SECTION 14 24 11
HYDRAULIC CARTLIFT

SPEC WRITER NOTE: Delete between //_____// if not applicable to project. Delete items or paragraphs content not applicable and write "not used" after title.

PART 1—GENERAL

1.1 DESCRIPTION

A. This section of the specification includes the engineering, furnishing and installation of the complete hydraulic cartlift system as described herein and indicated on the Contract drawings.

B. Items listed in the singular apply to each and every cartlift in this specification except where noted.

C. Hydraulic Cartlift No. C shall be oil hydraulic type with central station dispatching, signal system, car leveling device, power operated car and hoistway doors.

1.2 RELATED WORK

A. Section 01 33 23 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.

B. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-rated construction.

C. SECTION 09 06 00, SCHEDULE FOR FINISHES: As a master format for construction projects, to identify interior and exterior material finishes for type, texture, patterns, color and placement.

D. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of non-structural components.

E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.

F. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

G. 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.

H. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
I. Section 26 05 71, ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY:
   Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
J. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
K. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
L. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.
M. Section 26 51 00, INTERIOR LIGHTING: Fixture and ballast type for interior lighting.

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 shall be submitted for all workers employed in this capacity.
   4. Elevator contractor shall submit a list of two or more prior hospital installations where all the cartlift equipment he proposes to furnish for this project has performed satisfactorily under conditions of normal hospital use. 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 // one hour // two hours // four 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 cartlift installations of similar type and magnitude.

D. All hydraulic cartlifts shall be the product of the same manufacturer.

E. 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.

F. 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.

G. Electrical work shall be performed by Licensed Electricians as requirements by NEC. Certificates shall be submitted for all workers employed in this capacity.

1.4 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification. Cartlift 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-410 ............... Wire Rope and Strand
TT-E-489J ............. Enamel, Alkyd, Gloss, Low VOC Content
QQ-S-766 ............. Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip

C. International Building Code (IBC)
D. American Society of Mechanical Engineers (ASME):
   A17.1 ................. Safety Code for Elevators and Escalators
   A17.2 ................. Inspectors 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. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):
   SP-58............... Pipe Hangers and Supports

G. Society of Automotive Engineers, Inc. (SAE)
   J517-91............... Hydraulic Hose

H. Gages:
   For Sheet and Plate: U.S. Standard (USS)
   For Wires: American Wire Gauge (AWG)

I. American Welding Society (AWS):
   D1.1 .................. Structured Welding Code - Steel

J. National Electrical Manufacturers Association (NEMA):
   LD-3 .................. High-Pressure Decorative Laminates

K. Underwriter's Laboratories (UL):
   486A ................. Safety Wire Connectors for Alloy, Copper-clad Aluminum, and Copper Conductors
   797 .................. Safety Electrical Metallic Tubing

L. Institute of Electrical and Electronic Engineers (IEEE)

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 cartlift 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 cartlift unit specified including:
   a. Complete layout showing location of storage tank/pump assembly, controller, piping layout, outside diameter of cylinder/plunger assembly, size car platform, car frame members, and support assembly.
   b. Car, guide rails, brackets, buffers, size of car platform, car frame members, 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 hall button sample.
3. One each hall lantern/position indicator sample.
4. One each wall and ceiling material finish sample.
5. One each car lighting sample.
6. 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 rating, and RPM.
   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.

F. Complete construction drawings of elevator car enclosure, showing dimensioned details of construction, fastenings to platform, car lighting, and location of car equipment.

G. Complete dimensioned detail of vibration-isolating foundation for Storage tank/pump assembly.

H. Dimensioned drawings showing details of:
   1. All signal and operating fixtures.
   2. Car slide guides.
   3. Hoistway door tracks, hangers, and sills.
   4. Door operator, infrared curtain units.

