

**SECTION 14 21 11
TRACTION CARTLIFT**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the engineering, furnishing, and installation of the complete ready for operation traction 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. Cartlift No. CL1 and CL2 shall be geared traction, microprocessor controller, AC VVVF motor control, 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.
- 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 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section.
- E. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.
- F. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- G. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for cables and wiring.
- H. Section 26 05 73, ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY: Requirements for installing the over-current protective devices to ensure proper equipment and personnel protection.
- I. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low voltage transformers.
- J. Section 26 24 16, PANELBOARDS: Low voltage panelboards.
- K. Section 26 43 13, TRANSIENT-VOLTAGE SURGE SUPPRESSION: Surge suppressors installed in panelboards.

- L. 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 certificates 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 three 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 two hours of receipt of notification, together with certification that the quantity and quality of replacement parts stock is sufficient to warranty continued operation of the elevator installation.
- C. Approval will not be given to elevator contractors and manufacturers who have established on prior projects, either government, municipal, or commercial, a record for unsatisfactory elevator installations, have failed to complete awarded contracts within the contract period, and does not have the requisite record of satisfactorily performing cartlift installations of similar type and magnitude.

- D. All electric traction 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-766Steel, 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. 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 Farability
 - E1042-02.....Acoustically Absorptive Materials Applied by Trowel or Spray
- G. Gauges:
 - For Sheet and Plate: U.S. Standard (USS)
 - For Wire: American Wire Gauge (AWG)
- H. American Welding Society (AWS):
 - D1.1.....Structured Welding Code Steel
- I. National Electrical Manufacturers Association (NEMA):
 - LD-3.....High-Pressure Decorative Laminates
- J. Underwriter's Laboratories (UL):
 - 486A.....Safety Wire Connectors for Copper Conductors
 - 797.....Safety Electrical Metallic Tubing
- K. 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. Hoisting machines, controllers, power conversion devices, governors, and all other components located in machine room.
 - b. Car, counterweight, sheaves, supporting beams, 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
 - d. Reactions at points of supports and buffer impact loads.
 - e. Weights of principal parts.
 - f. Top and bottom clearances and over travel of car and counterweight.
 - 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. 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.
- E. Name of manufacturer, type or style designation, and applicable data of the following equipment shall be shown on the cartlift layouts:
1. Hoisting machine.
 2. Hoisting machine motor, HP rating, and RPM.
 3. Controller
 4. Starters and overload current protection devices.
 5. Car and counterweight safety devices; maximum and minimum rated loads and rated speeds.
 6. Governor
 7. Electric door operator; HP rating and RPM of motor.

8. Hoistway door interlocks.
 9. Car and counterweight buffers; maximum and minimum rated loads, maximum rated striking speed and stroke.
 10. Hoist ropes; ultimate breaking strength, allowable working load, and actual working load.
- F. Complete construction drawings of cartlift 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 traction hoisting machine.
 - H. Drawings showing details of controller.
 - I. 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 meet 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 three (3) 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. Cartlift control system shall be capable of starting the car without noticeable "roll-back" of hoisting machine sheave, regardless of load condition in car, location of car, or direction of travel.
- 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 under any condition including door operation.

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 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. Basis for Design: Matot, Material Cart Lift, with 100 fpm, power doors and security system features.
- B. 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.
- C. When two or more devices of the same class of materials or equipment are required, these devices shall be products of one manufacturer.
- D. 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.
- E. 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.
- F. 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 compatibility with the total

operating system. Mixing of manufactures related to a single system or group of components shall be identified in the submittals.

- G. 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.
- H. 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. Each cartlift shall have the capacity to lift a live load, including the weight of the car and cables, at the speed specified in the following schedule:

CARTLIFT SCHEDULE	
Cartlift Number	CL1 and CL2
Overall Platform Size	36 x 54 x 66
Rated Load - kg(lb)	1000
Contract Speed - m/s(fpm)	100
Total Travel - m/s(ft)	35'-3"
Number of Stops	2 Each Lift
Number of Openings	2 Each Lift, Openings on same side
Type of Roping	2:1
Entrance Type and Size	Floor Loading / Power

2.4 POWER SUPPLY

- A. For power supply in each machine room, see Specification 26 05 21, Electrical specifications, 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 car-lift equipment. 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.

