

SECTION 14 24 00 HYDRAULIC ELEVATORS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing, and installation of the complete electric hydraulic elevator system as described herein and as indicated on the contract drawings.
- B. Items listed in the singular apply to each and every elevator in this specification except where noted.
- C. Elevator No. 1 shall be oil hydraulic type with microprocessor based control, duplex selective collective automatic operation and power-operated two speed side opening car and hoistway doors. Elevators shall have Class "A" loading.

1.2 RELATED WORK

- A. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.
- C. See Finish Detail and Notes for elevator cab finishes.
- D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- E. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.
- F. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- G. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- H. Section 26 05 71, ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY: Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- I. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- J. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.
- K. VA Barrier Free Design Handbook (H-18-13)

1.3 QUALIFICATIONS

- A. Approval by the Contracting Officer is required for products or services of proposed manufacturers, suppliers and installers and shall be contingent upon submission by Contractor of a certificate stating the following:
 - 1. Elevator contractor is currently and regularly engaged in the installation of elevator equipment as one of his principal products.
 - 2. Elevator contractor shall have three years of successful experience, trained supervisory personnel, and facilities to install elevator equipment specified herein.

3. The installers shall be Certified Elevator Mechanics with technical qualifications of at least five years of successful experience and Apprentices actively pursuing certified mechanic status. Certificates are required for all workers employed in this capacity.
 4. Elevator contractor shall submit a list of two or more prior hospital installations where all the elevator equipment he proposes to furnish for this project functioned satisfactorily to serve varying hospital traffic and material handling demands. Provide a list of hospitals that have the equipment in operation for two years preceding the date of this specification. Provide the names and addresses of the Medical Centers and the names and telephone numbers of the Medical Center Administrators.
- B. Approval of Elevator Contractor's equipment will be contingent upon their identifying an elevator maintenance service provider that shall render services within two hours of receipt of notification, together with certification that the quantity and quality of replacement parts stock is sufficient to warranty continued operation of the elevator installation.
 - C. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record for unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and does not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
 - D. All hydraulic elevators shall be the product of the same manufacturer.
 - F. The Contractor shall provide and install only those types of safety devices that have been subjected to tests witnessed and certified by an independent professional testing laboratory that is not a subsidiary of the firm that manufactures supplies or installs the equipment.
 - E. 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 Publications AWS D1.1 to perform the type of work required. VAMC shall require welding certificates be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and shall be obtained from the COTR of safety department. Request permit one day in advance.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification. Elevator installation shall meet the requirements of the latest editions published and adopted by the United States Department of Veterans Affairs on the date contract is signed.
- B. Federal Specifications (Fed. Spec.):
 - J-C-30B.....Cable and Wire, Electrical (Power, Fixed Installation)
 - W-C-596F.....Connector, Plug, Electrical; Connector, Receptacle, Electrical
 - W-F-406E.....Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
 - HH-I-558C.....Insulation, Blankets, Thermal (Mineral Fiber, Industrial Type)
 - W-F-408E.....Fittings for Conduit, Metal, Rigid (Thick- Wall and Thin-wall (EMT Type)
 - RR-W-410Wire Rope and Strand
 - TT-E-489J.....Enamel, Alkyd, Gloss, Low VOC Content
 - QQ-S-766Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip
- C. International Building Code (IBC)
- D. American Society of Mechanical Engineers (ASME):
 - A17.1Safety Code for Elevators and Escalators
 - A17.2Inspectors Manual for Electric Elevators and Escalators
- E. National Fire Protection Association:
 - NFPA 13.....Standard for the Installation of Sprinkler Systems
 - NFPA 70.....National Electrical Code (NEC)

NFPA 72.....National Fire Alarm and Signaling Code
 NFPA 101.....Life Safety Code
 NFPA 252.....Fire Test of Door Assemblies

- F. American Society for Testing and Materials (ASTM):
 - A1008/A1008M-09.....Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
 - E1042-02Acoustically Absorptive Materials Applied by Trowel or Spray
- G. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):
 - SP-58.....Pipe Hangers and Supports
- H. Society of Automotive Engineers, Inc. (SAE)
 - J517-91Hydraulic Hose, Standard
- I. Gages:
 - For Sheet and Plate: U.S. Standard (USS)
 - For Wires: American Wire Gauge (AWG)
- J. American Welding Society (AWS):
 - D1.1Structured Welding Code – Steel
- K. National Electrical Manufacturers Association (NEMA):
 - LD-3High-Pressure Decorative Laminates
- L. Underwriter's Laboratories (UL):
 - 486ASafety Wire Connectors for Copper Conductors
 - 797Safety Electrical Metallic Tubing
- M. Institute of Electrical and Electronic Engineers (IEEE)
- N. Regulatory Standards:
 - Uniform Federal Accessibility Standards
 - Americans with Disabilities Act

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Before execution of work, furnish information to evidence full compliance with contract requirements for proposed items. Such information shall include, as required: Manufacturer's Name, Trade Names, Model or Catalog Number, Nameplate Data (size, capacity, and rating) and corresponding specification reference (Federal or project specification number and paragraph). All submitted drawings and related elevator material shall be forwarded to the Contracting Officer.
- C. Shop Drawings:
 - 1. Complete scaled and dimensioned layout in plan and section view showing the arrangement of equipment and all details of each and every elevator unit specified including:
 - a. Complete layout showing location of storage tank/pump assembly, controller, piping layout, outside diameter of cylinder/plunger assembly, size of car platform, car frame members, and support assembly.
 - b. Car, guide rails, brackets, buffers, and other components located in hoistway.
 - c. Rail bracket spacing and maximum vertical forces on guide rails in accordance with ASME A17.1 Section 2.23 and Section 8.4.8 for Seismic Risk Zone 2 or greater.
 - d. Reactions at points of supports and buffer impact loads.
 - e. Weights of principal parts.

- f. Top and bottom clearances and over travel of the car.
 - g. Location of shunt trip circuit breaker, switchboard panel, light switch, and feeder extension points in the machine room.
- 2. Drawings of hoistway entrances and doors showing details of construction and method of fastening to the structural members of the building.
 - a. If drywall construction is used to enclose hoistway, submit details of interface fastenings between entrance frames and drywall.
 - b. Sill details including sill support.
- D. Samples:
 - 1. One each of stainless steel, 75 mm x 125 mm (3 in. x 5 in.).
 - 2. One each of baked enamel, 75 mm x 125 mm (3 in. x 5 in.).
 - 3. One each of floor finishes, minimum 8 in. x 8 in.
 - 4. One each of protection pads, 75 mm x 125 mm (3 in. x 5 in.) if used.
 - 5. No other samples of materials specified shall be submitted unless specifically requested after submission of manufacturer's name. If additional samples are furnished pursuant to request, adjustment in contract price and time will be made as provided in Section 00 72 00, GENERAL CONDITIONS.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the elevator layouts:
 - 1. Storage tank/pump assembly.
 - 2. Pump and motor, HP and RPM rating, Voltage, Starting and Full Load Ampere, Number of phases, and Gallons per minute.
 - 3. Controller
 - 4. Starters and Overload Current Protection Devices.
 - 5. Car Safety Device; Rupture Valve and Manual Shut Off Valves.
 - 6. Electric Door Operator; HP rating and RPM of motor.
 - 7. Hoistway Door Interlocks.
 - 8. Car Buffers; maximum and minimum rated load, maximum rated striking speed and stroke.
 - 9. Cab Ventilation Unit; HP rating and CFM rating.
- F. Complete construction drawings of elevator car enclosure, showing dimensioned details of construction, fastenings to platform, car lighting, ventilation, ceiling framing, top exits, and location of car equipment.
- G. Complete dimensioned detail of vibration isolating foundations for storage tank/pump assembly.
- H. Dimensioned drawings showing details of:
 - 1. All signal and operating fixtures.
 - 2. Car slide guides/roller guides.
 - 3. Hoistway door tracks, hangers, and sills.
 - 4. Door operator, infrared curtain units.
- I. Cuts or drawings showing details of controllers and supervisory panels.
- J. Furnish certificates as required under: Paragraph "QUALIFICATIONS".

1.6 WIRING DIAGRAMS

- A. Provide three complete sets of field wiring and straight line wiring diagrams showing all electrical circuits in the hoistway, machine room and fixtures. Install one set coated with an approved plastic sealer and mounted in the elevator machine room as directed by the Resident Engineer.
- B. In the event field modifications are necessary during installation, diagrams shall be revised to include all corrections made prior to and during the final inspection. Corrected diagrams shall be delivered to the Resident Engineer within 30 days of final acceptance.
- C. Provide the following information relating to the specific type of microprocessor controls installed:

1. Owner's information manual, containing job specific data on major components, maintenance, and adjustment.
2. System logic description.
3. Complete wiring diagrams needed for field troubleshooting, adjustment, repair and replacement of components. Diagrams shall be base diagrams, containing all changes and additions made to the equipment during the design and construction period.
4. Changes made during the warranty period shall be noted on the drawings in adequate time to have the finalized drawings reproduced for mounting in the machine room no later than six months prior to the expiration of the warranty period.

