

The following standard specification is intended to be edited according to the specifics of the project. Brackets [] and areas shaded in gray [e.g. format] indicate requirements that are optional depending upon the type of system being provided or per instructions associated with the [] and project requirements. Consult with University's Representative and campus stakeholders.

DOCUMENT UTILIZES TRACK CHANGES TO RECORD YOUR CHANGES AS YOU EDIT.
DO NOT CHANGE THE FOOTER OF THE DOCUMENT

The handling of such items will be decided by consultation between the University's Representative, Design and Construction Management and the Facilities CQCC Elevator Shop. Other forms of conveyance such as wheel chair lifts shall comply with these requirements. Coordinate requirements with Elevator Shop.

SECTION 14 20 00 ELEVATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General Requirements

1. Provide hydraulic elevator[s] [ADD COMPLETE SCOPE OF WORK] {Note to Design Professional – University requires hydraulic elevators for maximum rise up to 40 feet}
2. Provide traction elevator[s] [ADD COMPLETE SCOPE OF WORK] {Note to Design Professional – University requires traction elevators beyond 40 feet.}
3. Provide non-proprietary microprocessor-controlled system with controller.

B. Related Work

1. Coordinate electrical requirements as well as code requirements for the pit, overhead clearance, shaft ventilation, pit ladder, light and electrical outlet, equipment room and phone in cab. Locate shunt trip for the main breaker outside of the elevator equipment room. Coordinate with electrical.

C. Contractor shall achieve the California Division of Occupational Safety and Health (Cal/OSHA) Elevator Unit approval of complete conveying system including shop drawings prior to any elevator construction, and other necessary documents in accordance with code, and provide all parts including miscellaneous and labor required to provide a complete workable system that is approved by the University and the (Cal/OSHA) Elevator Unit prior to building occupancy. The Cal/OSHA Elevator Unit is the Authority Having Jurisdiction (AHJ).

D. Contractor shall coordinate with the University's Representative to seek CQCC Elevator Shop (UCD-CQCC) acceptance before seeking state approval.

1.2 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer's Qualifications: The design, engineering and manufacture of major elevator components such as machines, motors, SCR units, controllers, door operators, safeties, governors, selectors, power units, etc. shall be from manufactures that have been in the business for the last 10 years. Equipment must have a history of successful operation under similar conditions for the last 5 years.
2. Installer Qualifications: Installer shall have a current and active license as a C11 - Elevator Contractor in the State of California and be a Cal/OSHA Certified Qualified Conveyance Company (CQCC).
 - a. Show evidence of successful experience in complete installation and maintenance of manufacturer's elevator equipment for at least 5 years.
 - b. Directly employ sufficient competent personnel within 50 miles of project to handle construction and maintenance duties.
 - c. Maintain local stock of parts adequate for replacement on permanent or emergency basis.

- d. Respond to trouble calls within one hour.
- e. Elevator Cars and Entrances including all parts and appurtenances: Elevator Manufacturer shall be State of California approved.

B. Requirements of Regulatory Agencies

- 1. Codes: In accordance with the latest applicable edition requirements of the following and as specified:
 - a. ADA: Americans with Disabilities Act.
 - b. ASME: American Society of Mechanical Engineers – A17.[4 or current code] [7]; Safety Code for Elevators and Escalators.
 - c. CBC: Title 24; California Building Codes.
 - d. CCR: Title 8; California Code of Regulations.
 - e. NEC: National Electric Code. **Current applicable enforced code.**
 - f. UBC: Uniform Building Code. **Current applicable code to Elevator Work**
 - g. Fire Codes – Reference Section 28 31 00 Fire Detection and Alarm
 - h. **All local codes which govern.**
- 2. Welding: All welding on the job shall be performed by a certified welder. Show proof of certification prior to any welding being performed.
- 3. Permits: Arrange and pay for inspections by authorities having jurisdiction to obtain installation and operating permits.

1.3 SUBMITTALS

- A. Manufacturers' and Contractor qualifications required under Quality Assurance article.
- B. Shop Drawings: Submit to the University's Representative for review and acceptance by UCD-CQCC Representative. Contractor shall then seek approval by OSHA Elevator Division. The University's Representative and UCD-CQCC reserve the right to require any details of any portion of the equipment.
 - 1. Layouts: Plan and section of hoistways, pits and machinery spaces; include impact and static loads imposed on building structure; location of hoistway ventilation and required clearances around equipment.
 - 2. Details: Submit details of cabs, fixtures and entrances.
 - 3. Data: Indicate on layouts or separate data sheets; machine spaces heat release, power requirements, conduit runs outside of hoistways and machine rooms, car and counterweight roller guides and door operators.
- C. Samples: Provide samples of materials and finishes exposed to public view. Samples shall be 6 by 6 inch panels, 12 inch lengths or full size if smaller, as applicable.
- D. Operating Instructions: Submit manufacturer's literature describing system operations and special operations as specified.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect equipment during transportation, erection and construction. Store under cover to prevent damage due to weather conditions. Replace damaged or rusted materials.

1.5 WARRANTY

- A. Provide special project warranty, signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work which may develop within one (1) year from final date of completion and acceptance of the entire installation by the University's Representative. "Defective" is hereby defined to include, but is not limited to, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, rust, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration and similar unusual, unexpected and unsatisfactory conditions.

PART 2 - PRODUCTS

2.1 DESCRIPTION OF SYSTEMS

A. Elevator No. #

1. Type Geared Traction
2. Capacity 3500 Pounds
3. Speed 350 FPM
4. Stops
5. Openings
6. Travel As shown
7. Control..... AC/VVVF (Alternating Current/Variable voltage variable frequency)
8. Operation..... Simplex Selective Collective
(or if more than one elevator together - Group Operation)
9. Machine Location Overhead
10. Compensation As Required By Manufacturer
11. Special Operations Independent Service
Fire Emergency Service
Anti-Nuisance Service
12. Car Enclosure Type Passenger
 - a. Inside Clear 6'-8"W by 5'-5"D by 8'-0"H
13. Signals and Fixtures..... Design as Specified
 - a. Car Operating Panels 1 Per Car; Applied Type
 - b. Car Position Indicator..... Integral with Each Car Panel
 - c. Communication Sys. Integral with Car Panel
 - d. Service Cabinet..... Integral with Car Panel
 - e. Hall Pushbuttons 1 Riser
 - f. Hall Lanterns All Floors
 - g. Hall Pos. Indicators Main Floor
14. Passenger Entrance Type..... Side Open, Single Speed
 - a. Size 3'-6"W by 7'-0" H
 - b. Frames
 - 1) All Floors Stainless Steel #4 Satin Finish
 - c. Doors
 - 1) All Floors Stainless Steel #4 Satin Finish
 - d. Sills
 - 1) All Floors Aluminum
15. Miscellaneous Items:..... Disabled Access Requirements
Key Operated Hoistway Access
Earthquake Requirements

B. Elevator No. #

1. Type Hydraulic Direct Plunger
2. Capacity Passenger: 3500 Pounds/Service: 4500 Pounds
3. Speed 150 FPM (Maximum)
4. Stops
5. Openings
6. Travel As Shown
7. Control..... Resistance A.C.
8. Operation..... Simplex Selective Collective (or if more than one elevator together-Group Operation)
9. Machine Location At Lowest Level Adjacent to hoistway.
10. Special Operations Independent Service
Fire Emergency Service