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 ground faults. Insulation resistance between individual external conductors and between conductors and ground shall be a minimum of one megohm.
- D. Where size of conductor 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 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 CABLE

- 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.

2.9 MICROPROCESSOR CONTROL SYSTEM

- A. Provide a microprocessor based system with absolute position/speed feedback encoded tape to control the hoisting machine and signal functions in accordance with these specifications. Complete details of the components and printed circuit boards, together with a complete operational description, shall be submitted for approval.
 - 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 metal cabinets 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 VVVF AC MOTOR CONTROL

- A. Variable Voltage Variable Frequency Motor Control:
 - 1. Cart-lift control shall be affected by means of a compact solid state motor control unit for each and every cartlift with electrical characteristics to suit the power supply. The system shall consist of the necessary three phase, full-wave bridge rectifiers.
 - 2. Solid state motor control unit shall operate with high efficiency and low power consumption, have the capacity to handle peak currents typical of cartlift service and contain a balanced, coordinated fault protection system which shall accomplish the following:
 - a. Protect the complete power circuit and specifically the power semi-conductors from failure under short circuit (bolted fault) conditions.
 - b. Protect against limited faults arising from partial grounds, partial shorts in the motor armature or in the power unit itself.
 - c. Protect the drive motor against sustained overloads. A solid state overload circuit shall be used.
 - d. Protect motor and power unit against instantaneous peak overload.
 - e. Provide semi-conductor transient protection.
 - f. Provide phase sequence protection to insure incoming line is phased properly.

- g. Removable printed circuit boards shall be provided for the VVVF control. Design tabs so boards cannot be reversed.

2.11 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.
 - h. 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.

2.12 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 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. Call register lights shall be LED illuminated located within or behind the buttons. Illuminate the floor numeral corresponding to the call registered. Provide an "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 at other floors 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.

2.13 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.

2.14 MACHINE BEAMS

- A. Provide structural steel beams required for direct support of an attachment to building structure of hoist machine, deflector sheaves, overhead sheaves, governor, and rope dead-end hitch assemblies.
- B. Provide bearing plates, anchors, shelf angles, blocking, embedment, etc., for support and fastening of machine beams or equipment to the building structure.
- C. Provide hold-down bolts for offset hoist machines located beside or under hoistway where concrete hold-down pad is provided.

2.15 GEARLESS TRACTION MACHINE

- A. Gearless Traction Hoist Machine:
 - 1. Gearless traction machine with an AC motor, brake, drive sheave, and deflector sheave mounted in proper alignment on an isolated bedplate.
 - 2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
 - 3. Armature must be electrically balanced and together with motor coupling and brake, mechanically balanced.
 - 4. The structural design of the motor shall insure perfect alignment of bearings. The rotating elements shall be dynamically balanced to minimize vibration.
 - 5. Hoist machine shaft shall be supported by two bearings mounted on a bedplate or integral with machine frame. Shaft shall be of forged steel or close grain electric furnace cast steel.
 - 6. Drive sheaves shall be free from cracks, sand holes, and other imperfections that would tend to injure the hoist ropes. Sheave shall be turned smooth and true with rope grooves of proper design to insure maximum traction and maximum life of the hoist ropes. Traction sheave shall be mechanically coupled to the hoist motor center in a positive manner.
 - 7. Hoisting machine brake shall be drum or disc type and shall have the capacity to hold the elevator with 125 percent of rated load. Arrange brake circuits so that no current shall be applied to the brake coil prior to the establishment of the hoistway door interlock circuit, except during leveling and releveling operation.

2.16 SHEAVES

- A. Overhead sheaves shall be securely mounted on overhead beams in proper alignment with the traction sheave, two-to-one idler sheaves in counterweight head frame or car crosshead respectively.
- B. Deflector sheave bearings shall be the same as specified for hoisting machine, except that sheave bearings of the anti-friction bearing metal type with grease cup lubrication may be used for deflector sheaves and overhead sheaves used with machine mounted below, and two-to-one car and counterweight idler sheaves.
- C. Overhead deflector sheaves shall be provided with a substantial metal basket type guard mounted below the sheave. Guard shall be securely fastened to sheave beams.
- D. Provide two-to-one idler sheaves on car and counterweight with a suitable metal guard which will effectively prevent foreign objects falling between ropes and sheave grooves, prevent ropes jumping off grooves in case of accident, and prevent accidental fouling by or injury to workmen on top of the car.

