

SECTION 14 24 00
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the, engineering, furnishing and installation of the complete electro-hydraulic elevator system as described herein and shown on the drawings.
- B. Electric passenger elevator, shall be oil hydraulic type with microprocessor based control, one car group; selective-collective automatic operation with car leveling device, signal system, power-operated single-speed single-slide side opening car and hoistway doors. Elevator shall have Class "A" loading and be HC accessible.

1.2 QUALITY CONTROL

- A. Qualifications:
 - 1. Approval by the Contracting Officer is required of products or services of proposed manufacturer, suppliers, and installers and will be contingent upon submission by Contractor of a certificate stating the following:
 - a. Manufacturer is currently and regularly engaged in manufacturing of elevator equipment as one of his principal products.
 - b. Installer has technical qualifications of at least three years of successful experience, trained supervisory and installation personnel, and facilities to install elevator equipment specified herein.
 - c. Contractor shall submit a list of two or more prior parking facilities directly related to hospital installations where all the elevator equipment the contractor proposes to furnish on this project has performed satisfactorily together under conditions of normal use. The list shall include projects that have been in operation for a period of not less than two years preceding the date of these specifications; include the name and addresses of the Parking Structure operator as well as the related Medical Center and the Medical Center Administrators.
 - 2. All hydraulic elevators shall be the product of the same manufacturer.
 - 3. Approval of manufacturer's equipment will be contingent upon his having a permanent and satisfactory maintenance service branch which shall render services within two hours of receipt of notification.

Manufacturer shall submit the names and address of his authorized branch or service department which will render service to this installation, together with certification that the quantity and quality of replacement parts stock on hand is sufficient to warranty continued operation of the elevator installation.

4. Approval will not be given to any Elevator Contractor and/or manufacturer who has established on prior projects, either Government, municipal, or commercial, a record for unsatisfactory elevator installations, or has repeatedly failed to complete contracts awarded to him within the contract time, or has not the requisite record of satisfactorily performing elevator installations of similar type and magnitude.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only:

- B. Federal Specifications (Fed. Spec.):

J-C-30B(1).....Cable and Wire, Electrical (Power, Fixed Installation)
J-C-580B(1).....Cord, Electrical and Wire, Electrical (0 to 600-Volt Service)
W-C-596/12F.....Connector, Receptacle, Electrical, General Purpose, Duplex, Hospital Grade Grounding, 2 Pole, 3 Wire, 15 Amperes, 125 Volts, 50/60 Hertz
W-F-406D.....Fittings for Cable, Power, Electrical and Conduit, Metal Flexible
W-F-408E.....Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-Wall (EMT) Type)
W-S-610E.....Splice Connectors
FF-S-325.....Shield, Expansion; Nail Expansion; and Nail, Drive
QQ-S-766D.....Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip
L-P-508H.....Plastic Sheet, Laminated, Decorative and Non-Decorative (Style "D" Type I Class 25 Plastic Laminate)
TT-E-489.....Enamel, Alkyd, Gloss, Low Voc Content
WW-C-566C.....Conduit, Metal, Flexible

- C. American Society for Testing and Materials (ASTM):

- A1008/A1008M-02.....Steel, Sheet, Cold Rolled, Carbon, Structural,
High-Strength Low-Alloy and High Strength Low-
Alloy with Improved Formation
- C612-00a.....Mineral Fiber Block and Board Thermal Insulation
- E1042-92(1997)e1.....Acoustically Absorptive Materials Applied by
Trowel or Spray
- D. Manufacturer's Standardization Society of the Valve and Fittings
Industry (MSS):
SP-58-1993.....Pipe Hangers and Supports
- E. American Society of Mechanical Engineers (ASME):
A17.1-2000.....Safety Code for Elevators and Escalators
A17.2-2001.....Inspectors Manual for Elevators and Escalators
- F. National Fire Protection Association (NFPA):
70-2002 or current code. National Electric Code
252-2003.....Fire Test of Door Assemblies
- G. Society of Automotive Engineers, Inc. (SAE)
J517-91.....Hydraulic Hose, Standard; April 1991
- H. Gages:
For Sheet and Plate: U.S. Standard (USS)
For Wires: American Wire Gauge (AWG)
- I. American Welding Society (AWS):
D1.1-2002.....Structured Welding Code - Steel
- J. National Electrical Manufacturers' Association (NEMA):
LD3-2000.....High-Pressure Decorative Laminates
- K. Underwriter's Laboratories (UL):
486A-97 Ninth Edition...Wire Connectors and Soldering Lugs for Use with
Copper Conductors
797-83.....High Safety Electrical Metallic Tubing
- L. Regulatory Standards:
A Specification 16721 Fire Alarm - Local Building System
VA Barrier Free Design Handbook (H-08-13)
Uniform Federal Accessibility Standards - 1988
Americans with Disabilities Act - 1991

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA,
AND SAMPLES.
- B. Complete scaled and dimensioned layout of each elevator installation in
plan, elevation, and section.
- C. Complete layout showing location of storage tank; pump; controller;
selectors and supervisory panels; outside diameter of cylinder; plunger;

pipng layout and working pressure; clearance of car at top and bottom of hoistway when car makes normal stops at terminals, and clearance of car at bottom of hoistway when buffers are fully compressed; car platform; size of car frame members; support assembly and weights of principal parts.

- D. Complete drawings of hoistway entrances and doors showing details of construction, and method of fastening to structural members of building.
 - 1. If dry-wall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
- E. Drawing showing methods of fastening conduit or duct systems, fixture boxes, fascia plates, intermediate supports, rail brackets, and hoistway construction.
- F. Complete drawings of elevator car enclosure, showing dimensioned details of construction, location of car equipment, fastenings to platform, car lighting, ventilation, ceiling framing and top exit:
 - 1. Dimensioned drawings showing details of guide shoes.
- G. Dimensioned drawings showing details of all signal and car equipment and fixtures.
- H. Complete drawings showing details of jack unit.
- I. Dimensioned drawings and description of power door operator and photo-electric devices.
- J. Dimensioned drawings and description of hoistway door hangers.
- K. Cuts of drawings of hydraulic fluid scavenger pump system.
- L. Complete dimensioned hydraulic fluid storage tank and jack unit.
- N. Samples (One each):
 - 1. Stainless steel plate, 75 mm by 125 mm (3-inches by 5-inches.)
 - 2. Baked enamel plate, 75 mm by 125 mm (3-inches by 5-inches.)
 - 3. Color vinyl floor tile, .31 mm (12-inch square.)
 - 4. Protection pads, 75 mm by 125 mm (3-inches by 5-inches.)
 - 5. No other samples of materials specified shall be submitted unless specifically requested after submission of manufacturer's name. In case such samples are furnished pursuant to request, adjustment in contract price and time will be made as provided in Section 00 72 00, GENERAL CONDITIONS.
- O. Materials Data: Submit the name of manufacturer and type or style designation of the following for approval:
 - 1. Controllers.
 - 2. Size of hydraulic power unit.
 - 3. H.P. and R.P.M. of hydraulic power unit motor.
 - 4. Electric control valves, including capacity range.

5. Electric power and power door operator.
6. Hoistway door interlocks and electric contacts.
7. Stroke, certified maximum and minimum loads and maximum striking speed of car buffers.
8. HP and CFM rating on cab ventilation unit.

1.5 WIRING DIAGRAMS

- A. Provide three (3) sets field wiring and straight line wiring diagrams showing all electrical circuits of all elevator equipment in the hoistway, as well as the machine room. One (1) set of diagrams shall be framed under plastic or on pivoted hardboards coated with an approved plastic sealer, and mounted in each elevator machine room as directed by Resident Engineer. In the event field modifications are found necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection.
- B. Diagrams shall be delivered to the Resident Engineer within 30 days of final acceptance.

1.6 ADDITIONAL EQUIPMENT

- A. Furnish and install any additional equipment required to operate specified equipment manufactured or contemplated for this installation.
- B. Special equipment not required by specification, but manufactured by elevator contractor, which would improve the operation as a whole, may be installed on or in conjunction with the specified equipment by the contractor at his option at no additional cost to the Government, provided prior approval is obtained from the Contracting Officer.

1.7 TOOL CABINET

Provide a metal tool cabinet, having two shelves and a hinged door. cabinet size shall be approximately 1200 mm (48 inches) high, 450 mm (18 inches) wide, 375 mm (15 inches) deep and shall contain not less than 213.4 cubic cm (7 cubic feet) of storage.

1.8 PERFORMANCE STANDARDS

- A. The elevators shall be capable of meeting the highest standards of the industry and specifically the following:
 1. Contract speed shall mean speed in the UP direction with full capacity load in the car. Speed variation under any load condition, regardless of direction, shall be no more than ten (10) percent.
 2. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. The door opening time:
 1. Door opening shall be not more than 2.2 seconds maximum.
 2. Door closing time shall be 2.7 seconds minimum.

- C. Cycle time shall be measured from the time the doors starts to close until the car has reached the next floor level, with the car stopped within the level allowance of plus or minus 3 mm (1/8 inch). Cycle time shall be not more than 13.5 seconds. The measured floor-to-floor time interval shall be accomplished without re-leveling, and with advance door opening action.
- D. Pressure: Fluid system components shall be designed and factory tested for 500 p.s.i. maximum operating pressure shall be 500 p.s.i.
- E. Floor Accuracy
 - 1. Accuracy shall be maximum 3 mm (1/8 inch) above or below the floor, regardless of load condition.