- Emergency Battery Lowering
- 11. Car Enclosure Type Passenger / Service
 - a. Inside Clear Passenger: 6'-8"W by 4'-3"D by 8'-0"H/
Service: 5'-8"W by 7'-10"D by 9'-0"H
- 12. Signals and Fixtures..... Design as Specified
 - a. Car Operating Panels 1 Per Car; Applied Type
 - b. Car Position Indicator..... Integral with Car Panel
 - c. Communication Sys. Integral with Car Panel
 - d. Service Cabinet..... Integral with Car Panel
 - e. Hall Pushbuttons 1 Risers
 - f. Hall Lanterns All Floors
 - g. Hall Pos. Indicators Main Floor
- 13. Passenger Entrance Type..... Passenger: Side Open, Single Speed
Service: Side Open Two Speed
 - a. Size Passenger: 3'-6"W by 7'-0"H/
Service: 4'-0"W by 7'-0"H
 - b. Frames
 - 1) All Floors Stainless Steel #4 Satin Finish
 - c. Doors
 - 1) All Floors Stainless Steel#4 Satin Finish
 - d. Sills
 - 1) All Floors Aluminum
- 14. Miscellaneous Items..... Disabled Access Requirements
Key Operated Hoistway Access
Earthquake Requirements

2.2 FINISHES

A. Exposed-to-View Surfaces.

- 1. Aluminum: Clear anodized finish.
- 2. Sheet Steel:
 - a. Shop Prime: Degrease clean of foreign substances and apply one coat of corrosion inhibiting primer compatible with finish paint selected. Hoistway items visible to public shall be painted one additional coat of black paint.
 - b. Finished Paint: Three coats baked enamel; sand each coat smooth; color as selected.

Select Stainless Steel finish from the following two options:

- 3. Stainless Steel
 - a. Plain: Satin, directional polish, No. 4 Mirror directional polish, No. 8 Mirror non-directional polish, No. 10 finish unless otherwise specified.
OR
 - b. Patterned: Rigidized Metal's No. 5 WL, Ardmore Textured Metals No. 5-SM or equal.
- 4. Touch-Up
 - a. Prime Surfaces: Use same paint as factory for field touch-up.
 - b. Finish Painted Surfaces: Refinish whole panel with shop prime and finish paint as specified above.

B. Non-Exposed-to-View Surfaces: Degrease and shop paint manufacturer's standard corrosion inhibiting primer.

2.3 AUTOMATIC OPERATION

A. General Operation of Individual Elevators

- 1. Provide a non-proprietary microprocessor-controlled system with the controller manufactured by Motion Control Engineering or equal (no known equal). The dispatching system shall be

designed to monitor all types of traffic and sufficiently flexible so that it can be modified to accommodate changes in traffic patterns. Include hardware necessary to protect hoist motors, motor drives and door operators. Software shall control group and simplex program operations.

2. The System shall continuously monitor the demand based on real time calculations to assign and reassign the elevators to handle the traffic in the most efficient manner.
 3. Design the control system to accept reprogramming with no shutdown of system.
 4. The system shall be flexible irrespective of the number of elevators in normal service.
 5. Individual elevators shall operate on the basis of directional single cancellation collective automatic control in accordance with the following:
 - a. The control and indicating devices and supplementary service modes to be provided, together with the basic functioning of these and of power doors, door protective devices and similar items, are described in the relevant paragraphs of this specification.
 - b. Car and landing calls in each direction of travel shall be answered in the order in which required floors are approached by the car, provided that the call is registered sufficiently in advance of the car's arrival to permit a stop to be made.
 - c. Provide "anti-nuisance service" whereby all car calls will be cancelled if the load weighing device detects that an abnormal number of calls are registered given the number of passengers in the car. System using false call answering to accomplish this is not acceptable.
 6. Serial Link communications: Provide a distributed processing network consisting of localized processors located in machine rooms, car stations, hall stations and top of car to allow system to make fast decisions based on data shared by the processor involved in the different operations of the elevators. **[For group dispatch operations, all elevators in the group shall be capable of acting as a group common dispatcher as the need arises.]**
 7. Fault Diagnostic System and Machine Room Monitor: Provide all hardware such as computer, keyboard and monitor to retrieve and display the following:
 - a. Diagnostic System shall be capable of determining faults most difficult to find. It shall constantly monitor the condition of all car computers. When variances occur from the normal mode, the change or fault shall be detected, the location of the elevator, time of day, number of times fault occurred, along with fault code message shall be stored on memory. This information shall be retrievable to a minimum of the last 200 entries and shall be displayed on a monitor in the machine room.
 - b. Car position and direction.
 - c. Registered car calls.
 - d. Registered hall calls.
 - e. Indication that car parked and is the next available car for dispatch.
 - f. Display for each car indicating load-weighing device is actuated, percent of load in car and bypassing hall calls.
 - g. Performance of hall call waiting analysis.
- B. Group Automatic Operation; For Two or More Cars
1. Provide an "on-demand" hall call response system that will continuously scan the hall calls and assign the closest elevator in time to respond to that call. The system shall be capable of reassigning the elevator if demand changes the real time calculation.
 2. A car with no car calls registered arriving at a floor where both "up" and "down" hall calls are registered shall respond to the hall call in the direction of travel and illuminate the appropriate lantern. If no car call is registered for that direction, the lantern shall be extinguished, the lantern for the other direction shall light and the car shall respond to the call in that direction. The doors shall not close and reopen.
 3. The system shall be capable of monitoring hall and car calls to monitor coincidental calls. The cars will continuously scan the whole system to determine the closest elevator in time taking into account the coincidental car and hall call.
 4. Other Required Features

- a. Should a car be delayed from leaving a floor for any reason, other cars shall respond to the hall calls at that floor and shall be dispatched in a normal manner.
 - b. Provide each car with an adjustable load weighing device which will immediately dispatch cars and bypass hall calls when car is loaded to predetermined load.
5. General Program Adjustments
- a. After each group of elevators has been placed in regular service and the building substantially occupied, the elevators shall be regularly observed under normal operating conditions and minor adjustments shall be made as found necessary to ensure that the elevators operate at maximum efficiency.
 - b. If zones are employed, arrangements shall be made in the control circuits of the elevators for the division between each zone to be raised or lowered if found necessary due to uneven distribution of traffic between the zones and/or University's building occupancy requirements.

C. Simplex Selective Collective Operation

1. Arrange for Simplex Selective Collective automatic operation. Operate elevators from a single riser of landing buttons and from operating device in car.
2. Momentary pressure of one or more car or landing buttons, other than those for landing at which car is standing, starts car, and causes car to stop at first landing for which a car or landing call is registered corresponding to direction in which car is traveling. Stops made in order in which landings are reached, irrespective of sequence in which calls are registered.
3. Double door operation not permitted. If an up traveling car has a passenger for an intermediate floor and a down call is registered at that floor, with no calls above car, it travels to floor, opens door to let passenger out, then lights down direction arrow in hall lantern and accepts waiting passenger without closing and reopening doors.