1.7 ADDITIONAL EQUIPMENT

- A. Additional equipment required to operate the specified equipment manufactured and supplied for this installation shall be furnished and installed by the contractor. The cost of the equipment shall be included in the base bid.
- B. Special equipment not required by specification, which would improve the operation, may be installed 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's Technical Representative.

1.8 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet size shall be 1220 mm (48 in.) high, 762 mm (30 in.) wide, and 457 mm (18 in.) deep.

1.9 PERFORMANCE STANDARDS

- A. The elevators shall be capable of meeting the highest standards of the industry and specifically the following:
 1. Contract speed is high speed in either direction of travel with rated capacity load in the elevator. Speed variation under all load conditions, regardless of direction of travel, shall not vary more than five (5) percent.
 2. The controlled rate of change of acceleration and retardation of the car shall not exceed 0.1G per second and the maximum acceleration and retardation shall not exceed 0.2G per second.
 3. Starting, stopping, and leveling shall be smooth and comfortable without appreciable steps of acceleration and deceleration.
- B. The door operator shall open the car door and hoistway door simultaneously at 2.5-feet per second and close at 1-foot per second.
- C. Pressure: Fluid system components shall be designed and factory tested for 500 psi operating pressure.
- D. Floor level stopping accuracy shall be within 3 mm (1/8 in.) above or below the floor, regardless of load condition.
- E. Noise and Vibration Isolation: All elevator equipment including their supports and fastenings to the building, shall be mechanically and electrically isolated from the building structure to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.
- F. Sound Isolation: Noise level relating to elevator equipment operation in machine room shall not exceed 80 dBA. All dBA readings shall be taken three (3) feet off the floor and three (3) feet from equipment.
- G. Airborne Noise: Measured noise level of elevator equipment during operation shall not exceed 50 dBA in elevator lobbies and 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed.

1.10 WARRANTY

- A. Submit all labor and materials furnished in connection with elevator system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The one year Warranty shall commence after final inspection, completion of performance test, and upon full acceptance of the installation and shall concur with the guarantee period of service.
- B. During warranty period if a device is not functioning properly or in accordance with specification requirements, or if in the opinion of the Contracting Officer's Technical Representative, 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 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 installation all stainless steel surfaces shall be protected 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. Items not meeting this requirement, but meet technical specifications which can be established through reliable test reports or physical examination of representative samples, will be considered.
- B. When two or more devices of the same class of materials 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. Individual components of assembled units shall be products of the same manufacturers.
 - 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. Motor nameplates shall state manufacturers' 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.
- E. The elevator equipment, including controllers, door operators, and supervisory system shall be non-proprietary, the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure compatibility with the total operating system. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.
- F. Where key operated switches are furnished in conjunction with any component of this elevator installation, furnish four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each and every key shall have a tag bearing a stamped or etched legend identifying its purpose. Barrel key switches are not acceptable, except where required by code.

- G. If the elevator equipment to be installed is not known to the Resident Engineer, the Contractor shall submit drawings in triplicate for approval to the Resident Engineer, Contracting Officer, and VA CFM Elevator Engineer showing all details and demonstrate that the equipment to be installed is in strict accordance with the specifications.

2.3 CAPACITY, SIZE, SPEED, AND TRAVEL

- A. Each direct-plunger elevator shall have the capacity to lift the live load, including the weight of entire car and plunger, at the speed specified in the following schedule:

ELEVATOR SCHEDULE	
Elevator Number	1
Overall Platform Size	6'-0" x 9'-4-1/2"
Clear Shaft Opening	7'-4" x 10'-2"
Rated Load - kg(lb)	2268kg (5000lb)
Contract Speed - m/s(fpm)	0.65m/s(125fpm)
Total Travel - m/s(fpm)	11'-0"
Number of Stops	2
Number of Openings	2 front
Entrance Type & Size	4'-0" side opening
Plunger Size	17'-0"

2.4 POWER SUPPLY

- A. For power supply in each machine room see Specification 260521, ELECTRICAL SPECIFICATION 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. Feeders from the power source indicated on the drawings to each elevator controller.
 2. Shunt Trip Circuit Breaker for each controller shall be located inside machine room at the strike side of the machine room door and lockable in the "Off" position.
 3. Provide Surge Suppressors to protect the elevator equipment.
- C. Power for auxiliary operation of elevator as specified shall be available from auxiliary power generator, including wiring connection to the elevator control system.

2.5 CONDUIT AND WIREWAY

- A. Unless otherwise specified or approved, install electrical conductors, except traveling cable connections to the car, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than 3/4 inch or electrical metallic tubing smaller than 1/2 inch electrical trade size shall not be used. All raceways completely embedded in concrete slabs, walls, or floor fill shall be rigid steel conduit. Wireway (duct) shall be used in the hoistway and to the controller and between similar apparatus in the elevator machine room. Fully protect self-supporting connections, where approved, from abrasion or other mechanical injury. Flexible metal conduit not less than 3/8 inch electrical trade size may be used, not exceeding 18 inches in length unsupported, for short connections between risers and limit switches, interlocks, and for other applications permitted by NEC.

- B. All conduit terminating in steel cabinets, junction boxes, wireways, switch boxes, outlet boxes and similar locations shall have approved insulation bushings. Install a steel lock nut under the bushings 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.
- C. Rigid conduit and EMT fittings using set screws or indentations as a means of attachment shall not be used. All fittings shall be steel or malleable iron.
- D. Connect motors or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.6 CONDUCTORS

- A. Unless otherwise specified, conductors, excluding the traveling cables, shall be stranded or solid coated annealed copper in accordance with Federal Specification J-C-30B for Type RHW or THW. Where 16 and 18 AWG are permitted by NEC, single conductors or multiple conductor cables in accordance with Federal Specification J-C-580 for Type TF 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 or number coding for each conductor. Conductors for control boards shall be in accordance with NEC. Joints or splices are not permitted 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 machine room and hoistway.
- C. All wiring must test free from short circuits or ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductors is not given, voltage and amperes shall not exceed limits prescribed by NEC.
- E. Provide equipment grounding. Ground the conduits, supports, controller enclosure, motor, platform and car frame, 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 Federal Specification W-S-610. The Elevator Contractor may, at his option, make these terminal connections on 10 gauge 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. All conductors to the car shall consist of flexible traveling cables conforming to the requirements of NEC. Traveling cables shall run from the junction box on the car directly to the controller. Junction boxes on the car shall be equipped with terminal blocks. Terminal blocks having pressure wire connectors of the clamp type that meet UL 486A requirements for stranded wire may be used in lieu of terminal eyelet connections. Terminal blocks shall have permanent indelible identifying numbers for each connection. Cables shall be securely anchored to avoid strain on individual terminal connections. Flame and moisture resistant outer covering must remain intact between junction boxes. Abrupt bending, twisting and distortion of the cables shall not be permitted.
- B. Provide spare conductors equal to 10 percent of the total number of conductors furnished, but not less than 5 spare conductors in each traveling cable.
- C. Provide shielded wires for the auto dial telephone system within the traveling cable.

- D. If traveling cables come into contact with the hoistway or elevator due to sway or change in position, provide shields or pads to the elevator and hoistway to prevent damage to the traveling cables.
- E. Hardware cloth wide may be installed from the hoistway suspension point 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 flat wall.

2.8 CONTROLLER AND SUPERVISORY PANEL

- A. UL/CSA Labeled Controller: Mount all assemblies, power supplies, chassis switches, and relays on a self-supporting steel frame. Completely enclose the equipment and provide a mean to control the temperature. Solid state components shall be designed to operate between 32 to 104 degrees Fahrenheit, humidity non-condensing up to 85 percent.
- B. All controller switches and relays shall have contacts of design and material to insure maximum conductivity, long life and reliable operation without overheating or excessive wear, and shall provide a wiping action to prevent sticking due to fusion. Switches carrying highly inductive currents shall be provided with arc shields or suppressors.
- C. Where time delay relays are used in the circuits, they shall be of acceptable design, adjustable, reliable, and consistent such as condenser timing or electronic timing circuits.
- D. Properly identify each device on all panels by name, letter, or standard symbol which shall be neatly stencil painted or decaled in an indelible and legible manner. Identification markings shall be coordinated with identical markings used on wiring diagrams. The ampere rating shall be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel shall be neatly formed, laced, and identified.