1.9 WARRANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of one (1) year from the date of acceptance of the entire installation by the Contracting Officer. Warranty shall commence upon final inspection and completion of performance test and upon full acceptance of the installation.
- B. If it becomes evident during warranty period that any device is not functioning properly or in accordance with specification requirements, or if in the opinion of the Contracting Officer, excessive maintenance and attention must be employed to keep device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation of installation is obtained. Period of warranty shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Where stainless steel is specified, it shall be corrosion resisting steel complying with Fed. Spec. QQ-S-766, Class 302 or 304, Condition A with Number 4 finish (150 grit) on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension and surfaces shall be smooth and without waves. During erection, protect all stainless steel surfaces with a suitable material.
- B. Where cold rolled steel is specified, it shall be low-carbon steel rolled to stretcher leveled standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. Materials, devices and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items.
- B. When two or more units of same class of materials, devices or equipment are required, these units shall be products of one manufacturer.
- C. Manufacturers of equipment assemblies which include components made by others shall assume complete responsibility for the final assembled unit.
1. All components of an assembled unit shall be products of same manufacturer.
 2. Parts which are alike shall be the product of a single manufacturer.
 3. Components shall be compatible with each other and with the total assembly for the intended service.
- D. Welding: Welding at the project site shall be made by welders and welding operators who have previously qualified by test as prescribed in American Welding Society Publication AWS D1.1 to perform type of work required.
- E. Motor nameplates shall state manufacturer's name, rated horsepower, speed, volts, amperes and other characteristics required by NEMA standards, and shall be securely attached to the item of equipment in a conspicuous location.
- F. Where key-operated switches or key-operated cylinder locks are furnished in conjunction with any component of the elevator installation, four keys for each individual switch or lock shall be furnished. Barrel keys are not acceptable. Attach each key to a tag bearing a stamped or etched legend identifying its purpose. Engrave tags and imprint "Property of U.S. Government" on reverse side.

2.3 CAPACITY, SPEED AND TRAVEL

- A. Direct-plunger elevator shall have the capacity to lift the live load exclusive of the weight of entire car and plunger, as specified in the following schedule.

Elevator Number	
Overall Platform Size	7'-0" X 6'-2"
Rated Load - kg(pounds)	3500 lbs.
Rated Speed - m/s(fpm)	125 fpm
Total Travel)	34'-0"
Number of Stops	4 Stops

Number of Openings	4 Openings
Entrance Type & Size	3'-6" Single Speed Single-Slide Side-Opening
Cabs	Steel construction
Visible Equipment in the Hoistway	All visible equipment, switches, etc. shall be treated with 3 coats of rustoleum paint; paint color Black. This includes all car and hoistway fixture boxes, leveling switches, guide rails (non-running surface), top of car, etc.

- B. Actual elevator speed shall not vary more than 10 percent above nor more than 10 percent below specified speed.

2.4 POWER SUPPLY

- A. For power supply in each machine room see specification Division 26, ELECTRICAL and electrical drawings.
- B. It shall be the electrical contractor's responsibility to supply the labor and materials for the installation of the following:
1. A feeder from the power source indicated on the drawings to each hydraulic controller.
 2. Shunt Trip Circuit Breaker for each controller located at the strike side of the machine room door. Shall be lockable in the "Off" position.
 3. Auxiliary circuits for hydraulic signal and control systems as indicated on the drawings, from the indicated source to each hydraulic controller. The hydraulic controller, the elevator contractor shall supply and install motor and power and signal wiring from the controller to the machine.
- C. Power for auxiliary power operation of elevator as specified hereinafter shall be available from auxiliary power generator, including wiring connection to the elevator control system, and be provided by the general contractor or under Section 26 32 13, ENGINE GENERATORS. See Section 14 24 00, HYDRAULIC ELEVATORS, Paragraph, 2.33 AUXILIARY POWER OPERATION.

2.5 CONDUIT PER NEC

- A. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushing. Install a steel locknut under the bushing if they are constructed completely of insulating materials. Protect the conductors at ends of conduits not terminating in steel cabinets or

boxes by terminal fittings having an insulated opening for the conductors.

- B. Do not use set screws or indentations as a means of attachment or connection. Use compression fittings.
- C. Conduit size: 19mm (1/2") minimum.
- D. Flexible metal conduit not less than 9.5 mm(3/8-inch) electrical trade size may be used, not exceeding 457 mm (18 inches) in length, for short connections between risers and limit switches, interlocks, and for other applications permitted by the NEC. Flexible heavy-duty service cord, type S.O., may be used between fixed car wiring and switches on car doors for safety edges and light ray devices.
- E. Provide terminal boxes for the conduit and wiring connections to the pump motor.
- F. Size conduit, junction boxes, outlet boxes, etc., for future travel requirements.

2.6 CONDUCTORS

- A. Unless otherwise specified, conductors, exclusive of traveling cables, shall be stranded or solid coated annealed copper in accordance with Fed. Spec. J-C-30 for either Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, either single conductor cable in accordance with Fed. Spec. J-C-580 for Type TF, or multiple conductor cable, may be used provided the insulation of single conductor cable and outer jacket of multiple conductor cable is flame retardant and moisture resistant. Multiple conductor cable shall have color coding or other suitable identification for each conductor. Conductors for control boards shall be in accordance with NEC. Permit no joints or splices in wiring except at outlets. Tap connectors may be used in wireways provided they meet all UL requirements.
- B. Provide all necessary conduit and wiring between remote machine room and hoistway.
- C. All wiring must test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one megohm.
- D. Where size of conductors is not given, capacity shall be such that maximum current shall not exceed limits prescribed by NEC.
- E. Provide equipment grounding. Ground conduits, supports, controller enclosures, motors, platform and car frames, and all other non-current conducting metal enclosures for electrical equipment in accordance with NEC. The ground wires shall be copper, green, insulated and sized as

required by NEC. Bond the grounding wires to all junction boxes, cabinets, and wire raceways.

- F. Terminal connections for all conductors used for external wiring between various items of elevator equipment shall be solderless pressure wire connectors in accordance with Fed. Spec. W-S-610. The Contractor may, at his option, make these terminal connections on No. 10 or smaller conductors with approved terminal eyelets set on the conductor with a special setting tool, or with an approved pressure type terminal block. Terminal blocks using pierce-through serrated washers are not acceptable.

2.7 TRAVELING CABLES

- A. Traveling cables from junction box on car to junction box in hoistway or directly to controller shall consist of flexible traveling cables conforming with requirements of NEC. Equip junction boxes in hoistway and on car with terminal blocks. Provide all connections to terminal blocks with either terminal eyelet connections or pressure wire connectors of the clamp type that meet UL 486A requirements from stranded wire. Terminal blocks shall have permanent indelible identifying numbers for each connection. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending or twisting producing distortion of cable shall not be allowed.
- B. Provide 10 percent, but not less than 5 spare conductors in each traveling cable.
- C. Provide shielded traveling cable wires for the auto dial phone system in each elevator car. Cable shall extend from auto dial phone system in car directly to controller or from junction box in hoistway to controller.
- D. Six hundred millimeter (24 inch) wide hardware cloth shall be installed from each hoistway junction box downward to the elevator pit to prevent traveling cables from rubbing or chafing. Hardware cloth shall be securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flush wall.
- E. For type and location of hoistway lighting and intercom junction boxes, see contract drawings.

2.8 CONTROLLERS

- A. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.

- B. Wiring: Controller wiring shall be neatly arranged, readily accessible, easily traced and securely fastened in place. Identify all spare conductors to controller.
- C. Identify each device and fuse (ampere rating) on panels by name, letter, or standard symbol, in an approved indelible and legible manner on device or panel. Coordinate identification markings with identical markings or wiring diagrams.
- D. Provide solid state components and printed circuit boards to control the hydraulic machine or signal functions. If this option is exercised, complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval prior to manufacture. Incorporate the following features into the design:
 - 1. The electrical connections between the printed circuit boards (modules) and the circuit connectors incorporated in the mounting racks shall be made through individual tabs which shall be an integral part of each module. The tabs shall be nickel-gold plated or other approved metal of equal electrical characteristics. Notch modules so as to prevent insertion of the modules in the inverted position.
 - 2. Light emitting diode (LEDS) may be used for visual monitoring of individual modules.
 - 3. Components shall have interlocking circuits to assure fail-safe operation and to prevent unwarranted elevator movement in case any component fails to function properly.
 - 4. Submit method of wire wrappings for point to point wire connections on the mounting racks for approval.
 - 5. Modules shall be of the type that plug into pre-wired mounting racks. No field wiring or alteration shall be necessary in order to replace defective modules.
 - 6. Any field wiring changes required during construction shall be made only to the mounting rack connection points and not to the individual module circuitry or components. Any changes to individual modules shall be performed at the factory.
 - 7. Fabricate module boards from non-conductive, non-corrosive material which is of sufficient strength so as to support all components mounted thereon without warping. Space mounting racks sufficiently apart to prevent accidental contact between individual modules.
 - 8. All logic symbols and circuitry designations shall be in accordance with ASME Standards.

9. Design solid state components to operate at a maximum of 40 degrees C (104 degrees F).
10. Bring wiring connections for operating circuits and for external control circuits to terminal blocks mounted in an accessible location within the controller cabinet. Terminal blocks using pierce-through serrated washers shall not be acceptable.

2.9 MICROPROCESSOR CONTROL SYSTEM

The Contractor shall, provide solid state components and printed circuit boards to control the hoisting machine and signal functions in accordance with these specifications. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval.

2.10 HYDRAULIC JACK UNIT

- A. Design cylinder and plunger in accordance with ASME A17.1. It shall be of sufficient size to lift gross load the height specified. Factory test at a pressure equal to twice the calculated working pressure, for strength and to insure freedom from leakage. Provide bottom of cylinder head with internal guide bearing and top of cylinder head with removable packing gland. Packing gland shall permit ready replacement of packing. Victaulic type packing gland head will not be permitted.
 1. Provide a bleeder valve located below the cylinder flange on the jack unit to release air or other gases from the system.
 2. Equip cylinder with drip ring below the packing gland to collect leakage of hydraulic fluid.
 3. Bolt the jack unit mounting brackets to continuous footing channels that also support the rails and buffers.
- B. Install a copper tubing scavenger line with a electrically operated pump between the piston drip ring and oil storage tank. Scavenger line, pump and strainers shall operate independently of hydraulic fluid pressure. Equip scavenger pump with a water float designed to prevent operation of the pump, should the pit flood. Also, design to be manually reset. Strap the pump and reservoir to the pit floor.
- C. Plunger shall be heavy seamless steel tubing, turned smooth and true to within plus or minus .38 mm (0.015-inches) tolerance and no diameter change greater than .07 mm (0.003-inches per-inch) of length. Ground the plunger surface to a fine polish finish, 12 micro-inches or finer. Where plunger is multi-piece construction, machine turn the joints to assure perfectly matching surfaces. No tool marks shall be visible.
 1. Secure plunger to underside of platform supporting beams with fastenings capable of supporting four times the weight of the

- plunger. The platen shall incorporate piston car vibration isolator as, hereinafter, specified.
2. Provide a stop ring electrically welded or screwed to the bottom of plunger to positively prevent plunger from leaving its cylinder.
 3. Isolate plunger head from the platen to prevent corrosion or electrolysis.
 4. Carefully protect plunger and replace if gouged, nicked or scored.
 5. If conditions beneath the pit floor are not adequate to support the total loading of the elevator, install reinforcing members in the pit floor.
- D. Before installation, clean entire cylinder wall of all traces of oil, grease, moisture, dirt and scale.

