three (3) manufacturer's standard products that are sized to meet the capacity requirements of the traffic analysis.

5. ELEVATOR HOISTWAY:

- 5.1.** The elevator hoistway shall be encased through its full height in a fire resistant enclosure per the building code.
- 5.2.** Floor numbers, not less than four (4) inches in height, shall be provided on the hoistway side of doors and panels.
- 5.3.** The elevator hoistway shall be provided with means to prevent the accumulation of smoke and hot gasses in case of fire, as required by the building code.
- 5.4.** If there is a dimensional change in the hoistway that creates a ledge greater than one half (1/2) inch, it shall be beveled at an angle of not less than sixty (60) degrees or more than seventy five (75) degrees.
- 5.5.** Elevator rails shall not be used as the lightning protection system grounding conductor.
- 5.6.** The hoistway shall be designed to accommodate the cab dimensions of at least three (3) different manufacturers.

6. ELEVATOR PIT:

- 6.1.** Drains connected directly to sewers shall not be installed in the elevator pit. A sump basin with a sump pump shall be designed in the base of the elevator pit to collect the accumulation of water in the elevator pit. The elevator pit sump basin shall be covered and level with the elevator pit floor. Coordinate with the electrical engineer to provide emergency power for the sump pump. Also provide an oil separator, located remote from the elevator pit, for sump pump discharge where required by code. Provide a high water level alarm, connected to the building automation system.
- 6.2.** A fixed vertical ladder shall extend not less than forty two (42) inches above the sill of the elevator pit access door.
- 6.3.** Permanent energy efficient electrical lighting shall be provided in the elevator pit with a minimum illumination of ten (10) foot candles at the pit floor. Lighting shall be fluorescent vapor proof type with a wire guard. The light switch shall be accessible from the access door. A duplex GFCI electric receptacle rated not less than 15 amps, 120 volts shall be provided in the elevator pit on dedicated circuit, designed in accordance with the NEC 620, latest edition.
- 6.4.** An elevator stop switch shall be installed in the elevator pit. The stop switch shall be accessible from the elevator pit access door. When access to the pit is through the lowest landing hoistway door, a stop switch shall be located approximately eighteen (18) inches above the lowest landing floor. When the pit exceeds sixty seven (67) inches in depth, an additional stop switch is required. Where more than one switch is provided, they shall be wired in series.
- 6.5.** Where the depth of the elevator pit exceeds sixty seven (67) inches, a working platform of galvanized steel shall be included in the design in compliance with code requirements.

- 6.6.** The design of hoistway pits shall be of sufficient dimension and depth to accommodate the standard products of a minimum of three acceptable elevator manufacturers that comply with the traffic analysis.

7. ELEVATOR EQUIPMENT REQUIREMENTS:

- 7.1. General:** It is the University's preference to utilize a holeless hydraulic elevator system for buildings of three floors or less. For buildings of more than three floors, the University prefers the use of electric traction elevators. The design of holed hydraulic elevators requires written approval by UMB.

- 7.2. Electric Traction Elevators:** The design shall utilize standard commercial quality, pre-engineered electric traction equipment, including cars, hoistway entrances, control and signal systems, safety equipment, hoistway equipment, and elevator machinery. Include the following in the construction documents:

- a. Specify 'T' - type guide rails; tubular guides will not be permitted.
- b. Specify roller guide shoes.
- c. Specify the elevator to operate at a minimum of three hundred fifty (350) feet per minute.

- 7.3. Hydraulic Elevators:** The design shall utilize standard commercial quality, pre-engineered hydraulic equipment, including either direct or indirect systems of a hydraulic plunger and cylinder (jack), with other components of the work including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, control systems, signal equipment, guide rails, electrical wiring, buffers, and devices for operating, dispatching, safety, security, leveling, alarm, maintenance, and similar required performances and capabilities. Include the following in the construction documents:

- a. Indicate intended support and anchorage system for above-grade jack units, guide rails, and sills, noting what part of the work is "elevator work".
- b. Indicate well or casing locations, depths for hydraulic jacks and the plunger/cylinder. The cylinder shall have auxiliary PVC casing for protection against electrolysis, and proper sealing against water intrusion.
- c. Hydraulic piping and electrical conduit shall be run overhead.
- d. Specify the elevator to operate at a minimum speed of two hundred (200) feet per minute.

- 7.4. Service Elevators:** In all projects at least one elevator, and in single elevator installations, one elevator, shall service all levels, including basement, penthouse mechanical levels, and the roof level if large mechanical equipment is located on the roof. This elevator may be designated as "service" in multi-elevator installations, and may be located remote from a multi-elevator passenger bank. A service elevator is not required for parking garage designs. Include the following in the construction documents:

- a. Capacity shall be five thousand (5,000) lb. with an oversized cab to accommodate occasional moving of furniture, equipment or materials.
- b. Car platform minimum clear inside dimension shall be six (6) feet – eight (8) inches wide x nine (9) feet – four (4) inches deep x nine (9) feet – four

(4) inches clear high. Hoistway doors shall be five (5) feet – zero (0) inches clear x seven (7) feet – eight (8) inches high, two (2) speed side opening.

