

FACILITIES DESIGN GUIDELINES APPENDIX EL - ELEVATORS

EL.1 PURPOSE

Effective March 28, 2007 this Appendix supplements Facilities Design Guidelines Building Services BSRV.10 VERTICAL TRANSPORTATION as a required methodology to address the proven need for non-proprietary elevator control and diagnostic equipment essential to the effective and life safety maintenance of elevators serving the academic and healthcare community at the University of Virginia and the University of Virginia College at Wise.

The following outline specifications are intended to supplement BSRV.10 VERTICAL TRANSPORTATION and to be incorporated in to specifications provided by consulting architects and engineers contracted by the University of Virginia for professional design services. These outline specifications are suited for Facilities Management use in procuring bids and/or proposals for elevator replacements.

EL.2 GUIDELINES FOR HYDRAULIC ELEVATORS

SCOPE AND INTENT

These guidelines are provided to assist with the requirements of the University for the Installation of hydraulic elevators.

Under no condition will any manufacturers or suppliers proprietary equipment, systems, or software be accepted.

All equipment shall carry a warranty period of one full year from the date of the University's acceptance. Defects or equipment failures occurring during that one year period shall be promptly corrected at no cost to the University.

The contractor shall provide one full year of complete maintenance service as part of this warranty. This service shall include monthly maintenance inspections and emergency call-back service 24 hours a day, seven days a week. A fire service check chart will be kept in the machine room and fire recall will be tested once a month and recorded on this chart.

The service technician will be required to check in with the elevator maintenance supervisor and to check out leaving a copy of the time ticket showing all work performed.

Roped hydraulic elevators will not be permitted to be installed at the University.

All material that is specified to be used can be purchased by any elevator company.

Any questions should be directed to the project manager for a particular installation.

HYDRAULIC ELEVATORS

1. Provide legal machine room to include but not limited to:
 - A. Fire rated enclosure
 - B. Fire rated, self-closing and self-locking door
 - C. Proper lighting with protection for lamps
 - D. Fire extinguisher mounted on wall adjacent to entrance
 - E. Smoke detectors
 - F. Heat detectors located within 24" of each sprinkler head
 - G. Sprinklers
 - H. Lockable shunt trip located adjacent to entrance in sight of equipment, and properly labeled
 - I. Fused, lockable disconnect switch for car lighting properly labeled
 - J. Machine room walls and floor to be painted
 - K. No pipes shall run through machine room except ones pertaining to the elevators
 - L. Pre-action system with timer shall be furnished and shall be located outside of the machine room enclosure
 - M. GFI duplex receptacle shall be furnished
 - N. Cooling and heating shall be provided to meet the operation requirements of the equipment
 - O. All piping for the hydraulic system shall be schedule 80 and shall be threaded. No victaulic fittings will be allowed.

2. Provide legal hoistway to include but not limited to:
 - A. Supports for brackets for guide rails
 - B. Fire rated enclosure
 - C. Angles for sills with proper pockets
 - D. Divider beams
 - E. Proper height to allow for proper clearances at the top
 - F. Beveling of any ledges in the hoistway
 - G. Cut outs for hall fixtures
 - H. Proper venting
 - I. Smoke detector at pit level
 - J. Heat detector if sprinkler is provided

3. Provide legal pit to include but not limited to:
 - A. Proper depth
 - B. Pit ladder extending proper distance above landing
 - C. Hole for sump pump with grating located at back side of hoistway
 - D. Single non GFI receptacle for sump pump located at pit ladder
 - E. Water sensor with signal going to systems control
 - F. GFI duplex receptacle
 - G. Proper lighting with switch located at ladder
 - H. Piping buried in the ground shall have a protective casing
 - I. An over speed valve shall be provided

4. Governing Codes:

All work shall be performed in accordance with the requirement of ASME A17.1, safety code for elevators and escalators. All electrical shall conform to NFPA – 70. All smoke and heat detector installation shall comply with NFPA – 72. In the performance of any work all personnel shall comply with all VOSHA safety regulations as well as with all specific safety regulations required buy the University. All work and materials shall comply with the Virginia uniform statewide building code. All work shall comply with accessibility for the disabled requirements of ADAAG 407.

