DIVISION 14 - CONVEYING SYSTEMS

Section 14000 - General Discussion

Introduction

The size, number, and location of elevators must be addressed at the earliest stages of the design, to ensure that neither the overall function of the facility nor the optimum configuration of elevators is compromised. The size and location of the machine room is similarly critical.

Provide a minimum elevator machine room size of 100 square feet, exclusive of the area above the hoistway (for traction elevators), and without any odd corners, narrow passages or structural interferences.

Consultant shall design elevators to comply with current ASME A117.1, ASME A117.2, UBC and NEC codes.

When new elevators are being installed into existing buildings where elevators do not currently exist (as opposed to elevator modernization) comply with the criteria for new elevators to the most practical degree (extent) possible.

The Consultant is expressly responsible for incorporating these overall requirements into the project, and for ensuring that all sub-consultants are aware of the requirements and incorporate them into their designs as well.

Reliance on "after-the-fact" equipment selections to compensate for a problematic design decision is unacceptable.

Consultant is encouraged to develop the basic building design so that stairs are the naturally preferred mode of vertical travel.

Service elevators shall be located near the loading dock.

Basic Elevator Selection

Hydraulic elevators are generally used in low-rise buildings with two to three floors. Electric traction elevators are generally used in buildings over three stories. Consultant shall coordinate the electrical requirements as well as the code requirements for the pit, overhead clearance, shaft ventilation, pit ladder, light (with switch adjacent to ladder) and electrical duplex 120 VAC outlet in pit, equipment room and phone in cab.

In addition to this general discussion section refer to the following applicable sections:

- Section 14210 – Electric Traction Elevators
- Section 14240 – Hydraulic Elevators
- Section 14440 – Stair Lifts
- Section 16175- Elevator Power and Controls

Fire Alarms and Protection

Provide fire sprinkler heads in elevator shafts and machine rooms, when required by NFPA.

Provide smoke/heat detectors in elevator shafts and machine rooms when required by NFPA.

In addition, provide heat detectors with in 24 inches of each sprinkler head in the elevator shafts and in the machine rooms, which are connected to a shunt trip circuit, which in turn will shut off elevator equipment power prior to the discharge of water from the sprinkler system.
University Checklist

The following checklist is used by the University when reviewing elevator drawings and specifications. The Consultant is encouraged to review this against his specifications to insure completeness at the time of submittal.

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion Control Engineering Controls</td>
<td>Motion control performance</td>
</tr>
<tr>
<td>Modem and connections</td>
<td>ADA phone and make connections</td>
</tr>
<tr>
<td>Shunt trip breaker w/ heat detector</td>
<td>GFI breakers on 120 V. circuits, M/R and hoistway</td>
</tr>
<tr>
<td>Sump pump in elevator pit</td>
<td>Run phone wires for emergency phone and modem</td>
</tr>
<tr>
<td>Fire Service</td>
<td>Vent and cool M/R</td>
</tr>
<tr>
<td>Mount controller on M/R wall to prevent vibration</td>
<td>Lockable car light switch in M/R</td>
</tr>
<tr>
<td>Oil return pump</td>
<td>Submersible pump on hydraulic pump units</td>
</tr>
<tr>
<td>Pit depth</td>
<td>Duplex receptacle in pit</td>
</tr>
<tr>
<td>Pit stop switch next to ladder</td>
<td>Pit ladder</td>
</tr>
<tr>
<td>Sump pump in pit</td>
<td>PVC casing around jack assembly</td>
</tr>
<tr>
<td>Vent hoistway (unobstructed)</td>
<td>Emergency light located in car control station</td>
</tr>
<tr>
<td>Paint fascia</td>
<td>Car position indicator</td>
</tr>
<tr>
<td>Car control station shall be hinged and swing for easy access</td>
<td>Hall position indicator at main lobby only</td>
</tr>
<tr>
<td>Hall lanterns (directional arrows)</td>
<td>Tamper resistant fixtures by EPCO</td>
</tr>
<tr>
<td>All fixtures illuminated by LED's</td>
<td>Meet ADA requirements (Braille &amp; audible signals)</td>
</tr>
<tr>
<td>Stop switch keyed to EPCO-1</td>
<td>Light &amp; fan switches keyed to EPCO-1</td>
</tr>
<tr>
<td>Independent service keyed to EPCO-1</td>
<td>Fire service switch keyed to MFD-1</td>
</tr>
<tr>
<td>Smoke detectors to be compatible with and tie into building system</td>
<td>Provide emergency access in all hall hoist way doors</td>
</tr>
<tr>
<td>S.S. Handrails</td>
<td>Provide protective cab blankets &amp; hooks</td>
</tr>
<tr>
<td>Squirrel cage fan single speed</td>
<td>Engrave bldg name and elevator # in car control panel</td>
</tr>
<tr>
<td>Photo curtain (Gatekeeper 2000 by Adams)</td>
<td>GAL door equipment</td>
</tr>
<tr>
<td>Instruct University</td>
<td>Nudging</td>
</tr>
<tr>
<td>As-built drawing, parts list, instructions (in triplicate)</td>
<td>12 mo. warranty and maintenance w/24 hour coverage at no added cost</td>
</tr>
<tr>
<td>Key lock out to be mortised and accept Sargent &amp; Medico cylinders</td>
<td>Verify M/R access, slope ships ladder to be less than 60°</td>
</tr>
<tr>
<td>Self-closing self-latch machine room Doors</td>
<td>Fire extinguisher in all machine rooms</td>
</tr>
<tr>
<td></td>
<td>Elevator shutdown (shunt trip)</td>
</tr>
<tr>
<td></td>
<td>Shunt trip control circuits monitored</td>
</tr>
</tbody>
</table>

- Ancillary electrical elevator equipment shall be fed from a separate, solely dedicated, elevator electrical LOAD CENTER. This elevator load center shall only be used for elevator related equipment and devices. It will provide the required means to lockout the equipment for service. Required characteristics of elevator electrical Load center are: surface mounted, copper bus, no door, dead front, 14 inches wide, lockable (lockout) breakers and a maximum size of 12 full size breaker spaces. Additional spaces are authorized only where the number of elevator related loads increases above 12 spaces. Unused breaker spaces shall not have any spare breakers installed. Ancillary elevator equipment to be fed from this panel may be, but is not limited to, the following:
  - Shunt trip control feed
  - Machine room lights/receptacles
  - Elevator car lights
  - Elevator pit lights/GFI receptacle
  - Elevator pit sump pump
  - Machine room A/C
  - Elevator Fan (A/C)
  - Hydraulic oil cooler
Main electrical elevator feed should employ a molded case shunt trip breaker and a suitably sized enclosure. Larger enclosures for electronic type breakers are to be avoided as they take up too much room in an already cramped service space. Requirements for electrical coordination to be accomplished upstream of the main elevator feed.