2.9 MICROPROCESSOR CONTROL SYSTEM

- A. Provide a microprocessor based system with absolute position/speed feedback encoded tape and electronic motor starter to control the pump motor and signal functions in accordance with these specifications. Across the line and wye-delta starters are not acceptable. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval.
 - 1. All controllers shall be non-proprietary.
 - 2. Proprietary tools shall not be necessary for adjusting, maintenance, repair, and testing of equipment. Use Motion Control Elevator (MCE) 2000 or equivalent.
 - 3. Controller manufacturer shall provide factory training, engineering and technical support, including all manuals and wiring diagrams to the VA Medical Center's designated Elevator Maintenance Service Provider.
 - 4. Replacement parts shall be shipped overnight within 48 hours of an order being received.
- B. All controller assemblies shall provide smooth, step-less acceleration and deceleration of the elevator, automatically and irrespective of the load in the car. All control equipment shall be enclosed in a metal cabinet with lockable, hinged door(s) and shall be provided with a means of ventilation. All non-conducting metal parts in the machine room shall be grounded in accordance with NEC. Cabinet shall be securely attached to the building structure.
- C. Circuit boards for the control of each and every elevator system; dispatching, signals, door operation and special operation shall be installed in a NEMA Type 1 General Purpose Enclosure. Circuit boards shall be moisture resistant, non-corrosive, non-conductive, fabricated of non-combustible material and adequate thickness to support the components mounted thereon. Mounting racks shall be spaced to prevent accidental contact between individual circuit boards and modules.
- D. Modules shall be of the type that plug into pre-wired mounting racks. Field wiring or alteration shall not be necessary in order to replace defective modules.

- E. Each device, module and fuse (with volt and ampere rating) shall be identified by name, letter or standard symbol in an approved indelible and legible manner on the device or panel. Coordinate identification markings with identical markings on wiring diagrams.
- F. 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. Modules shall be keyed or notched to prevent insertion of the modules in the inverted position.
- G. Light emitting diodes (LED) shall be for visual monitoring of individual modules.
- H. Components shall have interlocking circuits to assure fail-safe operation and to prevent elevator movement should a component malfunction.
- I. Method of wire wrapping from point to point with connections on the mounting racks shall be submitted for approval.
- J. 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. If it is necessary to alter individual modules they shall be returned to the factory where design changes shall be made and module design records changed so correct replacement units will be available.
- K. All logic symbols and circuitry designations shall be in accordance with ASME and NEC Standards.
- L. Solid state components shall be designed to operate within a temperature range of 32 to 104 degrees Fahrenheit, humidity non-condensing up to 85 percent.
- M. Wiring connections for operating circuits and for external control circuits shall be brought to terminal blocks mounted in an accessible location within the controller cabinet. Terminal blocks using pierce through serrated washers shall not be used.

2.10 AUXILIARY POWER OPERATION

- A. The control system for Elevators P 1 through P 2, and S 1 through S 2 shall provide for the operation of at least one car per elevator bank on auxiliary power upon failure of the normal power supply.
- B. Auxiliary power supply, its starting means, transfer switch for transfer of elevator supply from normal to auxiliary power, two pair of conductors in a conduit from an auxiliary contact on the transfer switch (open or close contacts as required by Controller Manufacturer) to terminals in the group elevator controller and other related work shall be provided by the Electrical Contractor.
- C. 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, shall be provided by the Elevator Contractor.
- D. Upon loss of normal power supply there shall be a delay before transferring to auxiliary power of 10 seconds minimum to 45 seconds maximum, the delay shall be accomplished through an adjustable timing device. Following this adjustable delay the associated elevators shall function as follows:
 - 1. Selector switch, Automatic position:
 - a. Not more than one elevator at a time in each group shall be automatically selected and returned to the main floor, at normal speed, cycle its car and hoistway doors and shut down, with "Door Open" button remaining operable.
 - b. As each elevator reaches the designated floor and shuts down, another elevator shall start and return to the designated floor.
 - c. Elevators that have been manually removed from automatic service and are on independent service, fire service or medical emergency shall receive an automatic return signal. Elevators on inspection service or out of service shall not receive a signal.

- d. When an elevator is given a signal to return and it is unable to start its movement to the designated floor within 30 seconds it shall be by-passed. When an elevator is by-passed, another elevator shall start and return.
 - e. This process shall continue until all elevators have returned to the designated floor and shut down.
 - f. Any elevator or elevators by-passed on initial return signal shall be signaled again.
 - g. When all cars in group have returned to designated floor, one elevator in each group shall be designated for automatic operation. Individual cars in each group shall restart at 5 second intervals.
 - h. If elevator S-1 is keyed on to medical emergency service in the car prior to transfer to auxiliary power operation, medical emergency service shall be retained. A car call registered prior to transfer shall also be retained. This elevator shall be the first automatically selected elevator to operate on auxiliary power operation, and complete its selected call demand. The elevator will return to the designated floor after the key switch is reset to normal position.
2. Selector switch, Manual operation:
- a. Selector switch shall be mechanically and electrically interlocked to prevent the selection of more than one elevator from operating on auxiliary power.
 - b. The selector switch shall have positions marked with the number of each elevator controlled. It shall also have a position marked "Automatic". When the selector switch is set to the automatic position, the medical emergency service car, shall operate on auxiliary power operation, or if none, the last car arriving at the designated floor and be capable of functioning under all design features.
 - c. Change in selection of elevators shall be by means of the selection switch and shall occur only when the previous selected elevator is stopped at the designated floor.
 - d. The selector switch shall be locked out of operation when the system is in the normal mode of operation.
 - e. Locate the selector switch above the hall push button station at the designated level 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. The enclosure faceplate shall be identified "Auxiliary Power Control" with 13 mm (1/2 in.) engraved letters filled with black paint.
3. The inside of the selector panel shall be brushed finish stainless steel with each device identified with 3 mm (1/8 in.) engraving filled with black paint. The panel shall contain:
- a. Selector switches for selecting the elevators shall be toggle type or rotary key switch.
 - b. Pilot lights to indicate normal mode of operation, auxiliary power service available, and which elevator or elevators in each group is connected to auxiliary service.
 - c. A lamp test circuit consisting of a momentary contact push button 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.
- E. Prior to the return of normal power an adjustable timed circuit shall be activated that will cause all cars to remain at a floor if already there or stop and remain at the next floor if in flight. Actual transfer of power from auxiliary power to normal building power shall take place after all cars are stopped at a floor with their doors open.
- F. Car lighting circuits shall be connected to the auxiliary power panel.

2.12 FIREFIGHTERS' SERVICE

- A. Provide Firefighters' Service as per ASME A17.1 Section 2.27.
- B. Smoke Detectors:
 - 1. Smoke detection devices that are designated for actuation of Elevator Phase I "FIRE SERVICE" response in each elevator lobby, top of hoistway, and machine room shall be provided by others.
 - a. Elevator lobby smoke detectors shall activate only the elevators sharing the corresponding or common lobby.
 - b. Top of hoistway smoke detectors shall activate fire recall and the top of hoistway motorized vent.
 - c. Elevator or group of elevators serving separate isolated areas of the same floor shall have an independent smoke detection system.

- d. Machine room smoke detectors shall activate fire recall for each and every elevator with equipment located in that machine room.

2.13 MEDICAL EMERGENCY SERVICE

- A. Provisions shall be made for calling elevator on "Medical Emergency" operating independently from the dispatch signals and landing call signals. Provide a two-position, key-operated, momentary contact, spring return switch at ground and first floors.
- B. Install key switch in the floor landing push button fixture above the push buttons.
- C. Landing key switches shall be momentary pressure-spring return to "OFF" position. Provide a call registered light indicator adjacent to key switch. The landing key switch and the "Medical Emergency" key switch in the car shall not be operable by keys used for any other purpose in the hospital.
- D. When switch is activated at any floor, the call register light indicator shall illuminate at that floor only, and the elevator supervisory control system shall instantly select the nearest available elevator in service to respond to the medical emergency call. Immediately upon selection, all car calls within that car shall be cancelled. Transfer any landing calls which had previously been assigned that car to another car. If the selected car is traveling away from the medical emergency call, it shall slow down and stop at the nearest floor, maintain closed doors, reverse direction and proceed nonstop to the medical emergency call floor. If the selected car is traveling toward the medical emergency call floor, it shall proceed to that floor nonstop. If at the time of selection it is slowing down for a stop, the car shall stop, maintain doors closed, and start immediately toward the medical emergency floor.
- E. Arriving at the medical emergency floor, the car shall remain with doors open for 30 seconds. After this interval has expired and the car has not been placed on medical emergency operation from within the car, the car shall automatically return to normal service.
 - 1. Locate a "Medical Emergency" key switch in the upper section of each main car operating panel for selecting medical emergency service. Activation of the key switch will allow the car to accept a car call for any floor, close doors, and proceed nonstop to the floor desired. The return of the key switch to normal position will restore the car to normal service. The key shall be removable only in the off position.
- G. Provide an LED illuminated indicator light next to the Medical Emergency key switch the same size as the Fire Service indicator. In the center of the rear cab panel provide a back lighted "MEDICAL EMERGENCY" LED illuminated display that shall flash on and off continuously when the car is assigned to this operation and until it is restored to normal service. "MEDICAL EMERGENCY" indicator shall be a photographic negative type 1830 mm (72 in.) to center above the floor, 152 mm (6 in.) wide X 76 mm (3 in.) high, with 12 mm (1/2 in.) high letters legible only when illuminated.
- H. All of the key switches in the "Medical Emergency" system for each and every elevator shall operate from the same key. The medical emergency call service key shall not operate any other key switch in the elevator system, nor shall any other key required by the elevator system be able to operate the medical emergency call service switches.
- I. Should all the cars be operating on "Independent Service", the medical emergency service indicator lights in the car operating panel and rear wall shall be illuminated, buzzer shall sound, and the "Audio Voice" system shall direct the attendant to return the car to automatic operation.
- J. Should all the cars be out of service and unable to answer medical emergency calls, the call register light shall not illuminate.
- K. Each switch faceplate shall have legible indelible legends engraved or etched to indicate its identity and positions. All letters in faceplates shall be 6 mm (1/4 in.) high, filled with black paint.