5. CONTROLLER

The controller shall provide means to access the computer memory for diagnostic purposes without the need for external devices. Everything that's required must come with the controller.

The elevator shall not require the functioning of the microprocessor to operate on car top inspection to provide a reliable means of moving the car if the microprocessor fails.

A motor limit timer function shall be provided which, in case of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing and park, open the doors automatically and then close them. Car calls shall be canceled and the car taken out of service automatically. Operation may be restored by cycling the main line disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.

A valve limit timer shall be provided which shall automatically cut off current to the down valve solenoids if they have been energized longer than a predetermined time. The car calls shall then be canceled and the car taken out of service automatically. Operation may be restored by cycling the main line disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.

A means of lowering the elevator shall be provided when there is a power failure. This operation shall bring the car to the lowest landing and allow passengers to exit the elevator. This operation requires a separate battery-operated power supply system.

The car call relays on the controller shall be furnished with a means of allowing a call to be registered at the controller without means of a wire jumper.

All available options or parameters shall be field programmable, without need for any external device or knowledge of any programming languages. Programmable options and parameters shall be stored in nonvolatile memory. As a minimum, there shall be a 32-character alphanumeric display used for programming and diagnostics. Programmable parameters and options shall include, but not limited to, the following:

- A. Number of stops/openings served (each car)
- B. Simplex/duplex
- C. Single automatic push-button
- D. Selective collective/single button collective
- E. Programmable fire code options/fire floors (main, alternates)
- F. Floor encoding (absolute PI)

- G. Digital PIs/single wire PIs
- H. Programmable door times
- I. Programmable motor limit timer
- J. Nudging
- K. External car shutdown input (e.g. rescuator)
- L. External Low Oil Sensor Input
- M. External viscosity control input
- N. Parking floors
- O. Hall or car gong selection

Upon completion of the installation, the contractor shall provide **four complete sets** of all user's manuals, maintenance manuals, logic diagrams, computer software, access codes, password, wiring diagrams, electrical drawings, and all other materials required for on-going maintenance and use of the system. The contractor shall also provide any hardware required to interface with, diagnose or maintain the system. If required, interface tools may be hand-held or built into the system, and shall function for the life of the system.

All control equipment shall be provided by MCE (Motion Control Engineering).

The contractor, in conjunction with his sub-contractors and suppliers, shall provide the owner's operations and maintenance personnel with instructions and training in the proper operation and maintenance of the equipment and related controls provided or altered in the work.

Training shall be provided for a designated Facilities Management elevator technician, and the cost including traveling shall be included in the elevator cost.

6. LANDING CONTROL SYSTEM

Provide and install new landing control system utilizing a perforated stainless steel tape mounted in hoistway. System shall have neither rotating parts nor mechanical magnetic switches. All adjustments shall be from a digital keypad with LCD readout. All adjustments shall be self explanatory on readout. System shall have a minimum resolution of 0.125 inches. System shall have binary floor encoding to ensure correct floor position at each floor. No mechanically adjusted or machine room encoders will be accepted.

System to be furnished by MCE

7. PUMPING UNIT

Pumping unit shall have the valve and motor located within the reservoir.

The unit must be mounted on sound isolation pads.

The type of valve shall be Maxton.

Pumping unit to be furnished by Quality Elevator Company.

8. ROPED HYDRAULICS

Roped hydraulics will not be permitted to be installed at the University. **No exceptions.**

9. GUIDE SHOES

All guide assemblies shall be roller guides. The elevator jack assembly shall be located so as not to put undue pressure on any individual roller. Car must be balanced properly.

10. HOISTWAY DOOR EQUIPMENT

Emergency access shall be provided at each entrance.

Top and bottom retaining devices shall be provided.

Manufacturer for all door equipment shall be GAL Mfg. Corp.

Provide hoistway access switches at the top and bottom landings.