Refer to attached pages 14000-3 through 14000-7 for “Construction Guidelines For Elevators” and “Firefighters Service/Shutdown Requirements” presented by The Industrial Commission of Arizona.
ICA/ADOSH-ELEVATOR SECTION – PHOENIX (602) 542-3313 TUCSON (520) 320-4236/4237

CONSTRUCTION GUIDELINES FOR ELEVATORS
(PER ASME A17.1-2000' SAFETY CODE)

HOISTWAY

1) Rule 2.1.1.1: Provide fully enclosed hoistway as required. (seal all penetrations)
2) Rule 2.1.1.2.2(d): Glass shall be laminated and each piece visibly marked as per ANSI Z.97.1 or 16 CFR Part 1201. (windows are prohibited in hoistways)
3) Rule 2.1.4: Provide hoistway ventilation if more than three floors. The area of the vent shall not be less than 3 1/2 % of the area of the hoistway or a minimum of 3 square feet per elevator.
4) Rule 2.1.6.2(b): Projections, ledges, or recesses more than 4 in. wide shall be beveled to 75 degrees.
5) Rule 2.8.1.2: Electrical or mechanical equipment not pertaining to the elevator is prohibited.
6) Rule 2.8.2.4: Pipes conveying gases, vapors, or liquid not pertaining to the elevator is prohibited.
7) Rule 2.8.2.3.1: Sprinkler protection branch lines shall supply sprinklers at not more than one floor.
6) Rule 2.27.3.2.1(c): Provide smoke detector at the top of the shaft when the hoistway is sprinkled.
9) R4-13-512: The clearance between the car and the hoistway enclosure shall not exceed 18 in.

PIT

1) Rule 2.8.2.4: Pipes conveying gases, vapors, or liquid not pertaining to elevators is prohibited.
2) Rule 2.8.2.3.1: Sprinkler protection branch lines shall supply sprinklers at not more than one floor.
6) Rule 2.22.2: Provide a drain or a sump with sump pump and cover that is level to the floor. Either means shall have positive means to prevent water, gases, and odors from entering the hoistway.
4) Rule 2.2.5: Provide a light (10 fc. min.) with guard, easily accessible light switch, and GFI receptacle.
5) Rule 2.8.2.3.4: If sprinkled; all electrical equipment in the pit, within 48 in. above the pit floor shall have a weatherproof (NEMA4); and (b) wiring identified for use in wet locations as req'd in NFPA 70.
6) Rule 2.2.2.2: Provide a ladder or separate pit door for access when required.
7) Rule 2.2.8: Provide a permanent means to access the underside of car if the distance from the pit floor to the underside of the planks channels or slings exceeds 83 inches.
8) N.E.C. 620.24: Provide separate branch circuit for hoistway pit lighting and GFI receptacle.

MACHINE ROOM

1) Rule 2.7.1: Machine rooms and machinery spaces shall have a fire-resistance rating not less than what is required for the hoistway enclosure.
2) Rule 2.7.3: Provide safe, permanent, and convenient access to machine room and machine spaces.
3) Rule 2.7.3.4.1(b): Access doors to machine rooms shall be self-closing and self-locking. (c): be provided with a spring-type lock to permit opening from the inside without a key.
4) Rule 2.7.4.1: Machine rooms shall have a clear headroom of not less than 7 ft.
5) Rule 2.7.3.2.1(b): Smoke detector required.
6) Rule 2.7.5.1: Provide lighting (19 fc. min.) with bulb protection, light switch, and GFI receptacle.
7) N.E.C. 620.23: Provide separate branch circuit for machine room/ machinery space lighting and GFI receptacle.
8) Rule 2.7.5.2: Provide adequate ventilation to meet the manufacturers’ specifications.
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CONSTRUCTION GUIDELINES-PAGE 2

(continued)

9) Rule 2.8.4: Air conditioning equipment shall not be located directly above elevator equipment or electrical equipment. Required condensation drains shall not be located directly above elevator equipment or electrical equipment and not connected directly to a sewer.

10) Rule 2.8.2.3: Only branch sprinkler lines permitted in the machine room. (heat detectors when used for shunt-trip operation* must be within 2 ft. radius of each head)

11) Rule 2.8.2.5: Pipes containing liquid shall not be located above the elevator equipment.

12) N.E.C. 620.51(a): Provide single mainline disconnect lockable in the open position (when the elevator equipment areas are sprinkled- the disconnect shall have shunt-trip operation*). Per N.E.C. 620-91(c): A hydraulic elevator provided with battery lowering requires an auxiliary contact in the mainline disconnect.

13) N.E.C. 620.22: Provide separate branch circuit for the car lights, and car-top GFI receptacle. The overcurrent protection device shall be located in the machine room.

14) N.E.C. 620.53: Provide single means of disconnect for car light source and must be lockable in the open position.

15) Rule 8.6.1.6.5: Provide Class A-B-C fire extinguisher (easily accessible).

16) Rule 2.8.1.1: All wiring must be enclosed in metal conduit (telephone, detectors, etc.).

17) Rule 2.8.1.2: Electrical or mechanical equipment not pertaining to the elevator is prohibited.

18) Rule 2.8.2.4: Pipes conveying gases, vapors, or liquid not pertaining to the elevator is prohibited.

19) Rule 8.9.1&2: Provide code data plate on the controller or mainline disconnect.

20) Rule 2.6.1.5.10(e): When provided, machine room inspection operation with open door circuits shall have a means of two-way communication between the interior of car and the machine room.

SECONDARY & OVERHEAD SPACES- (IF APPLICABLE)

1) Rule 2.7.3.4.1(a): Requires access door (29.5” x 29.5” minimum).

2) Rule 2.7.5.1: Provide lighting (19 fc. min.) with bulb protection, light switch, and GFI receptacle.

3) N.E.C. 620.23: Provide separate branch circuit for machine room/ machinery space lighting and receptacle.

CAR

1) Rule 2.27.1.2: Provide means of two-way conversation to authorized personnel responsible for taking appropriate action (telephone).

2) Rule 2.14.1.8: Glass in cars must be laminated, permanently marked (each piece of glass), and meet ANSI Z97.1 or 16 CFR Part 1201.

3) Rule 2.14.1.5: An emergency exit electrical device shall be provided on the car-top exit cover.

4) Rule 2.14.1.7.1: Provide a handrail on all sides of the car-top when the distance from the car-top to the hoistway enclosure exceeds 12 inches.

GENERAL

1) *Rule 2.8.2.3.2: If sprinkled: Provide means to automatically disconnect the mainline power supply prior to the application of water from sprinklers located in the machine room or shaft. (re: Shunt-trip)

2) Rule 2.27.3: Provide Firefighters’ Emergency Operation for all automatic elevators.

3) ALL ELEVATORS SHALL COMPLY WITH NFPA 72. (smoke and heat detectors shall be connected to a fire alarm panel**, give location, be monitored, have secondary power, etc…)

**THE FIRE ALARM PANEL SHALL NOT BE LOCATED IN THE ELEVATOR MACHINE ROOM.

THE ELEVATOR SECTION WILL MANDATE COMPLIANCE WITH THE ABOVE. PRIOR TO AN ELEVATOR INSPECTION ALL DEVICES MUST BE PRE-TESTED FOR CONFORMANCE TO THESE RULES. THIS WILL MINIMIZE DELAYS FOR A CERTIFICATE OF COMPLIANCE.
OVER 2 FLOORS VENTILATION REQ'D
2FT OR 3 1/2K OF THE AREA
OF THE HOISTWAY

S = SMOKE DETECTOR
H = HEAT DETECTOR
P = SPRINKLER HEAD

ALL DETECTORS MUST MAKE CONNECTION
TO THE FIRE ALARM SYSTEM AND
MUST MEET THE REQUIREMENTS OF
NFPA 72.

NEMA 3R SHUNT-TRIP DISCONNECT
IF REQ'D (RED SPRINKLED) W/
AUXILIARY CONTACTS IF REQ'D

INDEPENDENT VENTILATION REQ'D
MUST MEET MANUFACTURER'S SPECS
FOR TEMPERATURE RANGE AND BE
CONNECTED TO STAND-BY POWER -
IF APPLICABLE.