- L. When Phase I fire recall is activated it shall over-ride elevators on medical emergency service and return them to the main or alternate fire service recall floor. When the fire emergency floor has been identified the attendants may complete their medical emergency run on Phase II firefighters' operation if life safety is not affected.
- M. Provide four (4) keys for each "Medical Emergency" key cylinder furnished.

2.14 SEISMIC REQUIREMENTS

- A. Meet the requirements of ASME A17.1 Section 8.4, Elevator Safety Requirements for Seismic Risk Zone 2 or greater and VA Seismic Design Manual H-18-8.
- B. Support and maintain pump unit, controller, 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 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.
- C. Support all vertical conduits and duct systems within the hoistway at points above the center of gravity of riser. Provide lateral guides at regular intervals.
- D. Provide hydraulic equipment mounted on vibration isolators with seismic restraints.
- E. Bolt pump unit and controller to the floor and provide sway braces at top. Secure all electrical components within the panels to the panel frame. Fit doors and hinged panels with positive locking latches.
- F. Car guide rail brackets and rail clip bolts shall be guarded against snagging on the side of the rail adjacent to the point of suspension of the traveling cables.
- G. 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 ft). If intermediate brackets cannot be installed because of lack of structural support, reinforce rails with 225 mm (9 in.) channel or approved equal backing.
- H. Guide rails shall not be less than 22.5 kg/m (15 lb/ft).
- I. 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.
- J. 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 re-lamping.
- K. Submittals are required for all equipment anchors, supports, restraints and detectors. Submittals shall include weight, dimensions, center of gravity, standard connections, calculations, manufacturer's recommendations, behavior problems (vibration, thermal, expansion, etc.,) so that design can be properly reviewed.

2.15 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. Enclose unit on four open sides of the power unit frame with not less than 16 gauge steel removable panel sections. Provide a minimum 50 mm (2 in.) air space between the top of the panels and bottom of tank. Line panels on the interior side with one-inch rigid acoustical insulation board.
- B. Control valves shall be electronically controlled. Hydraulic fluid flow shall be controlled to insure speed variation of not more than five (5) percent under all load conditions.

- C. Hydraulic system working pressure shall not exceed 500 psi under any load condition.
- D. Pump shall be positive displacement, rotary screw type, specifically 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 five (5) 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.
- E. Motor shall be squirrel-cage, drip proof, ball bearing, and 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.
- G. No submersible pumps.

2.16 HYDRAULIC SYSTEM

- A. Construct the storage tank of sheet steel, welded construction, and a steel cover with suitable means for filling, a minimum one-inch protected vent opening, an overflow connection, and a valve 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 monitor 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 // chilled water heat exchanger // 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 threaded, flanged, or welded 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 305 mm (12 in.) on each side of every change of direction of pipe line and space supports not over 3.0 meters (10 ft) 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 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. Arrange control valves to operate 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 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 more than a ten percent increase in high speed in the down direction. 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 ASME A17.1 Section 3.19 and to insure smooth, safe, and satisfactory operation of elevator.
- L. Furnish and adjust by-pass and relief valve in accordance with ASME A17.1 Rule 3.19.4.2.
- M. Install check valve to hold the elevator car with rated load at any point when the pump stops.
- N. Provide shut-off valves in the pit near the cylinder and in the machine room capable of withstanding 150 percent of design operating pressure. Each manual valve shall have an attached handle.
- 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.

2.17 HYDRAULIC PLUNGER ASSEMBLY

- 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 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 cylinder mounting brackets to continuous footing channels that also support the rails and buffers.
- B. Install a flexible tubing scavenger line with an 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 and designed to be manually reset. Strap the pump and reservoir to the pit channels.
- C. Plunger shall be heavy seamless steel tubing, turned smooth and true to within plus or minus .38 mm (0.015 in.) tolerance and no diameter change greater than .07 mm (0.003in.) per-inch of length. Grind the plunger surface to a fine polish finish, 12 micro-inches or finer. Where plunger is multi-piece construction, machine 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 plate shall incorporate piston car vibration isolator as herein specified.
 - 2. Provide a stop ring welded or screwed to the bottom of plunger that shall prevent the plunger from leaving its cylinder.
 - 3. Isolate plunger head from the platen plate 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.

2.18 HYDRAULIC CYLINDER CASING

- A. The casing shall be iron or steel not less than 0.375-inch thick, at least 15.2 mm (6 in.) 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 the plunger assembly. Close the bottom with a minimum of 15.2 mm (6 in.) of concrete.
- B. Provide PVC casing liner to fit inside steel casing. Fabricate from schedule 80 PVC pipe with watertight bottom and a top flange gasket to seal plunger flange and form a complete, watertight, electrically non-conductive encasement of the entire unit.
- C. Provide suitable well hole to accommodate casing. Coordinate the drilling of well hole and setting of the 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.

2.19 CAR BUFFERS

- A. Provide a minimum of two spring buffers for each elevator that meet the requirements of ASME A17.1 Section 3.22. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on elevator. Every installed buffer shall have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.
- B. Design and install buffers to provide minimum car run-by required by ASME A17.1 Rule 3.4.2.
- C. Furnish pipe stanchions and struts as required to properly support the buffer.

2.20 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. 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 be 150 mm (6 in.) unless the six wheel roller type is used. 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.
- D. Equip car with an auxiliary guiding device for each guide shoe which shall prevent the car from leaving the rails in the event that the normal guides are fractured. These auxiliary guides shall not, during normal operation, touch the guiding surfaces of the rails. Fabricate the auxiliary guides from hot rolled steel plate and mount between the normal guide shoes and the car frames. The auxiliary guides may be an extension of the normal guide shoe mounting plate if that plate is fabricated from hot rolled steel. The portion of the auxiliary guide which shall come in contact with the rail guiding surfaces in the event of loss of the normal guides shall be lined with an approved bearing material to minimize damage to the rail guiding surfaces.

2.21 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Guide rails shall conform to ASME A17.1 Section 2.23.
- B. Guide rails for car shall be planed steel T-sections and weigh 22.5 kg/m (15 lb/ft).
- C. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.
- D. Provide necessary car rail brackets of sufficient size and design to secure substantial rigidity to prevent spreading or distortion of rails under any condition.
 - 1. Slotted or oversized holes shall be fitted with flat washers and shall conform to ASME A17.1 Rule 2.23.10.3.
 - 2. Where fastenings are over 4.2 m (14 ft) apart, rails shall be reinforced with 228 mm (9 in.) channel or approved equal backing to secure the rigidity required.
- E. Rail joints and fishplates shall be in accordance with ASME A17.1 Rule 2.23.7. Rail joints shall not interfere with clamps and brackets. Design rail alignment shims to remain in place if fastenings become loose.
- F. Guide rails shall extend from channels on pit floor to within 76 mm (3 in.) of the underside of the concrete slab or grating at top of hoistway with a maximum deviation of 3.2 mm (1/8 in.) from plumb in all directions. Provide a minimum of 19 mm (3/4 in.) clearance between bottom of rails and top of pit channels.
- G. Guide rail anchorages in pit shall be made in a manner that will not reduce effectiveness of the pit waterproofing.
- H. In the event inserts or bond blocks are required for the attachment of guide rails, the Contractor shall furnish such inserts or bond blocks and shall install them in the forms before the concrete is poured. Use inserts or bond blocks only in concrete or block work where steel framing is not available for support of guide rails. Expansion-type bolting for guide rail brackets will not be permitted.
- I. Guide rails shall be clean and free of any signs of rust, grease, or abrasion before final inspection. Paint the shank and base of the T-section with two field coats of manufacturer's standard enamel.

