

**SECTION 14 24 11
HYDRAULIC CARTLIFT**

SPEC WRITER NOTE: Delete between //__// and paragraph content not applicable to project 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 cartlift in this specification except where noted.
- C. Hydraulic Cartlift #C- must be oil hydraulic type with central station dispatching, signal system, car leveling device, power operated car and hoistway doors and Class "C3" loading rated.

CARTLIFT SCHEDULE	
Overall Platform Size	
Rated Load - kg (lb)	
Contract Speed - m/s (fpm)	
Total Travel - m (ft)	
Floors Served	
Number of Openings	
Entrance Type & Size	
Plunger Size	

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 19, 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 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION 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 must 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 must have three years of successful experience, trained supervisory personnel, and facilities to install cartlift equipment specified herein.
 3. Elevator Mechanic (Installer) must have passed a Mechanic Examination approved by the U.S. Department of Labor and have technical qualifications of at least five years of experience in the elevator industry or 10,000 hours of field experience working in the elevator industry with technical update training. Apprentices must be actively pursuing Certified Elevator Mechanic status. Certification must be submitted for all workers employed in this capacity.
- B. Approval of Elevator Contractor's equipment will be contingent upon their identifying an elevator maintenance service provider that must

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 cartlift 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 do not have the requisite record of satisfactorily performing elevator installations of similar type and magnitude.
- D. Equipment within a group of electric hydraulic elevators must be the product of the same manufacturer.
- E. The Contractor must provide and install 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 must 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. Certificates must be submitted for all workers employed in this capacity. A welding or hot work permit is required for each day and must be obtained from the VAMC safety department. Request permit one day in advance.
- G. Electrical work must be performed by a Licensed Master Electrician and Licensed Journeymen Electricians as requirements by NEC. Certificates must 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 must 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)
 - J-C-580.....Cord, Flexible, and Wire, Fixture
 - W-S-610.....Splice Connectors
 - 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. American Society of Mechanical Engineers (ASME):
- A17.1.....Safety Code for Elevators and Escalators
- A17.2.....Inspectors Manual for Electric Elevators and
Escalators
- D. 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
- E. International Building Code (IBC)
- 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
- E1042-02.....Acoustically 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):
- J517-91.....Hydraulic Hose, Standard
- I. Gages:
- For Sheet and Plate: U.S. Standard (USS)
- For Wires: American Wire Gauge (AWG)
- J. American Welding Society (AWS):
- D1.1.....Structured Welding Code - Steel

- K. National Electrical Manufacturers Association (NEMA):
 - LD-3.....High-Pressure Decorative Laminates
- L. Underwriter's Laboratories (UL):
 - 486A.....Safety Wire Connectors for Copper Conductors
 - 797.....Safety Electrical Metallic Tubing
- M. Institute of Electrical and Electronic Engineers (IEEE)
- N. Regulatory Standards:
 - VA Seismic Design Manual H-18-8

SPEC WRITER NOTE: Edit section 1.5 to meet project requirement.

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 must 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 must 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 cartlift unit specified including:
 - a. Complete layout showing location of storage tank/pump assembly, 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 H-18-8 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.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment must 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, RPM, Voltage, and Ampere rating 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, 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 roller/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 paper and one electronic set 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 must be revised to include all corrections made prior to and during the final inspection. Corrected diagrams must be delivered to the Resident Engineer within thirty (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 must 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 must 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 TOOL CABINET

- A. Provide a metal parts/tool cabinet, having two shelves and hinged doors. Cabinet size must be 1219 mm (48 in.) high, 750 mm (30 in.) wide, and 450 mm (18 in.) deep.

1.8 PERFORMANCE STANDARDS

- A. The cartlift must 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, must not vary more than five (5) percent.
 - 2. Starting, stopping, and leveling must be smooth without appreciable steps of acceleration and deceleration.

- B The door operator must 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 Floor level stopping accuracy must be within 3 mm (.125 in.) above or below the floor, regardless of load condition.
- D. Noise and Vibration Isolation: All cartlift equipment including their supports and fastenings to the building, must 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.
- E. Sound Isolation: Noise level relating to cartlift equipment operation in machine room must not exceed 80 db. All db readings must be taken three (3) feet off the floor and three (3) feet from equipment.
- F. Airborne Noise: Measured noise level of cartlift equipment during operation must not exceed 50 db in cartlift lobbies and 60 db inside car under any condition including door operation.