2.4 SPECIAL OPERATIONS

- A. Inspection Operation: Provide key-operated hoistway access device and car top operating device. Key switches shall be mounted in door frames with only ferrule exposed at terminal landings. Incorporate access switches in hall button stations for freight elevators.
- B. Independent Service: Independent service operation shall be provided so that, by means of a switch located in the car service cabinet, the car can be removed from automatic operation and be operated by an attendant. The attendant shall have full control of the starting, stopping and direction of car travel. The car shall respond to car buttons only. The hall signals for the car on independent service shall not operate.
- C. Operation Under Fire or Other Emergency Conditions: Provide special emergency service to comply with ASME A17.1, CCR Title 8, UBC and local codes having jurisdiction. Provide Phase 1 recall switch at Main Floor Elevator Lobby. Key switches at main floor shall be integrated in hall button station with engraved instructions. Keyswitch shall be Adams WD01, to match University's existing system.

2.5 DOOR OPERATION

- A. Passenger Type Horizontal Sliding
 1. Door Operator: Provide heavy-duty closed loop master type operators with direct current motor mounted on structural support independent of car enclosure. GAL MOH MOVFR, or equal, no known equal. {Note to design professional - add qualities that distinguish this product from unacceptable products.}
 - a. Car and hoistway doors shall open and close simultaneously, quietly and smoothly; door movement shall be cushioned at both limits of travel. Door operation shall not cause cars to move appreciably.
 - b. Door hold open times shall be readily and independently adjustable when car stops for a car or hall call. Main floor door hold times shall be adjustable independent of other floors.

2. Hangers and Tracks: Sheave type with two-point suspension. Steel sheaves with flanged groove and resilient sound-absorbing tires. Minimum 2-1/2 inch diameter for hoistway, 3 inch for car. Manufacturer's heavy-duty tracts and ball or roller bearing with adjustable upthrusts.

B. Door Protection; Passenger Type

1. Electronic Scanning Type
 - a. Provide a door protective system which does not rely on physical contact with a person or object to inhibit door movement or initiate door reversal. Adams "I.C.U.", Janus "Panaeighty", or equal.
 - b. The system shall be able to detect a 2 inch diameter rod introduced at any position within the door movement at full height of opening.
 - c. Detection of intrusion into the protected area shall cause the doors, if fully open, to be held in the open position and, if closing, to reverse to fully open position.
 - d. If doors are prevented from closing for an adjustable period of 15 to 45 seconds or upon activation of Fire Emergency Service, they shall proceed to close at reduced speed and a loud buzzer shall sound. Door closing force shall not exceed 2-1/2 ft.-lbf when door re-opening device is not in operation.
 - e. For side-opening doors, the detector for the strike jamb side shall be recessed, flush with strike jamb.

- C. Interlocks: Equip each hoistway door with a tamper-proof interlock which shall prevent operation of the car until doors are locked in the closed position as defined by the Code. Interlock shall prevent opening of doors at landing from corridor side unless car is at rest at landing, is traveling through leveling zone or, hoistway access switch is used. Interlocks shall lock the two door sections together.

2.6 SIGNALS AND OPERATING FIXTURES

- A. General: Provide signals and fixtures as shown and specified. Location and arrangement of fixtures shall comply with handicap requirements.
 1. Buttons: Provide vandal-resistant stainless steel buttons with integral illumination, EPCO; Survivor plus or equal, no known equal. {Note to design professional - add qualities that distinguish this product from unacceptable products.} Operation of car or hall button shall cause button to illuminate. Response of car to car or hall call shall cause corresponding button to extinguish
 2. Switches: Toggle type typically or key operated where noted.
 3. Faceplates: Provide of material and finish as indicated and specified; 1/8 inch minimum thickness with sharp edges relieved.
 4. Fastenings: Provide with concealed fasteners or flush tamper-proof screws of material and finish matching faceplates.
 5. Cabinets: Provide with pulls, concealed hinges and doors mounted flush with hairline joints to adjacent surface.
 6. Arrangement: Arrangement of fixtures shall generally conform to that specified, but components may be rearranged, if desired, subject to University's Representative's approval.
 7. Engraving: Of size indicated; color backfill with epoxy paint in contrasting color as selected.
 8. Lamps: Miniature LED type.
 9. Audible Chimes: Electronic adjustable audible chimes; bell type gong not acceptable.
 10. Provide floor passing signal of the adjustable electronic audible chime type.
 11. Tactile Markings: Provide raised braille and alpha characters, numerals or symbols to the left of operating buttons and devices used by the public. Indications may be engraved directly on faceplates or separate plates flush mounted with hairline joints and concealed mechanical fasteners. Plates shall be of same size and shape as buttons. Raised characters shall be white on a black background with braille designation directly below the character.
 12. All keys shall integrate with campus keying system "Best A" for stop switch, access and switches in service cabinet. For floor lock outs use MEDCO. Coordinate supply of keyswitches with University's Representative and University's Lock Shop. Certification of Elevator will not be issued by UCD-CQCC without key integration verification.

B. Car Operating Panels

1. General: Provide buttons numbered to conform to floors served and the following:
 - a. Locate top operating button at 48 inches above floor, maximum 54 inches when required.
 - b. Locate emergency stop and illuminated alarm button in bottom row at 35 inches above floor. Wire emergency stop to ring alarm bell.
 - c. Provide "Door Open" and "Door Close" buttons located above emergency stop and alarm of same design as car button.
 - d. Engrave main panel with capacity, number of passengers and elevator number in 1/4 inch letters. Engrave auxiliary panel with NO SMOKING in 1 inch letters. All other signage required by local codes shall be engraved as directed by University's Representative and UCD-CQCC.
 - e. Provide fire emergency key switch, engraved instructions and call cancel button with audible/visual signals and fire department phone jack located below emergency stop and alarm.
 2. Applied Type: Integrate cabinets, buttons and engraving into hinge single piece faceplate mounted to front return panel.
- C. Car Position Indicators: Provide car position indicators with indications corresponding to floor designations with matching direction arrows and floor passing chimes. Provide digital type direct readout indicator with minimum one inch high indications mounted integral with each car operating panel.
- D. Hall Position Indicators: Provide digital type 2 inch high numerals mounted in a stainless steel faceplate. Combine with hall lanterns at main floor only.
- E. Service Cabinet: Provide cabinet door with a lock and concealed hinge as an integral part of car operating panel mounted with flush hairline joints. Cabinet door shall be provided with a flush glazed window of required size to hold elevator operating permit. Service cabinet shall contain the following:
1. Independent service switch.
 2. Two-speed ventilation switch.
 3. Light switch or dimmer as applicable.
 4. Inspection switch, key operated.
 5. Duplex convenience outlet.
 6. Buzzers as required.
 7. Test switch for emergency car lighting.
- F. Speaker Phone: Provide a complete communication system in compliance with ADA regulations and the following University's requirements consisting of a combination speaker/microphone, amplifier, automatic dialer, push button to activate system and acknowledgement lights. Mount behind a pattern of holes as selected as an integral part of car operating panel. Automatic dialer shall be programmed as directed by University's Representative's and University's UCD-CQCC Representative.
- G. Hall Button Fixtures: Each fixture shall contain buttons which light to indicate hall call registration and extinguish when call is answered. Engrave fire exiting instructions on faceplates.
1. All Floors: Provide rectangular circular shaped faceplates fabricated from Stainless Steel No. 4 finish.
- H. Hall Lanterns: Provide with single chime for up and double chime for down direction. Lantern illuminates white for up and red for down. As car approaches floor, lantern shall illuminate and chime approximately 4 seconds prior to doors opening to indicate next direction of travel.
1. Provide at all floors, manufacturer's standard hall lanterns with square equilateral triangular lenses with faceplates in a Stainless Steel No. 4 finish faceplate.

