J. Vertical Transportation

1. Introduction

This portion of the Facility Standards includes vertical transportation requirements to be followed by the Consultant in the course of a project at the University of Chicago.
The following standards apply to a variety of conditions and types of vertical transportation systems. The standards outline preliminary requirements for vertical transportation systems throughout the campus, whether the work involves a new installation or only modernization. The Consultant or Elevator Consultant will be responsible for code compliance for the design and specification of the elevator, machine room and shaft as part of the Contract Documents for the project. The Consultant or Elevator Consultant will review all variances and applications for installation or alterations for elevators. The intent of these standards to provide guidelines in developing vertical transportation systems that:

1. Provide acceptable levels of elevator service as related to the Average Interval and Handling Capacity.
2. Provide safe and convenient transport of passengers and material.
3. Provide systems that meet the highest level of accessibility for people with disabilities.
4. Incorporate specifically identified standardized part for easy maintenance and rapid repair and/or replacement.
5. Provide reliability and achieve desired lifecycle service and cost, and
6. Provide for standardized vertical transportation systems and other identified equipment as chosen by the University of Chicago thereby eliminating the installation of manufacturer proprietary equipment and controls.

Non-Proprietary Design
The University of Chicago does not have in-house maintenance personnel and therefore relies upon vendors to maintain the equipment. For this reason, it is important that **non-proprietary elevator control equipment** be installed and that the following be provided by the installing elevator contractor with each vertical transportation project:

Diagnostic test device complete with access codes, adjusters manuals and set-up manuals for adjustment, diagnosis and troubleshooting of elevator system and performance of routine safety tests. Manufacturer of diagnostic test device shall update, reprogram, recharge, etc., device for as long as the controls remain in place.

Only the following vertical transportation controllers systems shall be considered:
1. CEC
2. MCE
3. GAL
4. ECC
5. Approved Equal (must be non-proprietary)

A "Non-proprietary" controller product is one that is regularly sold by the manufacturer to other installers and one for which the manufacturer will provide technical support to other contractors maintaining the product.
The University of Chicago and Consultant shall retain the right to change or assign a controller manufacturer or product to the Contractor.

The University of Chicago or the Consultant is to retain the services of a qualified Elevator Consultant to the design team during the design, bidding, construction and warranty period of any building requiring either a new vertical transportation project or the renovation of an existing vertical transportation project. The Elevator Consultant will provide the following:

1. Provide traffic analysis and theoretical design or complex use buildings.
2. Identify the type, size and capacities of proposed vertical transportation units.
3. Review all vertical transportation specifications.
4. Review shop drawings for compliance with specifications.
5. Provide PE stamped drawing and specifications.
6. Perform inspection services during any vertical transportation installation.
7. Provide copies of all documentation of review and inspection reports to the current elevator maintenance provider.
8. Attend progress meetings and conducting final inspections.
9. Perform the 12 month warranty inspection.

2. System Guidelines

The Consultant shall use/or obtain and use the following in the design of a new vertical transportation system installation including elevators in and for building renovations and/or additions and/or for vertical transportation new installations, modernizations and upgrades.

The Consultant is to provide, including but not limited to, theoretical and/or traffic analysis for all new buildings, especially high-rise and/or complex use buildings and identify the type (i.e. traction, hydraulic), speed, size and capacities of proposed vertical transportation units. Refer to performance charts included in these standards as well.

- Elevators shall be installed 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.
- New elevators shall be given an individual numbering identity. Elevators that have been modernized shall retain the existing number identification.

a) Traction Elevators

1. Geared traction elevators shall be used for all medium-duty and heavy-duty applications that exceed 45 feet of travel or four stops and above.
2. Controllers: Refer to Introduction for approved non-proprietary elevator controls
3. Rise: Any elevator utilizing more than four (4) openings in line or having abnormally tall floor heights (more than 12 feet) will be reviewed for speed requirements. In the case of

new installations exceeding 12 or more landings, consultant shall provide theoretical analysis to identify the need for gearless applications.