- c. Specify the elevator to operate at a minimum speed of three hundred fifty (350) feet per minute.
- d. Specify operation as Simplex selective, collective.
- e. Elevator controls shall be a micro processor based system to properly service the building use. The controls shall be specified to provide relay outputs for remote monitoring of alarms and trouble signals.
- f. Elevators shall be connected to the building emergency power system.
- g. Hoistway entrance doors and frames shall be of fire-resistant labeled construction as required by the Code. University standard finish is stainless steel complying with AISI type 302/304 with manufacturer's standard vertical natural satin finish. Doors shall be hollow metal one and one quarter (1.25) inch thick of seamless welded flush construction, fabricated of 16 gauge sheet with internal reinforcing channels spaced six (6) inches on center and spot welded four (4) inches on center to face sheets. Provide key hole at every floor level.

8. ELEVATOR CAB:

8.1. Cab enclosures shall be developed to indicate floor selection buttons incorporated in a brushed stainless steel panel (No.4 finish) designed to accommodate all required signage, fireman's key, key box, and any other signal equipment. Exit floor indications, braille and graphic signage shall be in strict accordance with requirements of the code. Provide the following:

- a. The A/E shall select appropriate, durable finishes and lighting for the intended use of the elevators. Submit selected finishes and lighting to the University for review and approval at the Design Development Submission.
- b. Specify that removable fire rated protective pads for all cab walls, including mounting hardware, shall be included with the elevator cab.
- c. Specify that code required signage for fire service operation shall be engraved on both hall call stations and car operating panels.

8.2. Dedicated service elevator cab enclosures shall include the following:

- a. Front transom, wall panels, doors and door frame shall be 16 gauge AISI, type 302/304 stainless steel with manufacturer's standard directional polish or satin finish.
- b. Steel sheets for exposed metal panels, walls and ceilings shall be stretcher-leveled, cold rolled commercial quality furniture steel, complying with ASTM A 366 matte finish
- c. Exterior of cab shall receive a sound deadening material. Reveals, base and frieze shall be stainless steel with # 4 finish.
- d. Sills of cab and hatchway shall be cast iron complying with ASTM B48, class 20 gray iron casting not less than seven sixteenth (7/16) inch thick with an antislip surface.

- e. Flooring shall be suitable for extra heavy traffic service such as “Nora Rubber Flooring”, “Norament 925A” or other durable material with surface complying with ADA requirements. Specify a ten (10) year warranty.
- f. Lighting shall be energy efficient, and sufficient to provide ten (10) foot-candles at rail height. Conceal source, but provide easy access from within the cab for replacement of lamps and ballasts, etc.
- g. Provide handrails and low bumper rails on sides and back consistent with requirements of the code.
- h. Provide a removable protective blanket lining for sides and rear of the car complete with hooks and blanket grommets.

9. ELEVATOR MACHINE ROOM:

- 9.1. Access to the machine room and overhead machinery space shall be provided by a stairway with a platform and swinging door at the top level. The size of the platform shall be sufficient to permit the full swing of the door plus two (2) feet from the top stair riser to the swing line of the door.
- 9.2. The access door to the machine room and overhead machinery space shall be a minimum thirty six (36) inches wide and six (6) feet eight (8) inches high, and shall be self closing and self locking. Doors must be kept closed and locked, and shall have a spring-type lock arranged to permit the door to be opened from the inside without a key.
- 9.3. Specify that a stop switch shall be located adjacent to each elevator controller.
- 9.4. Headroom in the machine room and overhead machinery space shall be a minimum of seven (7) feet.
- 9.5. Permanent energy efficient electrical lighting shall be provided in the machine room with a minimum illumination of nineteen (19) foot candles at floor level. The light control switch shall be mounted on the wall adjacent to the lock jamb side of the access door. All elevator machine rooms shall have emergency and normal lighting.
- 9.6. The machine room shall be cooled, heated and ventilated to provide the correct conditions for efficient control, machinery, and personnel operation. Coordinate the type of cooling and heating system and control requirements with UMB. The machine room shall not vent into the hoistway or stairwell. The temperature and humidity shall be continuously monitored through the building automation system.
- 9.7. Provide dedicated power circuits for each elevator controller in each machine room. A GFCI duplex receptacle rated at not less than 15 amps, 120V shall be provided in each machine room.
- 9.8. The only ducts, piping, conduit, and wiring permitted to be installed in the hoistway, machine room, and machinery space are those required for heating, cooling, and ventilating these specific spaces.
- 9.9. Standard sprinkler protection conforming to the requirements of ANSI/NFPA 13 shall be installed in the hoistway, machine room and machinery space. All risers and returns shall be located outside these spaces. Branch lines in the hoistway shall supply sprinklers at not more than one (1) floor level. Smoke detectors shall not be used to activate sprinklers in these spaces or to disconnect the main line

power supply. Pipes or ducts conveying gasses, vapors, or liquid not associated with the operation of the elevator shall not be installed in any hoistway, machine room, or machinery space. Hydronic and sprinkler piping serving roof top elevator machine rooms shall be located in conditioned shafts to prevent freezing.