2.11 HYDRAULIC JACK UNIT CASING

- A. The casing shall be iron or steel not less than 0.375-inch thick, at least 15.2 mm (six-inches) larger in diameter than the cylinder. The Elevator Contractor shall demonstrate to the Resident Engineer that the casing has been accurately set, positioned, and plumbed to accept jack unit. Close the bottom with a minimum of 15.2 mm (6-inches) of concrete. Fill space between casing and cylinder and tamp with washed, dry sand after cylinder has been accurately located. After setting, the top of the casing shall be sealed.
- B. Provide PVC casing liner to fit inside steel casing. Fabricate from schedule 80 PVC pipe with watertight bottom and a top flange gasketed to seal to plunger flange and to form a complete, watertight, electrically non-conductive encasement of the entire unit. Provide two one-inch diameter PVC filler elbows and caps at the top of the casing liner. Fill space between jack unit and casing liner with a petroleum-based corrosion preventive by pouring into one filler (both caps removed) until oil is visible in both fillers. Cap both tubes.
- C. Provide suitable well hole to accommodate casing. Coordinate the drilling of jack hole and setting cylinder with construction of concrete pit. Provide watertight joint between the casing and the pit floor at bottom of pit.
- D. Base bid on drilling hole in dirt, sand, rock, gravel, loam, boulders, hardpan, water, or other obstacles. Include the removal of all dirt and debris.

2.12 PUMP UNIT ASSEMBLY

- A. Completely integrate the pump unit for the control of the elevator and self-contain in a unit fabricated of structural steel. The unit shall consist of a hydraulic fluid pump driven by an induction motor together

with oil control valves, piping, etc. Do not install hydraulic equipment within the storage tank. Completely enclose unit on four open sides of the power unit frame with not less than 16 gauge steel removable panel sections. Fully line panel sections on the interior with one-inch rigid board, mineral or glass fiber, or equivalent acoustical insulation.

- B. Design hydraulic system so that working pressure does not exceed 400 p.s.i. under any loading condition.
- C. Pump shall be positive-displacement, rotary screw type, specially designed for hydraulic elevator service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output shall be capable of lifting elevator car with rated capacity, with a speed variation of no more than ten percent between no load and full load. Pump shall operate under flooded suction in an accurately machined case with the clearance required to assure maximum efficiency. Hydraulic fluid by-pass shall discharge directly into storage tank.
- D. Submersible pump unit not acceptable.
- E. Motor shall be squirrel-cage, drip proof, ball bearing, induction type, with a synchronous speed not in excess of 1800 RPM. Design motor specifically for elevator service, not to exceed nameplate full load current by more than 10% and be continuously rated 120 starts per hour without exceeding a rise of 40 degrees C. Include closed transition SCR soft start.
- F. Connect motor and pump with multiple V-belt. Size belts and sheaves for duty involved and design to prevent any metallic contact between motor and pump shaft. Provide isolation units of rubber in shear to prevent transmission of pump and motor vibration to the building. Install expanded metal sheave guard that can be easily removed for servicing and inspection.

2.13 HYDRAULIC SYSTEM

- A. Construct the storage tank of sheet steel, welded construction, and a steel cover. Suitable means for filling, a minimum one-inch protected vent opening, an overflow connection, and a valved drain connection. Tank shall act as a storage tank only, and sized to pass through machine room door as shown on drawings. Provide marked gauge to meter hydraulic fluid level. Tank shall be of capacity to hold volume of hydraulic fluid required to lift elevator to top terminal landing, plus a reserve of not less than ten gallons. Provide a baffle in the bottom of the tank to prevent entry of any sediment or foreign particles into hydraulic system. Baffle shall also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level shall be clearly indicated.

Hydraulic fluid shall be of good grade to assure free flow when cool, and have minimum flash point of 400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.

1. Thermostatically control the viscosity of the hydraulic fluid with thermal cooling unit and temperature thermostat to maintain the fluid temperature in the reservoir, pump and valves at a constant operating viscosity.
 2. Provide a data plate on the tank framing indicating the characteristics of the hydraulic fluid used.
- B. Furnish and install connections between the storage tank, pump, muffler, operating valves, and cylinder complete with necessary valves, pipe supports, and fittings. All connections between the discharge side of the pump, check valve, muffler, cylinder, lowering valves shall be of schedule 40 steel with screw, flanged, welded, or approved flexible or mechanical couplings. Size of pipe and couplings between cylinder and pumping unit shall be such that fluid pressure loss is limited to 10 percent.
- C. Do not subject valves, piping, and fittings to working pressure greater than those recommended by the manufacturer.
- D. Support all horizontal piping. Place hangers or supports within 3 mm (12 inches) on each side of every change of direction of pipe line and space supports not over 3.0 meters (10 feet) apart. Secure vertical runs properly with iron clamps at sufficiently close intervals to carry weight of pipe and contents. Provide supports under pipe to floor.
1. Provide all piping from remote machine room to hoistway, including necessary supports or hangers. If remote piping is underground or in damp, inaccessible areas, install hydraulic piping thru PVC sleeve pipe.
- E. Install pipe sleeves where pipes pass through walls or floors. Set sleeves during construction. After installation of piping, equip the sleeves with snug fitting inner liner of either glass or mineral wool insulation.
- F. Install blowout-proof, non-hammering, oil-hydraulic muffler in the hydraulic fluid supply pressure line near power unit in machine room. Design muffler to reduce to a minimum any pulsation or noises that may be transmitted through the hydraulic fluid into the hoistway.
- G. Solenoid operate and arrange control valves so hydraulic fluid flow will be controlled in positive and gradual manner to insure smooth starting and stopping of elevator.

- H. Provide safety check valve between cylinder and flexible pump connection which will hold elevator with specified load at any point when pump stops or pressure drops below minimum operating levels.
- I. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Weld pipe protruding from cylinder at inlet and thread to receive shut-off valve. Activate the automatic shut-off valve when there is a ten percent drop in no-load operating pressure. When activated, this device shall immediately stop the descent of the elevator, and hold the elevator until it is lowered by use of the manual lowering feature of the valve. Arrange the manual lowering feature of the automatic shut-off valve to limit the maximum descending speed of the elevator to 15 FPM. The exposed adjustments of the automatic shut-off valve shall have their means of adjustment sealed after being set to their correct position.
- J. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.
- K. Provide all pump relief and other auxiliary valves to comply with the requirements of the Code and to insure smooth, safe, and satisfactory operation of elevator.
- L. Furnish and adjust by-pass and relief valve in accordance with Rule 3.19.4.2 of ASME A17.1.
- M. Install check valve to hold the elevator car with rated load at any point when the pump stops.
- N. Provide a shut-off valve in the pit near the jack and in the machine room capable of withstanding 150 percent of design operating pressure. Manual valve shall have handle attached to the valve.
- O. Conveniently locate the manual lowering valve, easily accessible, and properly identified with a red arrow and not concealed within the storage tank. Mark the operating handle in red.
- P. Provide a low oil control feature which shall shut off the motor and pump and return the elevator to the lowest landing. Upon reaching the lowest landing, doors will open automatically allowing passengers to leave the car. Then doors shall close. All control buttons, except the door open button, shall be made ineffective.
- Q. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan shall be not less than 16 gauge sheet steel, with one-inch sides.
- R. The entire hydraulic system, including muffler, shall be tested to withstand a pressure equal to twice the calculated working pressure. Submit certification that test has been performed.

2.14 GUIDE RAILS

- A. Guide rails shall be planed steel, standard T-Section, securely fastened to building structure with steel brackets by means of bolts and heavy duty steel rail clips. Rails shall weigh not less than 15 pounds per foot and have suitable size and weight for the application. Rails shall conform with ASME A17.1, and located so that the entire car assembly is in true balance with the guide rails.
- B. Support guide rails by brackets at each floor. Where fastenings are over 4.3 meters (14 feet) apart, reinforce rails with 2.3 mm (9 inch) channel backing, or approved equal, to secure the rigidity required for elevator capacity, platform size and method of loading.
- C. Locate all joints so as not to interfere with supporting clamps and brackets. Design shims used to secure rail alignment so that they remain in position, even though the fastening bolts may be loosened.
- D. Extend guide rails from channels on pit floor to within three-inches of the underside of the concrete slab at the top of the hoistway with a maximum deviation of 1/8 inch from plumb in all directions. Provide a minimum of 3/4-inch clearance between bottom of rails and top of channels.
- E. Guide rail anchorages in pit shall be made in a manner that will not reduce the effectiveness of the pit waterproofing.
- F. Clean guide rails of any signs of rust or abrasion, and file to remove all rough edges prior to final inspection. File all guide rail joints to assure perfectly matching surfaces.
- G. For attachment of guide rails in concrete or brick, where steel framing is not available, install approved inserts or bond blocks.