4. Emergency Power: Unless specified otherwise, emergency power for one elevator in each group must be provided.
5. Modernization of traction elevators: In the case of traction elevators modernization, the original design criteria will be maintained unless otherwise specified by the University and/or elevator consultant.
6. Hoist Machine – New:
    i. Provide a Holister Whitney or approved equal worm-geared traction machine with a motor, brake, gears and demountable drive sheave mounted in proper alignment on a common bedplate. The worm shall be accurately machined from steel and provided with a single end, double race ball bearing thrust. The worm gear shall be made from a phosphor bronze rim, accurately cut, fitted and bolted to a cast iron spider. The drive sheave shall be a demountable casting from the best grade of metal with a Brinnell hardness of 215 to 230, and shall be machined with grooves, providing maximum traction with a minimum of cable and sheave wear. Provide means for lubricating the machine. The gear housing shall have a gasketed hole to inspect the gear.
    ii. Provide machine with electro-mechanical brake. The brake shall be spring applied and electrically released. Swivel type brake shoes shall be applied to the braking surface simultaneously and with equal pressure by means of helical compression springs. Design brake electromagnet for quick release to provide smooth and gradual application of brake shoes.
    iii. Furnish and install new hoist cables properly sized and quantity as per code.

7. Hoist Machine – Reuse & Refurbish
    i. If it is deemed the existing machine shall be refurbished and reused for modernization purposes. The machine shall be dismantled to the extent necessary in order to properly examine critical wearing surfaces.
    ii. The gear case shall be drained of existing lubricants and flushed so as to remove all sediment. All seals, gaskets and packing shall be renewed in conjunction with re-assembly of the machine. The proper amount of fresh lubricant as specified by the OEM shall be added to the gear case. All worn bearings are to be replaced. Upon reassembly, the machines shall be sealed using proper gasket material on all surfaces. The use of silicone alone will **not** be accepted.
    iii. Hoist machine brake mechanisms shall be dismantled, cleaned and examined. Brake linings shall be replaced with an asbestos-free material bonded and riveted to the exiting brake shoes. Brass or composite brake plunge sleeves displaying any sign of wear shall be replaced. Metal casing, which contained oversize or eccentric holes for brake pivot pins, shall be reamed and fitted with oilite bronze bushings. Brake pivot pins shall fit their respective holes with a maximum clearance of .003". Pivot pins, which are undersized or scored, shall be replaced with new pins machined from cold-rolled steel. Electrical insulation on the brake coil shall be renewed. Upon re-assembly, brake lift shall be set to OEM specification with spring tension adjusted to comply with Rule 1002.3d of ASME A17.1 Code.

b) Hydraulic Elevators

Hydraulic passenger elevators shall be used for light-duty applications. They shall be limited to a maximum travel of 45 feet or four stops. New and existing applications will need to be reviewed by University and Elevator Consultant.

1. Controllers: Refer to Section 1.0 for approved non-proprietary elevator controls. Solid-state starters shall be used in all applications.
2. Provide Battery Lowering Device for emergency use in the event of a main power supply failure.
3. Speeds: Typical car speed is 125 – 150 feet per minute. Two stop or holeless applications may use 100-125 feet per minute.
4. Rise: Where the building rise is more than forty (40) feet, or the elevator requires staggered openings on either end of the car, check with Elevator Consultant for possible change in equipment of different application.
5. Power Units: Submersible and non-submersible, non-proprietary power units are only allowed.
6. Control Valve: Provide Maxton and EECO control valves only. Any other valve used must have approval by the University and/or Elevator Consultant.
7. Hydraulic Tank: Provide internal tank heater for elevators and in all parking garages, unheated buildings, or where exposed to freezing temperatures.