ELEVATOR SHUNT TRIP CONTROLS

A/C UNIT

NEMA 3R

MICROPROCESSOR

GFI RECEPTACLE

GFI RECEPTACLE

CAR LIGHT CIRCUIT
OVER CURRENT PROTECTION DEVICE

MACHINE ROOM DOOR:
SELF-CLOSING AND
SELF-LOCKING

LOAD CENTER WITHIN
20 LF OF MACHINE ROOM

SUMP W/ COVER REQ'D

CAR LIGHT CIRCUIT
PROTECTION DEVICE

UNIVERSITY OF ARIZONA
MANUAL OF DESIGN SPECIFICATION STANDARDS

STANDARD DETAIL:
THE INDUSTRIAL COMMISSION OF ARIZONA

DRAWN BY: M.N.DUAS
DETAIL NO: 1026
APPROVED BY: M.COLESBY
ACAD: 14000-11.DWG

8 Pages

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06/08
ELEVATOR SECTION

FIREFIGHTERS' SERVICE / ELEVATOR SHUTDOWN

GENERAL REQUIREMENTS
(Per ASME A17.1-2000* and NFPA 72-current edition)

General Note:
The following requirements are only a guideline for Firefighters' Service ("elevator recall") and
Elevator Shutdown. See the above listed code books for complete requirements. These two
operations are separate and work independently of each other. Smoke detectors are used to
"recall" an elevator for Firefighters' Service (takes it out of normal service) and heat detectors
are used for Elevator Shutdown (main power removal) via the "Shunt-Trip" disconnect.

(A) Fire Alarm Panel requirements:
1) The Fire Alarm Panel shall not be located in the elevator machine room.
2) The Fire Alarm Panel, or where required - "remote annunciator-fire alarm panel", must
   be located in an area where an alarm will be readily noticed. If that is not possible, the
   Fire Alarm Panel, wherever its building location, must be remotely monitored.
3) The Fire Alarm Panel and when required - "remote annunciator-fire alarm panel" must
   identify the type of device activated and its location. Example: "smoke detector - top of
   elevator shaft (hoistway)"

(B) Detector requirements with no sprinklers in the hoistway or machine room:
1) A smoke detector is required in the elevator machine room. Activation of this device
   shall recall the elevator to the alternate floor, unless the machine room is remotely
   located, and must cause the "Fire Hat" light in the elevator car station to flash.
2) Smoke detectors are required in all enclosed (not open to the outside) elevator lobbies.
   The detector at the designated (egress) floor level must recall the elevator to the alternate
   floor and all other lobby detectors must recall the elevator to the designated level.
3) No detectors are allowed in the hoistway.

(C) Detector and other requirements with sprinkler in the machine room:
Same requirements as (B) plus:
1) Heat detector(s) required and shall be located within 24 inches of each sprinkler head.
   Heat detector(s), when activated, must "Shunt-Trip" the mainline disconnect before the
   activation of the any sprinkler head.
2) If at any time, the power source to operate "Shunt-Trip" is not present, the Fire Alarm
   Panel and required annunciator panels must indicate a supervisory signal for "loss of
   elevator shunt-trip power".
3) If the mainline disconnect in the machine room is manually turned "off" or its been
   Shunt-Tripped "off" from a heat detector activation, the Fire Alarm Panel must NOT
   indicate a supervisory signal for "loss of elevator shunt-trip power".

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cont’d

(D) Detector and other requirements with sprinkler at the top of the hoistway:
   Same requirements as (B) number 1) and 2) plus:
   1) A smoke detector is required at the top of the hoistway. Activation of this device shall recall the elevator to the designated level and must cause the “Fire Hat” light in the elevator car station to flash.
   2) A heat detector is required at the top of the hoistway within 24 inches of the sprinkler head. Activation of this device must “Shunt-Trip” the mainline disconnect prior to the activation of the sprinkler head.
   3) All electrical equipment within 48 inches of the pit floor must be weatherproof and NEMA 4 rated (must provide protection from the water spray of a sprinkler head).

(E) Detector and other requirements with sprinkler at the bottom of the hoistway:
   Same requirements as (B) number 1) and 2) plus:
   1) A smoke detector is required at the top of the hoistway. Activation of this device shall recall the elevator to the designated level and must cause the “Fire Hat” light in the elevator car station to flash.
   2) A heat detector is required in the pit within 24 inches of the sprinkler head if the sprinkler head can be located within 24 inches of the pit floor. If the sprinkler head is over 24 inches above the pit floor, a heat detector will be required, and must meet the weatherproof NEMA 4 rating.
   3) All electrical equipment within 48 inches of the pit floor must be weatherproof and NEMA 4 rated (must provide protection from the water spray of a sprinkler head).
   4) A smoke detector is not advisable in the elevator pit (possibility for false alarms).

(F) Firefighters’ Service Indication requirements:
   1) Upon activation of any smoke detectors in any affected elevator spaces, or when the affected elevator Phase I Fire Service recall key switch is turned to the “on” position, an indicator light, on or at, the Phase I Fire Service recall key switch located at the designated level shall illuminate to indicate that the affected elevator(s) is on Firefighters’ Service. Activation of any affected elevator lobby smoke detector shall illuminate the “Fire Hat” symbol located inside the elevator. Activation from a hoistway or machine room smoke detector shall illuminate a “flashing Fire Hat” symbol inside the elevator.

(G) Hydraulic Elevator Auxiliary (battery) Lowering with a Shunt-Trip disconnect req’s:
   1) An auxiliary contact on the mainline disconnect must be provided to disable the battery lowering function (elevator cannot move) if the mainline disconnect is manually turned “off” or if it has shunt-tripped “off”. Battery lowering can only occur if the normal building power that feeds the mainline disconnect is not present.

(H) Sprinkler Line general requirements:
   1) Only branch sprinkler lines are allowed in elevator spaces. Branch lines must terminate once they enter a space. Branch sprinkler lines entering the hoistway must enter only from the floor they are to serve. A branch sprinkler line that enters the hoistway at the first landing to sprinkle the pit, can only sprinkle the pit. The branch sprinkler line for the pit cannot extend up to sprinkle the top of the hoistway. That branch line must enter at the top landing. Branch sprinkler lines entering the hoistway at the top floor to sprinkle the top of the hoistway may not extend to other parts of the building. A branch sprinkler line entering the machine room shall only sprinkle the machine room, or it can be allowed to extend to the hoistway only if it will branch sprinkle at that level.

(2)

End of Section 14000
DIVISION 14 - CONVEYING SYSTEMS

Section 14210 - Electric Traction Elevators

WORK INCLUDED

- Installation of a new engineered TRACTION elevator complete as described in this standard.
- Elevator systems shall be engineered in accordance with the requirements within this document.

SUBMITTALS

- Submit bound operation and maintenance manuals for the new equipment (4 copies) with operating and maintenance instructions, parts listing, recommend parts inventory listing, purchase source, listing for critical component, emergency instructions, complete "as built" wiring and block diagrams including input signals, and diagnostic and/or trouble-shooting guide shall be furnished to the Owner.

- Submit a complete list of all items to be furnished and installed under this section. Included manufacturer’s specifications, catalog cuts, and other data to demonstrate compliance with the specified requirements.

- Submit complete shop drawings for all work in this section, showing dimensions and locations of all items including supporting structure and clearances required.