2.22 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. Normal and final terminal stopping devices shall conform to ASME A17.1 Section 2.25.
- B. Mount terminal slowdown switches and direction limit switches on the elevator or in hoistway to reduce speed and bring car to an automatic stop at the terminal landings.
 - 1. Switches shall function with any load up to and including 100 percent of rated elevator capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of elevator in reverse direction of travel.
- C. Mount final terminal stopping switches in the hoistway.
 - 1. Switches shall be positively opened should the car travel beyond the terminal direction limit switches.
 - 2. Switches shall be independent of other stopping devices.
 - 3. Switches, when opened, shall remove power from pump motor and control valves preventing operation of car in either direction.
- D. After final stopping switches have been adjusted, through bolt switches to guide rail.

2.23 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead. Data plate shall bear information required by ASME A17.1 Section 2.16.3 and 2.20.2.1.

- B. Permanently attach a Code Data Plate, in plain view, to the controller, ASME A17.1 Section 8.9.

2.24 WORKMAN'S LIGHTS AND OUTLETS

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

2.25 TOP-OF-CAR OPERATING DEVICE

- A. Provide a cartop operating device that meets the requirements of ASME A17.1 Section 2.26.
- B. The device shall be activated by a toggle switch mounted in the device. The switch shall be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (1/4 in.) letters.
- C. Movement of the elevator shall be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop toggle type switch.
- E. Provide permanent identification for the operation of all components in the device.
- F. The device shall be permanently attached to the elevator crosshead on the side of the elevator nearest to the hoistway doors used for accessing the top of the car.

2.26 CAR LEVELING DEVICE

- A. Car shall be equipped with a two-way leveling device to automatically bring the car to within 3 mm (1/8 in.) of exact level with the landing for which a stop is initiated regardless of load in car or direction.
- B. If the car stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the car within 3 mm (1/8 in.) of level with the floor landing regardless of the load carried.
- C. Provide encoded steel tape, steel tape with magnets or steel vanes with magnetic switches. Submit design for approval.

2.27 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch for each top-of-car device, pit, machine spaces, service panel and firefighters' control panel inside the elevator. Mount stop switches in the pit adjacent to pit access door, at top of the pit ladder 1220 mm (48 in.) above the bottom landing sill and 1220 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch shall be red in color and shall have "STOP" and "RUN" positions legibly and indelibly identified.

2.28 MAIN CAR OPERATING PANEL

- A. Locate the main car operating panel in the car enclosure on the front return panel for passenger/service elevators and the front of the side wall for freight elevators. The top floor car call push button shall not be more than 1220 mm (48 in.) above the finished floor. Car call push buttons and indicator lights shall be round with a minimum diameter of 25 mm (1 in.), LED white light illuminated.

- B. One piece front faceplate, with edges beveled 15 degrees, shall have the firefighters' service panel recessed into the upper section and the service operation panel recessed into the lower section, fitted with hinged doors. Doors shall have concealed hinges, be in the same front plane as the faceplate and fitted with cylinder type key operated locks. Secure the faceplate with stainless steel tamperproof screws.
- C. All terminology on the main car operating panel shall be raised or engraved. Use 6 mm (1/4 in.) letters to identify all devices in upper section of the main car operating panel. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.
- D. The upper section shall contain the following items in order listed from top to bottom:
1. Engrave elevator number, 25 mm (1 in.) high with black paint for contrast.
 2. Engrave capacity plate information with black paint for contrast with freight loading class and number of passengers allowed.
 3. Emergency car lighting system consisting of a rechargeable battery, charger, controls, and LED illuminated light fixture. The system shall automatically provide emergency light in the car upon failure or 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 1220 mm (48 in.) above the car floor and approximately 305 mm (12 in.) in front of the car operating panel, for not less than four (4) hours.
 4. LED illuminated digital car position indicator with direction arrows. Digital display floor numbers and direction arrows shall be a minimum of 50mm (2 in.) high.
 5. Firefighters' Emergency Operation Panel shall conform to the requirements of ASME A17.1 Section 2.27. Firefighters' Panel shall be 1676 mm (66 in.) minimum to 1830 mm (72 in.) maximum to the top of the panel above finished floor.
 6. Firefighters' Emergency Indicator Light shall be round with a minimum diameter of 25 mm (1 in.).
 7. Medical Emergency switch P-1 marked "MEDICAL EMERGENCY" with two positions labeled "ON" and "OFF" and Medical Emergency Indicator Light located next to the key switch shall be round with a minimum diameter of 25 mm (1 in.). Instruction for Medical Emergency operation shall be engraved below the key switch and light.
 8. Independent Service switch, see Section 2.30 for detailed description.
 9. Complete set of round car call push buttons, minimum diameter of 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call buttons shall be legibly and indelibly identified by a floor number and/or letter not less than 12mm (1/2 in.) high in the face of the call button. Stack buttons in a single vertical column for low rise buildings up to six floors with front openings only.
 10. Door Open and Door Close buttons shall be located below the car call buttons. They shall have "OPEN" and "CLOSE" legibly and indelibly identified by letters in the face of the respective button. The Door Open button shall be located closest to the door jamb as required by ADA.
 11. Red Emergency Alarm button that shall be located below the car operating buttons. Mount the emergency alarm button not lower than 890 mm (35 in.) above the finished floor. It shall be connected to audible signaling devices as required by A17.1 Rule 2.27.1.2. Provide audible signaling devices including the necessary wiring.
 12. Emergency Help push button shall activate two way communications by Auto Dial telephone system as required by ASME A17.1 Rule 2.27.1.1.3. Help button shall be LED white light illuminated and flash when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12 mm (1/2 in.) high letters.
 13. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.
- E. The service operation panel, in the lower section shall contain the following items:
1. Light switch labeled "LIGHTS" for controlling interior car lighting with its two positions marked "ON" and "OFF".

2. Inspection switch that will disconnect normal operation and activate hoistway access switches at terminal landings. Switch shall be labeled "INSPECTION" with its two positions marked "ON" and "OFF".
3. Three position switch labeled "FAN" with its positions marked "HIGH", "LOW" and "OFF" for controlling car ventilating blower.
4. Two position, spring return, toggle switch or push button to test the emergency light and alarm device. It shall be labeled "TEST EMERGENCY LIGHT AND ALARM".
5. Two position emergency stop switch, when operated, shall interrupt power supply and stop the elevator independently of regular operating devices. Emergency stop switch shall be marked "PULL TO STOP" and "PUSH TO RUN".

2.29 AUXILIARY CAR OPERATING PANEL

- A. Provide an auxiliary car operating panel in the side wall of the elevator between the handrails immediately adjacent to the front entrance column strike jamb. The auxiliary car operating panel shall contain only those controls essential to passenger (public) operation. The auxiliary car operating panel faceplate shall match the main car operating panel faceplate in material and general design. Secure the faceplate with stainless steel tamperproof screws.
 1. Mount door "OPEN" and door "CLOSE" buttons closest the door jamb and mount the red alarm button no lower than 875 mm (35 in.) above the finished floor. The Door Open button shall be located closest to the door jamb as required by ADA.
 2. Complete set of round car call push buttons, minimum diameter 25 mm (1 in.), and LED white light illuminated, corresponding to the floors served. Car call button shall be legibly and indelibly identified by a floor number and/or letter not less than 12 mm (1/2 in.) high in the face of the call button corresponding to the numbers of the main car operating buttons. Install buttons in a vertical stack on front mounted panel up to six floors and horizontally for side mounted panel.
 3. Cross-connect all buttons in the auxiliary car operating panels to their corresponding buttons in the main car operating panel. Registration of a car call shall cause the corresponding button to illuminate in the main and auxiliary car operating panel.
 4. Emergency Help push button shall activate two way communications by Auto Dial telephone system as required by ASME A17.1 Rule 2.27.1.1.3. Help button shall be LED white light illuminated and flash when call is acknowledged. Legibly and indelibly label the button "HELP" in the face of the button with 12 mm (1/2 in.) high letters. Install emergency telephone system in the auxiliary car operating panel.
 5. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

2.30 INDEPENDENT SERVICE

- A. Provide a legibly and indelibly labeled "INDEPENDENT SERVICE", two-position key operated switch on the face of the main car operating panel that shall have its positions marked "ON" and "OFF". When the switch is in the "ON" position, the car shall respond only to calls registered on its car dispatch buttons and shall bypass all calls registered on landing push buttons. The car shall start when a car call is registered, car call button or door close button is pressed, car and hoistway doors are closed, and interlock circuits are made. When switch is returned to "OFF" position, normal service shall be resumed.

2.31 CAR POSITION INDICATOR

- A. Provide an alpha-numeric digital car position indicator in the main car operating panel, consisting of numerals and arrows not less than 50 mm (2 in.) high, to indicate position of car and direction of car travel. Locate position indicator at the top of the main car operating panel, illuminated by light emitting diodes.

