

## **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.

#### **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 two (2) 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 two (2) copies of Operation and Maintenance Manuals, Installation Manuals and Parts Manual necessary for full servicing of the elevator and microprocessor.
- Provide one (1) Digital copies on "CD" "AS-BUILT" wiring drawings and O & M Manuals.

#### **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

- Where specified, Motion Control Engineering Controls may be substituted with other brands provided the following terms and conditions can be applied:
  - Vendor acknowledges that the University of Arizona is a self-maintainer
  - Vendor agrees that any needed software and related security authentication means required to maintain and diagnose this installation be turned over as part of this installation
  - Vendor acknowledges that the University of Arizona cannot sign or enter into any agreement that limits liability, states that any state other than the State of Arizona laws have jurisdiction and has not been approved by the Chief Procurement Officer of the University of Arizona.
  - Vendor agrees to sell to the University of Arizona any needed parts for this installation for a period of ten years, the University of Arizona acknowledges that parts may be discontinued by the manufacture which is beyond the control of the vendor
- **Acceptable elevator manufacturers/vendors are:**
  - Kone Elevator Company
  - Otis Elevator Company
  - Schindler Elevator Company
  - Thyssen Krupp
  - Arizona Elevator Solutions
- **Attributes (Hydraulic Elevator):**
  - Capacity: TBD
  - Speed: TBD
  - Operation: Selective Collective
  - Control: Microprocessor based, Motion Control Engineering 2000 Hydraulic 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) Alternate: Innovation Bruiser Series.
  - 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 (Keyed to an EPCO-1).
      - Emergency stop key switch (Keyed to an EPCO-1).
      - Independent service key switch (Keyed to an EPCO-1).
      - Inspection/access key switch (Keyed to an EPCO-2).
      - Fire-fighter service key switch (Keyed to AZFS).
      - COP Maintenance panel key to (Northeast J200).
      - Alarm bell push type switch.
      - Engraved capacity plate and elevator designation. Verify fabrication.

- Engrave " INSPECTION CERTIFICATE ON FILE AT FACILITIES MANAGEMENT "
- Light key switch (Keyed to an 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. T-rails with all required mounting hardware required for mounting.

## 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 2000 controller 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 (AZFS)
- 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 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.
- 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 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 (Keyed to an EPCO-1).
  - Emergency stop key switch (Keyed to an EPCO-1).
  - Independent service key switch (Keyed to an EPCO-1).
  - Inspection/access key switch (Keyed to an EPCO-2).
  - Firefighter service key switch (Keyed to AZFS)
  - Alarm bell push type switch.
  - Light key switch (Keyed to an 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 shut down prior to sprinkler activation. This is accomplished by the use of a shunt trip breaker activated by a heat detector connected to and controlled by the fire alarm system.
- Heat detector to be located no more than 24" from any fire sprinkler head installed in elevator shaft or machine room
- 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**