Well Holes, Casings & Cylinders – New Installation & Replacement

1. Provide and install hydraulic jack unit. Jack unit shall be the proper size to lift the gross load to the height specified. Jack shall be factory tested to ensure adequate strength and freedom from leakage. No brittle materials shall be used in the jack construction. Jack unit shall consist of the following components:

    i. Heavy seamless steel tubing plunger accurately turned and polished.
    ii. Stop ring shall be electrically welded to the plunger to positively prevent plunger leaving the cylinder.
    iii. Internal guide bearing.
    iv. Packing or seal of suitable design and quality.
    v. Drip ring around cylinder top.
    vi. Cylinder made of steel pipe and provided with a pipe connection and air bleeder.
    vii. Weld brackets to the jack cylinder for supporting the elevator on pit channels. An auxiliary safety bulkhead shall be provided in the lower end of the cylinder.
    viii. Jack cylinder and underground piping shall be double wrapped with an approved coating designed to help protect it from electrolytic and chemical corrosion.
    ix. Provide PVC cylinder liner to protect the cylinder from corrosion and to contain any oil in the event of a cylinder leak. Liner shall be closed end connected to the top of the jack unit

2. Piping: Provide all necessary piping for the hydraulic elevator system. Piping shall be of the size, type and weight recommended by the manufacturer and as required by Code. Protect underground piping by coating and wrapping same as specified for cylinder. Provide sound-isolating couplings for connections of piping to power unit. Support all horizontal piping with hangers spaced no more than 10 feet apart.
3. Extra Drilling: Contractor should clearly indicate in their bid the number of hours of drilling and excavation included in their bid price as part of the jack replacement. Contractor should submit with their bid the billing rate for extra drilling hours as required.
4. Contractor shall be responsible for removal of drilling spoils from hydraulic jack replacement. Spoils must be removed and disposed of per all code and regulatory guidelines. Contractor must provide University with evidence of proper disposal of spoils.

Holeless Hydraulic Elevators – New Installations

Holeless hydraulic elevators will be considered by the University and/or elevator consultant for use on a case-by-case basis as specific requirements may necessitate.

c) Machine Roomless Elevators

Machine roomless elevators will be considered by the University and/or Elevator Consultant for use on a case-by-case basis. These should be considered for low to moderate traffic installations. The ability to remain non-proprietary may be difficult.

3. Component Guidelines

a) Pushbutton Fixtures

1. Provide vandal resistant pushbutton fixtures with tamper proof screws as manufactured by:
   i. Monitor Controls, Inc.
   ii. Innovation Industries, Inc.
2. Use vandal-resistant car direction indicators located on the elevator car to indicate direction of travel and visual arrows for car direction.
3. Provide arrival gongs at each elevator lobby.
4. Fire Service Operation: Elevators shall completely comply with the applicable ASME code as adopted and/or modified by local and state law. All fixtures, operations, and provision necessary for proper operation must be provided and installed.
5. Provide the Fire Service key switch at the main fire-recall lobby pushbutton.
   i. Provide etched, embossed or engraved Fire Service Signage located on each hall pushbutton cover. Surface-applied signage shall be approved by University.
   ii. Engrave, etch, or emboss fire service instruction on the fixture cover in accordance with ANSI A17.1a.

6. Pushbutton designation numbering shall match room numbering designation i.e. if architectural drawing call the lowest floor "Lower Level" the elevator floor designation shall **not** be "Basement" etc.
7. Note that all new car and hall fixtures shall be chosen by a building representative. Failure to gain approval of the owner prior to ordering fixtures may result in contractor having to reorder fixtures acceptable to the owner.

b) Power Door Operator Equipment

1. Use only door operator equipment that includes drive operator, hangers, locks, closures, etc. as manufactured by GAL Manufacturing Corp.
2. MOVFR door operator model shall be used on all horizontal slide passenger elevators.