2.32 AUDIO VOICE SYSTEM

- A. Provide digitized audio voice system activated by stopping at a floor. Audio voice shall announce floor designations, direction of travel, and special announcements. The voice announcement system shall be a natural sounding 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 designations and direction of travel, and another for special announcements. The voice announcer shall have a full range loud speaker, located on top of the cab. The audio voice unit shall contain the number of ports necessary to accommodate the number of floors, direction messages, and special announcements. Install voice announcer per manufacturer's recommendations and instructions. The voice announcer units shall be the product of a manufacturer of established reputation. Provide manufacturer literature and list of voice messages.
 - 1. Fire Service Message
 - 2. Medical Emergency Service Message
 - 3. "Please do not block doors."
 - 4. Provide special messages as directed by Resident Engineer.

2.33 AUTO DIAL TELEPHONE SYSTEM

- A. Furnish and install a complete ADA compliant intercommunication system.
- B. Provide a two-way communication device in the car with automatic dialing, tracking and recall features with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.
- C. "HELP" button shall illuminate and flash when call is acknowledged. Button shall match floor push button design.
- D. Provide "HELP" button tactile symbol engraved signage and Braille adjacent to button mounted integral with car operating panels.
- E. 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.
- F. Each elevator shall have an individual phone number.
- G. If the operator ends the call, the phone shall be able to redial immediately.

2.34 CORRIDOR OPERATING DEVICE FACEPLATES

- A. Fabricate faceplates for elevator operating and signal devices from not less than 3 mm (1/8 in.) thick flat stainless steel with all edges beveled 15 degrees. Install all faceplates flush with surface on which they are mounted.
- B. Corridor push button faceplates shall be at least 127 mm (5 in.) wide by 305 mm (12 in.) high. The centerline of the landing push buttons shall be 1067 mm (42 in.) above the corridor floor.
- C. Elevator Corridor Call Station Pictograph shall be engraved in the faceplate.
- D. Fasten all car and corridor operating device and signal device faceplates with stainless steel tamperproof screws.
- E. Design corridor push button faceplates so that pressure on push buttons shall be independent of pressure on push button contacts.
- F. Engraved legends in faceplates shall have lettering 6 mm (1/4 in.) high filled with black paint.
- G. Provide a corresponding Braille plate on the left side of each button. The handicapped markings with contrasting background shall be recessed .030 inch in the faceplate, square or rectangular in shape, with the finished face of the 12 mm (1/2 in.) numerals and markings flush with the faceplates. Surface mounted plates are not acceptable.

2.35 CORRIDOR OPERATING DEVICES

- A. Provide one risers of landing call buttons located as shown on contract drawings.
- B. Fixtures for intermediate landings shall contain "UP" and "DOWN" buttons. Fixtures for terminal landings shall contain a single "UP" or "DOWN" button.
- C. Each button shall contain an integral registration LED white light which shall illuminate upon registration of a call and shall extinguish when that call is answered.

- D. The direction of each button shall be legibly and indelibly identified by arrows not less than 12 mm (1/2 in.) high in the face of each button.
- E. Landing push buttons shall not re-open the doors while the car and hoistway doors are closing at that floor, the call shall be registered for the next available elevator. Calls registered shall be canceled if closing doors are re-opened by means of "DOOR OPEN" button or infrared curtain unit.

2.36 CORRIDOR LANTERN/POSITION INDICATOR

- A. Provide each car with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each and every floor. Provide each terminal landing with "UP" or "DOWN", minimum 64 mm (2 1/2 in.) high digital arrow lanterns and each intermediate landing with "UP" and "DOWN" digital arrow lanterns. Each lens shall be LED illuminated of proper intensity, so shielded to illuminate individual lens only. The lenses in each lantern shall be illuminated green to indicate "UP" travel and red to indicate "DOWN" travel. Lanterns shall signal in advance of car arrival at the landing indicating the direction of travel whether or not corridor button has been operated at that 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 chime 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. Car riding lanterns are not acceptable.
- B. Provide alpha-numeric digital position indicators directly over hoistway landing entranceways between the arrival lanterns at each and every floor. Indicator faceplate shall be stainless steel. Numerals shall be not less than 50 mm (2 in.) high with direction arrows. Cover plates shall be readily removable for re-lamping. The appropriate direction arrow shall be illuminated during entire travel of car in corresponding direction.
- C. Provide LED illumination in each compartment to indicate the position and direction the car is traveling by illuminating the proper alpha-numeric symbol. When the car is standing at a landing without direction established, arrows shall not be illuminated.

2.37 HOISTWAY ACCESS SWITCHES

- A. Provide hoistway access switches for elevator at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Elevators S-1, S-2, P-1 and P-2 with side slide doors, mount the access key switch 1830 mm (6 ft) above the corridor floor in the wall next to the strike jamb. Exposed portions of each access switch or its faceplate shall have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions. Submit design and location of access switches 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 the "OFF" position. Lock shall not be operable by any other key which will operate any other lock or device used for any other purpose in the VA Medical Center. When the car is moved down from the top terminal landing, limit the zone of travel to a distance not greater than the top of the crosshead level with the top floor.
- B. Provide emergency access for all hoistway entrances, keyways for passenger and service elevators and locked door release system (key access) for freight elevators.

2.38 HOISTWAY ENTRANCES: PASSENGER/SERVICE ELEVATORS

- A. Provide entrances of metal construction using cold rolled steel. Door frames shall be constructed 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.
- 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 overall height of not less than 19 mm (3/4 in.) set true, straight, and level, with hoistway edges plumb over each other, and top surfaces flush with finished floor. Grout the sills full length after installation.
- C. Construct hanger supports of not less than 4.5 mm (3/16 in.) thick steel plate, and bolted to strut angles.

- D. Structural steel angles 127 mm x 127 mm x 13 mm (5 in. x 5 in. x 1/2 in.) shall extend from top of sill to bottom of floor beam above, and shall be securely fastened at maximum 457 mm (18 in.) on center 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 bolted or welded construction, and provided with three anchors each side. Side jambs shall be curved type. Radius of curvature shall be 89 mm (3 1/2 in.). Head jamb shall be square type, and shall overhang corridor face of side jambs by 6 mm (1/4 in.). Rigidly fasten jambs and head soffits to building structure. Provide jambs with protective covering. After installation, protect jambs and head soffits to prevent damage to finish during construction. Solidly grout jambs.
- F. Provide 14-gauge sheet steel fascia plates 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 shear guards beveled back to and fastened to the wall.
- G. Provide hoistway entrance with flush two speed side slide hoistway. Door panels shall be not less than 16-gauge stainless steel, flush type construction, and not less than 32 mm (1 1/4 in.) thick. Wrap stainless steel around the leading and trailing edges of the door panel. Top and bottom of door panels shall have continuous stiffener channels welded in place. Reinforcement of the door panels shall be approximately 1.0 mm (0.04 in.) in thickness and of the hat section type. At bottom of each and every panel, provide two removable laminated phenolic gibs or other approved material guides and a separate fire gib. Reinforce each door panel for hangers, interlock mechanism, drive assembly, and closer. One door panel for each entrance shall bear a BOCA label, Underwriters' label, or in lieu of this, labels from other accredited test laboratories may be furnished provided they are based on fire test reports and factory inspection procedures acceptable to the COTR. Fasten sight guard of 14-gauge stainless steel, extending full height of panel, to leading edge of each panel of center opening doors.
- H. Provide hangers for hoistway door panels and provide relating devices to transmit motion from one door panel to the other. Fasten the hangers to the door sections. Provide reinforcements at the point of attachment. The hanger shall have provisions for vertical and lateral adjustments. Hang doors on two-point suspension hangers having sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with rubber or non-metallic sound-reducing tires mounted on malleable iron or steel brackets. 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 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.
- I. Do not use hangers that are constructed integrally with the door panels.
- J. Provide raised numerals on cast, rear mounted plates for all openings. Numerals shall be a minimum of 50 mm (2 in.) high, located on each side of entrance frame, with centerline of 1524 mm (5 ft) above the landing sill. The number plates shall contain Braille.
- K. Provide unique car number on every elevator entrance at designated main fire service floor level, minimum 76 mm (3 in.) in height.

2.39 ELECTRIC INTERLOCKS

- A. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position. Hoistway door interlocks shall not be accepted unless they meet the requirements of ASME A17.1 Section 2.12.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed 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 meets the requirements of ASME A17.1 Section 2.12.
- C. 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 equivalent.

- D. Provide devices, either mechanical or electrical, that shall prevent operation of the elevator in event of damaged or defective door equipment that has permitted an independent car or hoistway door panel to remain in the "unclosed" and "unlocked" position.

2.40 CAR FRAME: PASSENGER/SERVICE ELEVATORS

- A. Car frame shall conform to the requirements of ASME A17.1 Section 2.15, constructed of steel plates and structural shapes securely riveted, bolted, or welded together. Iron casting shall not be permitted. The entire assembly shall be rugged construction, and amply braced to withstand unequal loading of platform. Car frame members shall be constructed to relieve the car enclosure of all strains. Balance car front to back and side to side. Provide balancing weights and frames, properly located, to achieve the required true balance.
- B. Provide a bonding wire between frame and plunger.