I. Drawings showing details of controller.

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 cartlift 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 PERFORMANCE STANDARDS
A. The cartlift 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 cartlift. 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 without appreciable steps of acceleration and deceleration.
B. The door operator shall open the car door and hoistway door simultaneously at .3 m (1 ft) per second and close at .3 m (1 ft) per second.
C. Pressure: Fluid system components shall be designed and factory tested for 500 psi maximum 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 cartlift 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 cartlift 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 cartlift equipment during operation shall not exceed 50 dBA in cartlift lobbies and 60 dBA inside car under any condition including door operation.

1.9 WARRANTY

A. Submit all labor and materials furnished in connection with cartlift 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 devices 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 cart-lift equipment, including controllers, door operators, and supervisory system shall be the product of manufacturers of established reputation, provided such items are capably engineered and produced under coordinated specifications to ensure a first class, safe and smooth 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 cartlift 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 cartlift 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. The direct-plunger cartlift shall have the capacity to lift the live load, including the weight of entire car and plunger, as specified in the following schedule:

<table>
<thead>
<tr>
<th>CARTLIFT SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartlift Number</td>
</tr>
<tr>
<td>Overall Platform Size</td>
</tr>
<tr>
<td>Rated Load - kg(lb)</td>
</tr>
<tr>
<td>Contract Speed - m/s(fpm)</td>
</tr>
<tr>
<td>Total Travel - m(ft)</td>
</tr>
<tr>
<td>Number of Stops</td>
</tr>
<tr>
<td>Number of Openings</td>
</tr>
<tr>
<td>Entrance Type &amp; Size</td>
</tr>
<tr>
<td>Plunger Size</td>
</tr>
</tbody>
</table>

2.4 POWER SUPPLY

A. For power supply in each machine room, see Specification 26 05 21, 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 cartlift 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 cart-lift equipment.

SPEC WRITER NOTE: If cartlift is to be connected to auxiliary power supply, include paragraph C.

C. Power for auxiliary operation of cartlift as specified shall be available from auxiliary power generator, including wiring connection to the cartlift control system.
2.5 CONDUIT AND WIREWAY

A. Unless otherwise specified or approved, install electrical conductors, except traveling cable connections to the cartlift, 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 installed in the hoistway and to the controller and between similar apparatus in the cartlift 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 and connectors 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.

SPEC WRITER NOTE: Use Paragraph E for future floors only.

E. //Conduit, junction boxes, outlet boxes, etc., shall be sized for future travel requirements.//

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 conduit and wiring between machine room, hoistway, and fixtures.

C. All wiring must test free from short circuits or grounds. Insulation resistance between individual external conductors and between conductors and ground shall be not less than one megohm.

D. Where size of conductors is not given 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 cartlift equipment shall be solderless pressure wire connectors in accordance with Federal Specification W-S-610. The Contractor may, at his option, make these terminal connections on 10-guage 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. If traveling cables come into contact with the hoistway or cartlift due to sway or change in position, provide shields or pads to the cartlift and hoistway to prevent damage to the traveling cables.

D. Hardware cloth may be installed from the hoistway suspension point downward to the cartlift 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

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. 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 shall be neatly formed, laced, and identified.

SPEC WRITER NOTE: If future travel is planned, include paragraph C.

//C. Controller shall be provided with wiring and components for additional future travel of __ floors and approximately __ feet of travel.///

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.
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 cartlift, 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 cartlift 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 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 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 cartlift 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 becomes 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 CALL AND SEND OPERATION: CARTLIFT

A. Dispatch cart from make-up area level to designated floor and return.

1. Cart shall be manually placed on cartlift platform. Destination button activation shall illuminate that button indicating call registration.

2. Sequence of Operation:
   a. Hoistway and cartlift doors shall automatically close.
   b. Cartlift shall proceed to the designated floor.
   c. Arrival lantern shall light and sound prior to the door's opening.
   d. Hoistway and cartlift doors shall open automatically.
   e. Remove cart manually from cartlift.
   f. Hoistway and car doors shall close automatically or manually by pressing the door close button.
   g. Cartlift shall return to the central station floor or answer the next call if one has been placed or remain at this level and park with its hoistway and car doors closed until another dispatch is made.
If a cart is not unloaded at the destination floor, an adjustable timer, set at between sixty (60) seconds and two hundred forty (240) seconds will close the doors starting with a five (5) second warning buzzer. The car will return to Central Station with the cart.