2.17 HOIST ROPES

- A. Provide cartlift with the required number and size of ropes to insure adequate traction for the range of loads with a factor of safety not less than required by ASME A17.1 Section 2.20. Hoisting ropes shall be preformed 8 x 19 or 8 x 25 traction steel, complying with Federal Specification RR-W-410 with minimum nominal diameter of 0.50 inch. For machines located overhead, 6 x 19 preformed traction steel hoisting ropes may be used in lieu of 8 x 19 that meet the requirements of the sheave manufacturer, at the elevator contractor's option.
- B. Securely attach a corrosion resistant metal data tag to one hoisting rope fastening on the cartlift.
- C. Provide wedge type shackles.

2.18 HOIST ROPE COMPENSATION

- A. Provide compensation when required by controller manufacturer. Compensation shall consist of a necessary number and size of encapsulated chains or whisper flex attached to the underside of car and counterweight frames. Hoist rope compensation shall meet the requirements of ASME A17.1 Rule 2.21.4.
 - 1. Provide pit guide to minimize chain sway.
 - 2. Provide take-up to compensate for hoist rope stretch.
 - 3. Pad areas where compensation may strike car or hoistway items.

2.19 CAR AND COUNTERWEIGHT SAFETY DEVICE

- A. Provide "Type A Safeties" on the cartlift and counterweight that meet the requirements of ASME A17.1 Section 2.17.
- B. Field testing of the safeties and governor shall be as specified in Section 3.7 PRETEST and TEST of this specification.

2.20 CAR AND COUNTERWEIGHT BUFFERS

- A. Provide two buffers for each car and one for each counterweight that meet the requirements of ASME A17.1 Section 2.22. Securely fasten buffers and supports to the pit channels and in alignment with striker plates on car and counterweight. Every installed buffer shall have a permanently attached metal plate indicating its stroke and load rating. Buffer anchorage shall not puncture pit waterproofing.
- B. Design and install buffers to provide minimum car runby required by ASME A17.1 Rule 2.4.2.
- C. Furnish pipe stanchions and struts as required to properly support the buffer.

2.21 COUNTERWEIGHT

- A. Cartlift shall be counterweighted to the extent of the weight of the car plus 40-50 percent of the rated capacity load, as required by controller manufacturer.
- B. Furnish two (2) tie rods with cotter pins and double nuts at top and bottom. Install set collars or other approved means on tie rods to prevent counterweight sub-weights from jumping and/or rattling. Both ends of tie-rods shall be visible and accessible.
- C. Provide counterweight guard in pit in accordance with ASME A17.1 Rule 2.3.2.

2.22 CAR AND COUNTERWEIGHT 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 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.

2.23 GUIDE RAILS, SUPPORTS, AND FASTENINGS

- A. Guide rails shall conform to ASME A17.1 Section 2.23.
- B. Guide rails for car and counterweight shall be planed steel T-sections
- C. Securely fasten guide rails to the brackets or other supports by heavy duty steel rail clips.
- D. Provide necessary 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.

2.24 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 carlift 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 125 percent of rated cartlift capacity at any speed obtained in normal operation.
 - 2. Switches, when opened, shall permit operation of cartlift 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 hoist motor, apply hoist machine brake, and prevent operation of car in either direction.
- D. After final stopping switches have been adjusted, through bolt switches to guide rail.

2.25 CROSSHEAD DATA PLATE AND CODE DATA PLATE

- A. Permanently attach a non-corrosive metal Data Plate to car crosshead. Data plate shall bear information required by ASME A17.1 Section 2.16.3 and Rule 2.20.2.1.
- B. Permanently attach a Code Data Plate, in plain view, to the controller, ASME A17.1 Section 8.9.

2.26 WORKMAN'S LIGHTS AND OUTLETS

- A. Provide duplex GFCI protected type receptacles and lamps with guards on top of each 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.

2.27 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.

2.28 CARTLIFT LEVELING DEVICE

- A. Cart-lift 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.

2.29 EMERGENCY STOP SWITCHES

- A. Provide an emergency stop switch for each top-of-cartlift device, pit, and machine spaces. 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.

2.30 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 car 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.

2.31 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 close 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.