11. CAR DOOR OPERATOR

Door operators shall be furnished by GAL Mfg. Corp. The type shall be MOVFR, and shall be furnished with adjusting tool.

12. DOOR DETECTOR

The door detector shall be Tri Tronics Edge Corp.

13. DOOR RESTRICTOR

The type of door restrictor shall be the Adams hatch latch type.

14. CAR OPERATING PANELS

Car operating panels shall be vandal resistant and comply with all ADA requirements.

As part of the car operating panel the following words shall be etched into the panel:

- A. Certificate of inspection on file in engineer's office
- B. Elevator capacity pounds
- C. Phase II operating instructions
- D. No Smoking

Provide box and wiring to accommodate the University's ADA telephone.

All car panels shall be furnished by PTL Mfg. Corp.

15. HALL FIXTURES

All hall fixtures shall be furnished by PTL Mfg. Corp.

16. SCAVENGER PUMP

A scavenger unit with filters to return oil to the reservoir will be provided. If water is detected it will shut off power to the unit to prevent water from getting into the system.

17. LIFT NET

Lift net to be provided on all units. Lift net is provided by Integrated Display Services.

18. HOSPITAL EMERGENCY SERVICE

Any area with patient care shall have hospital emergency service provided at every floor.

EL.3 GUIDELINE FOR GEARED ELEVATORS

SCOPE AND INTENT

These guidelines are provided to assist with the requirements of the University for the Installation of geared elevators.

Under no condition will any manufacturers or suppliers proprietary equipment, systems, or software be accepted.

All equipment shall carry a warranty period of one full year from the date of the University's acceptance. Defects or equipment failures occurring during that one year period shall be promptly corrected at no cost to the University.

The contractor shall provide one full year of complete maintenance service as part of this warranty. This service shall include monthly maintenance inspections and emergency call-back service 24 hours a day, seven days a week. A fire service check chart will be kept in the machine room and fire recall will be tested once a month and recorded on this chart.

The service technician will be required to check in with the elevator maintenance supervisor and to check out leaving a copy of the time ticket showing all work performed.

Roped hydraulic elevators will not be permitted to be installed at the University.

All material that is specified to be used can be purchased by any elevator company.

Any questions should be directed to the project manager for a particular installation.

GEARED ELEVATORS

1. Provide legal machine room to include but not limited to:

- A. Fire rated enclosure
- B. Fire rated, self-closing and self-locking door
- C. Proper lighting with protection for lamps
- D. Fire extinguisher mounted on wall adjacent to entrance
- E. Smoke detectors
- F. Heat detectors located within 24" of each sprinkler head
- G. Sprinklers
- H. Lockable shunt trip located adjacent to entrance in sight of equipment, and properly labeled
- I. Fused, lockable disconnect switch for car lighting properly labeled

- J. Machine room walls and floor to be painted
 - K. No pipes shall run through machine room except ones pertaining to the elevators
 - L. Pre-action system with timer shall be furnished and shall be located outside of the machine room enclosure
 - M. GFI duplex receptacle shall be furnished
 - N. Cooling and heating shall be provided to meet the operation requirements of the equipment
2. Provide legal hoistway to include but not limited to:
- A. Supports for brackets for guide rails
 - B. Fire rated enclosure
 - C. Angles for sills with proper pockets
 - D. Divider beams
 - E. Proper height to allow for proper clearances at the top
 - F. Beveling of any ledges in the hoistway
 - G. Cut outs for hall fixtures
 - H. Proper venting
 - I. Smoke detector at pit level
 - J. Heat detector if sprinkler is provided
3. Provide legal pit to include but not limited to:
- A. Proper depth
 - B. Pit ladder extending proper distance above landing
 - C. Hole for sump pump with grating located at back side of hoistway
 - D. Single non GFI receptacle for sump pump located at pit ladder
 - E. Water sensor with signal going to systems control
 - F. GFI duplex receptacle
 - G. Proper lighting with switch located at ladder

4. Governing Codes:

All work shall be performed in accordance with the requirement of ASME A17.1, safety code for elevators and escalators. All electrical shall conform to NFPA – 70. All smoke and heat detector installation shall comply with NFPA – 72. In the performance of any work all personnel shall comply with all VOSHA safety regulations as well as with all specific safety regulations required by the University. All work and materials shall comply with the Virginia uniform statewide building code. All work shall comply with accessibility for the disabled requirements of ADAAG 407.