c) Traveling Cable Requirements

1. Provide all elevators with complete new wiring in the hoistway, pit and machine rooms adequate for the proper operation of the equipment. Conductor shall be copper. The minimum size of conductors, exclusive of those which form an integral part of control devices and/or cabinets, shall be a minimum no. 14 for lighting or power circuits and no. 18 for operating, control and signal circuits. All material used and method of installation shall conform to the NFPA National Electrical Code and/or local Building Department Code. All insulated wiring, control wiring and wiring in traveling cables shall be tag coded at their terminal in the machine room, shaft box, elevator cab junction box and push-button stations within the cab and shall agree with the submitted wiring diagrams.
2. Existing wire raceway may be reused. Where additional wire raceway is required, it shall be zinc-coated rigid steel conduit, intermediate electrical conduit, electrical metallic tubing (EMT), or metal wireways and outlet boxes except for traveling cables. Flexible metal conduit may be used for the short connections not subject to moisture, oil or embedment in concrete. Connections to the controller shall be made in a manner that minimizes transmission of vibration or noise to the building. Hoistway raceway may be in rigid steel wiring duct. Threadless fittings shall not be used with rigid galvanized steel conduit. Electrical connections to machinery shall allow for one foot of lateral motion.
3. Travelers - New traveling cables shall be provided for all elevators and designed for elevator service in accordance with the NFPA National Electrical Code and/or local Building Department Code and shall be sufficiently flexible to readily adapt to all changes in the position of the elevator cab and hang straight without twist. The cables shall be capable of bending 360 degrees with an inside radius of one (1) foot without any permanent set and without cracking of the outer covering. The open loop shall show no tendency to twist upon itself. Cables shall have a flame-retarding and moisture-resistant outer cover. Each traveling cable shall contain 10 percent (10%) spare wires and, in any event, not less than two (2) spare wires. Traveling cables shall contain shielded wires for the intercommunication system and Coaxial Cable sufficient for a CCTV system.
4. The coaxial cable shall be terminated in the elevator pit, in a separately identified box. The other end of the coax cable shall be dead ended on one of the top corners of the elevator

cab. In addition a duplex GFCI outlet shall be located on the top corner of the elevator cab dedicated for camera power only.
5. Traveling cables exceeding 100 feet in length shall have steel supporting core cables and shall be suspended directly from them to relieve the conductors of strain.
6. Provide ten percent (10%) spare wires between the controller, selector, hatchway junction box and starter's panel and also provide ten percent (10%) spare wires in each traveling cable. All spares shall be properly tagged or otherwise identified with clear and indelible markings. Install beam pads as necessary to prevent chafing of traveling cables.
7. Strain boxes shall be installed not over 80 feet apart.

d) Elevator Equipment Room

1. Provide proper access to the machine room areas, hoistways and pits for all elevators in accordance with the appropriate Codes.
2. Suitable storage space for tools and materials brought to the site by the Contractor. Contractor must specify at the beginning of the project the details of storage space required. Storage space requested shall be reasonable and in accordance with the projected schedule.
3. Required mechanical ventilation in the machine room(s) to maintain ambient temperature between 45 and 90 degrees Fahrenheit with relative humidity not to exceed 85% based upon scheduled heat generation, or to maintain temperature as required by equipment proposed to be installed if different. Contractor must specify environmental requirements for the proposed equipment along with their bid package.
4. Provide properly labeled, self-closing and self-locking machine room, pit, and overhead doors.
5. Telephone lines for an autodialing in-cab communication system shall be acquired by the building and terminated in the machine room. Contractor shall install wiring from unit to the phone jack in the machine room.
6. Required electrical power to the elevator system(s) shall be provided by owner. This shall include the mainline disconnect switch(es) fused and lockable in the open position, with fuses as required, and this shall also include a ground wire. Provide 120V single phase fused and lockable disconnect switch per elevator located in the machine room for elevator car lights and fans. Provide duplex GFI protected outlets in machine room and secondary spaces. Existing grounding, feeding service and distribution in the elevator machine room shall be reviewed and upgraded as per code and equipment requirements. If needed, provide auxiliary disconnects to provide a disconnect switch within the line of sight of any moving equipment.
7. Provide shunt trip operation for mainline disconnect switches in the machine room. Shunt trip shall be initiated from heat detectors located within the vicinity of the existing sprinkler heads in accordance with applicable code guidelines. Operation of the systems upon activation of any heat detector shall be according to all applicable building, fire and elevator codes.
8. Provide smoke sensing devices at elevator lobbies on each floor, machine room, and hoistway with three (3) dry contacts terminating at a properly marked terminal in the machine room. One dry contact will be for fire recall, the second for alternate floor fire

return, and the third to indicate that the smoke sensor in the machine room has been initiated. Sensing devices shall be properly zoned to provide alternate floor return for fire service recall phase I.