2.41 CAR PLATFORM: PASSENGER/SERVICE ELEVATORS

- A. Construct the car platform to comply with all the requirements of ASME A17.1 Section 2.15.5. The platform shall be designed to withstand the forces developed under the loading conditions specified. 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 sheet metal of not less than 27-gauge, with all exposed joints and edges folded under. Fire resistant paint is not acceptable. Platform shall have flexible composition flooring not less than 3 mm (1/8 in.) thick. For color, see Section 09 06 00, SCHEDULE FOR FINISHES. Adhesive material shall be type recommended by manufacturer of flooring. Lay flooring flush with threshold plate and base.
- B. Provide a platform guard (toe guard) that meets the requirements of ASME A17.1 Section 2.15.9, of not less than 12-gauge sheet-steel on the entrance side, extend 76 mm (3 in.) beyond each side of entrance jamb. Securely brace platform guard to car platform, and bevel bottom edge at a 60-75 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 in.).
- C. Isolate the platform from the car frame by approved rubber pads or other equally effective means.
- D. Provide adjustable diagonal brace rods to hold platform firmly within car suspension frame.
- E. Provide a bonding wire between frame and platform.

2.42 CAR ENCLOSURE: PASSENGER/SERVICE ELEVATORS

- A. Car enclosure shall have a dome height inside the cab of 2440 mm (8 ft).
- B. Securely fasten car enclosure to platform by through bolts located at intervals of not more than 457 mm (18 in.) running through an angle at the base of panels to underside of platform. Provide 6 mm (1/4 in.) bolts with nuts and lock washers.
- C. Car enclosure base shall be of 14-gauge stainless steel, 152 mm (6 in.) high. Provide straight type base at front return sides. Vertical face of base at sides and rear shall be flush with, or recessed behind the wainscot directly above the base. There shall be no exposed fastenings in base. Provide natural ventilation openings divided equally between the bottom and top of the car enclosure that shall provide a minimum 3.5 percent of the inside car floor area.
- D. Construct canopy of not less than 12-gauge steel.
- E. Car top railings shall meet the requirements of ASME A17.1 Rules 2.14.1.7 and 2.10.2.

- F. Front return wall panel, entrance columns, rear corner columns, entrance head-jamb and transom shall be 14-gauge stainless steel full height of car. Side and rear walls from top of base to top of panel shall be constructed of 14-gauge cold rolled steel. Side and rear walls up to 1220 mm (48 in.) above finished floor shall be covered with stainless steel. Side and rear walls from 1220 (48 in.) to the ceiling shall be covered with high pressure plastic laminate. Apply directly to the cab walls or to 13 mm (1/2 in.) plywood/particle board that meets requirements of ASTM E 84, UL 723, or CAN/ULC-S102.2, whichever is applicable. Submit a method of fastening plywood/particle board to steel walls. It shall be flush with the face of the bottom section of the stainless steel. Plastic laminate shall comply with Federal Specification L-P-508, Style Type 1, and Class 1. Color PL-2 is listed on Sheet AI-100, 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 in.) thick followed by a prime coat of paint. Mastic material shall conform to ASTM E1042.
1. Smooth and flush all joints with no ragged or broken edges. Plastic laminate shall comply with NEMA LD-3, textured finish, general purpose type, grade designation GP 50, and 0.050 in. thickness, except with a minimum wear resistance of 1200 cycles, and backer sheet, grade designation BK 20, and 0.020 in. thickness.
- G. Provide a hinged top emergency exit cover. Exit shall be unobstructed when open and shall have mechanical stops on the cover. Provide a code approved exit switch to prevent operation of the elevator when the emergency exit is open.
- H. Provide duplex, GFCI protected type receptacle in car. Locate flush-mounted receptacle on the centerline of the main car operating panel, 150 mm (6 in.) above the car floor.
- I. Lighting for elevator:
1. Provide car lighting with indirect fluorescent or LED lamps mounted in lighting coves along each side of the cab ceiling, front to back.
See Specification 265100, Interior Lighting for fixture and ballast type. Maintain a minimum light level of 50-foot candles at 914 mm (36 in.) above the finished floor.
 2. Equip the lighting cove with asymmetrical reflectors having specular ALZAK (or equal) finish. Maintain a minimum light level of 50-foot candles 914 mm (36 in.) above finished floor at the car operating panels.
 3. Enclose the entire vertical space between the light trough outer edge and the cab canopy with approved opaque white or clear lumicite sheeting. Install the lumicite sheeting so that it is removable for cleaning and re-lamping.
- J. Provide a blower unit arranged to exhaust through an opening in the canopy. Provide a stainless or chrome plated fan grill around the opening. Provide 2-speed fan, capable of rated free delivery air displacement of approximately 380 and 700 cfm at respective speeds. Mount fan on top of car with rubber isolation to prevent transmission of vibration to car structure. Provide screening over intake and exhaust end of blower. Provide a 3-position switch to control the unit in service panel.
- K. Provide car enclosure with two sets of stainless steel handrails.
1. 75 mm (3 in.) wide x 9 mm (3/8 in.) thick flatstock located with centerlines 750 mm and 1050 mm (30 in. and 42 in.) above the car floor.
 2. Locate handrails approximately 38 mm (1 1/2 in.) from cab wall. Install handrails on // two side and rear walls // two sides //. Curve ends of handrails to walls. Conceal all handrail fastenings. Handrails shall be removable from inside the car enclosure.

- L. Provide car entrance with two-speed side opening horizontal slide car doors of the same type as hoist way doors. Construct door panels to be flush hollow metal construction, not less than 32 mm (1 1/4 in.) thick, consisting of one continuous piece 16-gauge stainless steel on car side face, leading and trailing edges. Separate 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 sealed ball-bearing sheaves not less than 76 mm (3 in.) in diameter, with rubber or non-metallic sound-reducing tires. Equip hangers with adjustable ball-bearing rollers to take upward thrust of panels. Upthrust rollers shall be capable of being locked in position after adjustment to a maximum of .38 mm (1/64 in.) clearance. Provide two laminated phenolic gibs on each door panel. Gibs shall be replaceable without removal of door panel. Provide door drive assembly, restrictor, gate switch, header, track, arms, and all related door hardware.
- M. Provide each service elevator one set of protection pads of sufficient length to completely cover two sides, rear walls and front return of cab interior. Pads shall consist of a minimum of 6 mm (1/4 in.) thick glass fiber insulation securely sewn between flame resistant vinyl coated coverings. Insulation shall conform to ASTM E 84, UL 723, CAN/ULCS102.2, or ASTM C612. Color of the covering shall be approved by the Resident Engineer. Provide stainless steel pad buttons or hooks, spaced at intervals of not more than 150 mm (18 in.) to adequately support pads.

2.43 POWER DOOR OPERATORS: PASSENGER/SERVICE ELEVATORS

- A. Provide a high-speed heavy duty door operator to automatically open the car and hoistway doors simultaneously when the car is level with the floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. 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 speed of .762 m (2.5 ft) per second. The closing speed of the doors shall be .3 m (1 ft) per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction of the infrared curtain or the door "OPEN" button, shall be accomplished within 38 mm (1.5 in.) maximum of door movement. Emphasis is placed on obtaining quiet interlock and door operation; smooth, fast, dynamic braking for door reversals, stopping of the door reversal, and stopping of the doors at extremes of travel. Construct all levers and drive arms operating the doors, of heavy steel members, and all pivot points shall have ball or roller bearings. Auxiliary automatic door closers required under ASME A17.1 Section 2.11.3 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 the car door and hoistway door from within the car, only in the door zone. Out of door zone, doors are restricted to 100 mm (4 in.) 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 a predetermined adjustable interval of 20 to 60 seconds by operation of the curtain unit, the doors shall stay open, the audio voice message and a buzzer located on the car shall sound only on automatic operation. **Do not provide door nudging.**
 - 1. If an obstruction of the doors should not activate the photo-electric door control device and prevent the doors from closing for more than a predetermined adjustable interval of 15 to 30 seconds, the doors shall reverse to the fully open position and remain open until the "Door Close" button re-establishes 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 re-open. Momentary pressure of the door "CLOSE" button shall initiate the closing of the doors prior to the expiration of the normal door open time.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this Section depends. Report defects to the 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 and guard.
- C. Ensure that machine room is properly illuminated, heated and ventilated, and equipment, foundations, beams correctly located complete with floor and access stairs and 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 of the specification has been provided. If the Elevator Contractor requires changes in size or location of trolley beams, or their supports, trap doors, etc., to accomplish their work, he must make arrangements, subject to approval of the Contracting officer and include cost in their bid. Where applicable, locate controller near and visible to its respective hydraulic pump unit. Work required prior to the completion of the elevator installation:
 - 1. Supply of electric feeder wires to the terminals of the elevator control panel, including circuit breaker.
 - 2. Provide light and GFCI outlets in the elevator pit and machine room.
 - 3. Furnish electric power for testing and adjusting elevator equipment.
 - 4. Furnish circuit breaker panel in machine room for car and hoistway lights and receptacles.
 - 5. Supply power for cab lighting and ventilation from an emergency power panel specified in Division 26, ELECTRICAL.
 - 6. Machine room enclosed and protected from moisture, with self closing, self locking door and access stairs.
 - 7. Provide fire extinguisher in machine room.
- F. Supply for installation, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

3.2 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 by Resident Engineer. Include cost of changes in bid that become a part of the contract. Provide proper, code legal installation of equipment, including all construction, accessories and devices in connecting with elevator, mechanical and electrical work specified.
- B. Where concrete beams, floor slabs or other building construction protrude more than 50 mm (2 in.) into hoistway; bevel all top surfaces of projections to an angle of 75 degrees with the horizontal.