1.9 WARRANTY

- A. Submit all labor and materials furnished regarding cartlift system and installation to terms of "Warranty of Construction" articles of FAR clause 52.246-21. The One-Year Warranty and Guarantee Period of Service must commence and run concurrent after final inspection, completion of performance test, and upon acceptance of each cartlift.
- B. During warranty period if a device is not functioning properly in accordance with specification requirements, more maintenance than the contract requires keeping device operational, device must be removed and a new device meeting all requirements must be installed as part of work until satisfactory operation of installation is obtained. Period of warranty must start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

1.10 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 19, Electrical specifications, and Electrical drawings.
- B. Main Line Disconnect Switch/Shunt Trip Circuit Breaker for each controller must be located inside the machine room at the strike side of the machine room door and lockable in the "Off" position.
- C. Surge Suppressors to protect the elevator equipment.

1.11 EMERGENCY POWER SUPPLY

- A. Emergency power supply, its starting means, transfer switch for transfer of cartlift supply from normal to emergency 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 must be provided by the Electrical Contractor.
- B. Upon loss of normal power supply there must be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay must be accomplished through an adjustable timing device.

1.12 MACHINE ROOM AND MACHINE SPACE

- A. Provide a machine room that meets the requirements of ASME A17.1, IBC, and NEC.
- B. Provide stairs and landing for access to the machine room. The landing must be large enough to accommodate full opening of the door plus 60 cm (24 in.).
- C. Locate the light switch on the lock side of the door inside the machine room.
- D. Locate sprinkler pipes to provide 210 cm (7 ft) head clearance. Do not locate sprinkler heads, heat detectors, and smoke detectors directly over elevator equipment.

1.13 HOISTWAY LIGHTING

- A. Provide lighting with 3-way switches at the top and bottom of the hoistway accessible from cartlift hoistway entrance prior to entering the pit or stepping onto the car top.
- B. Lighting must illuminate top of cartlift cab when it is at the top floor and the pit when at the bottom floor.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Where stainless steel is specified, it must 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 must have the grain of belting in the direction of the longest dimension and surfaces must be smooth and without waves. During installation all stainless-steel surfaces must be protected with a suitable material.

- B. Where cold rolled steel is specified, it must be low-carbon steel rolled to stretcher leveled standard flatness, complying with ASTM A109.

2.2 MANUFACTURED PRODUCTS

- A. Materials, devices, and equipment furnished must be of current production by manufacturers regularly engaged in the manufacture of such items. The cartlift equipment, including controllers, door operators, and supervisory system must be 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.
- B. Manufacturers of equipment assemblies which include components made by others must assume complete responsibility for the final assembled unit. Components must be compatible with each other and with the total assembly for the intended service.
- C. Mixing of manufactures related to a single system or group of components must be identified in the submittals.
- D. Key operated switches provide for this cartlift installation must be provided with four (4) keys for each individual switch or lock. Provide different key tumblers for different switch and lock functions. Each key must have a tag bearing a stamped or etched legend identifying its purpose.

2.3 CONDUIT AND WIREWAY

- A. Provide new conduit and wireway. Install electrical conductors, except traveling cable, in rigid zinc-coated steel or aluminum conduit, electrical metallic tubing or metal wireways. Rigid conduit smaller than 18.75 mm (.75 in.) or electrical metallic tubing smaller than 12.5 mm (.50 in.) electrical trade size must not be used. All raceways completely embedded in concrete slabs, walls, or floor fill must be rigid steel conduit. Wireways (duct) must be installed 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 9.375 mm (.375 in.) electrical trade size may be used, not exceeding 45 cm (18 in.) 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 must 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 must not be used.
- D. Connect motor or other items subject to movement, vibration or removal to the conduit or EMT systems with flexible, steel conduits.

2.4 CONDUCTORS

- A. Conductors must 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 must have color or number coding for each conductor. Conductors for control boards must 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 ground faults. Insulation resistance between individual external conductors and between conductors and ground must be a minimum of one megohm.
- D. Where size of conductor is not given, voltage and amperes must not exceed limits set 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 must 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 must 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.