- I. Medical Emergency Elevator: Conform to Section 2-5108, Part 2, Title 24 CCR. The identification symbol (Star of Life) shall be fabricated from material and finish matching hall button stations and mounted with concealed mechanical fasteners. Submit samples. The Medical Emergency Elevator shall be designated by UCDFD (State Fire Marshal).

2.7 WIRING

- A. General: Provide all necessary wiring with 15 percent or a minimum of four spares between cars and controllers and to all remote control stations. Provide shielded wires in cables for all communications card readers and speakers. Include two four additional pairs of shielded spares for each car.
- B. Traveling Cables: Use minimum number of traveling cables with flame retarding and moisture resisting covers. Include shielded wires and spares as noted above. Cord thoroughly and protect cables from rubbing against hoistways or car items. Provide with steel cable core and properly anchored to relieve strain on individual conductors.
- C. Work Light and Convenience Outlet: Provide on top of car with wire lamp guard.
- D. Stop Switch: Provide in each pit and on top of car.
- E. Alarm Gong: Six-inch size, 110 volt. Provide on top of each car and one per group inside of hoistway at main landing to be actuated by corresponding alarm button or emergency stop switch.

2.8 CAR ENCLOSURES

- A. General: Fabricate finish work smooth and free from warps, buckles, squeaks and rattles; joints lightproof. Car shall be sound isolated from car frame. Apply outside of car with 3/16 inch thick sound deadener. No visible fastenings, except as indicated.
- B. Passenger Cars; Elevator No. _____
 1. Steel Shell: Fabricate walls of 14 gauge sheet steel from floor to canopy. Canopy 12 gauge reinforced. Paint shell in color as selected by University's Representative.
 2. Emergency Exit: Top of car per code.
 3. Ventilation: Two-speed squirrel cage exhaust blower, Morrison model AA or equal, with sound isolation mounting on canopy. Provide concealed vents above base and ceiling as required.
 4. Car Doors: Fabricate from 16 gauge sheet steel on front and back of each panel sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides per panel located one inch from each end. Provide full length neoprene astragals. Mount doors on structural header, not on car enclosure. Finish car side with stainless steel #4 finish and return finish 1/2 inch around edge of doors.
 5. Front Return Panels: Provide fixed type front return panels fabricated from 14 gauge stainless steel #4 finish.
 6. Interior Panels: Provide removable panels of 3/4 inch particle board core with balance sheet; align joints with ceiling grid. Face and edge with plastic laminate as selected by University's Representative's.
 7. Base and Metal Trim: Provide base below removable panels, vertical joints between panels and other metal fabricated from stainless steel.
 8. Ceiling and Lighting: Provide a suspended aluminum frame and tee bar ceiling grid with fluorescent light fixtures to provide uniform illumination of lay-in panels and 25 foot-candles at handrail height. Lay-in panels shall be manufacturer's standard. Milk-white acrylic. Install 8 7 inches below canopy.
 9. Handrail: Provide handrail on rear wall. Fabricate from 1-1/2 inch diameter stainless steel #4 finish with matching brackets. Securely attached to car shell with concealed fasteners.
 10. Sills: Provide extruded aluminum threshold plate. Mount with concealed mechanical fasteners. Allow for installation of finish flooring.
 11. Finish Flooring: Provide tile as selected by University's Representative's.
- C. Service Cars; Elevator No. _____

1. Steel Shell: Fabricate walls of 14 gauge sheet steel. Extend from floor to canopy and heavily reinforce to withstand severe service. Paint color as selected by University's Representative.
 2. Canopy and Lighting: 12 gauge reinforced sheet steel with recessed fluorescent light fixtures with protective lens. Protect light housing from damage. Paint color as selected by University's Representative.
 3. Emergency Exit: Top of car per code.
 4. Car Doors: Fabricated from 16 gauge sheet steel on front and back of each panel sufficiently reinforced with steel to insure rigidity and sound deadened. Provide two guides per panel located one inch from each end. Provide full length neoprene astragals. Mount doors on structural header, not on car enclosure. Finish car side with stainless steel #4 finish and return 1/2 inch around edge of doors.
 5. Entrance Columns and Front Return: Provide front return panels fabricated from 14 gauge stainless steel #4 finish.
 6. Interior Panels: Provide removable panels of 1/2 inch in particle board with balance sheet faced and edged with patterned stainless steel.
 7. Bumper Rails: Provide 1/2 inch by 6 inch stainless steel No. 4 finish bar located at 12 inches above floor on all walls without entrances. Mount with matching brackets securely attached to car shell between panels.
 8. Handrail: Provide a 1-1/2 inch diameter stainless steel rail on rear walls without entrances mounted with matching brackets securely attached to car shell. Top of handrail to be 32 inches above floor level (AFL).
 9. Sills: Provide extruded aluminum threshold plate. Mount with concealed mechanical fasteners. Allow for installation of finish flooring.
 10. Finish Flooring: Provide aluminum checker plate.
- D. Emergency Lighting; All Elevators: Provide an emergency car lighting unit mounted on top of car, battery driven and self-rechargeable. Upon outage of normal power the unit shall, within 5 seconds, light two lamps as part of normal car lighting or separate lights mounted above drop ceiling. The unit shall have sufficient capacity to keep the lights in continuous operation for four hours and also the alarm bell for one hour. Provide a readily accessible means for testing the unit in service cabinet. Light fixtures mounted in car front returns or operating panels are not acceptable.
- 2.9 HOISTWAY ENTRANCES; PASSENGER / SERVICE TYPE
- A. General: Fabricate finish work smooth with flush surfaces and free from warps and buckles. Entrance assemblies shall bear 1-1/2 hour U.L. rating.
 - B. Struts and Closer Angles: As required for entrance installation and door closer mechanism. Use full length struts. Hanger headers, minimum 3/16 inch material extending from strut to strut.
 - C. Dust and Hanger Covers: Provide as required of minimum 16 gauge sheet steel. Provide hanger cover plates extending full length of door track. Paint black.
 - D. Fascia, Toe and Head Guards: Minimum 16 gauge sheet steel; reinforce fascia. Paint black. Provide blind fascia in express zones for reverse openings as required.
 - E. Sills: Extruded aluminum sills with non-slip surfaces and grooves suitable for guides. Extend strut to strut and mount without exposed screws. Provide all support angles and levelers for a complete installation. -
 - F. Frames: Fabricate from 14 gauge material with standard bolted frames. Apply effective sound deadening on inside of frames. Material and finish of frames shall be stainless steel #4 finish.
 - G. Doors: Fabricate from 16 gauge material sufficiently reinforced with steel to insure rigidity and sound deadened NEED TO SPECIFY A LEVEL. Provide two guides per panel which will remain engaged in sill if guiding member is destroyed. Provide full length neoprene astragals on leading edge and non-vision wings of material and finish to match doors. There shall be no keyholes in the door.. Corridor side of door panel material shall be stainless steel #4 finish. Return finish shall be

a minimum of 1/2 inch around edges of door. Exterior doors shall be stainless steel having a full core door with stainless steel panels welded to frame.