2.32 ELECTRIC INTERLOCKS

- A. Equip each hoistway door with an interlock, functioning as hoistway unit system, to prevent operation of car until all hoistway doors are locked in closed position. Hoistway door interlock shall not be accepted unless it meets the requirements of ASME A17.1 Section 2.12.
- B. Equip car doors with electric contact that prevents operation of car until doors are closed unless car is operating in leveling zone or hoistway access switch is used. Locate door contact to prevent its being tampered with from inside of car. Car door contact shall not be accepted unless it meets the requirements of ASME A17.1 Section 2.12.
- C. Wiring installed from the hoistway riser to each door interlock shall be NEC type SF-2 or equivalent.
 1. Type SF-2 cable terminations in the interlock housing shall be sleeved with glass braid fillers or equivalent.
- D. Provide devices, either mechanical or electrical, that shall prevent operation of the cartlift 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.
- E. Provide an electric contact conforming to ASME A17.1, paragraph 2.26.2.26 at pit access doors to prevent operation of the cart lift when the door is open.

2.33 CAR FRAME

- A. Construct car frames of structural shapes, ASTM A-36, rigidly bolted and welded together of adequate strength to support car with rated load and to conform to ASME A17.1 Rule 7.2.2.
- B. Provide a bonding wire between frame and platform if isolation frame is used.

2.34 CAR ENCLOSURE

- A. Car shall have width and depth required for contract load and constructed of minimum 14-gauge stainless steel except car 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 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 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, rated load in pounds, and stamped, etched or raised letters.
- B. Car top railings shall meet the requirements of ASME A17.1 Rules 2.14.11.7 and 2.10.2.

2.35 POWER DOOR OPERATORS: CARTLIFTS

- A. Provide a heavy duty powered door operator to automatically open the car and hoistway doors simultaneously when the car is level with a floor, and automatically close the doors simultaneously at the expiration of the door-open time. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Motor shall be of the high-internal resistance type, capable of withstanding high currents resulting from stall without damage to the motor. The door operator shall be capable of opening 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.

2.36 MACHINE ACCESS DOOR:

- A. Hinged access door shall be 24" wide x 24" high and shall be furnished at machine location for service and maintenance as indicated on the drawings.
- B. Access door shall be 16 gauge #4 satin polish stainless steel.

PART 3—EXECUTION

3.1 PREPARATION

- A. Before fabrication, take necessary job site measurements, and verify work 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.

1. Shaft and openings for moving equipment are plumb, level and in line, and that pit is proper depth, waterproofed and drained with necessary access doors, ladder and guard.
 2. Machine room is properly illuminated, heated, cooled, and ventilated, and equipment support beams correctly located, complete with floor, access stairs, and door. Report defects to the Resident Engineer in writing that may affect the work of this trade or equipment operation.
- B. 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 hoisting beams or their supports and trap doors, etc., to accomplish his work, he must make arrangements, subject to approval of the Contracting Officer, and include additional cost in his bid. Locate controller near and visible from its respective hoist machine.
- C. Work required prior to the completion of the cartlift installation:
1. Supply of electric feeder wires to the terminals of the cartlift 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.
 6. Machine room enclosed and protected from moisture, with self closing, self locking door and access stairs.
 7. Provide fire extinguisher in machine room.
- D. Supply for installation: inserts, anchors, 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 hoisting machine.

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. Hoist cables which are exposed to accidental contact in the machine room and pit shall be completely enclosed with 16-gauge sheet metal guards.
- G. 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 after completion of installation and prior to final inspection, all equipment shall be thoroughly cleaned of grease, oil, cement, plaster, and other debris.
- 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. Hoist machine assembly shall be factory painted with manufacturer's standard finish and color.
- B. Controller, sheave, car frame and platform, counterweight, beams, rails and buffers, cams, brackets and all other uncoated ferrous metal items, except their machined surfaces, shall be painted one factory priming coat or approved equal.
- C. All equipment, except specified architectural finishes, shall be given two coats of paint of approved color, conforming to manufacturer's standard.
- D. Field painting of governors shall be in accordance with ASME A17.1 Rule 2.18.3.1.
- E. Stencil or apply decal floor designations not less than 100 mm (4 in.) high on hoistway doors, fascias or walls. The color of paint used shall contrast with the color of the surfaces to which it is applied.