2.5 TRAVELING CABLES

- A. All conductors to the car must consist of flexible traveling cables conforming to the requirements of NEC. Traveling cables must run from the junction box on the car directly to the controller. Junction boxes on the car must 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 must have permanent indelible identifying numbers for each connection. Cables must 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 must 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 contact 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 to the cartlift pit to prevent traveling cables from rubbing or chafing. Hardware cloth must be securely fastened and tensioned to prevent buckling. Hardware cloth is not required when traveling cable is hung against a flat wall.

2.6 CONTROLLER AND SUPERVISORY PANEL

- A. UL/CSA Labeled Controller: Mount all assemblies, power supplies, chassis switches, and relays on a steel frame in a NEMA Type 1 General Purpose Enclosure. Cabinet must be securely attached to the building structure.
- B. Properly identify each device on all panels by name, letter, or standard symbol which must be neatly stencil painted or decaled in an indelible and legible manner. Identification markings must be coordinated with identical markings used on wiring diagrams. The ampere

rating must be marked adjacent to all fuse holders. All spare conductors to controller and supervisory panel must be neatly formed, laced, and identified.

2.7 MICROPROCESSOR CONTROL SYSTEM

- A. Provide a microprocessor control system with absolute position/speed feedback to control dispatching, signal functions, door operation, and VVVF Drive for hoist motor control. Complete details of the components and printed circuit boards, together with a complete operational description, must be submitted for approval.
- B. Controller manufacturer must provide factory training, engineering and technical support, including all manuals, wiring diagrams, and tools necessary for adjusting, maintenance, repair, and testing of equipment to the VA for use by the VA's designated Elevator Maintenance Service Provider.
- C. Controller must be provided with wiring and components for additional future travel if required.

2.8 EMERGENCY POWER OPERATION

- A. The control system for Cartlift(s) must provide for the operation of at least one cartlift per group on emergency power upon failure of the normal power supply.
- B. Auxiliary equipment on elevator controllers, wiring between associated elevator controllers and wiring between cartlift controllers and remote selector panel as required to permit the cartlifts to operate as detailed, must be provided by the Elevator Contractor.
- C. Upon loss of normal power supply there must be a delay before transferring to emergency power of 10 seconds minimum to 45 seconds maximum, the delay must be accomplished through an adjustable timing device. After adjusting delay, the associated cartlift must function the same as on normal power.

2.9 CALL AND SEND OPERATION: CARTLIFTS

- A. Car must be dispatched from landing by manually closing car door and hoistway door and pressing call button for the landing corresponding to floor to be served, provided interlocked circuits have been established.
- B. Car must be called to such landing by pressing button at floor to be served and must proceed to destination.
- C. Car door must be opened manually after car has stopped at landing.

- D. Landing push buttons must be ineffective during travel of car through hoistway and for sufficient time after car has stopped to allow manual opening of car door and hoistway door.

2.10 CORRIDOR OPERATING STATIONS

- A. Operating stations and control panel must be stainless steel, flush mounted in or adjacent to the hoistway entrances.
 - 1. All faceplates must have edges beveled at 15 degrees.
 - 2. Fasten all faceplates with non-corrosive stainless steel tamperproof screws.
 - 3. Operating push buttons in faceplates must be designed so that pressure on contact must be independent of pressure on operating push button.
 - 4. Each switch and operating device must 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 12.5 mm (.50 in.) numbers in the face of the button corresponding to the floors served. Push buttons must not protrude beyond the faceplate when in normal position. Call register lights must be LED illuminated located in the buttons. Illuminate the floor numeral corresponding to the call registered. Provide an "In Use" light in three panels 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. A red LED illuminated indicator light to indicate a malfunction in the system.