- H. Tactile Markings: Provide raised Braille and alpha characters, numerals or symbols similar to those for car stations of size required by current code. Locate on each entrance jamb at 60 inches above floor indicating floor designation. Material and finish of plates shall have contrasting background and mounting means similar to those on car panels. Braille designation shall be to the left of the raised character.

2.10 TRACTION ELEVATOR EQUIPMENT [NOTE TO SPECIFIER - IF THERE ARE NO TRACTION ELEVATORS DELETE ARTICLE]

A. Design Criteria

1. Performance

- a. Contract Speed: Maximum 5 percent speed variation under any loading condition in either direction.
- b. Motion Time: Brake release to brake set as measured in both directions for a typical one floor run under any loading condition. After make-up of hoistway door interlock, initiate movement of car within 0.7 second for geared elevators.
 - 1) 5.0-5.5 seconds for 12 foot floor height.
- c. Door Open Times
 - 1) 2.3-2.5 seconds for 3 feet-6 inch side opening doors.
 - 2) 2.5-2.7 seconds for 4 feet-0 inches two speed side opening doors.
- d. Door Close Times: Minimum, without exceeding kinetic energy and closing force, allowed by code.
- e. Door Dwell Times: Comply with ADA formula and provide separate adjustable timers with initial settings as follows:
 - 1) Main lobby Hall Call: 5.0 seconds.
 - 2) Upper Lobbies Hall Call: 5.0 seconds.
 - 3) Car Call: 5.0 seconds.
 - 4) Interruption of Door Protective Device: Reduce dwell to 1.0 second.
- f. Leveling: Within 1/4 inch under any loading condition. Level into floor at all times, do not overrun floor and level back.
- g. Releveling: Provide smooth and accurate releveling required due to cable stretch.

2. Operating Qualities: University's Representative and UCD-CQCC will judge riding qualities of cars and enforce the following requirements. Make all necessary adjustments.

- a. Acceleration and Deceleration: Starting and stopping shall be smooth and comfortable, without obvious steps of acceleration. Slowdown, stopping and leveling shall be without jars or bumps. Stopping upon operation of emergency stop switch shall be rapid but not violent.
 - 1) Vertical Acceleration: Maximum 4 ft. per second squared. Maximum jerk 8 ft. per second cubed.
 - 2) Horizontal Acceleration: Maximum 10 mg peak-to peak measured at full speed for full travel in both directions.

- b. Full Speed Riding: Free from vibration and sway.

3. Motor Control

- a. Equipment: Capable of operating at plus or minus 10 percent of normal feeder voltage and plus or minus 3 percent of feeder frequency without damage or interruption of elevator service.
- b. Control System: Closed loop feedback control incorporating positional and velocity selector system that is capable of operating continuously at contract speed and load for one hour without exceeding 50 degrees Centigrade from ambient machine room temperature. Design system to not adversely affect stability of voltage and frequency controls of emergency generator set or loads connected to emergency power bus during standby power operation.

- c. Car Load Sensing
 - 1) The control system shall sense the actual load condition of the elevator prior to any movement of the elevators. The start/acceleration pattern shall be adjusted to reflect the car load to achieve a smooth start/acceleration under all load conditions and location in the hoistway.
 - 2) Provide load sensing devices that utilize crosshead deflection or hoist rope pressure. System shall be accurate within 100 pounds and stable over extended periods.
 - 3) Systems using pre-torquing of the D.C. motor armature are acceptable; variable voltage control of the brake energization is not acceptable.
 4. Sound Control
 - a. Vibration: Sound isolate machines and motor drives from beams and building structure to prevent objectionable noise and vibration transmission to occupied building spaces.
 - b. Airborne Noise: Maximum acoustical output level of:
 - 1) 75 dba measured in machine room.
 - 2) 60 dba measured in elevator cars during all sequences of operation.
 - 3) 50 dba measured in elevator lobbies.
- B. Guide Rails
1. Size: Standard steel tees with backs machined for splice plates. Extend rails full depth of pits and mounted to continuous pit channels with adjustment bolts to allow for building settlement. Minimum weight in pounds per foot shall be 15 pounds for car and 15 pounds for counterweight. Guide rails and splice plates shall be engineered and approved by State of California.
 2. Installation: Drawings indicate basic hoistway framing and special supports for rail brackets. All additional supports and rail backing required shall be provided as part of the Elevator Work by the CQCC Contractor. Install plumb within 1/16 inch. File joints smooth.
- C. Roller Guides
1. Roller Guides with neoprene tires, minimum 3/4 inch wide and fully adjustable spring loaded to provide continuous contact with rail surfaces. Balance car to insure equal guide shoe pressure on all wheels and not exceed manufacturer's recommendations. Provide ESCO guides, or equal, no known equal. {Note to design professional - add qualities that distinguish this product from unacceptable products.}
 - a. Size: Nominal roller diameters shall be 6 inches for car and 4 inches for counterweight.
- D. Hoist and Governor Ropes: Size and number to insure proper wearing qualities; minimum eight strands wound around hemp core. Pre-formed cables will be permitted. Minimum size: Hoist ropes, 1/2 inch, governor ropes, 3/8 inch.
- E. Buffers: Mount on continuous pit channels with required blocking and supports. For deep walk-in pits, provide platforms with access ladders for servicing car buffers as acceptable to Elevator Code authorities.
1. Spring Type: Proper number and size; tag per code.
 2. Oil Type: Oil buffers, spring return type with switches. Pistons shall be fully protected by bluing or canvas covers.
- F. Counterweights: Sectional metallic weights securely fastened in structural frame. Frame to be designed to maintain structural integrity without bending upon activation of a seismic force of .5 g. Weight shall occupy a minimum of two-thirds the height of the frame.
- G. Safeties: Flexible guide clamp type mounted on underside of car frame.
1. Provide counterweight safeties of same type as car safeties.