2.11 CORRIDOR OPERATING STATIONS AND CONTROL PANEL

A. Operating stations and control panel shall be stainless steel, flush mounted adjacent to hoistway entrances.
   1. All faceplates shall have all edges beveled at 15 degrees.
   2. Fasten all faceplates with non-corrosive stainless steel tamperproof screws.
   3. Operating push buttons in faceplates shall be designed so that pressure on contact shall be independent of pressure on operating push button.
   4. Each switch and operating device shall have indelible, 6 mm (1/4 in.) high legends to indicate its identity and position.

B. Provide each floor served by cartlift with a complete set of operating push buttons with 13 mm (1/2 in.) numbers in the face of the button corresponding to the floors served. Push buttons shall not protrude beyond the faceplate when in normal position. LED illuminated call register lights located within or behind the buttons shall illuminate the floor numeral corresponding to the call registered. Provide an LED illuminated “In Use” light in this panel to show when cartlift is in operation or the door is open.

C. Provide cartlift with a control panel at the makeup area and as shown on drawings, containing the following:
   1. Key operated "ON/OFF" service switch.
   2. "Call” and "Send” buttons to upper floors.
   3. Door "Open" and "Close" buttons for maintenance purposes and manual operation.
   4. A red LED illuminated indicator light to indicate a malfunction in the system.

2.12 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. Each lantern shall contain a single stroke chime so connected that when the cartlift arrives at a landing, the chime shall sound momentarily. The lenses in each lantern shall be red LED illuminated.
Lanterns shall signal in advance of carlift arrival at the landing. Each lantern shall be equipped with a clearly audible electronic chime which shall sound once for carlift arrival. Audible signal shall not sound when a carlift 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 25 mm (1 in.) high. Cover plates shall be readily removable for re-lamping.

C. Provide LED illumination in each compartment to indicate the position and direction the carlift is traveling by illuminating the proper alpha-numeric symbol. When the carlift is standing at a landing without direction established, arrows shall not be illuminated.

2.13 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. Hydraulic equipment may be installed within the oil storage tank if applicable for elevator size, speed, and duty rating.

H. Design motor, pump, tank, and piping to accommodate future travel, if specified.

2.14 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 meter hydraulic fluid level. Tank shall be of capacity to hold volume of hydraulic fluid required to lift cartlift 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 Code 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 cartlift to the lowest landing. Upon reaching the lowest landing, doors will open automatically allowing cart to be removed from 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.

2.15 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 // including future travel.// 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 (0.003 in.) per-inch of length. Ground the plunger surface to a fine polish finish, 12 micro-inches or finer. Where plunger is multi-piece construction, machine 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 specified.
2. Provide a stop ring welded or screwed to the bottom of plunger that shall prevent plunger from leaving its cylinder. //For plunger units that include future travel, locate the stop ring to permit only the actual travel and required runby/.
3. Isolate plunger head from the platen to prevent corrosion or electrolysis.
4. Carefully protect plunger and replace if gouged, nicked or scored.
5. If conditions beneath the pit floor are not adequate to support the total loading of the elevator, install reinforcing members in the pit floor.