5. CONTROLLER AND VARIABLE FREQUENCY AC DRIVE UNIT

The controller shall be fully programmable microprocessor based controller. The controller shall provide selective collective simplex operation, shall provide Phase I and Phase II fire service, and shall conform to all code requirements defined by Part XII of ASME A17.1-1996.

The controller system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes without need for any external devices, and shall have permanent indicators to show important elevator statuses as an integral part of the

controller. Systems that require attachment of external devices for troubleshooting must be submitted for approval before the successful bidder's quotation can be evaluated. In the event that a system requiring an external device is accepted, a minimum of one (1) external device, including any/all software, passwords, parameters, etc. that may be needed for the operation of the device, shall be provided to the owner. External devices that require recharging and/or periodic reprogramming are prohibited.

Failure of any single magnetically operated switch, contact, or relay to release in the intended manner, or the failure of any static control device, speed measuring circuit, or speed pattern generating circuit to operate as intended, or the occurrence of a single accidental ground or short circuit shall not permit the car to start or run if any hoistway door or gate interlock is unlocked or if any hoistway door or car door or gate contact is not in the made position. Furthermore, while on car top inspection, failure of any single magnetically operated switch, contactor or relay to release in the intended manner, or the failure of any static control device to operate as intended, or the occurrence of a single accidental ground shall not permit the car to move even with the hoistway door locks and car door contacts in the closed or made position.

Dedicated permanent status indicators shall be provided on the controller to indicate the following: when the safety circuit is open, when the door locks are open, when the elevator is running at high speed, when the elevator is on independent service, when the elevator is on firefighters' service, when the elevator out of service timer has elapsed, and when the elevator has failed to successfully complete its intended movement.

An out of service timer shall be provided which will automatically take the car out of service if the car is delayed in leaving the landing while there are calls existing in the building. The car shall not respond to hall calls while in this mode of operation, and the detector screen input shall be unresponsive in the event that a faulty screen unit was delaying the car.

Door protection timers shall be provided for both the open and close directions which will help protect the door operator motor and which will help prevent the car from being "stuck" at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that the doors are prevented from reaching the open position. The door close protection timer shall reopen the doors for a short time in the event that the door-closing attempt fails to make up the door locks after a predetermined time.

A minimum of four different door standing open times shall be provided. A car call time value shall predominate when a car call only is canceled. A hall call time value shall predominate whenever a hall call is canceled. In the event of a door reopen from the detector screen, a separate short door time value shall predominate. If the doors are prevented from closing for longer than a predetermined time, door-nudging operation shall cause the doors to move at slow speed and reduced torque in the close direction. The detector screen shall stop the door but not reverse it. A buzzer shall sound while nudging operation is activated.

Hall call or car call registration and lamp acknowledgment shall be by means of a single wire per call besides the ground and power buss.

The car shall be equipped with two-way leveling to automatically bring the car within 1/4" of floor level regardless of load.

A test switch shall be provided. In the "test" position, this switch shall allow independent operation of the elevator without door open functioning for the purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls in this mode of operation.

A timer shall be provided to limit the amount of time a car is held at a floor due to a defective hall call or car call including stuck pushbuttons. Call demand at another floor shall cause the car to ignore the defective call and continue to provide service in the building.

The control equipment shall have all control parameters stored permanently on erasable programmable read-only memory. (EEPROM)

The microprocessor board shall be equipped with on-board diagnostics for ease of troubleshooting and the field programmability of a minimum of eight (8) specific control variables. The field changes should be stored permanently using non-volatile memory.