- H. Governor: Centrifugal speed type to be located over hoistway with protective covering over sheave, jaws and exposed gears. Frame shall be ratchet or tension type held under 200 pounds tension.
- I. Car Frame and Platform
1. Passenger Elevators: Steel frame with steel or double wood floor; isolate platform from car frame by rubber pads and provided with jacking bolts for pad replacement.
 2. Service Elevators: Freight type construction with heavy channels front and rear, metal stringers and double wood floor with heavy embossed rubber floor. Design to carry a one piece load on a small electric handtruck with a maximum 1/4 inch deflection, Class C-3 loading. Assume wheel base of 24 inches wide by 48 inches long.
- J. Traction Machines
1. General: Provide machines with heavy structural steel bedplates and motors rated for 30 minute with maximum 50 degree Centigrade rise or better.
 2. Geared Traction: Provide manufacturer's standard single wrap traction worm-gear machines as approved with 1:1 roping and undercut sheave grooves. Where machines are mounted adjacent to hoistways and where deflector sheaves are required for proper rope deflection, the deflector sheaves shall be an integral part of the machine bedplate.
- K. Controller: Motion Control Engineering's controller; or equal, (no known equal), {Note to design professional - add qualities that distinguish this product from unacceptable products.} overload relays in three legs of power circuit and in loop circuit; cabinets with NEMA-1 enclosures and doors arranged with locks or mechanical latches. Provide permanently marked symbols or letters identical to those on wiring diagrams adjacent to each component.
1. The controller wiring shall be carried out in a neat and workmanlike manner in accordance with relevant requirements of National Electric Code.
 2. All external connections to the equipment on each controller shall be made by means of approved cable thimbles and/or solderless cable lugs, depending on the current to be carried.
 3. Condenser activated or dash pot timers, motors or incandescent globes for dampening acceleration and deceleration steps are unacceptable.
 4. Main contactors or starter switches shall be horsepower rated and are not to be mounted directly to the steel cabinets, to ensure quiet operation of controllers.
 5. Where SCR drive control is provided, noise suppression chokes are to be connected in the A.C. feeders to the Silicone Controlled Rectifier (SCR) drive and for the D.C. feeders to the hoist motor and located within the base of the controller. These chokes are to be mounted in an isolated manner to prevent electrical vibration noise to the steel cabinet.
 6. The controllers must be properly shielded from line feeder pollution.
- L. Power Conversion and Regulation Unit
1. General: Variable Voltage Variable Frequency (VVVF/AC) or Solid State (SCR/DC) control optional with manufacturer.
 - a. All circuitry shall be as approved by the enforcing code. Operation shall be quiet and the performance standards herein specified shall be provided. Do not exceed 75 dba.
 - b. Design system to control starting and stopping and to prevent damage to motor from overload or excess current and to automatically disconnect power supply. Apply brake and bring car to rest in event of power failure or safety device operation.
 - c. Controllers shall not have failure modes which results in full power being applied to drive machine operation in event of phase reversal, phase failure or low voltage which might result in elevator malfunction.
 2. Solid State Control (SCR)
 - a. Provide smooth acceleration and deceleration by variable voltage applied to hoisting motor and by dynamic braking before brake application.

- b. Failure of any static control device, speed measuring circuit or speed pattern generating circuit to operate as intended or occurrence of single accidental ground or short circuit shall not permit car to start or run if any hoistway door or gate is open or unlocked.
 - c. Provide coordinated fault protection which protects entire power circuit and power semi-conductors against short circuit conditions; protects against limited faults arising from partial grounds, partial shorts in motor armature, or in power unit itself; protects drive motor against sustained overloads; and provides semi-conductor transient and incoming line phase sequence protection.
 - d. Protects building system power line against line voltage transients by providing each elevator drive with isolation transformer and devices to limit distortion to not more than 4 percent Root Mean Square (RMS) of base 60 Hz line voltage, with frequencies above 600 Hz attenuated at minimum of 12 db per octave. Measure voltage distortion requirements at secondary of building system transformer used to provide power to elevator system.
 3. Variable Voltage Variable Frequency (VVVF)
 - a. Provide system to convert 3 phase, 60 Hz, A.C. building power supply to a fixed D.C. voltage and then invert from D.C. voltage to a variable voltage, variable frequency, distortion-free, smooth A.C. current output to the A.C. hoist motor.
 - b. Motor speed shall be controlled by varying the frequency input to the motor; torque shall be controlled by varying the voltage to the motor.
 - c. System shall be provided with necessary devices to insure quiet operation not exceeding noise level specified in "Design Criteria" and to protect building system power line against line voltage transients.
- M. Machine Beams and Sheaves: Provide all structural steel machine and sheave beams with dead end hitch plates, bearing plates, anchors and blocking as required to support equipment. Secondary, overhead and deflecting sheaves with roller bearings and means for lubricating bearings from machine rooms as required where secondary levels are not provided.
- N. Selector
 1. The system shall utilize a device to establish incremental car position to an accuracy of .1875 inches or better using quadrature signal for the entire length of the hoistway. Absolute floor number encoding with parity shall be provided at each floor in order to establish exact floor position to the computer. The system shall not require movement to a terminal landing for the purpose of finding the correct car position.
 2. The system shall utilize an automatic two-way leveling device to control the leveling of the car to within 1/4 inch above or below the landing sill. Over travel, under travel, or rope stretch must be compensated and the car brought level to the landing sill.
 3. The individual car controller shall be capable of learning the position of each floor in the building to an accuracy of .1875 inches.
 4. The individual car controller shall have the software program that uses mathematical methods to create an idealized optimum velocity profile of the car travel from any floor to any other floor providing a smooth and stepless elevator ride. All the system motion parameters (such as jerk, acceleration, deceleration rates etc.) shall be field programmable with parametric limitations for the system dynamics, and be stored on Electronically Erasable Programmable Read Only Memory (EPROM) as non-volatile memory.
 5. The drive control system shall utilize the optimized velocity profile in a dual-loop feedback system based on car position and speed. A velocity feedback device shall permit continuous comparison of car speed with the calculated velocity profile to provide accurate control of the acceleration and deceleration, right to the final stop without discomfort, regardless of direction of travel or load in the car.
 6. The individual car controller shall have an independent safety processor that monitors the speed of the car and creates a phantom speed contour near the terminal landing, so that the car would not be capable of traveling faster than the phantom speed contour. This processor should work independently of any other logic or motion control processors in the system.

7. The controller shall utilize a solid state drive unit using solid state power devices to control the motor field and machine brake.
8. The controller shall provide the required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest upon failure of power.
9. In addition, the power control shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and to compare it with intended speed signal to verify proper and safe operation of the elevator.
10. During operation of the elevator with overhauling load (empty car up or loaded car down), precision speed control shall be obtained by the regulation system utilized in the power control. The automatic leveling zone shall not extend more than 12 inches above or below the landing level nor shall the doors begin to open until the car is within 12 inches of the landing. In addition, the inner leveling zone shall extend not more than 3 inches above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed.
11. All power feed lines to the brake shall be opened by an electro-mechanical switch. A single ground, short circuit, or solid state control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing are not acceptable.
12. A motor field current sensing means shall be provided which shall cause electric power to be removed from the armature and brake unless the direct current flowing in the shunt field of the motor is sufficient to prevent over speeding of the motor.

O. Compensation

1. Chain Type: Encapsulated chain Quiet Link, Whisperflex or equal with pivoted compensating sheave having a nominal diameter of 25 inches to maintain loop, limit horizontal movement and prevent rubbing of chain on elevator equipment or hoistway items.