2.15 CAR GUIDES

- A. Install on car frame four adjustable roller guides each assembled on a substantial metal base, to permit individual self-alignment to the guide rails.
- B. Roller Guides
 - 1. Each guide shall be of an approved type consisting of not less than three (3) wheels, each with a durable, resilient oil-resistant material tire rotating on ball bearings having sealed-in lubrication. Assemble rollers on a substantial metal base and mount to provide continuous spring pressure contact of all wheels with the corresponding rail surfaces under all conditions of loading and operation. The wheels shall be of ample diameter and shall run on three-machine finished dry rail surfaces. Secure the roller guides at top and bottom on each side of car frame and counterweight frame. All

- mounting bolts shall be fitted with nuts, flat washers, split lock washers and if required, beveled washers.
2. Provide sheet metal guards to protect wheels on top of car.
 3. Minimum diameter of car rollers shall not be less than 152 mm (6 inches). The entire elevator car shall be properly balanced to equalize pressure on all guide rollers. Cars shall be balanced in post-wise and front-to-back directions. Test for this balanced condition shall be witnessed at time of final inspection. //

2.16 CROSSHEAD DATA PLATE

Permanently attach a non-corrosive metal data plate to car crosshead. Data plate shall bear information required by Rule 2.16.3 and 2.20.2.1 of ASME A17.1. Etch or stamp such information on plate.

2.17 CAR BUFFERS

- A. Provide a minimum of two spring buffers for each car, in accordance with Rule 3.22 of ASME A17.1. Securely fasten buffers and supports to the pit channels, and in the alignment with striker plates on car. Permanently fasten to each buffer a metal plate showing stroke and loading rating. Buffer anchorage shall not puncture pit waterproofing.
- B. Design and install buffers to provide minimum car runby required by Rule 3.4.2 of ASME A17.1.
- C. Furnish pipe stanchions and struts, as required, to properly support the buffer.

2.18 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Mount normal stopping switch on car or in hoistway to slow speed of car and bring it to an automatic stop level with the terminal landings.
 1. Switch shall function with any load up to and including 125 percent of rated elevator capacity at any speed obtained in normal operation.
 2. Switch, when opened, shall permit operation of car in reverse direction.
 3. No normal stopping device, other than one mounted on car and activated by cams in hoistway, or mounted in hoistway and activated by cams on car, shall be permitted.
- B. Mount final terminal stopping switches in the hoistway.
 1. Switches shall be positively opened by car, should the car travel beyond the normal stopping switches.
 2. Switches shall be independent of other stopping devices.
 3. Switches, when opened, shall remove power from hoist motor, apply hoist machine brake, and prevent operation of car in either direction.

- C. After final stopping switches have been adjusted, through bolt switches to guide rail.

2.19 TOP-OF-CAR OPERATING DEVICE

- A. The device shall conform to ASME A17.1 and the following:
1. Activate the device by a toggle switch mounted in the device. The switch shall have the "ON" and "OFF" positions permanently marked on the faceplate with 1/4-inch letters.
 2. Accomplish movement of the elevator by the continuous pressure on a direction button and a safety button.
 3. Provide an emergency stop toggle type switch as per ASME.
 4. Provide permanent identifications for the operation of all components in the device.
 5. Permanently attach the device to the elevator crosshead, on the side of the elevator which is nearest to the hoistway door opening.

2.20 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacles and lamp, with wire guards on top of elevator car and beneath platform.
- B. The receptacles shall be in accordance with Fed. Spec. W-C-596/12D for Type D7, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts.

2.21 CAR LEVELING DEVICE

- A. Provide car leveling device for elevator which shall automatically bring car to within 3 mm (1/8-inch) of exact level with floor landing regardless of load in car or direction of travel.
- B. When the car is traveling in the up direction, the car shall level up to the floor; and when the car is traveling in the down direction, the car shall level down to the floor. The car shall at all times level into the floor and shall not stop above or below the floor and level back.
- C. One-way leveling, augmented with an anti-creep device, shall not be acceptable.

2.22 EMERGENCY STOP SWITCHES

- A. Provide each top-of-car device, pit, etc., with emergency stop toggle switches. Mount stop switch on top-of-car in a common fixture with the top-of-car operating device and stop switch in the pit adjacent to pit access door or at top of pit ladder.
- B. Each stop switch shall be red in color and shall have its "Identity" and "STOP" and "RUN" positions legibly and indelibly identified.

2.23 OPERATING DEVICE FACEPLATES

- A. Fabricate faceplates for all elevator operating and signal devices from not less than 3 mm (1/8-inch) thick flat stainless steel, with all edges

beveled at least 15 degrees. Install all faceplates flush with surface upon which they are mounted.

- B. Corridor push button faceplates shall be at least 65 mm (2 1/2-inches) wide by 200 mm (8 inches) high. The centerline of all corridor pushbutton fixtures shall be 1 meter (3 feet 6 inches) above the corridor floor.
- C. Fasten all car and corridor operating device and signal device faceplates with non-corrosive white metal spanner head or bristol head tamperproof screws.
- D. Design car and corridor pushbutton faceplates so that pressure on pushbuttons are independent of pressure on pushbutton contacts.
- E. Engraved legends or raised numerals in faceplates shall have lettering ¼ inch high filled with black paint.

2.24 OPERATING DEVICES AT HOISTWAY LANDINGS

- A. Provide a single riser of landing call buttons located at hoistway entrance of each floor. Fixtures for intermediate landings shall contain "UP" and "DOWN" buttons. Fixtures for terminal landings shall contain a single "UP" or "DOWN" button. Each button shall also contain an integral registration light which shall illuminate upon registration of a call and extinguish when that call is answered. If a landing button is operated while the car and hoistway doors are closing at the floor, the call shall be registered for the next elevator. Cancel calls so registered if closing doors are reopened by means of "DOOR OPEN" button, safety edge, or infrared curtain devices.

2.25 ELEVATOR CAR OPERATING PANELS

- A. Locate main car operating panel in car enclosure so that the highest passenger use device shall be no more than 1200 mm (4 feet) above the finished floor. Locate the alarm bell button at the bottom of the panel with the centerline no less than 875 mm (35 inches) above the finished floor.
 - 1. All terminology on main car operating panel and auxiliary panel shall be engraved. Use 6 mm (1/4 inch) or larger letters for all passengers use devices in main and auxiliary car operating panels. Use 3 mm (1/8 inch) letters to identify all other devices in lower section of the main car operating panel.
 - a. Phase II firefighters' operating instructions
 - b. Unique car number
 - c. "No Smoking"
 - d. Car capacity in pounds
 - e. Medical emergency operation

B. Main car operating panel with faceplate mounted on swing front return panel.

1. The control panel shall contain:
 - a. A complete set of raised or flush illuminated pushbuttons with a minimum diameter of 25.4 mm (1 inch). Buttons shall have the floor designation indelibly marked on their face using 13 mm (1/2 inch) characters. The button illumination shall extinguish when the car reverses its travel. As the car stops for a floor, that corresponding button shall be extinguished.
 - b. Emergency stop key switch (red in color) with markings to show "RUN" and "STOP". Emergency stop switch shall be key operated.
 - 1) Connect emergency signal alarm bell button to a 150 mm (6 inch) vibrating bell located on top of car. Furnish and install bell including the necessary wiring and auxiliary devices.
 - c. Emergency signal alarm bell button (red in color). Illuminate button when actuated.
 - d. Two position key operated independent service transfer switch marked "INDEPENDENT SERVICE" with two positions marked "ON" and "OFF".
 - e. A three position key operated fire service switch marked "FIRE OPERATION" with three positions marked "OFF, HOLD and ON".
 - g. A red translucent light jewel with a visual graphic per ASME A17.1 which shall illuminate when required on fire service operation. It shall be marked "FIRE SERVICE".
 - h. An audible signal system for fire service operation.
 - i. A button marked "CALL CANCEL" for fire service operation.
 - j. Door "OPEN" and door "CLOSE" buttons located below the car buttons. locate the door "OPEN" button adjacent to the car door entrance column. For rear openings provide rear door "OPEN" and "CLOSE" buttons for full selective door operation.
 - k. Emergency "Push to Call" button for two way communication with auto dial system. "Push to Call" button or adjacent light jewel shall illuminate and flash when call is acknowledged. Button shall match floor pushbutton design. Provide "Push to Call" button, tactile symbol and Braille adjacent to button mounted integral with car front return panel Engrave "Push To Talk" in 6 mm(1/4 inch) letters over button.
 - l. Medical emergency service light jewel and buzzer.

2.26 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the front return panel opposite the main car operating panel. The auxiliary car operating panel shall contain only those controls essential to passenger operation.
1. Mount red emergency signal alarm bell button, door "OPEN" and door "CLOSE" buttons in an easily identifiable group with stop switch and the alarm bell button mounted at a point no closer than 875 mm (35 inches) to the finished floor and nearest the door jamb.
 2. Complete set of illuminated pushbuttons with a minimum diameter of 25.4 mm (1 inch). Buttons shall have the floor designation indelibly marked on their face using 13 mm (1/2 inch) characters, corresponding to the numbers of the main car operating buttons. Provide the buttons in a compact vertical grouping for center opening doors and a horizontal group for two-speed doors.
 3. Cross-Connect all buttons in the auxiliary car operating panels to their respective buttons in the main car operating panel. Registration of a car call in either panel shall cause the corresponding button to illuminate in both the main and auxiliary car operating panels.
 4. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with non-corrosive white metal spanner head or bristol head tamperproof screws.
 5. Submit design of auxiliary car operating panel for approval.
 6. Install auto dial phone in auxiliary car operating panel.
 7. Emergency push to talk button for two way communication with auto dial system.

2.27 SINGLE CAR SELECTIVE COLLECTIVE AUTOMATIC OPERATION

- A. Provide single car selective collective automatic operation for passenger elevator.
- B. Operate car without attendant from push buttons inside the car and located at each floor adjacent to the elevator entrance. When car is available, automatically start car and dispatch it to the floor corresponding to registered car or hall call. Once car starts, it shall respond to registered calls in direction of travel in the order floors are reached. Do not reverse car directions until all car calls have been answered or until all hall calls ahead of car and corresponding to direction of car travel have been answered. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown

is initiated, automatically cancel the hall call and car call. Hold car at arrival floor an adjustable time interval to allow passenger transfer. Illuminate appropriate push button to indicate call registration. Extinguish light when call is answered.