D. Before installation, clean entire cylinder wall of all traces of oil, grease, moisture, dirt and scale.
2.16 HYDRAULIC CYLINDER CASING
A. The casing shall be iron or steel not less than 9 mm (3/8 in.) thick, at least 152 mm (6 in.) larger in diameter than the cylinder. The casing shall be accurately set, positioned, and plumbed to accept plunger assembly. The bottom shall be closed with a minimum of 152 mm (6 in.) of concrete. After setting, the top of the casing shall be sealed.
B. Provide PVC casing liner to fit inside steel casing. Fabricate from schedule 80 PVC pipe with watertight bottom and a top flange gasket to seal to plunger flange and to 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. Joint between the casing and the pit floor at bottom of pit shall be made watertight.
D. Bid shall be based on drilling hole in dirt, sand, rock, gravel, loam, boulders, hardpan, water, or other obstacles. The removal of all dirt and debris shall also be included.

2.17 CAR BUFFERS
A. Provide a minimum of two spring buffers for each car. Buffers and supports shall be securely fastened to the pit channels, and in alignment with striker plates on car. Every installed buffer shall have a permanently attached metal plate showing stroke and loading rating. Buffer anchorage shall not puncture pit waterproofing.
B. Buffers shall be designed and installed to provide minimum car runby required by ASME A17.1 Rule 3.4.2.
C. Pipe stanchions and struts shall be furnished, as required, to properly support the buffer.

2.18 CAR GUIDES
A. Install on car and counterweight frame four flexible sliding swivel guide shoes each assembled on a substantial metal base to permit individual self-alignment to the guide rails.
B. Provide each shoe with renewable non-metallic gibs of durable plastic material having low coefficient of friction and long-wearing qualities when operated on guide rails receiving infrequent, light applications of rail lubricant. Gibs containing graphite or other solid lubricants are not acceptable.
C. Flexible guide shoes of approved design, other than swivel type, may be used provided they are self-aligning on all three faces of the guide rails.

D. Provide spring take-up in car guide shoes for side play between rails.

2.19 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 \( 12 \text{ kg/m (8 lb/ft)} \) or \( 22.5 \text{ kg/m (15 lb/ft)} \).

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.
2.20 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.

2.21 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 Sections 2.16.3 and Rule 2.20.2.1.
B. Permanently attach a Code Data Plate, in plain view, to the controller, ASME A17.1 Section 8.9.

2.22 WORKMAN’S LIGHTS AND OUTLETS
A. Provide duplex GFCI protected type receptacle and lamp, with wire guards on top of cartlift. 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.

2.23 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 cartlift 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 cartlift crosshead on the side of the cartlift nearest to the hoistway doors used for accessing the top of car.

2.24 CARTLIFT LEVELING DEVICE

A. Cartlift shall be equipped with a two-way leveling device to automatically bring the cartlift to within 3 mm (1/8 in.) of exact level with the landing for which a stop is initiated regardless of load in cartlift or direction.
B. If the cartlift stops short or travels beyond the floor, the leveling device, within its zone shall automatically correct this condition and maintain the cartlift 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.

2.25 EMERGENCY STOP SWITCHES

A. Provide an emergency stop switch for each top-of-car device, pit, machine spaces, service panel and firefighter’s 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.

2.26 HOISTWAY ACCESS SWITCHES

A. Provide hoistway access switches for cartlift at top terminal landing to permit access to top of car, and at bottom terminal landing to permit access to pit. Mount the access key switch and the "ON/OFF" access activation switches in the top and bottom corridor hall stations next to the hoistway entrance jamb. Exposed portion 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 at the VA Medical Center. The hoistway switch shall initiate and maintain movement of the cartlift. When the cartlift is operated in the down direction from the top terminal landing, limit the zone of travel to a distance not greater than the top of the cartlift crosshead level with the top floor.

B. Provide emergency access for all hoistway entrances, locked door release system (key access) for freight elevators, cartlifts, and dumbwaiters.

2.27 HOISTWAY ENTRANCES

A. Each entrance shall have bi-parting or vertical sliding doors.

1. Frame shall be not less than No. 16 gauge, stainless steel assembled at corners and secured with smoothly dressed, welded joints. Sill shall be rigidly anchored and not less than No. 11 gauge stainless steel, and shall be set true, straight and level with hoistway edges plumb over each other. Reinforce sill as indicated on the drawings. Sill shall be grouted full length after installation.