- Manufacturer's recommended installation procedures which, when approved by the Owner, shall be the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

- Submit one (1) complete clean set of drawing prints and specifications with "as-built" conditions marked in crisp red ink. Sign and attest to the documents as reflecting all conditions "as-built".

- Provide four (4) copies of Operation and Maintenance Manuals, Installation Manuals and Parts Manual necessary for full servicing of the elevator and microprocessor.

- Provide two (2) digital copies on “CD” of “AS-BUILT” wiring drawings.

QUALITY ASSURANCE

- Elevator installer is responsible for quality assurance and insuring that all systems related to the function of the elevator are complete and functioning properly.

MAINTENANCE

- Starting at the time of substantial completion of the complete project, provide complete systematic inspection and maintenance of the elevator for a period of 12 months. Furnish trained experts and equipment to check, adjust, lubricate, and otherwise maintain the elevator in operation with out defects or deterioration. Replace or repair materials and parts which become defective or deteriorated for any reason except through abuse or misuse by Owner.

USE OF ELEVATOR

- The elevator shall not be used temporarily for building construction purposes unless specifically allowed by the Owner.

- If the Contractor is allowed to use the elevator prior to Substantial Completion of the project, the warranty and service period shall not be comprised and shall begin when substantial completion is achieved.
ENGINEERED TRACTION ELEVATOR

- Acceptable elevator manufacturers are:
  - Kone Elevator Company
  - Otis Elevator Company
  - Schindler Elevator Company
  - Thyssen Krupp
  - Southwest Elevator Company

- Attributes (Traction Elevator)
  - Capacity: TBD
  - Speed: TBD
  - Operation: Selective collective.
  - Control: Microprocessor based Motion Control Engineering iControl for AC motor drive.
  - Travel: TBD
  - Stops: TBD
  - Openings: TBD
  - Platform size: TBD
  - Clear inside car: TBD
  - Car Doors: TBD
  - Hoist way entrance: TBD
  - Hoist way entrance finish: TBD
  - Door Operation: G.A.L. MOVFR System
  - Signals: Illuminated car and hall operating buttons, illuminated by light emitting diodes. Tamper Proof.
  - Provide emergency access in all hoist way entrances.
  - Photo curtain shall be model A850G7 Gatekeeper 2000 by Adams Elevator Equipment Co.
  - Car telephone shall be model no. A936P3-2 as manufactured by Adams Elevator Co.
  - Car Enclosure:
    - Control panel (hinged to swivel toward the wall for easy access) complete with the following:
      - Digital car position and direction indicator, illuminated with light emitting diodes.
      - Fan key switch (EPCO-1).
      - Emergency stop key switch (EPCO-1).
      - Independent service key switch (EPCO-1).
      - Inspection/access key switch (EPCO-2).
      - Fire-fighter service key switch (MFD-1).
      - Alarm bell push type switch.
      - Engraved capacity plate and elevator designation. Verify fabrication.
      - Light key switch (EPCO-1).
      - Emergency light located in car control panel.
      - Emergency light test button.
    - The car platform shall be provided with vinyl composition tile flooring. Color as selected by Owner.
    - All elevators that are subject to high material or equipment transport use or other extreme uses (i.e., heavy loading, wheeled carts, exterior opening) shall have aluminum diamond plate floors.
    - For elevators that open to the exterior of a building the area surrounding the elevator entrance should be sufficiently sloped away from the entrance to prevent water from entering into the elevator hoistway.
    - Suspended egg crate ceiling with baked enamel finish or aluminum frame.
    - Lighting: Cool white T-8 fluorescent lighting.
    - Handrails: Stainless Steel.
• Sill: Aluminum.
• Ventilation: Exhaust type, single speed squirrel cage, 300 CFM velocity exhaust Blower. Isolate blower from steel cab canopy with rubber grommets.
• Provide hooks and removable blanket for protection of cab interior.
• Transom: Stainless steel.
• For elevators with glass installed in the cab or hoistway each piece of glass shall be laminated glass conforming to ANSI Z97.1 or 16 CFR Part 1201 with respective markings on each piece of glass clearly and permanently visible after installation.
• Elevator shall have provisions for handicapped complying with the requirements of ANSI A117.1 and new ADAAG Guidelines.

ENVIRONMENTAL CONSIDERATIONS

• Ambient temperature: 32 F to 104 F (0 C to 40 C).
• Humidity: not over 95% humidity.

OPERATION, EQUIPMENT AND FUNCTION

• Controller: Solid State Motion Control Engineering Model iControl AC Flux Vector Drive traction elevators.
  • Controller
  • The elevator controller shall be microprocessor based and designed specifically for elevator applications. Elevator and drive logic shall be implemented independently of safety functions.
  • Elevator logic shall be implemented on a single processor to facilitate tight coordination between subsystems and enhance reliability. The implementation shall utilize a real-time, multi-tasking operating system to allow the processor to simultaneously execute elevator control logic, drive control logic, operator interface logic, and communication support.
  • The elevator controller shall provide the ability to access significant memory capacity for configuration parameter storage, event recording, real-time diagnostics, and program execution.
  • The elevator controller shall have an independent safety system in order to implement safety features required by code. The safety system implementation shall utilize solid-state devices. No relays shall be used for safety logic. The safety subsystem shall incorporate a check redundant, dual-processor, dual-path, solid-state, ASME A17.1-2000 compliant implementation that meets CSA and CE standards.
  • The elevator controller shall be configured and packaged in such a way that external “jumpers” cannot be used (intentionally or unintentionally) while the elevator is running in any passenger mode of operation. Nonpassenger modes of operation shall be provided, along with means to bypass safety functionality, to allow inspection testing and other setup and/or troubleshooting operations.
  • The elevator control logic configuration shall be fully field programmable. Changes in number of floors, I/O configuration, drive setup, eligibility etc. shall not require the replacement/reprogramming of EEPROMs or other storage devices. Further, changes in the controller configuration shall be user adjustable in the field.
  • The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.
• Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is closed, when the door locks are closed, when the elevator is on Inspection/Access, etc. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.

• The elevator controller shall support an interface for communication and interaction via a separate application program running on a Windows PC. This application shall communicate with the controller and allow the user to access controller configuration parameters, view real-time elevator status information, initiate and facilitate setup and adjustment procedures, and provide advanced troubleshooting capabilities. The PC application shall be designed specifically for elevator applications and shall graphically and dynamically display information from the controller.

• A PC application shall provide facilities to manage elevator controller configuration parameters. The user shall be able to manage and manipulate parameters including:
  • Retrieve from the elevator controller and view/edit
  • Retrieve from the elevator controller and save to a file on the PC
  • Retrieve from the PC, view/edit, and download to the elevator controller
  • Manage separate configurations for multiple elevator controllers

• The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.

• A PC application display shall provide motor field (where applicable), armature and brake voltages, armature current, intended and actual car speeds and hoist machine RPM. The PC diagnostics and adjustment display shall include online context-sensitive parameter descriptions and help information for fault troubleshooting.

• The controller shall maintain an event log that records noteworthy events or faults. They shall be displayed in chronological order and time stamped for analysis or review. Data displayed shall include the type of event or fault, the date and time it occurred, and the position of the car and status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline via the PC application.

• Communication between the elevator controller and the PC application shall be via a standard 100 base T TCP/IP network connection. The elevator controller shall be compatible with standard networking equipment (cables, hubs, switches and routers etc.).