- C. When all calls in the system have been satisfied, the elevator shall shut down at the last landing served with the car and hoistway doors closed. Registration of a call at the landing where the car is parked shall automatically open the car and hoistway doors. Provide a predetermined time delay to permit passengers entering the parked car to register the call of their choice and establish direction of travel before the system can respond to landing calls registered to the same time above or below the parked car.
- D. Auxiliary Landing Call Operation: In the event of corridor call button circuit failure, elevators are to service each floor in both directions in a predetermined pattern without registration of a call within the elevator. Provide an illuminated signal in the controller to indicate that emergency dispatch operation is in effect. Restoration of the landing call button system shall cause normal operation to resume.
- E. Car lights and fan in the elevator shall not shut off when elevator is idle. Arrange circuits so that power to lights and outlets on top and bottom of car shall not be interrupted.

2.28 INDEPENDENT SERVICE

- A. Provide a two position key operated "INDEPENDENT SERVICE SWITCH" in the main car operating panel which shall have its positions marked "OFF" and "ON". When the switch is in the "ON" position, the car shall respond only to calls registered on landing push buttons. Car and hoistway door shall not close until a car button or the "DOOR CLOSE" button is pressed and held until the interlock circuits are established. Resume normal service when the switch is returned to the "OFF" position.

2.29 FIRE SERVICE

- A. Provide Fire Service as per ASME A17.1.
- B. Smoke Detectors:
 - 1. Smoke detection devices in each elevator lobby, top of hoistway, and machine room, provided by General Contractor. Furnish and install the smoke detection devices, together with all necessary conduit, wiring, relay, etc., required between the Fire Alarm System and the junction box of the elevator lobby control panel, under "FIRE ALARM SYSTEMS". All necessary connections from the elevator lobby control panel to the elevator control system in the machine room shall be furnished and installed under this section of the specification.

2. Upon activation of an elevator lobby, top of hoistway, and machine room smoke detection device, transmit a signal to the building fire alarm control console. Transmit an "Alarm" signal from the console to the elevators, which shall activate the "Fire Service" Phase I operation. The "Alarm" signal received from elevator lobby, top of hoistway, or machine room smoke detection device, except that device located in the main lobby shall activate the same sequence of operation activated by the "Fire Service" key operated switch in the main lobby control panel. Together the "Alarm" signal received from the smoke detection device, located in the main landing lobby, shall activate the same sequence of operation activated by sending the elevator to the designated alternate floor.
3. When an "Alarm" signal initiates Phase I operation, momentary movement of the "Fire Service" key in the lobby control panel to the "ON" position shall be required to return elevators to automatic operation if "Alarm" signal is cleared.

2.30 AUXILIARY POWER OPERATION

- A. The control system shall include provisions for operation on auxiliary power upon failure of the normal power supply.
- B. The electrical contractor provides auxiliary power supply, including its starting means, transfer switch for transfer of elevator supply from normal to auxiliary power, a pair of conductors in a conduit from an auxiliary contact on the transfer switch (contact closed on normal power - open on auxiliary power) to terminals on the elevator controller and other related work. If auxiliary power is not sufficient capacity to run both elevators, provide a timing relay from normal power to auxiliary power and another relay for delay back to normal power.
- C. The elevator contractor provides auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between elevator controllers and remote selector panel as required to permit the elevators to operate as detailed.
- D. Upon loss of normal power supply there shall be a delay before transferring to auxiliary power of three to fifteen seconds maximum the delay shall be accomplished through an adjustable timing device capable of delays from zero seconds to sixty seconds. Following this adjustable delay the associated elevator shall function as follows:
 1. Selector switch in automatic position:
 - a. Not more than one elevator at a time shall be automatically selected and returned to the main floor, at normal speed, open its doors and shut down.

- b. As each elevator reaches the main floor and shuts down, another elevator shall be started and returned.
- c. Any elevator which has manually been removed from automatic service, i.e., inspection service, independent service, fire service, main line switch, shall not receive an automatic return signal.
- d. When an elevator is given a signal to return and it is unable to start or complete its movement to the main floor within a minimum of 20 seconds, it shall be by passed. When an elevator is by passed, another elevator shall be started and returned.
- e. This process shall continue until both elevators have returned to the main floor and shut down.
- f. Any elevator by passed on initial return signal shall be signaled again.

E. Remote Selector Panel:

- 1. Locate as directed by Resident Engineer.
 - 2. Provide selector panel in a NEMA 1B flush type enclosure furnished with a brushed finish stainless steel hinged door and frame. The door shall contain a tumbler type lock furnished with four keys. Identify the enclosure faceplate as "Auxiliary Power Control" with 13 mm (1/2 inch) engraved letters filled with black paint.
 - 3. Brush finish the inside selector panel of stainless steel with each device identified with 3 mm (1/8 inch) engraved letters filled with black paint. The panel shall contain:
 - a. Selector switch or switches for selecting the elevators.
 - b. Pilot lights to indicate normal mode of operation, auxiliary power service available, and which elevator is connected to auxiliary service.
 - c. A lamp test circuit consisting of a momentary contact pushbutton to test all pilot lights in the circuit.
 - d. Provide a permanently mounted, easy to read, instruction plate, which shall include operating instructions for auxiliary power service and instructions for lamp test circuits.
- G. Upon restoration of normal power supply, an adjustable time circuit shall be activated which will cause both cars to remain at the floor, if already there, or stop and remain at the nearest floor if in flight. Actual transfer of power from auxiliary power to normal building power shall take place after both cars are stopped at a floor. Individual cars in each group shall restart at five second intervals.

H. When auxiliary power is not available, provide a power source to send each elevator to the lowest landing by activating the down valve. After the elevator has leveled at the lowest landing, provide power to open the car doors automatically. After a predetermined time the car doors shall close. Power shall stay applied to the door open button so the doors can be opened from inside the elevator only. The elevator shall remain shut down at the bottom landing until normal power is restored. Install a sign on each controller indicating that power is applied to the down valve and door operator during loss of normal power.

2.32 CAR POSITION INDICATOR

- A. Provide an alpha-numeric LED digital position indicator in each main car operating panel, consisting of numerals and arrows not less than 50 mm (2 inch) high, to indicate position of car and direction of car travel. Indicator faceplate shall be stainless steel. Provide L.E.D. or L.C.D. illumination. Locate position indicator in the main car operating panel. When no direction has been established, neither arrow shall be illuminated.
- B. Provide an audible signal to momentarily sound as the car is stopping at, or passing a floor. It shall be no less than 20dB with a frequency no higher than 1500 Hz.

2.33 CORRIDOR POSITION INDICATOR

- A. Provide alpha-numeric digital L.E.D. position indicators directly over hoistway landing entranceways at main landing and designated alternate fire response floor. Indicator cover plates shall consist of faceplates of stainless steel. Numerals shall be not less than 50 mm (2 inches) high. Cover plates shall be readily removable for relamping. In addition to the row of numerals, each indicator shall have a "WHITE" up arrow and a "RED" down arrow. When car is standing at landing with no direction established, arrows shall not be illuminated. Each corridor position indicator shall be equipped with a clearly audible gong which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. All fixtures and lens shall be vandal resistant.

2.34 CORRIDOR LANTERNS

- A. Provide each car entrance with a digital corridor lantern mounted over the hoistway entrances at all floors except main and alternate fire response floors. Provide each terminal landing with a single "UP" or "DOWN" 50mm (2 inch) arrow lantern and each intermediate landing with "UP" and "DOWN" lanterns. Each lens shall be illuminated with L.E.D. illumination of proper intensity, so shielded to illuminate individual

lens only. Connect lanterns to signal, in advance of approach and direction of stopping car whether or not corridor button has been operated at the floor. Hall calls shall receive immediate assignment to individual cars and hall lantern shall sound and illuminate. Corridor lanterns shall not be illuminated when a car passes a floor without stopping. Each lantern shall be equipped with a clearly audible electronic tone which shall sound once for "UPWARD" bound car and twice for "DOWNWARD" bound car. Audible signal shall not sound when a car passes the floor without stopping. Provide adjustable sound level on audible signal. All lanterns lens and fastenings shall be vandal resistant.

2.35 AUDIO VOICE SYSTEM

- A. Provide voice audio activated by stopping at a floor. Audio voice to give floor designations. The voice announcer shall be a digitized floor announcer that will announce the floor numbers and direction of travel and special announcements. The voice announcer will be a natural human voice that receives messages and shall comply with ADA requirements for audible car position indicators. The voice announcer shall have two separate volume controls. One for the floor announcement and another for the floor direction. The voice announcer shall be 250 mm W x 250 mm H x 150 mm D (10 inch W x 10 inch L x 6 inch D) voice box 450 mm (18 inch) full range loud speaker to be located on top of the cab. The voice box shall be concealed above the elevator dome. The speaker shall be mounted center of the elevator dome or as directed by the Engineering Officer. The voice announcer unit shall contain 21 ports which can accommodate 21 standard floors and direction messages. Install voice announcer per manufacturer's recommendations and instructions. The voice announcer shall be the product of one manufacturer of established reputation. Provide manufacturer literature and list of voice messages. Provide special messages for Fire Service, "Do not block doors" or others as directed by Resident Engineer.

2.36 HOISTWAY ACCESS SWITCHES

- A. Provide hoistway access switch for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. When center opening doors are specified, mount the access key switch six feet above the corridor alongside the jamb. The exposed portion of each access switch or its faceplate shall have legible, indelible legends to indicate identity and "UP", "DOWN", and "OFF" positions. Design and location of access switches shall be submitted for approval. Each access switch shall be a constant pressure cylinder type

lock having not less than five pins or five stainless steel disc combination with key removable only when switch is in "OFF" position. Barrel keys not acceptable. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose in the hospital. Arrange the hoistway switch to initiate and maintain movement of the car. When the car is moved down from the top terminal landing, limit the zone of travel to a distance not greater than the height of the car crosshead.