2.11 CORRIDOR LANTERN/POSITION INDICATOR

- A. Provide each cartlift with combination corridor lantern/position indicator digital display mounted over the hoistway entrances at each floor. Each lantern must contain a single stroke chime so connected that when the cartlift arrives at a landing, the chime must sound momentarily. The lenses in each lantern must be red LED illuminated. Lanterns must signal in advance of cartlift arrival at the landing. Audible signal must not sound when a cartlift 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 floor. Indicator faceplate must be stainless steel. Numerals must be not less than 25 mm (1 in.) high. Cover plates must be readily removable for re-lamping.
- C. Provide LED illumination in each compartment to indicate the position and direction the cartlift is traveling by illuminating the proper alpha-numeric symbol. When the cartlift is standing at a landing without direction established, arrows must not be illuminated.

2.12 PUMP, MOTOR, AND VALVE ASSEMBLY

- A. Provide pump assembly for the control of the cartlift self-contained in a unit fabricated of structural steel. The unit must consist of a hydraulic fluid pump, AC motor, oil control valves with down speed regulator, muffler, piping and fittings.
- B. Submersible pump with the motor and oil control valve mounted above the tank are preferred to eliminate heat from the motor being transferred to the oil. Submersible motor and pump power units are acceptable but are best suited for lower traffic areas. Enclose V-belt power unit on four open sides with not less than 16-gauge steel removable panel sections. Provide a 50 mm (2 in.) minimum, 100mm (4 in.) maximum 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. Install metal belt guard that can be removed with hand tools for servicing and inspection.
- C. Control valves must be electronically controlled. Hydraulic fluid flow must be controlled to insure speed variation of not more than three (3) percent under all load conditions in either direction of travel. Locate the manual lowering valve, easily accessible, properly identified and not concealed within the storage tank. Mark the operating handle in red.
- D. Pump must be designed for hydraulic cartlift service, having a steady discharge without pulsation to give smooth and quiet operation. Pump output must be capable of lifting cartlift with rated capacity, with a speed variation of no more than three (3) percent between no load and full load. Hydraulic fluid by-pass must discharge directly into storage tank.
- E. Provide motor specifically designed for cartlift service, synchronous speed not more than 1800 RPM, not to exceed nameplate full load current

by more than 10%, and rated 120 starts per hour without exceeding a rise of 40 degrees C.

- F. Provide isolation units of rubber to prevent transmission of pump and motor vibration to the building.

2.13 HYDRAULIC SYSTEM

- A. Construct the storage tank of sheet steel, welded construction and a steel cover with means for filling, a minimum one-inch protected vent opening, and a valve drain connection. Tank must be sized to pass through machine room door as shown on drawings. Provide marked sight gauges to monitor hydraulic fluid level. Tank must be sized to hold volume of hydraulic fluid required to lift elevator to stop ring, 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 must also minimize aeration of hydraulic fluid. Permissible minimum hydraulic fluid level must be clearly indicated. Hydraulic fluid must be of good grade to ensure free flow when cool and have minimum flash point of 380-400 degrees F. Provide initial supply of hydraulic fluid for operation of elevator.
 - 1. Provide a means to maintain the fluid viscosity in the reservoir, pump and control valve at the manufacturer's recommended operating temperature.
 - 2. Provide a data plate on the tank frame indicating the characteristics of the hydraulic fluid used.
- B. Provide and install connections between the storage tank, pump, muffler, operating valves and cylinder complete with necessary valves, pipe supports and fittings. Pipe must be minimum schedule 40 steel with threaded, flanged, or welded mechanical couplings. Size of pipe and couplings between cylinder and pumping unit must be such that fluid pressure loss is limited to 10 percent.
- C. Hydraulic system working pressure must not exceed 500 psi under any load condition. 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 pipeline and space supports not over 304.8 cm (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.
- 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 fire rated insulation.
- F. Provide an automatic shut-off valve in the oil supply line at the cylinder inlet. Weld inlet pipe to cylinder, threaded 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 must immediately stop the descent of the elevator and hold the elevator. The exposed adjustments of the automatic shut-off valve must have their means of adjustment sealed after being set to their correct position.
- G. Provide external tank shut-off valve to isolate hydraulic fluid during maintenance operations.
- H. 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 must have an attached handle.
- I. Provide oil-tight drip pan for assembled pumping unit, including storage tank. Pan must be not less than 16-gauge sheet steel, with one-inch sides.
- J. Components of the hydraulic system must be factory certified to withstand pressure equal to twice the calculated working pressure.