• A PC application and elevator controller shall support remote connection via the internet (if available). The elevator controller shall support up to four simultaneous PC connections (remote and/or local). A mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.

• A controller test switch shall be provided. In the test position, this switch shall enable independent operation of the elevator, with the door open function deactivated, for purposes of adjustment and testing. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.

• Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The cartop inspection switch shall render the controller inspection switch inoperative.

• The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.

• The brake supply shall be capable of providing at least four independently adjustable values of output voltage in order to provide smooth lifting, holding and releveling. These values shall be adjusted via computer parameters. Manual adjustment of resistor values shall not be required.
- The elevator controller shall provide auto-tuning of the brake control values.

- The controller shall provide logic to detect a failure of brake voltage to properly decay and relax a picked brake to hold/cooling position.

- The brake control system shall include circuitry to detect insufficient brake current. This failure shall cause the elevator to be removed from service at the next stop and remain out of service until the condition is corrected.

- For gearless applications, the drive control system shall use an optimized speed profile in a dual-nested-loop feedback system based on car position and speed. A speed feedback device (tachometer or encoder) shall permit continuous comparison of motor speed with the calculated speed profile to provide accurate control of acceleration and deceleration—right up to and including the final stop, regardless of direction of travel or load in the car. Drive subsystem control parameters shall be digitally adjustable through software and shall be stored in non-volatile FLASH memory.

- For DC applications, the system shall include precise closed-loop motor field control. The system shall regulate motor field current throughout the range of operation via current feedback from the motor field. The system shall provide motor field current sensing which shall shut down the elevator if insufficient motor field current is detected.

- The system shall provide adaptive gain parameters for optimum control of elevator speed throughout its travel.

- The system shall use a device to establish car position to an accuracy of 0.1875" (4.76 mm) or better, using a quadrature signal operating over the entire length of the hoistway.

- The system shall use an automatic two-way leveling device to control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Overtravel, undertravel, or rope stretch shall be compensated for and the car brought level to the landing.

- A system for pre-torquing the hoist motor shall be made available to ensure consistently smooth starts. An electronic load sensor shall be required to implement the pre-torquing feature.

- Pre-start sequencing shall be provided to safely energize the machine prior to the doors closing on a departing elevator, thus consistently improving floor-to-floor travel times.

- Door pre-opening as the car approaches a landing shall be field adjustable to begin a maximum of six inches from level-at-floor position.

**AC Flux Vector Drive**

- The control system shall utilize a flux vector AC drive.

- The flux vector drive shall be capable of producing full torque at zero speed and shall not require DC injection braking in order to control car deceleration.

- The drive shall be capable of controlling geared and gearless machines, induction and permanent magnet motors. The drive shall also work with different types of encoders such as incremental, sine/cosine, and Hiperface.

- The drive shall have built-in motor overload protection. External overload is not required.

- The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current, and frequency to properly match the characteristics of the AC elevator hoist motor.

- The drive shall not create excessive audible noise from the elevator motor.
The drive shall be heavy-duty, capable of delivering sufficient current required to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.

For non-regenerative drives, means shall be provided to remove regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank that is an integral part of the controller. Failure of the system to remove regenerated power shall cause the drive output to be removed from the hoist motor.

A regenerative drive option (PowerBack) is available to return power to the AC line during dynamic braking. This system is very effective for higher horsepower (above 30HP) and gearless applications.

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 controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds.

For applications where the building power supply has a “Grounded Leg Delta” configuration, an isolation transformer should be used to minimize noise and prevent any damage to the drive during voltage fluctuations.

**Monitoring**

- A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, door operation indication, dispatching ETAs, and security status.

- The monitoring system shall be capable of remotely registering car and hall calls and of configuring hall call and car call restrictions in support of building security. The system shall be capable of implementing security overrides if required.

- The monitoring system shall be capable of enabling Swing, Sabbath, and Auto-stop modes of operation on the group control and of acknowledging emergency alarm activity on any car in the group.

- The monitoring system shall be capable of selecting group mode of operation including, Balanced, Lobby Peak, Demand Down, Demand Up, and Auto-mode (dynamic mode selection by group controller) when Operating Mode Configuration 1 is active on the group.

- The monitoring system shall be capable of setting the group to Flood Operation mode when such mode is supported by the group control.

- The monitoring system shall be capable of initiating recall of any car in the group to a selected floor and of controlling door operation of that car at the selected floor.

**Reporting**

- A client/server based report collection and generation application shall be available. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call performance, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports.

- Systems that require hook-up of external devices for trouble-shooting are not acceptable.

- Nudging: If the doors shall be prevented from closing for longer than a predetermined time, door nudging operation shall the doors to move at slow speed in the close direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is active.
• Hall or car call registration and lamp acknowledgment shall be by means of a single wire per call besides the power busses. Systems that register the call with one wire and light the call acknowledgment lamp with a separate wire are not acceptable.

• Fireman's Phase I emergency recall operation, alternate level Phase I emergency recall operation, and Phase II emergency in-car operation shall be provided according to applicable local codes. Keyed (MFD-1)

• Independent service operation shall be provided such that the actuation of a key switch in the car operating panel will cancel any existing car calls, and hold the doors open at the landing. The car will then respond only to car calls and will ignore hall calls. Car and hoist way doors will only close by constant pressure on car call buttons or a door close button until the car starts to move. While on independent service, hall arrival lanterns or jamb mounted arrival lanterns and gongs shall be inoperative. Keyed (EPCO-1)

• Simplex selective collective automatic operation shall be provided for all single car installations. Operation of one or more car or hall call buttons shall cause the car to start and run automatically provided the hoist way door interlocks and car door contacts are closed. The car shall stop at the first car or hall call set for the direction of travel. Stops shall be made in the order in which the car or hall calls set for the direction of travel are reached, irrespective of the order in which they were registered. If only hall calls are set for the opposite direction of travel exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls. For multiple car installations use duplex, triplex, etc.

• A test switch shall be provided. In the "test" position, this switch shall allow independent operation of the elevator without the door open function for purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls shall not interfere with the other car in a duplex installation.

• 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 push-buttons. Call demand at another floor shall cause the car to eventually ignore the defective call and continue to provide service in the building.

• Door Equipment
  • Heavy Duty G.A.L. MOVFR Door Operating System to include, G.A.L. door rollers, door hanger tracks(car and hall) door pick-up assemblies, gate switch, door lock’s.
  • Provide emergency access in all hoist way doors.
  • All doors shall have 1-1/2 hr. label or other identification acceptable to governing authorities.
  • Provide adjustable nylon guide (by Nylube or Adams Elevator Equip. Co.).
  • Heavy-duty doors. Provide door skins on both sides of elevator doors.

• Lobby Position Indicator
  • Provide tamper resistant lobby position indicator on the ground level, illuminated by light emitting diodes. By Elevator Products Co. (EPCO)

• Smoke Detectors
  • Smoke and heat detectors shall be compatible and tie into building fire system. NOTE: Heat detectors for activation of shunt trip devices do not need to report to fire alarm system.

• Hall Direction Indicator
  • Up and down tamper resistant SURVIVOR PLUS as manufactured by Elevator Products Co. (EPCO). Direction indicators to be provided in the hall wall with a single chime or tone for up and double chime or tone for down direction and shall be illuminated by light emitting diode.
• **Photo Curtain**
  - Photo Curtain: An electric, passenger sensing device of the photo curtain shall project across the entrance to prevent the car and hoist way doors from closing if a passenger or object interrupts the curtain.
  - Nudging: If the doors are prevented from closing for longer than a predetermined time, door nudging operation shall cause the doors to move at a slow speed in the closed direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is occurring.