B. Provide emergency keyway for all hoistway entrances.

2.37 HOISTWAY ENTRANCES FOR PASSENGERS ELEVATORS

- A. Provide entrances of metal construction using cold rolled steel, except door frames which shall be of stainless steel. Complete entrances with sills, hanger supports, hangers, tracks, angle struts, unit frames, door panels, fascia plates, toe guards, hardware, bumpers, sight guards, and wall anchors. Paint back of entrances and all exposed hoistway equipment with three coats of black rustoleum.
- B. Provide one piece extruded nickel silver sills with non-slip wearing surface, grooved for door guides and recessed for fascia plates. Sills shall have an overall height of not less than 19 mm (3/4 inch), thickness of not less than 3 mm (1/8 inch), and set true, straight and level, with hoistway edges plumb over each other, and top surfaces flush with finished floor. Grout sills full length after installation.
- C. Construct hanger supports of not less than 4.5 mm (3/16 inch) thick steel plate, and bolted to strut angles.
- D. Structural steel angles 75 mm by 75 mm by 9 mm (3-inches by 3-inches by 3/8-inch) shall extend from top of sill to bottom of floor beam above, and shall be securely fastened at maximum 457 mm (18 inch) O.C. and at each end with two bolts.
- E. Provide jambs and head soffits, of not less than 14 gauge stainless steel, for entrances. Jambs and head soffits shall be combination buck and jamb welded construction, and provided with three tile anchors each side. Side jambs shall be curved type. Radius of curvature shall be about 90 mm (3 1/2-inches). Head jamb shall be square type, and shall overhang corridor face of side jambs by 6 mm (1/4 inch). Rigidly fasten jambs and head soffits to building structure. Provide jambs and head soffits with oiled paper covering suitably taped at factory, or other suitable type of protective covering. After installation, protect jambs and head soffits with wood framing to prevent damage to finish. Solidly grout jambs. Frames shall be satin stainless steel at all floors.

- F. If drywall is used for hoistway construction, submit method of anchoring jambs to front hoistway walls for approval.
- G. Provide hoistway entrance with flush center opening hoistway doors. Door panels shall be not less than 16 gauge sheet steel, flush type construction, and not less than 35 mm (1 1/2-inches) thick. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 0.04-inch in thickness and of the hat section type. At bottom of each panel, provide two accurately fitted removable laminated phenolic or other approved material, guides with fire stops. Reinforce each door panel for hangers, interlock mechanism, power door operator and closer. One door panel of each entrance shall bear a BOCA label, Underwriters' label, or, in lieu of this, other labels may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to Contracting Officer. Fasten sight guard of 14 gauge metal, extending full height of panel, to leading edge of each panel of center opening doors. Door finish shall be textured stainless steel and sight guards shall be stainless steel.
- H. Provide rubber bumpers at top and bottom of strike jambs and/or struts for stopping door panels at limits of travel in opening and closing directions. Provide continuous rubber astragal bumper strip of tongue and groove construction on center opening doors.
- I. Provide 14 gauge sheet steel fascia plates, painted with three coats of black rustoleum, in hoistway to extend vertically from head of hanger support housing to sill above. Plates shall be the same width as the door opening of elevator and adequately reinforced to prevent waves and buckles. Below bottom terminal landing and over upper terminal landing provide suitable toe guard and dust cover beveled back to wall and adequately fastened. Provide cover plate the width of the door opening on hanger pockets.
- J. Provide hangers for hoistway door panels and have means to transmit motion from one door panel to the other. Fasten the hangers to the door sections. Provide with reinforcements at the point of attachment. The hanger shall have provisions for vertical and lateral adjustment. The hanger shall be of the two-point suspension type, consisting of nylon or other non-metallic tired sheaves fitted with dustproof, grease packed ball or roller bearings mounted on a malleable iron or steel bracket. The hanger sheaves shall operate at a relatively low rotational speed, and shall roll on a high-carbon, cold-rolled or drawn steel track shaped so as to permit free movement of sheaves without regard to vertical

adjustment of sheave, bracket or housing. Beneath the track and each hanger sheave, provide a hardened steel up-thrust roller capable of withstanding a vertical thrust equal to the carrying capacity of adjacent upper sheave. The up-thrust shall have fine vertical adjustments, and the face of the roller shaped so as to permit free movement of the hanger sheave. The up-thrust roller shall have ball or roller bearings. Provide the hanger sheaves with steel fire stops to prevent disengagement from tracks. Fit each hanger sheave with a felt, or similar material, wiper to provide a light lubricating film between the sheave and hanger track.

- K. Do not use hangers that are constructed integrally with the door panels.
- L. Provide raised numerals for all openings, with a centerline of 50 mm (2 inches) high, located on each side of entrance frame, at a height of 1500 mm (5-feet) above the landing sill. The numerals shall also contain Braille.
- M. Provide unique car number on every elevator entrance at designated level, minimum 75 mm (3 inches) in height.

2.38 ELECTRIC POWER DOOR OPERATORS, PASSENGER ELEVATORS

- A. Provide a high-speed, heavy duty, direct-current or alternating-current, master-type, door operator to automatically open the car and hoistway doors simultaneously when the car is leveling, and automatically close the doors simultaneously at the expiration of the door-open timing. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to the motor. The door operator shall be capable of opening a car door and hoistway door simultaneously, at a maximum speed of not less than two feet per second. The closing speed of the doors shall be one foot per second. A reversal of direction of the doors from the closing to opening operation initiated by the infrared curtain unit reopening device, or the door "OPEN" button, shall be accomplished within no more than 38 mm (1 1/2-inches) maximum of door movement. Particular emphasis is to be placed on obtaining quiet interlock and door operation, and smooth, fast, dynamic braking for door reversals and stopping of the doors reversals, and stopping of the door extremes of travel. Construct all levers, operating the doors, of heavy steel members, and all pivot points shall have ball or roller bearings. Use electric power to open and close the doors. Auxiliary automatic door closers required under Rule 2.11.3 of ASME A17.1 shall be torsion spring type.
- B. Design the door operator so that in case of interruption or failure of the electric power from any cause, it shall permit emergency manual

operation of both the car door and the hoistway door from within the car, at door zone only, outside of door zone, doors are restricted to 100 mm (4 inch) opening.

1. It shall not be possible for the doors to open by power unless the elevator is within the leveling zone.
 2. Provide infrared curtain unit. The device shall cause the car and hoistway doors to reverse automatically to the fully-open position should the unit be actuated while the doors are closing. Unit shall function at all times when the doors are not closed, irrespective of all other operating features. The leading edge of the unit shall have an approved black finish.
- C. Should the doors be prevented from closing for more than predetermined adjustable interval of 20 to 45 seconds by the interruption or failure of the infrared curtain unit door control shall be rendered inoperative and the doors shall close at reduced speed while a nudging buzzer located on the car shall sound.
1. If an obstruction in the sill should not activate the infrared curtain unit door control device and prevent the doors from closing for more than a predetermined adjustable interval of 45 to 90 seconds, the doors shall reverse to the fully open position and reestablish the closing cycle.
- D. Provide door "OPEN" and "CLOSE" buttons. When the door "OPEN" button is pressed and held, the doors, if in the open position, shall remain open and, if the doors are closing, they shall stop, reverse and reopen. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

2.39 ELECTRIC INTERLOCKS

- A. Equip each hoistway door with true interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position as defined by ASME A17.1. Interlock shall prevent opening of hoistway door from corridor side, unless car is at rest at landing, is operating in leveling zone at landing, or hoistway access switch is used.
- B. Hoistway door interlock shall not be accepted, unless it has successfully met requirements of Rule 2.12.6 of ASME A17.1. Securely fasten approved devices to the car, and arrange to operate the interlocks without objectionable noise, shock or jar.
- C. Equip car doors with electric contact which prevents operation of car until doors are closed as defined in ASME A17.1 unless car is operating in leveling zone or hoistway access switch is used. Locate door contact

to prevent its being tampered with from inside of car. Car door contact shall not be accepted, unless it has successfully met requirements of Rule 2.13 of ASME A17.1.

- D. Wiring installed from the hoistway riser to each door interlock shall be NEC type (SF-2), or equivalent.
 - 1. Type SF-2 cable terminations in the interlock housing shall be sleeved with glass braid fillers, or asbestos braid jackets.
- E. Provide devices, either mechanical or electrical, which shall prevent operation of the elevator in event an accident to or defective door operator equipment has permitted an independent car or hoistway door panel to remain in the "unclosed" or "unlocked" position.
- F. Paint interlock box with three coats of black rustoleum.

2.40 CAR PLATFORM FOR PASSENGER ELEVATORS

- A. Construct the car platform so as to comply with all the requirements of ASME A17.1. Provide car entrances with extruded nickel silver sill or better with machined or extruded guide grooves. Cover underside and all exposed edges of wood filled platform with black sheet iron of not less than 27 gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Platform shall have flexible vinyl composition tile flooring not less than 3 mm (1/8 inch) thick. For color, see Section 09 06 00, SCHEDULE FOR FINISHES. Adhesive material shall be type recommended by manufacturer of tile. Lay tile flush with threshold plate and coved base. Equip platform with 533 mm (21 inch deep sheet-steel toe-guard apron of not less than 12 gauge at hoistway entrance side. Extend at least three-inches beyond each side of entrance jamb. Securely brace toe-guard apron to car construction, and bevel bottom edge at not less than 60 degree angle nor more than 75 degree angle from horizontal. Install platform in the hoistway, so that the clearance between front edge and landing threshold shall not exceed 32 mm (1 1/4-inches).
- B. Provide sound and vibration isolator of neoprene or other resilient material in compression, which will resist oil and aging, in conjunction with platform steel platen. Provide buffer strike plates securely fastened to car frame plank or bolster.
- C. Provide grounding connection between piston and underside of platform or car frame.

2.41 CAR ENCLOSURE FOR PASSENGER ELEVATORS

- A. Car enclosure for passenger elevators shall have a minimum dome height inside the cab of 2440 mm (8 feet).

- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 inches), running through an angle at the base of panels to underside of platform. Provide 6 mm (1/4 inch) bolts with nuts and lock washers.
- C. Front return wall panel, entrance columns, rear corner columns, entrance head, jamb and transom shall be 14 gauge stainless steel. Side and rear wall panels 1220 mm (48 inches) from finished floor to top of panel shall be 14 gauge stainless steel. Side and rear panels from 1220 mm (48 inches) above finished floor up to and including the canopy shall be 14 gauge cold rolled steel covered with stainless steel. Submit a method of fastening particle board to steel. This particle board shall be one piece on back and sides. It shall be flush with the face of the bottom section of the stainless steel. Interior shall be flush panel construction with angles welded on exterior to insure adequate rigidity. Coat exterior of panels with mastic sound insulation material approximately 2.5 mm (3/32-inch) thick followed by a prime coat. Mastic material shall conform to ASTM E1042. Stainless steel wainscot and wall panels above shall be radius "vee" joint with ends of panels turned to exterior and bolted together.
 - 1. Face panels with textured stainless steel.
- D. Provide a hinged top emergency exit to conform to ASME A17.1. Exit shall be unobstructed when open, and shall have a mechanical and electrical stop. Provide contacts to prevent operation of the elevator when the emergency exit is open.
- E. Locate car position indicator in main car operating panel.
- F. Provide duplex, GFCI protected type receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 6-inches above the car floor. The receptacle shall be in accordance with Fed. Spec. W-C-596, 2-pole, 3-wire grounded type rated for 15 amperes and 125 volts. Receptacle face plate stainless steel, and if removable, fasten with white metal tamperproof spanner head or bristol head screws. Receptacle shall permit current to flow only while a standard plug is in the proper position in the receptacle.
- G. Construct canopy of not less than 12 gauge steel.
- H. Provide car lighting with indirect fluorescent, lamps mounted above lighting coves along each side of cab, front to back. Ballasts for fluorescent fixtures shall be rapid starting type, UL Class P with a power factor not less than 90 percent. Sound ratings shall be "A", except for ballast sizes which are not available with "A" ratings as standard products of any manufacturer. Such ballast shall have the

quietest ratings available. Equip the fluorescent fixtures with a symmetrical reflector having specular ALZAK (or equal) finish. Maintain light level at a minimum 20 foot candles. Enclose the entire vertical space between the light trough outer edge and the cab canopy with approved clear plastic sheeting. Install the plastic sheets so that they are removable for cleaning and relamping.

- I. Provide an air conditioning unit manufactured by Quality Elevator Products (1 800 222 3688) or by LiftAire Elevator Motors and Materials Corp (631 293 4220 or 4440) or equal to exhaust through an opening in the canopy. In addition to the AC unit, provide a stainless or chrome plated fan grill around the opening. Provide 2-speed type unit, capable of rated free delivery air displacement of approximately 380 and 700 cfm at respective speed. Mount unit on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide screening over exhaust end of blower. Provide a switch for the air conditioning unit and a 3-position switch to control the unit in main car operating panel.
- J. Car enclosure base shall be of 14-gauge textured stainless steel, 150 mm (6 inches) high. Provide straight type base at front return sides, and rear of car. Vertical face of base at sides and rear shall be flush with, or recessed behind, the wainscot directly above the base. Base shall be not less than 14 gauge. There shall be no exposed fastenings in base. Provide a series of baffled openings around the base of the enclosure which shall provide a minimum area of 450 square mm (18 square inches) and a maximum area of 610 square mm (24 square inches).
- K. Provide car enclosure with double handrails of solid stainless steel, not less than 75 mm (3 inches) wide by 9 mm (3/8 inch) thick. Locate handrails approximately 38 mm (1 1/2-inches) from cab wall. Install handrails on two sides and rear. Curve ends of handrails to wainscoting. Conceal all handrail fastenings, and handrails shall be removable from inside the car enclosure. The centerlines of the handrails shall be 75 mm and 1050 mm (30 and 42 inches) above the car floor.
- L. Provide car entrance with single speed side opening horizontal single sliding car door. Construct door panels to be flush hollow metal construction, not less than 25 mm (1 inch) thick, consisting of not less than one piece continuous 16 gauge textured stainless steel on car side face and leading and trailing edges. Separate the two plates by a sound-deadening material, and reinforce by steel shapes welded to the plates at frequent intervals. Reinforce panels as required for installation of hangers, power-operating and door-opening devices. Hang

doors on two-point suspension hangers having ball-bearing sheaves not less than 75 mm (3 inches) in diameter, with rubber or non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Upthrust roller shall be capable of being locked in position after adjustment to a maximum of 0.015-inch clearance. Provide two non-metallic gibs on each door panel. Gibs shall be replaceable without removal of door panel.

- M. Provide a permanently attached stainless steel capacity plate on elevator. Capacity plate shall be conspicuously located integral with the service cabinet door on either the main or auxiliary car-operating panel. Plate shall show the rated load of the elevator in pounds, with engraved or cast letters not less than 6 mm (1/4 inch) high. Fill engraved letters with black paint. The capacity may be engraved in the main car-operating panel faceplate, in lieu of a separate capacity plate.
- N. Provide an emergency car lighting system on each car, consisting of a rechargeable battery, charger, controls, and light fixture. The system shall automatically provide emergency light in the car upon failure or abnormal interruption of the normal car lighting service, and function irrespective of the position of the light control switch in the car. The system shall be capable of maintaining a minimum illumination of 1.0 foot-candle when measured four feet above the car floor, and approximately one foot in front of the car operating panel, for a period of not less than four hours. The emergency light shall be located in the main car operating panel.
- O. A constant pressure switch that automatically returns to the "OFF" position when released, and a pilot light, for the periodic testing of battery and lamps, shall be provided.
- P. A two position switch shall be provided for the under car lights. Provide a minimum of two lights underneath the car.

2.42 AUTO DIAL PHONE SYSTEM

- A. Furnish and install a complete intercommunication system, as part of this work.
- B. The auto dial system shall be located in the auxiliary car operating panel. The speaker and unit shall be mounted on the backside of the perforated stainless steel plate cover.
- C. An auto dial system shall be provided for each elevator. The auto dial, when activated by the "PUSH TO TALK" button, shall automatically dial to the 24 hour area.
- D. Each elevator shall have an individual phone number.

2.43 SEISMIC REQUIREMENTS

- A. Support and maintain pump unit, controller, selector, rails, rail brackets, conduit, buffers, piping, scavenger pumps and jack unit assembly in place as to effectively prevent any part from sliding, rotating or overturning or jumping under conditions imposed by seismic forces not less than that required to produce an acceleration of gravity horizontally and $\frac{1}{2}$ gravity vertically acting simultaneously. Design the total system to continue operation without interruption under specified seismic acceleration, as outlined in H-18-8.
- B. Support all vertical conduit systems within the hoistway at points above the center of gravity of riser. Provide lateral guides at regular intervals.
- C. Provide hydraulic equipment mounted on vibration isolators with seismic restraints.
- D. Bolt controller and selector panels to the floor and provide with sway braces at top. Secure all electrical components within the panels to the panel frame. Fit doors and hinged panels with positive locking latches.
- E. Car guide rail brackets and rail clip bolts shall be guarded against snagging below the hoistway junction box on the side of the rail adjacent to the point of suspension of the traveling cables.
- F. Provide car guide rails with at least one intermediate bracket between brackets located at each floor so that bracket spacing does not exceed 2400 mm (8 feet). If intermediate brackets cannot be installed because of lack of structural support, reinforce rails with 225 mm (9 inch) channel or approved equal backing.
- G. Size guide rails no less than 15 pounds per foot.
- H. The stresses in parts of structural members made of steel shall not exceed 88 percent of the minimum elastic strength of the material used in the fastenings.
- I. Provide car enclosure ceiling panels and fluorescent tubes with latching devices that shall restrain the panels and fluorescent tubes. Devices shall be readily removable for cleaning or replacing panels and relamping.
- J. Submittals are required for all equipment anchors, supports, restraints and detectors. Submittals shall include weights, dimensions, center of gravity, standard connections, calculations, manufacturer's recommendations, behavior problems (vibration, thermal, expansion, etc.,) so that design can be properly reviewed.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this Section depends. Report defects to Resident Engineer in writing which may affect the work of this trade or equipment operation, dimensions from site for preparation of shop drawings.
- B. Ensure that shafts and openings for moving equipment are plumb, level and in line, and that pit is to proper depth, waterproofed and drained with necessary access doors, ladder, guard.
- C. Ensure that machine room is properly illuminated, heated and ventilated, and equipment, foundations, beams correctly located complete with floor and access door.
- D. Before fabrication, take necessary job site measurements, and verify where work is governed by other trades. Check measurement of space for equipment, and means of access for installation and operation. Obtain dimensions from site for preparation of shop drawings.
- E. Ensure the following preparatory work, provided under other Sections, has been properly completed to receive the elevator work:
 - 1. Supply of electric feeder wires to the terminals of the elevator control panel, including shunt trip circuit breaker. Provision of hoistway outlets for car light and for light in the pit and outlets in machine room for light. Furnishing of electric power for testing and adjusting elevator equipment.
 - 2. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 - 3. Supply of power for emergency cab lighting and ventilation from a power panel specified in Division 26, ELECTRICAL and fed by building emergency circuits.
 - 4. Machine room enclosed and protected from moisture, with self closing, self locking door.
 - 5. Provide fire extinguisher in machine room.
- F. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

3.2 INSTALLATION

- A. Perform work with competent mechanics skilled in this work and under the direct control and supervision of the elevator manufacturer's experienced foreman.
- B. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.

- C. Install machinery, guides, controls, car and all equipment and accessories in accordance with manufacturer's instructions, applicable codes, and standards, to provide a quiet, smooth operating installation, free from side sway, oscillation or vibration.
- D. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.
- E. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.
- F. Grout sills and hoistway entrance frames.

3.3 CLEANING

Prior to final acceptance, remove protection from finished or ornamental surfaces, and clean and polish surfaces with due regard to type of material.

3.4 SPACE CONDITIONS

- A. Attention is called to overhead clearance, pit clearances, overall space in machine room, and construction conditions at building site in connection with elevator work. Addition or revision of space requirements, or construction changes that may be required for the complete installation of the elevators, must be arranged for and obtained by the Contractor, subject to approval of Contracting Officer. Include cost of such changes in bid, and form a part of the contract. Provide proper, satisfactory code legal installation of equipment as a whole, including all construction, accessories and devices in connection with elevator, mechanical and electrical work specified herein.
- B. Where concrete beams, floor slabs or other building construction protrude more than 50 mm (2 inches) into hoistway, bevel all top surfaces of said projections 20 gauge steel to an angle of at least seventy-five degrees with the horizontal.