2.14 HYDRAULIC PLUNGER ASSEMBLY

- A. Cylinder and plunger must be sized to lift gross load the height specified. Factory test the plunger assembly 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. Victaulic type packing gland head is not 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 footing channels that support the 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 must 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. Secure pump and reservoir to the pit channels.
- C. Plunger must 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. Where plunger is multi-piece construction, machine the joints to assure perfectly matching surfaces.
 - 1. Secure plunger to underside of platform supporting beams with fastenings capable of supporting four times the weight of the plunger. The platen plate must incorporate piston to car vibration isolation.
 - 2. Provide a stop ring welded or screwed to the bottom of plunger that must prevent the 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 plate to prevent corrosion or electrolysis.
 - 4. Protect plunger, repair or replace if gouged, nicked or scored.

2.15 HYDRAULIC CYLINDER CASING AND WELL HOLE

- A. The casing must be iron or steel not less than 9.375 mm (0.375 in.) thick, at least 152 mm (6 in.) larger in diameter than the cylinder. Close the bottom with 152 mm (6 in.) of concrete.
- B. Provide PVC casing liner to fit inside steel casing. Fabricate liner 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.

2.16 CAR BUFFERS

- A. Provide spring buffer(s) for each cartlift. Securely fasten buffers and supports to the pit channels and in the alignment with striker plates on cartlift. Each installed buffers must have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage must not puncture pit waterproofing.

2.17 CAR GUIDES

- A. Install on cartlift 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 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 cartlift guide shoes for side play between rails.

2.18 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Guide rails for car must be planed steel T-sections and weigh // 12 kg/m (8 lb/ft) // 22.5 kg/m (15 lb/ft)//.
- B. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.
- C. Provide car rail brackets of sufficient size and design to insure substantial rigidity to prevent spreading or distortion of rails under any condition.
- D. Guide rails must 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 mm (.125 in.) from plumb in all directions. Provide a minimum of 19 mm (.75 in.) clearance between bottom of rails and top of pit channels.
- E. Guide rail anchorages in pit must be made in a manner that will not reduce effectiveness of the pit waterproofing.
- F. In the event inserts or bond blocks are required for the attachment of guide rails, the Contractor must furnish such inserts or bond blocks and must 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.

- G. Guide rails must 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 one field coats of manufacturer's standard enamel.

2.19 NORMAL AND FINAL TERMINAL STOPPING DEVICES

- A. 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 must 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, must permit operation of elevator in reverse direction of travel.
- B. Mount final terminal stopping switches in the hoistway.
 - 1. Switches must be positively opened should the car travel beyond the terminal direction limit switches.
 - 2. Switches must be independent of other stopping devices.
 - 3. Switches, when opened, must remove power from pump motor and control valves preventing operation of car in either direction.

2.20 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead.
- B. Permanently attach a Code Data Plate, in plain view, to the controller.

2.21 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacle and lamp, with guards on top of cartlift. The receptacles must 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.

2.22 TOP OF CAR OPERATING DEVICE

- A. Provide a cartop operating device.
- B. The device must be activated by a toggle switch mounted in the device. The switch must be clearly marked "INSPECTION" and "NORMAL" on the faceplate, with 6 mm (.25 in.) letters.
- C. Movement of the cartlift must be accomplished by the continuous pressure on a direction button and a safety button.
- D. Provide an emergency stop switch, push to stop/pull to run.

- E. Provide permanent identification for the operation of all components in the device.
- F. The device must be permanently attached to the cartlift crosshead on the side of the cartlift nearest to the hoistway doors used for accessing the top of cartlift.

2.23 LEVELING DEVICE

- A. Cartlift must be equipped with a two-way leveling device to automatically bring the cartlift to within 3 mm (.125 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 must automatically correct this condition and maintain the cartlift within 3 mm (.125 in.) of level with the floor landing regardless of the load carried.

2.24 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch, push to stop/pull to run, for each cartop 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 1219 mm (48 in.) above the bottom landing sill and 1219 mm (48 in.) above the pit floor adjacent to the pit ladder.
- B. Each stop switch must be red in color and must have "STOP" and "RUN" positions legibly and indelibly identified.