• **Car Operating Station**
  - Flush mounted operating panel shall be mounted in the car return panel and shall contain the devices required for the specified operation. The buttons and devices shall be of the easy readability type and the floor designation buttons shall become illuminated when pressed and shall stay illuminated until the floor call is answered. Provide continuous hinge on panel for easy access to internal components. Locate hinges on side of panel nearest wall of the elevator. The car operating shall contain the floor designations, and all the controls indicated.
    - Digital car position indicator, illuminated with light emitting diodes.
    - Fan key switch (EPCO-1)
    - Emergency stop key switch (EPCO-1).
    - Independent service key switch (EPCO-1).
    - Inspection/access key switch (EPCO-2)
    - Firefighter service key switch (MFD-1)
    - Alarm bell push type switch.
    - Light key switch (EPCO-1).
    - Engrave capacity and elevator designation.
    - Engrave "INSPECTION CERTIFICATE ON FILE AT FACILITIES MANAGEMENT "
    - Emergency light.
    - Emergency light test button.

• **Elevator Shutdown**
  - Elevator power shall automatically shutdown prior to sprinkler activation. This is typically accomplished by the use of a shunt trip breaker activated by a heat detector.
  - Heat detector to be located no more than 24” from any fire sprinkler head installed in elevator shaft or machine room
  - Heat detector should also report to fire alarm system
  - Conduit circuits to shut down elevator power shall be monitored and supervised by the Fire Alarm System.

**EXECUTION**

• **Telecommunication Link**
  - Install communication cable for controller modem not to exceed 24” from controller.
  - Install communication cable for car phone not to exceed 24” from controller.

• **Adjust And Balance**
  - Make necessary adjustments of equipment to ensure elevator operates smoothly and accurately.

• **Protection**
  - Locate and protect movable equipment and controls in such a way that they can only be operated by authorized persons.
Inspections

- Obtain and pay for inspections and permits and make sure test are as required by regulations of authorities. Conduct all tests and inspections in the presence of the Owner.
- Final inspection shall be after all new equipment is installed and operating correctly.
- Inspect installation in accordance with ANSI-A17.2
- Deliver test certificates and permits to Owner.

Operation And Maintenance

- Instruct Owner’s personnel in proper use, operations and daily maintenance of elevators.
- Training shall include operation of diagnostic microcomputer and servicing of elevator microprocessor.
- Make final check of each elevator operation, with Owner’s personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.
- Continuing Maintenance: Provide 1-year maintenance on elevators on an as-needed basis as part of standard 1-year warranty on new equipment and upgrades.
- Maintenance shall include systematic examination, adjustment and lubrication of new elevator equipment; replacement of seals, packing and valves to maintain required factor of safety; performance of maintenance work with out removing car during peak traffic periods and providing 24 hour emergency call back service during maintenance period, at an additional cost to Owner.
- Repair or replace electrical and mechanical parts of the new elevator equipment using only genuine standard parts produced by manufacturer of equipment concerned.
- Ensure that competent personnel handle maintenance service. Maintain and adequate stock of parts for replacement of emergency purposes, locally, and have qualified personnel available at such places to ensure the fulfillment of this service without unreasonable loss of time.

Cleaning

- Remove all trash and debris from site during elevator installation.
- Clean all elevator surfaces, removing all dirt, dust, spots, and scratches. Any damage shall be repaired or replaced as directed by Owner, at no cost to Owner.
- Prior to substantial completion, remove protection from finished or ornamental surfaces and clean and polish surfaces with due regard to type of material.
- Remove tools, equipment and surplus materials from site.

End of Section 14210
DIVISION 14 - CONVEYING SYSTEMS

Section 14240 - Hydraulic Elevators

WORK INCLUDED

- Installation of a new engineered HYDRAULIC elevator complete as described in this standard.
- Provide an engineered system in accordance with this document.

SUBMITTAL’S

- Submit bound operation and maintenance manuals for the new equipment (4 copies) with operating and maintenance instructions, parts listing, recommend parts inventory listing, purchase source, listing for critical component, emergency instructions, complete "as built" wiring and block diagrams including input signals, and diagnostic and/or trouble-shooting guide shall be furnished to the Owner.

- Submit a complete list of all items to be furnished and installed under this section. Included manufacturer’s specifications, catalog cuts, and other data to demonstrate compliance with the specified requirements.

- Submit complete shop drawings for all work in this section, showing dimensions and locations of all items including supporting structure and clearances required.

- Manufacturer's recommended installation procedures which, when approved by the Owner, shall be the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

- Submit one (1) complete clean set of drawing prints and specifications with "as-built" conditions marked in crisp red ink. Sign and attest to the documents as reflecting all conditions "as-built".

- Provide four (4) copies of Operation and Maintenance Manuals, Installation Manuals and Parts Manual necessary for full servicing of the elevator and microprocessor.

- Provide Two (2) Digital copies on “CD” “AS-BUILT” wiring drawings.

QUALITY ASSURANCE

- Elevator installer is responsible for quality assurance and insuring that all systems related to the elevator are complete and functioning properly.

MAINTENANCE

- Starting at the time of substantial completion of the complete project, provide complete systematic inspection and maintenance of the elevator for a period of 12 months. Furnish trained experts and equipment to check, adjust, lubricate, and otherwise maintain the elevator in operation without defects or deterioration. Replace or repair materials and parts which become defective or deteriorated for any reason except through abuse or misuse by Owner.

USE OF ELEVATOR

- The elevator shall not be used temporarily for building construction purposes unless specifically allowed by the Owner.

- If the Contractor is allowed to use the elevator prior to Substantial Completion of the project, the warranty and service period shall not be compromised and shall begin when substantial completion is achieved.
ENGINEERED HYDRAULIC ELEVATOR

- Acceptable elevator manufacturers are:
  - Kone Elevator Company
  - Otis Elevator Company
  - Schindler Elevator Company
  - Thyssen Krupp
  - Southwest Elevator Company

- Attributes (Hydraulic Elevator):
  - Capacity: TBD
  - Speed: TBD
  - Operation: Selective Collective
  - Control: Microprocessor based, Motion Control Engineering HMC-1000 oildraulic controller.
  - Travel: TBD
  - Stops: TBD
  - Openings: TBD
  - Platform size: TBD
  - Clear inside car: TBD
  - Car Doors: TBD
  - Hoist way entrance: TBD
  - Hoist way entrance finish: TBD
  - Door Operation: G.A.L. MOVFR System
  - Signals: Illuminated car and hall operating buttons, illuminated by light emitting diodes.
  - Tamper Proof. SURVIVOR PLUS by Elevator Products Co. (EPCO)
  - Provide emergency access in all hoist way entrances.
  - Photo curtain shall be model A850G7 Gatekeeper 2000 by Adams Elevator Equipment Co.
  - Car telephone shall be model no. A936P3-2 as manufactured by Adams Elevator Co.
  - Car Enclosure
    - Control panel (hinged to swivel for easy access) complete with the following:
      - Digital car position and direction indicators, illuminated with light emitting diodes.
      - Fan key switch (EPCO-1).
      - Emergency stop key switch (EPCO-1).
      - Independent service key switch (EPCO-1).
      - Inspection/access key switch (EPCO-2).
      - Fire-fighter service key switch (MFD-1).
      - Alarm bell push type switch.
      - Engraved capacity plate and elevator designation. Verify fabrication.
      - Light key switch (EPCO-1).
      - Emergency light located in car control panel.
      - Emergency light test button.