2.11 HYDRAULIC ELEVATOR EQUIPMENT [NOTE TO SPECIFIER - IF THERE ARE NO HYDRAULIC ELEVATORS DELETE ARTICLE]

A. Design Criteria

1. Performance
 - a. Contract Speed: Maximum 5 percent speed variation under any loading condition in either direction.
 - b. Motion Time: From start to stop of elevators motion as measured in both directions for a typical one floor run under any loading condition. Initiate movement of car within 1.5 second after make-up of hoistway door interlock.
 - 1) 10.0-10.5 seconds for 12 foot floor height.
 - c. Door Open Times
 - 1) 2.5-2.7 seconds for 3 feet-6 inches SS side opening doors.
 - 2) 2.5-2.7 seconds for 4 feet-0 inches two speed side opening doors.
 - d. Door Close Times: Minimum, without exceeding kinetic energy and closing force, allowed by code.
 - e. Door Dwell Times: Comply with ADA formula and provide separate adjustable timers with initial settings as follows:
 - 1) Main Lobby Hall Call: 5.0 seconds.
 - 2) Upper Lobbies Hall Call: 5.0 seconds.
 - 3) Car Call: 5.0 seconds.
 - 4) Interruption of Door Protective Device: Reduce dwell to 1 second.
 - f. Leveling: Within 3/8 inch under any loading condition. Level into floor at all times, do not overrun floor and level back.
 - g. Hydraulic Pressure: Hydraulic components shall be factory tested for 600 PSI. Maximum operating pressure shall be 425 PSI.
2. Operating Qualities: University's Representative and UCD-CQCC will judge riding qualities of cars and enforce the following requirements. Make all necessary adjustments.

- a. Starting and stopping shall be smooth and comfortable. Slowdown, stopping and leveling shall be without jars or bumps.
 - 1) Vertical Acceleration: Maximum 4 ft. per second squared. Maximum jerk 8 ft. per second cubed.
 - 2) Horizontal Acceleration: Maximum 10 mg peak-to-peak measured at full speed for full travel in both directions.
 - b. Full Speed Riding: Free from vibration and sway.
 3. Sound Control
 - a. Vibration: Sound isolate power units from building structure to prevent objectionable noise and vibration transmission to occupied building spaces.
 - b. Airborne Noise: Maximum acoustical output level of:
 - 1) 85 dba measured in machine room.
 - 2) 60 dba measured in elevator cars during all sequences of operation.
 - 3) 50 dba measured in elevator lobbies.
- B. Guide Rails
1. Size: Standard steel tees with backs machined for splice plates. Extend rails full depth of pits. Do not bottom on pit floor. Minimum weight shall be 15 pounds per foot. Use full strength splice plates.
 2. Installation: Drawings indicate basic hoistway framing and special supports for rail brackets. All additional supports and rail backing required shall be provided as part of the Elevator Work. by the CQCC Contractor Install plumb within 1/16 inch. File joints smooth. Through bolt brackets in wood framed hoistways.
- C. Roller Guides
1. Roller Guides with neoprene tires, minimum 3/4 inch wide and fully adjustable spring loaded to provide continuous contact with rail surfaces. Balance car to insure equal guide shoe pressure on all wheels and not exceed manufacturer's recommendations. Provide ESCO guides, or equal, no known equal. {Note to design professional - add qualities that distinguish this product from unacceptable products.}
 - a. Size: Nominal roller diameters shall be 6 inches for car and 4 inches for counterweight.
- D. Buffers: Spring type mounted on cylinder support channels with required blocking and supports. For deep walk-in pits provide platforms with access ladders for servicing plunger assembly.
- E. Car Frame and Platform
1. Passenger Elevators: Manufacturer's standard steel members, steel frame with steel or fire retardant treated double wood floor.
 2. Service Elevators: Freight type construction with heavy channels front and rear, metal stringers and fire retardant treated double wood floor with aluminum checker plate flooring. Design to carry a one piece load on a small electric handtruck with a maximum 1/4 inch deflection, Class C-3 loading. Assume wheel base of 24 inches wide by 48 inches long.
- F. Platen Isolation: Provide minimum 3/4 inch thick steel plates between top of plunger and car frame with one inch rubber or neoprene isolation material between.
- G. Cylinder Well and Casing
1. Well: The Elevator Installer shall become familiar with existing conditions and be responsible for drilling cylinder wells.
 2. Casing: Provide steel casing, 12 inches greater in diameter than wrapped cylinder and proper depth to retain hole and provide structural integrity of PVC casing. Provide minimum 10 gauge corrosion resistant well casing having minimum 0.2 percent copper content; water tight joints and closed bottom. Weld seams solid at multiple casing joints. Provide a steel ring at top of casing to be keyed into pit floor. Provide watertight seal at bottom using 2 feet 0 inches thick non-shrink concrete plug of type for installation under water where drive casing is required and closed bottom casing cannot be installed.

3. Provide minimum 3/8 inch thick PVC casing with watertight sealed couplings and bottom end caps. Inside diameter shall be 6 inches greater than outside diameter of cylinder. Extend PVC above pit floor to fit snug against cylinder head or pit channels. Seal top of PVC and provide an inspection port of 2 inch diameter by 4 inch long PVC pipe with threaded cap.
 4. Installation: Set cylinder and PVC casing within steel casing. Backfill between PVC casing and steel casing with clean dry pea gravel. Plunger and cylinder shall be plumb within 1/16 inch.
- H. Cylinder: Steel pipe, factory tested for 600 pounds/square inch working pressure. Sandblast or wire brush outside of cylinder to remove rust and scale. Paint with heavy coat of epoxy or mastic. Wrap with 20 mil wrapping of Trantex, Tapecoat, Glasswrap or equal. Work shall be done in shop and repaired in field if coating is damaged.
- I. Plunger: Use seamless steel pipe minimum Schedule 80. Plunger shall be no more than 0.010 inch out of round and straight within 1/16 inch. Protect during shipping and installation to avoid damage. If plunger is gouged, scarred or shows visible tool marks, it shall be replaced. Finish shall be 20 micro inches or finer. Plunger top shall be isolated from car frame. Plungers with follower guides are not acceptable.
- J. Packing: Provide packing which inhibits leaking of oil with drip ring.
- K. Scavenger Pump: Provide electrically operated scavenger pump with storage reservoir and float activated or other automatic means to return oil to system. Provide 1/2 inch copper tubing for oil return line.
- L. Oil: Provide Chevron OC turbine oil or equal, 150 SSU at 100 degrees F. temperature.
- M. Piping: Minimum Schedule 80 steel pipe suitable for 600 pounds pressure. No hoses shall be used in any part of piping. Provide sound isolating couplings in oil line between jack and pumping plant. Support piping using vibration isolating mounts or hangers with integral felt or neoprene at least 1/4 inch thick.
1. Overhead and Exposed Piping: Use victaulic method of piping throughout system with victaulic type 77 fittings or equal. Provide drip deflectors at pipe joints where pipes run above inaccessible ceiling areas to prevent damage to these areas in case of joint leakage.
 2. Underground Piping: Use threaded or welded joints. Protect with extruded high density polyethylene coating having a thickness of 25 to 60 mills applied with a minimum 8 mill thickness of modified rubber adhesive material all as manufactured by Plexco or equal. Install piping on three inch bed of clean, dry sand and backfill with additional three inches of sand.
 3. Testing: Before enclosing underground pipe system, close ends, fill with fluid, establish 600 PSI pressure and allow to stand for 24 hours. Make corrective repairs to leaks or pressure drop. Notify University's Representative of test. Conduct test in presence of University's Representative and UCD-CQCC.
- N. Shutoff Valves
1. Provide in each elevator pit a gate valve to shut off oil between cylinder and pumping plant.
 2. Provide a pressure type line rupture safety valve to shut off oil between cylinder head and pit valve. Activation of safety valve shall not void operation of lowering valve.
- O. Pumping Plant
1. General: Self contained unit with sound reducing cabinet and sound isolated base.
 2. Pump: IMO, Roper or equal for 150 Saybolt Universal Second (SSU) oil, belt driven or submersible. Maximum speed 3600 RPM. Maximum pressure 425 pounds per square inch.
 3. Tank: Capacity equal to plunger displacement plus 25 percent. Provide strainers, oil level sight gauge and device to maintain uniform oil temperature.
 4. Valves: Integral type by Elevator Equipment Company, Maxton Company, by elevator manufacturer, or equal. Provide conveniently located manual lowering valve accessible without removing pumping plant enclosure panels.