2.25 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 enabled switches in the top and bottom corridor hall stations next to the hoistway entrance jamb.
- B. Exposed portion of each access switch or its faceplate must have legible, indelible legends to indicate "UP", "DOWN", and "OFF" positions.
- C. Each access switch must 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.
- D. Lock must 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.

- E. Arrange the hoistway switch to initiate and maintain movement of the car. 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 car crosshead level with the top floor. Submit design and location of access switches for approval.
- F. Provide emergency access for all hoistway entrances, locked door release system (key access) for cartlifts.

2.26 HOISTWAY ENTRANCES

- A. Each entrance must have bi-parting or vertical sliding doors.
- B. Frame must be not less than 16-gauge, stainless steel assembled at corners and secured with smoothly dressed, welded joints. Sill must be rigidly anchored and not less than 11-gauge stainless steel, and must be set true, straight and level with hoistway edges plumb over each other. Reinforce sill as indicated on the drawings. Sill must be grouted full length after installation.
- C. Provide each door panel frame with four fixed or adjustable, malleable iron, mill-grooved, guide shoes not less than 62 mm (2.5 in.). Weight and method of fastening to frames and hoistway, above and below, must 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.
- D. Door panels must be flush, hollow metal construction and bear a 1.5-hour Underwriters' "B" label, one inch thick, of not less than 16-gauge stainless steel on both sides. Panels must be reinforced. Interior of panels must be filled with fireproof material. Upper door section must be fitted with a safety non-crushing astragal and a glass vision panel of 6 mm (.25 in.) thick, wire glass not less than 76 mm (3 in.) nor more than 100 mm (4 in.) in diameter.
- E. Door operators must be heavy duty close loop power operators designed to automatically open car and hoistway doors upon arrival of car at each landing. Door must close automatically upon completion of loading and unloading cycles. Door "opening" and "closing" speed must be one foot per second. Design, construction, and installation of doors and power operator must preclude the possibility of doors opening until the car stop at a landing.
- F. Entrances must be installed and protected by plastic or paper covering to prevent damage during construction. Frames must be furnished with wall anchors to assure additional rigidity.

- G. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of the cartlift until all hoistway doors are locked in closed position.
- H. 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.
- I. Wiring installed from the hoistway riser to each door interlock must be NEC type SF-2 or equivalent.

2.27 ELECTRIC INTERLOCKS

- A. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of the cartlift until all hoistway doors are locked in closed position.
- 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.
- C. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.

2.28 CARTLIFT FRAME

- A. Car frame must be constructed of channel stiles, crosshead, gussets, and braces, securely bolted and/or welded. The entire assembly must be constructed to withstand unequal loading of platform. Car frame members must be constructed to relieve the car enclosure of all strains.
- B. Provide a bonding wire between frame and platform.

2.29 CARTLIFT ENCLOSURE

- A. Car must have width and depth required for contract load and constructed of minimum 14-gauge stainless steel except car floor must be minimum 10-gauge stainless steel. Car floor must be reinforced to provide adequate support for loading and unloading unit and withstand impact of wheeled carts.
 - 1. Provide car entrance with vertical sliding or vertical 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 must be opened automatically and closed automatically by power operator. Provide automatic reversing edge on underside of upper door section or a curtain scanning device.

2. Provide a flush mounted light fixture in car ceiling. Light must be connected to illuminate automatically when car arrives at landing and hoistway door is opened and must be automatically extinguished when hoistway door is closed.
 3. Provide metal nameplate in car showing name of manufacturer, rated load in pounds, and stamped, etched or raised letters.
- B. A service demand bell with a 75 mm (3 in.) diameter gong must be provided on the cartlift car. Bell must be arranged to sound when a pushbutton is pressed while the car is standing at a floor with the doors open.
- C. Car top railings must be provided where required.