- The car platform shall be provided with vinyl composition tile flooring. Color as selected by Owner.
- All elevators that are subject to high material or equipment transport use or other extreme uses (i.e., heavy loading, wheeled carts, exterior opening) shall have aluminum diamond plate.
- For elevators that open to the exterior of a building the area surrounding the elevator entrance should be sufficiently sloped away from the entrance to prevent water from entering into the elevator hoistway.
- Suspended egg crate ceiling with baked enamel finish frame.
- Lighting: Cool white T8 fluorescent lighting.
- Handrails: Stainless Steel.
• Sill: Aluminum.
• Ventilation: Exhaust type, single speed squirrel cage, 300 CFM velocity exhaust blower. Isolate blower from steel cab canopy with rubber grommets.
• Provide hooks and removable blanket for protection of cab interior.
• Transom: Stainless Steel.
• For elevators with glass installed in the cab or hoistway each piece of glass shall be laminated glass conforming to ANSI Z97.1 or 16 CFR Part 1201 with respective markings on each piece of glass clearly and permanently visible after installation.

• Elevator shall have provisions for handicapped and complying with the requirements of ANSI A117.1 and ADAAG Guidelines.
• Furnish manufacturers standard 3 roller guide assemblies with spring tension and adjustable rollers.

ENVIRONMENTAL CONSIDERATIONS

• Ambient temperature: 32 F to 104 F (0 C to 40 C).
• Humidity: not over 95% humidity.
• Vent machine room to outside to remove hydraulic fluid odors from building.

OPERATION, EQUIPMENT AND FUNCTION

• Controller: Solid State Motion Control Engineering HMC-1000 for hydraulic elevators. Provide upgrade controller to be fully compatible with Owner's existing campus wide monitoring system. Mount controller to machine room wall to prevent vibration of solid state equipment. 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 operating at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator is out of service timer has elapsed or when the motor limit timer or valve timer has elapsed. In addition, provide means of displaying other special or error conditions that are detected by the microprocessor. The elevator shall not require the functioning or presence of the microprocessor to operate on car top inspection or hoistway access operation (if provided) in order to provide a reliable means to move the car if the microprocessor fails.

• The elevator controller shall utilize a microprocessor based logic system and shall comply with (ANSI/ASME 17.1) safety code for elevators. The control equipment shall have all control parameters stored permanently on erasable programmable read-only memories (EPROM), and shall have permanent indicators to indicate important elevator status's as an internal part of the controller. The system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes without need for any external devices. Systems that require hook-up of external devices for trouble-shooting are not acceptable.

• Failure of any single magnetically operated switch, contractor, or relay to release in the intended manner 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 or hoistway access operation, failure of any single magnetically operated switch, contractor or relay to release in the intended manner 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 operating at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator is out of service timer has elapsed or when the motor limit timer or valve limit timer has elapsed. In addition, provide means of displaying other special or error conditions that are detected by the microprocessor.
• A motor timer shall be provided which, in the event of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing, open the doors automatically and then re-close them. The car calls shall then be canceled and the car taken out of service automatically. Operation may be restored by cycling the power disconnect switch or putting the car on access or inspection operation.

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

• An out of service timer (T.O.S.) 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 photo eye input shall be unresponsive in the event that a faulty photo eye unit was delaying the car.

• Door protection timer shall be provided for both the open and close directions which will help protect the door motor and which will help prevent the car from getting 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 door is prevented from reaching the open position. The door close protection timer will 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 three 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 a photo curtain, or door open button, a separate short door time value shall predominate. The timing value for these timers must be field adjustable.

• Nudging: If the doors are prevented from closing for longer than a predetermined time, door nudging operation shall cause the doors to move at a slow speed in the close direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is active.

• Hall or car call registration and lamp acknowledgment shall be by means of a single wire per call besides the power busses. Systems that register the call with one wire and light the call acknowledgment lamp with a separate wire are not acceptable.

• Fireman's Phase I emergency recall operation, alternate level Phase I emergency recall operation, and Phase II emergency in-car operation shall be provided according to applicable codes. Keyed (MFD-1)

• Independent service operation shall be provided such that the actuation of a key switch in the car-operating panel will cancel any existing car calls, and hold the doors open at the landing. The car will then respond only to car calls and will ignore hall calls. Car and hoistway doors will only close by constant pressure on car call buttons or a door close button until the car starts to move. While on independent service, hall arrival lanterns or jamb mounted arrival lanterns and gongs shall be inoperative. Keyed (EPCO-1)

• Simplex selective collective automatic operation shall be provided for all single car installations. Operation of one or more car or hall call buttons shall cause the car to start and run automatically provided the hoistway door interlocks and car door contacts are closed. The car shall stop at the first car or hall call set for the direction of travel. Stops shall be made in the order in which the car or hall calls set for the direction of travel are reached, irrespective of the order in which they were registered. If only hall calls are set for the opposite direction of travel exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls. For multiple car installations use duplex, triplex etc.

• The car shall be equipped with two-way leveling to automatically bring the car within plus or minus (1/4") of landing level at any landing regardless of load.

• A selector switch shall be provided on the controller to select high or low speed during access or inspection operation as long as speed does not exceed 150 feet per minute.
- A test switch shall be provided. In the "test" position, this switch shall allow independent operation of the elevator without the door open function for purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls shall not interfere with the other car in a duplex installation.

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

- Viscosity Control (optional and valve design must permit the use of this option) shall cause the car to accomplish the following operation. If a temperature sensor determines the oil is too cold, and if there are no calls registered, the car shall proceed to the bottom landing and, as long as the doors are closed, the pump motor will run without the valve coils energized in order to circulate and heat the oil to the desired temperature. In the event the temperature sensor fails, a timer shall prevent continuous running of the pump motor.

**Solid State Motor Starter**
- Provide a new solid-state motor starter to limit current inrush during starting and to provide gradual acceleration of the motor.
- Motor starting shall not be initiated by mechanical contacts.
- The starter shall include a current limit adjustment range of 200% to 450% of the overload adjustment range.
- Provide an internal fault detection system, if the internal fault detection system detects a failure, power shall be removed from the motor.

**Hydraulic Jack**
- Install plunger-cylinder units plumb and accurate.
- Plunger to be machined from extra heavy steel pipe (A53, Grade B) or equivalent mechanical tubing and ground to 24-32 or better micro-inch finish. The upper end of the plunger is equipped with a heavy steel plate inset and fillet welded into the plunger wall. This plate is drilled and tapped to receive standard machine bolts for attachment to the load platform. The bottom end of the plunger is provided with a steel striker plate welded to the plunger. Where the plunger is of multiple-piece construction, the coupling end is machine-bored, faced, and internally threaded to receive the coupling. All plunger joints are assembled and machined across the joint to assure matching surfaces.
- Install schedule 40 PVC auxiliary casing with bottom completely sealed. Size casing for minimum 1.5" clearance to all jack assembly components.
- Install piping without routing underground. Where not possible, rout piping through schedule 40 PVC before back filling.
- Hydraulic hose for sound deadening is not permitted.