3.3 INSTALLATION

- A. Perform work with competent Certified Elevator Mechanics and Apprentices skilled in this work and under the direct supervision of the Elevator Contractor's experienced foreman.

- B. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.
- C. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.
- D. Install machinery, guides, controls, car and all equipment and accessories in accordance with manufacturer's instructions, applicable codes and standards.
- E. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.
- F. Grout sills and hoistway entrance frames.

3.4 ARRANGEMENT OF EQUIPMENT

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

3.5 WORKMANSHIP AND PROTECTION

- A. Installations shall be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation shall be mechanically and electrically correct. Materials and equipment shall be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment shall be included in the Contractor's work. All new holes in concrete shall be core drilled.
- C. Structural members shall not be cut or altered. Work in place that is damaged or defaced shall be restored equal to original condition.
- D. Finished work shall be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes shall project 50 mm (2 in.) above concrete slabs.
- F. Exposed gears, sprockets, and sheaves shall be guarded from accidental contact in accordance with ASME A17.1 Section 2.10.

3.6 CLEANING

- A. Clean machine room and equipment.
- B. Perform hoistway clean down.
- C. Prior to final acceptance, remove protective covering from finished or ornamental surfaces. Clean and polish surfaces with regard to type of material.

3.7 PAINTING AND FINISHING

- A. Hydraulic pump assembly shall be factory painted with manufacturer's standard finish and color.
- B. Controllers, car frames and platforms, beams, rails and buffers, except their machined surfaces, cams, brackets and all other uncoated ferrous metal items shall be painted one factory priming coat or approved equal.

- C. 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 otherwise specified as to architectural finish, shall then be given two coats of paint of approved color, conforming to manufacturer's standard.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascias or walls within door restrictor areas as required by ASME A17.1 Rule 2.29.2. The color of paint used shall contrast with the color of the surfaces to which it is applied.
- E. Elevator pump units, controllers, main line shunt trip circuit breakers, bolster channels, and cross heads of cars shall be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals shall contrast with surrounding color and shall be stenciled or decaled.
- F. Hoistway Entrances of Passenger, and Service 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.
 - 2. Fascia plates, top and bottom shear guards, dust covers, hanger covers, and other metalwork, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given one approved prime coat in the shop, and one field coat of paint of approved color.
- G. Elevator Cabs for Passenger and Service Elevators:
 - 1. Interior and exterior steel surfaces shall be parkerized or given equivalent rust resistant treatment before finish is applied.
 - 2. Interior steel surfaces shall be factory finished with one coat of baked on enamel or proxylin lacquer. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.
 - 3. Give exterior faces of car doors one finish coat of paint of medium gray color.

3.8 PRE-TESTS AND TESTS

- A. Pre-test the elevators and related equipment in the presence of the Resident Engineer or his authorized representative for proper operation before requesting final inspection. Conduct final inspection at other than normal working hours, if required by Resident Engineer.
 - 1. Procedure outlined in the Inspectors Manual for Hydraulic Elevators, ASME A17.2 shall apply.
 - a. Final test shall be conducted in the presence of and witnessed by an ASME QEI-1 Certified Elevator Inspector.
 - b. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each elevator.
 - 2. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked test weights, oil pressure gauge, voltmeter, amp probe, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, light meter, stop watch, and a means of two-way communication.
 - 3. If during the inspection process the Inspector determines the need, the following instruments shall be available within a four-hour period: Megohm meter, vibration meter, sound meter, and a light meter.
- B. Inspection of workmanship, equipment furnished, and installation for compliance with specification.
- C. Full-Load Run Test: Elevators shall be tested for a period of one hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all floors, in either direction of travel, for not less than five or more than ten seconds per floor.
- D. Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed shall be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.

- E. Temperature Rise Test: The temperature rise of the pump motor shall be determined during the full load test run. Temperatures shall be measured by the use of thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50 degrees Centigrade above ambient temperature. Test shall start when all machine room equipment is within 5 degrees Centigrade of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.
- F. Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm (1/8 in.) of level with any landing floor for which the stop has been initiated 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 in.) of level with the landing floor regardless of change in load.
- G. Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Elevator Inspector conducting the test.
- H. The amp readings for the cars in the up direction at full load shall not exceed the amp readings on the elevator motor.
- I. Overload Devices: Test all overload current protection devices in the system at final inspection.
- J. Limit Stops:
 - 1. The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.
 - 2. Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices shall be inoperative for the tests.
- K. Working Pressure: Verify working pressure of the hydraulic system by pressure gauge placed in the system line. Take readings with no load and full load in car.
- L. Test automatic shut-off valve for proper operation.
- M. Setting of Car Door Contacts: The position of the car door at which the elevator may be started shall be measured. The distance from full closure shall not exceed that required by ASME A17.1. The test shall be made with the hoistway doors closed or the hoistway door contact inoperative.
- N. Setting of Interlocks: The position of the hoistway door at which the elevator may be started shall be measured and shall not exceed ASME A17.1 requirements.
- O. Operating and Signal System: The elevator shall be operated by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.
- P. Performance of the Elevator supervisory system shall be witnessed and approved by the representative of the Resident Engineer.
- Q. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.

- R. If equipment fails test requirements and a re-inspection is required, the Contractor shall be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Resident Engineer.

3.9 INSTRUCTION OF VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one eight hour work day. Instruction shall commence after completion of all work and at the time and place directed by the Resident Engineer.
- B. Written instructions in triplicate relative to care, adjustments and operation of all equipment and accessories shall be furnished and delivered to the Resident Engineer in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrammatic cuts of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, and electronic devices, as well as R.P.M. values and related characteristics for all rotating equipment.
- C. Provide supplementary instruction for any new equipment that may become necessary because of changes, modifications or replacement of equipment or operation under requirements of paragraph entitled "Warranty of Construction".

3.10 INSPECTIONS AND SERVICE: GUARANTEE PERIOD OF SERVICE

- A. Furnish complete inspection and maintenance service on entire elevator installation for a period of one (1) year after completion and acceptance of all the elevators in this specification by the Resident Engineer. This maintenance service shall run concurrently with the warranty. Maintenance work shall be performed by Certified Elevator Mechanic and Apprentices employed and supervised by the company that is providing guaranteed period of service on the elevator equipment specified herein.
- B. This contract will cover full maintenance including emergency call back service, inspections and servicing the elevators listed in the schedule of elevator. The Elevator Contractor shall be required to perform the following:
 - 1. Bi-weekly systematic examination of equipment.
 - 2. During each maintenance visit the Elevator Contractor shall clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in first class condition and proper working order.
 - 3. Furnishing all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be only those products recommended by the manufacturer of the equipment.
 - 4. As required, motors, controllers, selectors, leveling devices, operating devices, switches on cars and in hoistways, hoistway doors and car doors or gate operating device, interlock contacts, guide shoes, guide rails, car door sills, hangers for doors, car doors or gates, and signal system shall be cleaned, lubricated and adjusted.
 - 5. Guide rails and bottom of platforms shall be cleaned every three months. Car tops and machine room floors shall be cleaned monthly. Accumulated rubbish shall be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment shall be accomplished quarterly. Cleaning supplies and vacuum cleaner shall be furnished by the Contractor.
 - 6. Maintain the performance standards set forth in this specification.
 - 7. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 - 8. Maintain smooth starting and stopping and accurate leveling at all times.
- C. Maintenance service shall not include the performance of work required as a result of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.

- D. Provide 24 hour emergency call-back service that shall consist of promptly responding to calls within two hours for emergency service should a shutdown or emergency 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 Elevator Contractor shall maintain a log book in the machine room. The log shall list the date and time of all bi-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.
- G. Written "Maintenance Control Program" shall be in place to maintain the equipment in compliance with ASME A17.1 Section 8.6.

END OF SECTION