2.30 POWER DOOR OPERATOR

- A. Provide door and gate operators with automatic open and // automatic // button operated // controls close the car and hoistway doors when the car is level with a floor. Microprocessor door control must have circuitry to continuously monitor and automatically adjust door operation based on velocity, position, and motor current. Motors must have high-internal resistance, capable of withstanding high currents resulting from doors stalling without damage to the motor. Hoistway doors and car gate must open automatically when the car reaches floor level with the landing when a stop is made. Provide a timer to hold the car gates and hoistway doors open for an adjustable predetermined period up to 120 seconds.
- B. Operating speed for hoistway doors and car gate must be 30 cm (1 ft) per second during high-speed operation.
- C. Provide re-opening devices, safety shoe and infrared sensor on the car gate that must, in the event the car gates meet an obstruction while closing, immediately stop and re-open the car gate. Design this device and adjust it to minimize the possibility of injury to persons by the gate.
- D. The hoistway door must open two-thirds of its travel before the car door or gate starts to open. The car gate must close two-thirds of its travel before the hoistway door starts to close.
- E. Provide encoded speed control, time control or limit switches to control motors as the doors and gates approach their limits of travel in the opening and closing directions.

- F. Install electric power door operators inside the hoistway rigidly supported. Mount electric gate operator on the car on rigid framed supported members.
- G. Each door and gate must be manually operable in an emergency without disconnecting the power door operating equipment unless the car is outside the unlocking zone.

PART 3—EXECUTION

3.1 PREPARATION

- A. Examine work of other trades on which the work of this Specification depends. Report defects to the Resident Engineer in writing that may affect the work of elevator contractor.
- B. Examine elevator hoistway openings for plumb, level, in line, and that elevator pit is proper size, waterproofed and drained with necessary access door, and ladder.
- C. Examine machine room for proper illumination, heating, ventilation, electrical equipment, and beams are correctly located complete with access stairs and door.
- D. If the Elevator Contractor requires changes in size or location of trolley beams or their supports and trap doors, etc., to accomplish their work, he must decide, subject to approval of the Contracting officer, and include additional cost in their bid.
- E. 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. Provide to General Contractor for installation; inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.

3.2 ARRANGEMENT OF EQUIPMENT

- A. 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 hoisting machine.

3.3 INSTALLATION, WORKMANSHIP, AND PROTECTION

- A. Installations must be performed by Certified Elevator Mechanics and Apprentices to best possible industry standards. Details of the installation must be mechanically and electrically correct. Materials and equipment must be new and without imperfections.
- B. Recesses, cutouts, slots, holes, patching, grouting, refinishing to accommodate installation of equipment must be included in the Contractor's work. All new holes in concrete must be core drilled.
- C. Structural members must not be cut or altered. Work in place that is damaged or defaced must be restored equal to original new condition.
- D. Finished work must be straight, plumb, level, and square with smooth surfaces and lines. All machinery and equipment must be protected against dirt, water, or mechanical injury. At final completion, all work must be thoroughly cleaned and delivered in perfect unblemished condition.
- E. Sleeves for conduit and other small holes must project 50 mm (2 in.) above concrete slabs.
- F. Hoist cables that are exposed to accidental contact in the machine room and pit must be completely enclosed with 16-gauge sheet metal or expanded metal guards.
- G. Exposed gears, sprockets, and sheaves must be guarded from accidental contact.

3.4 CLEANING

- A. Upon completion of installation and prior to final inspection, all equipment must be thoroughly cleaned of grease, oil, cement, plaster and other debris.
- B. Clean machine room and equipment.
- C. Perform hoistway clean down.
- D. Prior to final acceptance; remove protective coverings from finished or ornamental surfaces. Clean and polish surfaces with regard to type of material.

3.5 PAINTING AND FINISHING

- A. All equipment, except specified architectural finishes, must be given two coats of paint of approved color, conforming to manufacturer's standard.
- B. Hoist machine assembly must be factory painted with manufacturer's standard finish and color.
- C. Controller, car frame and platform, rails and buffers, cams, brackets and all other uncoated ferrous metal items, except their machined surfaces, must be painted one factory priming coat or approved equal.
- D. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascia or walls. The color of paint used must contrast with the color of the surfaces to which it is applied.
- E. Cartlift hoist machine, controller, main line shunt trip circuit breaker, bolster channel, and cross head of car must be identified by 100 mm (4 in.) high numerals and letters located as directed. Numerals must contrast with surrounding color and must be stenciled or decals.
- F. Hoistway entrances of cartlift:
 - 1. Door panels must 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 must be given an approved prime coat in the shop, and one field coat of paint of approved color.