**Hydraulic Pump**
- Pumping Unit: The pumping unit shall be of integral design and shall include an electric motor connected to a submersible pump, a hydraulic control system, hydraulic fluid reservoir and necessary piping connections all compactly designed as a self-contained unit. This unit shall be designed for vibration free operation. The unit shall be factory adjusted and tested before shipment to the job site. The testing procedure shall include actual job type conditions of load, speed, etc. Refer to the drawings for remote arrangement of hydraulic unit for this project.
- The pump shall be specifically designed for all hydraulic operation and shall be of the positive displacement type. Oil flow shall be controlled in such a manner that car operation will be smooth and quiet in both directions of travel. Accurate car leveling shall take place in both the up and down direction. The control valve shall be easily adjusted from the front of the power unit.
- The "up start" system shall be adjustable and designed to initiate the stop of the elevator and shall control the acceleration smoothly and evenly.
• The "down start" system shall be adjustable and designed to initiate the stop of the elevator and shall control the deceleration of the elevator smoothly and evenly.

• The power unit shall have a have shut-off valve which will isolate the oil reservoir to enable servicing of the pump hydraulic assembly. The shut off valve shall be located in the machine room as directed by Owner.

• A suitable muffler designed to withstand the high pressure shall be installed in the power unit in a blowout proof housing.

• Submersible Pump: The submersible pump shall be a positive displacement screw type to give smooth operation and shall be especially designed and manufactured for elevator service.

• **Elevator Pit Hydraulic Oil Return Pump**

  • Drip Pan Return Pump: 120V fractional h.p. pump suitable for pumping of hydraulic fluid. Furnish pump with float activated on/off switch.
  • Drip Pan: 24 gauge, galvanized sheet metal of suitable size to accommodate return pump.

• **Door Equipment**

  • Heavy Duty G.A.L. MOVFR Door Operating System, G.A.L. door rollers, door hanger tracks (car and hall) door pick-up assemblies, gate switch, door locks.
  • Provide emergency access in all hoist way doors.
  • All doors shall have 1-1/2 hr. label or other identification acceptable to governing authorities.
  • Provide adjustable nylon guide (by Nylube or Adams Elevator Equip. Co.).
  • Heavy duty doors. Provide door skin on both sides of elevator doors.

• **Lobby Position Indicator**

  • Provide tamper resistant lobby position indicator on the ground level, illuminated by light emitting diodes. By Elevator Products Co. (EPCO).

• **Smoke Detectors**

  • Smoke and heat detectors shall be compatible and tie into building fire system.

• **Hall Direction Indicator**

  • Up and down tamper resistant SURVIVOR PLUS as manufactured by Elevator Products Co. (EPCO). Direction indicators to be provided in the hall wall with a single chime or tone for up and double chime or tone for down direction and shall be illuminated by light emitting diode.

• **Photo Curtain**

  • Photo Curtain: An electric, passenger sensing device of the photo curtain shall project across the entrance to prevent the car and hoist way doors from closing if a passenger or object interrupts the curtain.
  • Nudging: If the doors are prevented from closing for longer than a predetermined time, door nudging operation shall cause the doors to move at a slow speed in the closed direction and to be unresponsive to the photo curtain. A buzzer shall sound while nudging operation is occurring.

• **Car Operating Station**

  • Flush mounted operating panel shall be mounted in the car return panel and shall contain the devices required for the specified operation. The buttons and devices shall be of the easy readability type and the floor designation buttons shall become illuminated when pressed and shall stay illuminated until the floor call is answered. Provide continuous hinge on panel for easy access to internal components. Locate hinges on side of panel nearest wall of the elevator. The car operating shall contain the floor designations, and all the controls indicated.
Digital car position indicator, illuminated with light emitting diodes.
- Fan key switch (EPCO-1)
- Emergency stop key switch (EPCO-1).
- Independent service key switch (EPCO-1).
- Inspection/access key switch (EPCO-2).
- Firefighter service key switch (MFD-1)
- Alarm bell push type switch.
- Light key switch (EPCO-1).
- Engrave capacity and elevator designation.
- Engrave "INSPECTION CERTIFICATE ON FILE AT FACILITIES MANAGEMENT"
- Emergency light.
- Emergency light test button.

Elevator Shutdown
- Elevator power shall automatically shutdown prior to sprinkler activation. This is typically accomplished by the use of a shunt trip breaker activated by a heat detector.
- Heat detector to be located no more than 24” from any fire sprinkler head installed in elevator shaft or machine room
- Heat detector should also report to fire alarm system
- Conduit circuits to shut down elevator power shall be monitored and supervised by the Fire Alarm System.

EXECUTION

Telecommunication Link
- Install communication cable for controller modem not to exceed 24” from controller.
- Install communication cable for car phone not to exceed 24” from controller.
- Install modem MC – PA board and modem outlet inside of controller.

Adjust And Balance
- Make necessary adjustments of equipment to ensure elevator operates smoothly and accurately.

Protection
- Locate and protect movable equipment and controls in such a way that they can only be operated by authorized persons.

Inspections
- Obtain and pay for inspections and permits and make sure tests are as required by regulations of authorities. Conduct all tests and inspections in the presence of the Owner.
- Final inspection shall be after all new equipment is installed and operating correctly.
- Inspect installation in accordance with ANSI-A17.2
- Deliver test certificates and permits to Owner.

Operation And Maintenance
- Instruct Owner’s personnel in proper use, operations and daily maintenance of elevators.
- Training shall include operation of diagnostic microcomputer and servicing of elevator microprocessor.
- Make final check of each elevator operation, with Owner’s personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.
- Continuing Maintenance: Provide 1-year maintenance on elevators on an as-needed basis as part of standard 1-year warranty on new equipment and upgrades.
• Maintenance shall include systematic examination, adjustment and lubrication of new elevator equipment; replacement of seals, packing and valves to maintain required factor of safety; performance of maintenance work without removing car during peak traffic periods and providing 24 hour emergency call back service during maintenance period, at an additional cost to Owner.
• Repair or replace electrical and mechanical parts of the new elevator equipment using only genuine standard parts produced by manufacturer of equipment concerned.
• Ensure that competent personnel handle maintenance service. Maintain an adequate stock of parts for replacement of emergency purposes, locally, and have qualified personnel available at such places to ensure the fulfillment of this service without unreasonable loss of time.

• Cleaning

• Remove all trash and debris from site during elevator installation.
• Clean all elevator surfaces, removing all dirt, dust, spots, and scratches. Any damage shall be repaired or replaced as directed by Owner, at no cost to Owner.
• Prior to substantial completion, remove protection from finished or ornamental surfaces and clean and polish surfaces with due regard to type of material.
• Remove tools, equipment and surplus materials from site.

End of Section 14240
DIVISION 14 - CONVEYING SYSTEMS

Section 14440 – Lifts

Introduction

The application and use of stair lifts to provide a means of wheelchair access on new and existing stairs requires careful consideration as these elements present significant operational, maintenance and safety concerns to the University. The University’s experience has shown that only the following units provide reliable and trouble free service. Only the units identified below are to be considered acceptable for use on University projects.

Part 1 - General

Part 2 - Products

- Straight incline wheelchair lifts shall be Garaventa, model XPRESS II

- Vertical wheelchair lifts shall be Garaventa, model GVL-EN. Drive mechanism can be either hydraulic or screw type depending on the use and height of the lift.

- Curving or turning lifts, for going around corners or up a stairwell, shall be Garaventa models GSL-1 or GSL-3, depending on the specific needs of the unit.

Part 3 – Execution

- Factory assisted installation and set up is required for all lifts.

End Of Section 14440