5. Motor: General Electric, Imperial, Westinghouse or equal; maximum speed 1800 RPM for belt driven and 3600 RPM for submersible. Provide minimum 120 start heavy-duty motor, continuous rated, 50 degrees C. temperature rise, Class A insulation or 70 degrees C. rise for Class B insulation.
 6. Controller: Provide Motion Control Engineering Controller, or equal, no known equal with integral, floor or wall mounted as applicable to space conditions. Include door operating relays combined with controller. Provide solid state starter. Nordic class 72D or equal (no known equal). International Electrical Code (IEC) method of line starter application is unacceptable. Provide three (3) manual reset overload relays, one in each line and reverse phase relay. Provide externally mounted permanently identified junction boxes on controller cabinets for termination of communication circuits.
 7. Muffler: Blow-out proof type between pumping plant and cylinder.
- P. Hydraulic Elevator Protective Circuit: In the event the car should stall due to low oil in the system or, if for other cause the car fails to reach the top landing within a predetermined time while traveling "up", a special circuit shall be provided which shall automatically return the car to the bottom landing and open the doors for 10 seconds after which the elevator will close doors and completely shut down. Service shall be restored by recycling the mainline switch.
- Q. Hydraulic Elevator Battery Emergency Lowering Operation: Provide a battery driven unit which will initiate operation of the Protective Circuit and lower elevator to bottom landing in the event of a power failure. Service shall be restored automatically upon restoration of normal power supply. Arrange with an exposed method of testing. Arrange circuitry so that, if the mainline switch is open when the power transfer takes place, the elevator will not respond to the operation of the protective circuit. Provide a double pole isolating switch on the battery unit to disconnect the battery output.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field Measurements: Field verify dimensions before proceeding with the Work. Coordinate related Work including, but not limited to electrical, fire alarm, plumbing, security systems and HVAC. Verify the following to be acceptable for installation of elevators.
1. Hoistway has been correctly sized and otherwise properly prepared.
 2. Equipment supports are satisfactory.
 3. Electrical rough-ins are correct.
 4. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install all new equipment per manufacturer's requirements those of regulatory agencies and as specified.

3.3 FIELD QUALITY CONTROL

- A. Casing and Cylinder Installation: Notify University's Representative and UCD-CQCC prior to the installation of the steel casing, PVC casing and cylinder so that the representative can witness the installation.
- B. Examination and Testing: When installation is ready for final acceptance, notify and assist the University's Representative and UCD-CQCC in making a walk-through review of entire installation to assure workmanship and equipment complies with contract documents. ADA Compliance will be certified by UCD-CQCC.
- C. Regulatory Agencies Inspection: Before any Cal/OSHA Elevator Unit tests may occur, Contractor shall obtain approval to proceed with testing from University's Representative and UCD-CQCC. Upon completion of elevators, and after University's approval, Contractor shall provide instruments, weights and personnel to conduct test required by regulatory agencies. The Contractor shall submit a complete report describing the results of the tests.

- D. Correction: Make corrections to defects or discrepancies at no additional cost to University. Should discrepancies be such that re-examination and retesting is required, all costs shall be paid by the Contractor.
- E. Final Acceptance: Final acceptance of the installation will be made only after all corrections are complete, final submittals including spare parts and O&M Manuals and certificates are received and the University's Representative and UCD-CQCC are satisfied and the installation is complete in all respects.

3.4 INSTRUCTIONS

- A. Instruct the University's UCD-CQCC personnel in proper use of each system. Allow for 8 hours of instruction.

3.5 MAINTENANCE

- A. General: Provide complete continuing maintenance on entire elevator equipment during regular working hours on regular working days for a period of 12 months after building is occupied and elevator is in service.
- B. Examination: Include systematic examination monthly for adjustment, and lubrication of elevator equipment whenever required and replacement of defective parts with parts of same manufacture as required for proper operation.
- C. Replace packing 6 months after final completion of hydraulic elevator.
- D. Performance Standards
 - 1. Maintain the performance standard set forth in this Specification and maintain correct operation of the dispatching system.
 - 2. Maintain smooth starting and stopping, smooth riding qualities and accurate leveling at all times.
- E. Testing: Perform monthly fire recall tests as required by code.
- F. Call-Backs: In event of failures, provide 24 hour call-back service at no additional cost to University. CQCC Contractor shall respond within 1 hour during normal working hours and within 2 hours during overtime hours with CQCC personnel competent to remedy failure.
- G. Maintenance Materials
 - 1. Expendable Parts: Contractor shall provide a metal cabinet in each machine room on project premises containing the following expendable parts required for prompt replacement. Parts used for routine maintenance shall be replenished and stored in machine room to ensure an adequate supply is available. Parts and cabinet shall become University's property and not removed upon expiration of maintenance period.
 - a. One set starter contacts and coils.
 - b. Two resistors of each type installed.
 - c. One set hanger sheaves for car and hoistway doors.
 - d. Two relays and relay bases of each type installed.
 - e. Twenty-four lamps of each type installed.
 - f. Car and hall buttons with identical graphics installed; 6 for manufacturer's standard buttons, 1 of each type for special buttons.
 - g. Twelve fuses of each type installed.
 - h. One set motor brushes of each type installed.
 - i. Any other parts required for prompt replacement.
 - j. Lubricants and cleaners of all types used for maintenance.
 - k. One spare control board of each type installed.
 - 2. Replacement Parts: Keep the following parts in a warehouse within 50 miles of the project premises.
 - a. One door operator motor of each type used.

- b. Transformers of each type installed.
 - c. Two complete door interlocks.
 - d. Parts for SCR drives.
 - e. Parts for door protective devices.
 - f. One set of packing for each size cylinder.
 - g. Such other parts as are needed to insure prompt replacement in event of elevator shutdown such as spare control boards for computer operated systems.
- H. Maintenance Data: After completion of installation and prior to final acceptance, submit 3 sets of complete and accurate maintenance data specific for each elevator.
- 1. Manuals: Describe proper use and maintenance of equipment, lubrication points, types of lubricants used and frequency of lubricant application.
 - 2. Parts Catalogs: Complete listing of all parts of equipment and components used in the installation.
 - 3. Wiring Diagrams: One laminated set mounted in machine room and one blue line set delivered to University's Representative and UCD-CQCC. Wiring diagrams shall be as built, specific for this installation, and reference identification on drawings shall match points identified on terminals of controllers.
 - 4. Maintenance Tool and Software Manuals: Provide maintenance tools and supporting software documentation required for the complete maintenance of the entire system including diagnostics and adjusting. Maintenance tool may be hand held or built into control system and shall be of the type not requiring recharging or reprogramming nor of the automatic destruct type.

END OF SECTION 14 20 00