3.6 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.
 - 1. The VA must obtain the services of an Independent Qualified Elevator Inspector, ANSI/ASME QEI-1 Certified, that must witness all tests. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed form and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results

and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance with ASME A17.1.

2. Contractor must 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, 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 must be tested for a period of one-hour continuous run with full contract load in the car. The test run must 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 must be determined in both directions of travel with full contract load and no load in the cartlift. Speed must be determined by certified tachometer. The actual measured speed of the cartlift with all loads in either direction must be within three (3) percent of specified rated speed. Full speed runs must be quiet and free from vibration and sway.
 - E. Temperature Rise Test: The temperature rise of the pump motor must be determined during the full load test run. Temperatures must be measured using thermometers. Under these conditions, the temperature rise of the equipment must not exceed 50 degrees Centigrade above ambient temperature. Test must 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 must be performed as prescribed by the Institute of Electrical and Electronic Engineers.
 - F. Car Leveling Test: Cartlift leveling devices must 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 must be within plus or minus 3 mm (.125 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 must automatically correct over travel as well as under travel and must maintain the car floor within plus or minus 3 mm (.125 in.) of level with the landing floor regardless of change in load.

- G. Insulation Resistance Test: The cartlift complete wiring system must be free from short circuits and grounds and the insulation resistance of the system must be determined by use of megohm meter, at the discretion of the Inspector conducting the test.
- H. Safety Devices Tests: Safety devices must be tested.
- 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 must be accurately measured.
 - 2. Final position of the cartlift relative to the terminal landings must be determined when the cartlift has been stopped by the final limits. The lower limit stop must be made with contract load in the cartlift. Cartlift must be operated at inspection speed for both tests. Normal limit stopping devices must 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. Operating and Signal System: The cartlift must be operated by the operating devices provided and the operation signals and automatic floor leveling must function in accordance with requirements specified. Starting, stopping and leveling must be smooth and comfortable without appreciable steps of acceleration or deceleration.
- N. If equipment fails test requirements and a re-inspection is required, the Contractor must be responsible for the cost of re-inspection; salaries, transportation expenses, and per-diem expenses incurred by the representative of the Resident Engineer.

3.7 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 must 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 must be furnished and

delivered to the Resident Engineer in independently bound folders. DVD recordings will also be acceptable. Written instructions must 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 diagrams of equipment and parts. Information must also include electrical operation characteristics of all circuits, relays, timers, electronic devices, 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".

3.8 CARTLIFT GUARANTEE PERIOD OF SERVICE: MAINTENANCE SERVICE AND INSPECTIONS

- A. Furnish complete maintenance service and inspections on each cartlift installation for a period of one (1) year after completion and acceptance of each cartlift in this specification by the Resident Engineer. This maintenance service must run concurrently with the warranty. Maintenance work must be performed by Certified Elevator Mechanics and Apprentices.
- 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 must be required to perform the following:
 1. Monthly systematic examination of equipment.
 2. During each maintenance visit the Elevator Contractor must clean, lubricate, adjust, repair and replace all parts as necessary to keep the equipment in first class condition and proper working order.
 3. Furnish all lubricant, cleaning materials, parts and tools necessary to perform the work required. Lubricants must 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 must be cleaned, lubricated and adjusted.
 5. Guide rails and bottom of platforms must be cleaned every three months. Car tops and machine room floors must be cleaned monthly.

- Accumulated rubbish must be removed from the pits monthly. A general cleaning of the entire installation including all machine room equipment and hoistway equipment must be accomplished quarterly. Cleaning supplies and vacuum cleaner must be furnished by the Contractor.
6. Maintain the performance standards set forth in this specification.
 7. The operational system must 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 must not include the performance of work required because of improper use, accidents, and negligence for which the Elevator Contractor is not directly responsible.
 - D. Provide 24-hour emergency call-back service that must 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 must 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 must 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 must be given to the Resident Engineer.
 - F. The Elevator Contractor must maintain a log in the machine room. The log must list the date and time of all monthly examinations and all trouble calls. Each trouble call must be fully described including the nature of the call, necessary correction performed, or parts replaced.
 - G. Written "Maintenance Control Program" must be in place to maintain the equipment in compliance with ASME A17.1 Section 8.6.

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