The microprocessor board shall provide the following features:

- A. On board diagnostic switches and alphanumeric display. These switches and displays shall provide user-friendly interaction between the serviceman and the controller.
- B. On board Real Time Clock. The real time clock shall display the time and date, and shall be reset by using on board switches.
- C. Display of calls on a per floor basis. All types of calls shall be conveniently entered and/or displayed using on board switches and buttons.
- D. Field programmability of specific timer values. The value of these timers may be viewed and/or altered through use of the on board switches and buttons.
- E. Display of the status of all of the inputs, outputs, and internal control variables and flags, listed in order of their mnemonics.

The controller replacement shall include the installation of a variable frequency AC drive. Acceptable drive manufacturers are General Electric Company, and Mitsubishi Electric. Other manufactures whose product meets and/or exceeds the performance characteristics of the equipment of these manufacturers shall be accepted upon documentation that the equipment is "equal". The variable frequency drive unit shall be fully compatible with and complementary to the microprocessor-based controller.

The drive shall utilize a three phase, full wave rectifier and capacitor bank to provide DC

for the solid-state inverter. The solid state inverter shall utilize power semiconductor devices and a duty cycle modulation fundamental frequency of not less than one kilohertz to synthesize three phase, variable voltage, variable frequency output to operate the hoist motor in an essentially synchronous mode.

A means shall be provided for removing regenerated power from the drive DC power supply. This power shall be dissipated in resistors or returned to the three-phase AC power line. Failure of the system to remove the regenerated power shall cause drive output to be removed from the hoist motor.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored and the elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

The drive shall be heavy-duty type capable of delivering sufficient current required to accelerate the elevator to the contract speed (200 fpm) with the rated load (2500 lb.). The drive shall provide speed regulation appropriate to the open loop system mode.

Ambient temperature requirements (extremes) for the drive unit are -10 degrees C to +40 degrees C, and relative humidity (non-condensing) extremes are 20 to 90% RH.

The drive shall be capable of providing an adjustable DC current to the AC motor for an adjustable time in order to provide a braking pulse to use in the stopping sequence.

The drive shall have the ability to adjust or program the voltage/frequency curve as necessary to properly match the characteristics of the existing elevator hoist motor.

The drive shall not create excessive audible noise in the elevator motor.

Standard functions shall include: slip compensation, current limiting, restart after instantaneous power failure, multi-speed, jump frequency, automatic acceleration/deceleration, 2-wire/3-wire control selection, high or low limiter, bias frequency, pattern operation, selection of terminal function, terminal link.

Standard protection shall include: stall prevention, over current, over voltage, under voltage, instantaneous power failure, inverter overload, inverter overheating, motor overload, CPU error, and short circuit for input terminal.

The unit shall be self-cooling.

The controller shall provide four (4) independent speed adjustments.

The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling the car shall shut down immediately, requiring a reset operation.

The leveling accuracy shall be within 1/4" of floor level regardless of loading conditions.

A means shall be provided in the controller to register calls without the use of jumpers.

All control equipment shall be provided by MCE (Motion Control Engineering).

DUPLEX OPERATION - TWO CAR GROUP

This duplex configuration, with a computer for each controller, assigns cars on a real time basis using estimated time of arrival (ETA). Should one computer lose power or become inoperative in any way, the other computer shall be capable of accepting and answering all hall calls. When both computers are in operation only one of them shall assume the role of dispatching the hall calls to both elevators.

MULTIPLE CAR GROUP

This group configuration, with a computer for each controller, assigns cars on a real time basis using estimated time of arrival (ETA). Should one computer lose power or become inoperative in any way, the other computers shall be capable of accepting and answering all hall calls. When all computers are in operation only one of them shall assume the role of dispatching the hall calls to the other elevators.

SPECIAL OPERATING FEATURES

INDEPENDENT SERVICE

The car shall be provided with a switch to remove it from operation and it shall operate in response to car calls only in an in car independent mode of operation.

DOOR TIMING

Separate adjustable timing shall be provided to establish independent minimum passenger transfer times for car stops, hall stops, main lobby stops and door reversal protection.