2. Provide each door panel frame with four fixed or adjustable, malleable iron, mill-grooved, guide shoes not less than 63 mm (2 1/2 in.). Weight and method of fastening to frames and hoistway, above and below, shall conform to a standard practice of cartlift manufacturer. Provide gibs, struts from floor-to-floor, chains, and steel sheaves with sealed ball or roller bearings. Provide guides and stops for door travel.

3. Door panels shall be flush, hollow metal construction and bear a 1-1/2 hour Underwriters' "B" label, one inch thick, of not less than No. 16 gauge stainless steel on both sides. Panels shall be reinforced. Interior of panels shall be filled with fireproof material. Upper door section shall be fitted with a safety non-crushing astragal and a glass vision panel of 6 mm (1/4 in.) thick, wire glass not less than 76 mm (3 in.) nor more than 102 mm (4 in.) in diameter.

4. Door operators shall be heavy duty closed loop power operators designed to automatically open car and hoistway doors upon arrival of car at each landing. Door shall close automatically upon completion of loading and unloading cycles. Door "opening" and "closing" speed shall be one foot per second. Design, construction,
and installation of doors and power operator shall preclude the possibility of doors opening until the car stop at a landing.

5. Entrances shall be installed and protected by plastic or paper covering to prevent damage during construction. Frames shall be furnished with wall anchors to assure additional rigidity.

2.28 ELECTRIC INTERLOCKS

A. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of cartlift until all hoistway doors are locked in closed position. Hoistway door interlock shall not be accepted unless it meets the requirements of ASME A17.1 Section 2.12.

B. Equip cartlift doors with electric contact that prevents operation of cart until doors are closed unless cart is operating in leveling zone or hoistway access switch is used. Cart 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 car 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.

2.29 CAR FRAME

A. Construct cart frames of structural shapes, ASTM A-36, rigidly bolted and welded together of adequate strength to support cart with rated load and to conform to ASME A17.1 Rule 7.2.2.

B. Provide a bonding wire between frame and platform.

2.30 CAR ENCLOSURE

A. Car shall have width and depth required for contract load and is constructed of minimum 14-gauge stainless steel except cart floor shall be minimum 10-gauge stainless steel. Construction shall conform to ASME A17.1 Rule 7.2.1. Car floor shall be reinforced to provide adequate support for loading and unloading units and withstand impact of wheeled carts.

1. Provide car entrance with vertical sliding or bi-parting door constructed of sheet panels of stainless steel, guided and connected to each other by cables running over sheaves mounted at top of car. Car door shall be opened automatically and closed automatically by
power operator. Provide safety contact, automatic reversing edge on underside of upper door section.

2. Provide a flush mounted light fixture in car ceiling. Light shall be connected to illuminate automatically when car arrives at landing and hoistway door is opened and shall be automatically extinguished when hoistway door is closed.

3. Provide metal nameplate in car showing name of manufacturer and rated load in pounds stamped, etched or raised letters and numerals.

2.31 POWER DOOR OPERATORS: CARTLIFT

A. Provide a heavy duty door operator to automatically open the car and hoistway doors simultaneously when the car is level, 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 and closing the car door and hoistway door simultaneously, at a speed of .3 m (1 ft) per second. A reversal of direction of the doors from the closing to opening operation, whether initiated by obstruction or the door "OPEN" button, shall be accomplished within 38 mm (1-1/2 in.) of door movement.

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 additional 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 cartlift 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 cartlift pit and machine room.
3. Furnish electric power for testing and adjusting cartlift 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, ancillors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

3.2 SPACE CONDITIONS

A. Code compliance is required for overhead clearance, pit clearances, the size of machine room including equipment clearances, and construction conditions at building site in connection with cartlift installation. Addition or revision of space requirements, or construction changes that may be required for the complete installation of the cartlift must be arranged for and obtained by the Contractor, subject to approval of Contracting Officer. Include cost of changes in bid that become a part of the contract. Provide proper, code compliant installation of equipment, including all construction, accessories and devices in connecting with cartlift, mechanical and electrical work specified.