- F. Cartlift hoist machine, controller, governor, main line shunt trip circuit breaker, safety plank, and cross head of car 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.
- G. Hoistway entrances of cartlift:
 - 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-TEST AND TEST

- 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. Procedure outlined in the Inspectors Manual for Electric Elevators, ASME A17.2 shall apply.
 - a. Final test shall be conducted in the presence of and witnessed by an ASME QEI-1 Certified Elevator Inspector.
 - b. Government shall furnish electric power including necessary current for starting, testing, and operating machinery of each cartlift.
 - 2. Contractor shall furnish the following test instruments and materials on-site and at the designated time of inspection: properly marked test weights, voltmeter, amp-meter and amp probe, thermometers, direct reading tachometer, and a means of two-way communication.
 - 3. If during the inspection process the Inspector determines the need, the following instruments shall be available within a four-hour period: Megohm meter, vibration meter, sound meter, and a light meter.
- B. Inspection of workmanship, equipment furnished, and installation for compliance with specifications.
- C. Balance Tests: The percent of counterbalance shall be checked by placing test weights in car until the car and counterweight are equal in weight when located at the mid-point of travel. If the actual

- percent of counter balance does not conform to the specification, the amount of counterweight shall be adjusted until conformance is reached.
- D. 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.
- E. Speed Test: The actual speed of the cartlift shall be determined in both directions of travel with full contract load, balanced load and no load in the cartlift. Speed shall be determined by applying a certified tachometer to the car hoisting ropes or governor rope. The actual measured speed of the cartlift with all loads in either direction shall be within three (3) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.
- F. Temperature Rise Test: The temperature rise of the hoisting 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.
- G. Car Leveling Test: Cartlift leveling devices shall be tested for accuracy of leveling at all floors with no load in car, balanced 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.
- H. Brake Test: The action of the brake shall be prompt and a smooth stop shall result in the up and down directions of travel with no load and rated load in the elevator. Down stopping shall be tested with 125 percent of rated load in the cartlift.
- I. 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.

- J. Safety Devices and Governor Tests: The safety devices and governor shall be tested as required by ASME 17.1 Section 8.10.
- K. Overload Devices: Test all overload current protection devices in the system at final inspection.
- L. 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.
- M. Oil Buffer Tests: These tests shall be conducted with operating device and limit stops inoperative and with contract load in the cartlift for the car buffer and with no load in the cartlift for the counterweight buffer. Preliminary test shall be made at the lowest (leveling) speed. Final tests shall be conducted at contract speed. Buffers shall compress and return to the fully extended position without oil leakage.
- N. 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.
- O. 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.
- P. 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.
- Q. Evidence of malfunction in any tested system or parts of equipment that occurs during the testing shall be corrected, repaired, or replaced at no additional cost to the Government, and the test repeated.

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

3.9 INSTRUCTION OF VA PERSONNEL

- A. Provide competent instruction to VA personnel regarding the operation of equipment and accessories installed under this contract, for a period equal to one-eight hour day. Instruction shall commence after completion of all work and at the time and place directed by the Resident Engineer.
- B. Written instructions in triplicate relative to care, adjustments, and operation of all equipment and accessories shall be furnished and delivered to the Resident Engineer in independently bound folders. DVD recordings will also be acceptable. Written instructions shall include correct and legible wiring diagrams, nomenclature sheet of all electrical apparatus including location of each device, complete and comprehensive sequence of operation, complete replacement parts list with descriptive literature, and identification and diagrams of equipment and parts. Information shall also include electrical operation characteristics of all circuits, relays, timers, electronic devices, and related characteristics for all rotating equipment.

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 Mechanics 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 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. Furnish all lubricants, cleaning materials, parts and tools necessary to perform the work required. Lubricants shall be products recommended by the manufacturer of the equipment.
 4. Equalizing tension, shorten or renew hoisting ropes where necessary to maintain the safety factor.
 5. 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, signal system, car safety device, governors, tension and sheaves in pit shall be cleaned, lubricated and adjusted.
 6. Guide rails, overhead sheaves and beams, counterweight frames, 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. Maintain the performance standards set forth in this specification.
 8. The operational system shall be maintained to the standards specified hereinafter including any changes or adjustments required to meet varying conditions of hospital occupancy.
 9. 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. Provide written "Maintenance Control Program" that shall be in place to maintain the equipment in compliance with ASME A17.1 Section 8.6.

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