DOOR NUDGING OPERATION

Should the doors be held open due to a stuck call button or the failure of an electronic door reopening device for a predetermined adjustable time, a buzzer shall sound and the doors shall close at a reduced torque of 2.5 ft/lb. or less, permitting the car to run.

Upon completion of the installation, the successful bidder shall provide **three complete sets** of all user's manuals, maintenance manuals, logic diagrams, computer software, access codes, password, wiring diagrams, electrical drawings, and all other materials required for on-going maintenance and use of the system. The successful bidder shall also provide any hardware required to interface with, diagnose or maintain the system. If required, interface tools may be hand-held or built into the system, and shall function for the life of the system.

EMERGENCY POWER OPERATION

When emergency power is detected, cars shall return to the main lobby one elevator at a time, and remain there with doors open. While each car is being returned, the other cars shall be shut down so as not to overload the emergency power generator. Once all cars have been returned to the lobby, one or more cars may be selected to run under emergency power, depending on the capability of the emergency power generator. Selection of the cars that run under emergency power shall be done automatically by the

group system. This automatic selection may be overridden through manual selection. The actual number of cars allowed to run under emergency power shall be a pre-programmed value and the number of cars allowed to run shall not exceed this value.

The panel for the manual selection switches for each group of elevators will be installed at a location determined by The University.

The contractor, in conjunction with his sub-contractors and suppliers, shall provide the owner's operations and maintenance personnel with instructions and training in the proper operation and maintenance of the equipment and related controls provided or altered in the work.

Training shall be provided for a designated Facilities Management elevator technician, and the cost including traveling shall be included in the elevator cost.

6. LANDING CONTROL SYSTEM

Provide and install new landing control system utilizing a perforated stainless steel tape mounted in hoistway. System shall have neither rotating parts nor mechanical magnetic switches. All adjustments shall be from a digital keypad with LCD readout. All adjustments shall be self explanatory on readout. System shall have a minimum resolution of 0.125 inches. System shall have binary floor encoding to ensure correct floor position at each floor. No mechanically adjusted or machine room encoders will be accepted.

System to be furnished by MCE

7. GUIDE SHOES

All guide assemblies shall be roller guides. Car must be balanced properly.

8. BRAKE

Manufacturer shall be Hollister Whitney

9. ROPES

Ropes shall be furnished with wedge sockets.

10. MACHINES

All geared machines, car sheaves and deflector sheaves shall be manufactured by Hollister Whitney.

11. GOVERNOR AND TENSION SHEAVE

The governor and the pit tension sheave shall be manufactured by Hollister Whitney.

12. HOISTWAY DOOR EQUIPMENT

Emergency access shall be provided at each entrance.

Top and bottom retaining devices shall be provided.

Manufacturer for all door equipment shall be GAL Mfg. Corp.

Provide hoistway access switches at the top and bottom landings.

13. CAR DOOR OPERATOR

Door operators shall be furnished by GAL Mfg. Corp. The type shall be MOVFR, and shall be furnished with adjusting tool.

14. DOOR DETECTOR

The door detector shall be furnished by Tri Tronics Edge Corp.

15. DOOR RESTRICTOR

The type of door restrictor shall be the Adams hatch latch type.

16. CAR OPERATING PANELS

Car operating panels shall be vandal resistant and comply with all ADA requirements.

As part of the car operating panel the following words shall be etched into the panel:

- A. Certificate of inspection on file in engineer's office
- B. Elevator capacity pounds
- C. Phase II operating instructions
- D. No Smoking

Provide box and wiring to accommodate the University's ADA telephone.

All car panels shall be furnished by PTL Mfg. Corp.

17. HALL FIXTURES

All hall fixtures shall be furnished by PTL Mfg. Corp.

18. LIFT NET

Lift net to be provided on all units. Lift net is provided by Integrated Display Services.

19. HOSPITAL EMERGENCY SERVICE

Any area with patient care shall have hospital emergency service provided at every floor.