B. Where concrete beams, floor slabs, or other building construction protrude more than 100 mm (4 in.) into hoistway, bevel all top surfaces of projections to an angle of 75 degrees with the horizontal.
3.3 ARRANGEMENT OF EQUIPMENT
A. Clearance around cartlift, 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. Where applicable, locate controller near and visible to its respective hydraulic pump unit.

3.4 INSTALLATION
A. Installation shall be performed by Certified Elevator Mechanics and Apprentices skilled in this work and under the direct supervision of the Elevator Contractor’s experienced foreman.
B. Erect hoistway sills, headers and frames prior to erection of rough walls and doors. Erect fascias and toe guards after rough walls are finished.
C. Set hoistway entrances in alignment with car openings, and true with plumb sill lines.
D. Grout sills and hoistway entrance frames.
E. Install machinery, guides, controls, carlift, all equipment and accessories, in accordance with manufacturer's instructions, applicable codes and standards.
F. Isolate and dampen machine vibration with properly sized sound-reducing anti-vibration pads.

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, level and plumb, with true, smooth surfaces and lines. All machinery and equipment shall be protected against dirt, water, and 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, cartlift 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. All equipment, except specified architectural finish, shall 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. Cartlift 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 decals.

F. Hoistway entrances of material lift:
   1. Door panels shall be stainless steel with a brushed finish.
   2. Fascia plates, toe guards, dust covers, hanger covers and other metal work, including built-in or hidden work and structural metal, (except stainless steel entrance frames and surfaces to receive baked enamel finish) shall be given an approved prime coat in the shop, and one field coat of paint of approved color.
3.8 PRE-TESTS AND TESTS

A. Pre-test the cartlift 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.

   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 cartlift.

2. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: certified test weights, voltmeter, amp-meter and amp probe, oil pressure gauge, thermometers, direct reading tachometer, megohm meter, vibration meter, sound meter, and a light meter and a means of two-way communication.

B. Inspection of workmanship, equipment furnished, and installation for compliance with specifications.

C. Full-Load Run Test: Cartlift 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 cartlift 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 cartlift shall be determined in both directions of travel with full contract load and no load in the cartlift. Speed shall be determined by certified tachometer. The actual measured speed of the cartlift 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 be started only when all parts of equipment are within five (5) degrees Centigrade of the ambient temperature at time of starting test. Other tests for heat runs
on motors shall be performed as prescribed by the Institute of Electrical and Electronic Engineers.

F. Car Leveling Test: Cartlift 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 cartlift complete wiring system shall be free from short circuits and grounds and the insulation resistance of the system shall be determined by use of megohm meter, at the discretion of the Inspector conducting the test.

H. Safety Devices Tests: Safety devices shall be tested as required by ASME 17.1 Section 8.10.

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 cartlift relative to the terminal landings shall be determined when the cartlift has been stopped by the final limits. The lower limit stop shall be made with contract load in the cartlift. Cartlift 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 cartlift 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 cartlift may be started shall be measured and shall not exceed ASME A17.1 requirements.

O. Operating and Signal System: The cartlift 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. 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 day. Instruction shall commence after completion of all work and at the time and place directed by the Resident Engineer.

B. In addition to oral instruction, 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, fields, relays, timers, regulators 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 cartlift installation for a period of one (1) year after completion and acceptance of all the cartlifts in this specification by the Resident
Engineer. This maintenance service shall begin 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 cartlift equipment specified herein.

B. This contract will cover full maintenance including emergency call back service, inspections and servicing the cartlifts listed in the schedule of elevators. The Elevator Contractor shall be required to perform the following:

1. Monthly 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.
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 using the cartlift.

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 in the machine room. The log shall list the date and time of all monthly 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 ---