9. Ensure that existing sprinklers in pit are no higher than 24 inches from the floor. If they are higher than 24 inches, they should be extended downward as appropriate.
10. Provide a code-approved fire extinguisher in machine room.
11. Building should identify and abate any asbestos located in the existing elevator pit or shaftway. The contractor will be required to identify other hazardous conditions with their bid that may require attention by owner.
12. Provide card reader units to be mounted in car stations by elevator contractor. Provide mounting instructions for card readers to be mounted in new car stations. Contract with security vendor to supply card reader system to whichever elevator company will wire readers after installing them in the car stations as required.
13. Provide properly guarded pit lighting of code-required intensity, illuminated light switches, GFCI outlets, and ladder as per code requirements.
14. Provide proper lighting in machine room and other machine spaces of proper intensity and guarded as per applicable code requirements.
15. Provide a microswitch on the mainline disconnect switch to signal to the controller when the disconnect switch is switched to the "OFF" position.
16. Climate Control: Maintain temperature between 50 to 90 degrees F. See IBC Chapter 30 for additional requirements if emergency power is required or provided to elevators and for machine room venting.
17. Data/Communications: Furnish two (2) telephone lines in each elevator equipment room and one (1) data line located in a standard University data/telephone jack. One line is to be used for the emergency call system to the control center and one line is to be used RMS (remote monitoring system).

e) Pit And Hoistway

1. Pit Access: Provide a metal ladder from each pit floor starting 12" above the pit floor and extending to 48" above the lowest landing floor level.
   i. Locate the ladder at strike jamb side of hoistway when single panel or two speed doors are used.
   ii. Where center opening doors are used, locate the ladder on the nearest side wall.

2. Sump Pit: Provide a sump pit with approved cover below normal pit grade for all elevators on all campuses.
   i. Furnish the sump pump with integral oil sensor so that pump will not operate if hydraulic fluid is contaminating the water.
3. Fire Protection: Hoistways may be exempt from the requirements for automatic fire protection sprinkler heads in fully sprinklered buildings. Verify requirements with IBC Section 903.3.1.1.1.
4. Provide a 7" clearance between the cleat and pit wall.
5. Items unrelated to the elevator are prohibited in the hoistway or pit.

f) Cab Interiors

Refer to cab interior finish standards contained within this standard.

g) Emergency Power Operation

1. Emergency Power - New:

   The elevator system shall be made to operate properly with the building Emergency Power system, based on the capabilities of that system and according to code requirements for sequencing and operation. The Contractor will coordinate the emergency power system with building management. The elevator will be able to run on alternate acceleration and deceleration, speed profile when on emergency operation and have all chokes and filters installed to minimize line harmonic line distortion.

   Sequencing of multiple car banks shall also be provided to match the capabilities of the building's emergency generator system.

2. Emergency Power - Existing

   The elevator system shall be made to operate properly with an Emergency Power system, if one is added to the building in the future according to code requirements for sequencing and operation. The elevator will be able to run on alternate acceleration and deceleration, speed profile when on emergency operation and have all chokes and filters installed to minimize line harmonic line distortion.

   Sequencing of multiple car banks shall also be provided to match the capabilities of the building's emergency generator system.

h) Warranty

1. Prior to placing the elevator into service, the University and/or Elevator Consultant will schedule a final inspection of the equipment. The final inspection will include representatives of the Elevator Contractor, the Consultant, the Contractor, and the University elevator maintenance representative.
2. The operating permit for the elevator must be issued before the elevator can be used by the General Contractor, Sub-Contractors, or University.
3. The warranty period, which includes all labor and materials, is 12 months after substantial completion.
4. Any deficiencies found shall be corrected prior to the warranty expiration, or the warranty will be extended until such deficiencies are corrected and the elevator re-inspected.

4. References

The entire vertical transportation system, including all elevator equipment and work, shall be in accordance with the latest requirements of the American National Standard Safety Code for elevators (ANSI) and local governing authorities, as well as in compliance with the Americans with Disabilities Act (ADA).

All of the work covered by the specifications, including design, clearance, construction, workmanship and quality is to be done in strict accordance with all national, state and local codes, ordinances and elevator safety orders in effect at the time a contract for this work is executed. For any discrepancies, the code shall take precedent. Compliance is not limited to any changes or amendments imposed by the appropriate authorities to all laws specified.