3.5 ARRANGEMENT OF EQUIPMENT

- A. Clearance around elevator, mechanical and electrical equipment shall comply with applicable provisions of NEC.
- B. Arrange equipment in machine room so that major equipment components can be removed for repair or replacement, without dismantling or removing other equipment in same machine room.
- C. Where applicable, locate controller near and visible to its respective pump unit.

3.6 WORKMANSHIP AND PROTECTION

- A. All installations shall be made in a first class, neat and skillful manner by mechanics experienced in the trade involved. Mechanically and

electrically correct all details of the installation. All materials and equipment shall be new, and without imperfections.

- B. Include recesses, cutouts, slots, holes, patching, grouting, refinishing and the like, to accommodate installation of equipment in the elevator contractor's work. Core drill all new holes in concrete.
- C. No structural members shall be cut or altered. Restore work in place, which has been damaged or defaced, equal to original condition.
- D. Finish work shall be straight, level and plumb, with true, sharp surfaces and lines. Protect all machinery and equipment against dirt, water or mechanical injury. Thoroughly clean all work at final completion, and deliver in perfect unblemished condition.
- E. Grease gun fittings shall be pressure relief type.
- F. Completely enclose selector cables or tapes, which are exposed to accidental contact in the machine room with 16 gauge sheet metal or expanded metal guards.
- G. Guard exposed gears, sprockets, selector drums, etc. from accidental contact, in accordance with Rule 2.10.1 of ASME A17.1.

3.7 PAINTING AND FINISHING

- A. Elevator equipment shall be factory painted with manufacturer's standard finish and color.
 - 1. Elevator pump unit, controllers, and crossheads of cars shall be identified by 100 mm (4 inch) high numerals and letters located as directed. Color of numbers shall contrast with color surfaces to which they are applied.
 - 2. Surface (except contact surfaces of working parts) of elevator items, such as, controllers, car frame, underside of platforms, guide rails, rail brackets, all uncoated ferrous metal items and hydraulic piping shall be given approved prime coat.
 - 3. Upon completion of installation and prior to final inspection, all equipment shall be thoroughly cleaned of grease oil, cement, plaster, and other debris. All equipment, except that which is otherwise specified to have factory finish, shall then be given two coats of paint of approved color.
 - 4. Paint floor designation numbers not less than 100 mm (4 inches) high, on hoistway doors, fascias or walls as required by Rule 100.7 of ASME A17.1. The color of the paint used shall contrast with the color of the surfaces to which it is applied.
- B. Hoistway entrances of passenger elevators:

1. Door panels shall be parkerized or given equivalent rust resistant treatment and a factory finish of one coat of baked on primer and one factory finish coat of baked on enamel, unless stainless steel.
2. Fascia plates, toe guards, dust covers, hanger covers and other metal work, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given approved prime coat in the shop, and one field coat of paint of approved color.

3.8 PRE-TESTS AND TEST

- A. Pre-test as per specifications, the elevators and related equipment, in the presence of the Resident Engineer. Test for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by the Resident Engineer's Representative. Test elevators as specified in the presence of, and under the direction of, the Resident Engineer's Representative. Procedure outlined in the "Inspectors' Manual for Hydraulic Elevators ASME A17.2 shall apply.
- B. Upon completion of elevator installation, conduct operating and car testing for approval of Contracting Officer. Furnish test instruments and materials, including properly marked test weights, voltmeters, amp probe, sound level meter, centigrade thermometers, light meter, stop watch, MEGGER, pressure gauges, direct reading tachometer for making tests and a means of two-way communication. Conduct tests in the presence of, and witnessed by, a QEI certified elevator inspector.
- C. Speed Load Runs: Speed test with no load, 50 percent load, and contract load shall be made in both directions, before the full load run test and after the full load test.
- D. Full Load Run Test: Subject the elevator to a test for a period of one hour continuous run, with specified full load in the car. During test run, stop the car at all floors in both directions of travel, for a standing period of not less than eight nor more than twelve seconds per floor. Elevator starting, stopping, acceleration and deceleration shall remain consistent during the test.
- E. Temperature Rise Test: Test motors during Full Load Run Test to demonstrate that the temperature rise under operating conditions in the building will not exceed 40 degrees C, above ambient, when measured with a thermometer or other approved means. Do not make full load run tests until constant temperatures are reached on all such pieces of equipment.
- F. For installations where microprocessor controls are used:

1. A diagnostic testing device, maintenance terminal or approved means of diagnostic and maintenance suitable for all trouble shooting procedures related to the specific type microprocessor controls installed on this project, shall be provided. This diagnostic testing device or maintenance terminal shall conform to the following:
 - a. The diagnostic testing device or maintenance terminal shall become the property of the Veteran's Administration.
 - b. The diagnostic testing device or maintenance terminal shall be demonstrated and tested during the final testing of the elevator installation.
 - c. A series of not less than ten simulated malfunctions shall be diagnosed properly by the device.
 - d. A period of at least four hours shall be dedicated to the instruction of its use to a representative of the Department of Veterans Affairs designated by the Resident Engineer.
 - e. The diagnostic testing device shall be programmed specifically for this job and this job only.
 - f. The device shall not require recalibration or reconfiguration and shall be functional for the life of the equipment specified herein.
- G. Car Leveling Test: Test elevator car leveling device for accuracy of leveling at all floors with no load, 50 percent load, and full load in car, in both directions of travel before and after temperature test. Accuracy of floor leveling, as specified, shall be within plus or minus 3 mm (1/8 inch) of level with any landing floor for which the stop has been initiated (with a definite range of distance in advance of the landing), regardless of load in car or direction of travel. The car leveling device shall automatically correct over travel as well as under travel, and shall maintain the car floor within plus or minus 3 mm (1/8 inch) of level with the landing floor regardless of change in load.
- H. Setting of the Car-Door Contacts: Measure the position of the car door at which the car may be started. The distance from full closure shall not exceed that required by ASME A17.1. This test shall be made with the hoistway doors closed, or the hoistway door contact inoperative.
- I. Setting of Interlocks: Measure the position of the hoistway door at which the car may be started. And shall not exceed ASME A17.1 requirements.
- J. Overload Devices: Test all overload current protection devices in the system at final inspection.

- K. Operating and Signal Systems: Operate the car by the operating devices provided. The operation, signals, and automatic floor leveling shall function in accordance with the requirements specified. Starting, stopping and leveling shall be smooth and comfortable, without bumps or jars.
- L. Working Pressure: Verify working pressure of the hydraulic system by pressure gauges placed in the system line. Take readings in the machine room with no load, 50 percent load, balanced load and full load in car.
- M. Test automatic shutoff valve for proper operation.
- N. Insulation Resistance: Elevator's complete wiring system shall be free from short circuits and grounds; and the insulation resistance for the system shall be determined by use of MEGGER.
- O. Evidence of malfunction in any tested system or parts of equipment or component part thereof that occurs during, or as a result of, the tests, shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.
- P. If any equipment fails test requirements and a reinspection is required, the Contractor shall be responsible for the cost of reinspection including salaries, transportation expenses and other expenses incurred by the representatives of the Contracting Officer.

3.9 INSTRUCTION OF PERSONNEL

- A. Provide competent instructors to train Veteran's Administration personnel in care and operation of all parts of equipment. Instruction on hydraulic elevator installation shall be given during regular working hours. Instruction shall commence upon completion of all work required and upon initial operation before final acceptance of work. Instructors shall be qualified representatives, possessing complete knowledge of equipment.
- B. Instructors shall be available for one 8-hour working day minimum, with instruction period directed by the Resident Engineer.
- C. In addition to oral instruction, written instructions in triplicate relative to care and operation of all parts of equipment shall be furnished and delivered to the Resident Engineer in independently bound folders. Video cassette recording will also be acceptable. Written instructions shall include complete, correct and legible wiring diagrams, nomenclature sheets of all electrical apparatus, including location of each device, complete and comprehensive sequence of operations, complete parts lists with descriptive literature and identification, diagrammatic cuts of equipment and parts, etc. Information shall also include electrical operating characteristics of

all circuits, fields, relays, timers and electronic devices, as well as RPM values and related characteristics for all rotating equipment. Provide any supplementary instructions for adjustment and care of new equipment as may become necessary due to changes, modifications and/or replacement of equipment or its operation, under requirements of paragraph entitled, "Warranty of Construction".

3.10 INSPECTIONS AND MAINTENANCE

- A. Furnish complete maintenance and inspection service on entire elevator installation for a period of (1) one year after completion and acceptance of the elevator installation by the Resident Engineer. This maintenance service shall begin concurrently with the warranty. Maintenance work shall be performed by skilled elevator personnel directly employed and supervised by the same company that furnished and installed the elevator equipment specified herein.
- B. The maintenance service shall include the following:
 - 1. Bi-weekly systematic examination of equipment.
 - 2. Cleaning, lubricating, adjusting, repairing and replacing of all parts as necessary to keep the equipment in first class condition and proper working order.
 - 3. Furnishing all lubricant, cleaning materials and parts required.
 - 4. The performance standards set forth in this specification, including flight time, cycle time, and door times shall be maintained at all times.
 - 5. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 - 6. Maintain smooth starting and stopping and accurate leveling at all times.
- C. Maintenance service shall not include the performance of any work required as a result of improper use, accidents, or negligence for which the contractor is not directly responsible.
- D. Provide 24 hour emergency call-back service which shall consist of promptly responding to calls within two hours for emergency service should a shutdown or emergency trouble develop between regular examinations. Overtime emergency call-back service shall be limited to minor adjustments and repairs required to protect the immediate safety of the equipment and persons in and about the elevator.
- E. Service and emergency personnel shall report to the Resident Engineer or his authorized representative upon arrival at the hospital and again upon completion of the required work. A copy of the work ticket

containing a complete description of the work performed shall be given to the Resident Engineer.

- F. The contractor shall maintain a log in the machine room. The log shall list the date and time of all weekly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed or parts replaced.

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