- 9.10.** Air conditioning equipment is permitted in the machine room. Air conditioning equipment shall not be located directly above elevator equipment. The clear head room below suspended air conditioning equipment shall be seven (7) feet minimum. Air conditioning condensate drains shall not be located directly above elevator equipment.

10. SPECIFICATION REQUIREMENTS:

- 10.1.** Specifications for the elevator contract shall specifically state the requirements of these Design Standards. It is not sufficient to cite Part I blanket requirements for warranties, post-construction maintenance, etc.

- 10.1.** Include the following requirements in the project specifications:

a. Product Data:

- (1)** Signal and operating fixtures, operating panels, and indicators.
- (2)** Cab design, dimensions, layout, and components.
- (3)** Cab and hoistway door and frame details.
- (4)** Electrical characteristics and connection requirements.

b. Acceptable Manufacturers:

- (1)** Schindler Elevator Company
- (2)** Kone Elevator Company
- (3)** Thyssen Krupp Elevator

- c.** **Diagnostic and Test Equipment:** Specify to provide as an integral component of the elevator contract, and at no additional cost, any and all forms of proprietary testing and diagnostic equipment required to gain access to the control system, to identify malfunctions, to make adjustments to the equipment systems, or to conduct service, maintenance, and periodic safety tests. This shall include a laptop computer or other complete analyzer hardware/software used to diagnose or maintain any and all programs in system equipment for trouble shooting and proper maintenance.

- d.** **Instruction Manual:** Specify to provide an instruction manual on the use of the diagnostic tool that includes all of the fault codes identification, detailed description and correction procedures. Also specify to provide hardware and software updates during the warranty period and for an additional seven (7) years after the warranty period has expired.

- e.** **Replacement Circuit Boards:** Specify that the manufacturer shall provide at no additional cost to the owner one complete set of replacement printed circuit boards for all units of the control system and motor drive. There should be one replacement board for each board type. If separate boards for the drive are not available, provide one replacement drive for each drive model.

- f. Demonstration:** Specify that at the time of equipment acceptance, the manufacturer shall provide forty (40) hours of on-site instruction to University elevator service personnel in the proper use, operation, and on-going maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed for failure of equipment operation, as well as other common building emergencies. Train the University personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with UMB on requirements for a complete elevator maintenance program. All submittals and maintenance documents must be turned over to maintenance personnel before the instruction is scheduled to allow time for review and familiarization. Include instruction on special or proprietary equipment, computer hardware, software, and other devices utilized for diagnostic trouble shooting and malfunction identification.
- g. Service:**

 - (1) Initial Maintenance Service:** Specify that the purchase and installation contract shall include full maintenance service by skilled, competent employees of the elevator installer, working under supervision of the elevator manufacturer or manufacturer's authorized representative(s), for a period of twenty four (24) months following the date of Final Acceptance or Substantial Completion.
 - (2) Continuing Maintenance Service:** Specify that the installer shall provide, with the initial bid documents, a continuing full service maintenance proposal to the University, in the form of a standard yearly maintenance agreement commencing on the date construction contract warranty and initial maintenance requirements are concluded. State the services, pricing, structure, obligations, conditions, and terms for the agreement period, and for future renewal options for up to five (5) years.
 - (3)** Any and all proprietary equipment furnished and installed with the elevator(s) shall become the property of the University, and any replacement parts shall be available to the University and/or any third party vendor which may provide equipment maintenance under contract to the University solely for University use.
- h. Special Project Warranty:** Specify to provide a special project warranty, signed by the general contractor or construction manager, Installer, and manufacturer, guaranteeing the replacement, repair or restoration of defective materials and workmanship in the elevator work, and including any related repair or replacement work during the stated warranty period.
- i. Project Records:** The contract shall require that at the time of acceptance of the equipment, the following shall be provided to UMB in five (5) copies:

 - (1)** Complete sequence of operations for all elevators.
 - (2)** Complete control equipment layout and assembly drawings for parts pertaining to: electrical, mechanical, electronic and solid state equipment including printed circuit boards component layout for all boards used throughout installation.

- (3) “Record Drawing” wiring diagrams indicating the complete installation as constructed.
- (4) Motor and machine data, electrical, and mechanical data, pertaining to elevators.
- (5) Equipment layouts and assembly prints, drawings (record prints) pertaining to: car, hatch, machine room, pit, and shaft.
- (6) Service, adjustors, work processes or product manuals for all units of the elevator system with all update bulletins.
- (7) Include material lists and parts manuals for all elevator equipment, including printed circuit boards and identify each entry with equipment description and order number.
- (8) Maintenance and service contract and warranty.

END OF SECTION 3 AD - PART VIII