

\*\*\*\*\*  
USACE / NAVFAC / AFCEA / NASA UFGS-14240 (November 2004)  
-----  
Preparing Activity: USACE MasterFormat™ 2004 - 14 24 00  
Superseding  
UFGS-14240 (September 2002)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags

\*\*\*\*\*

### SECTION TABLE OF CONTENTS

#### DIVISION 14 - CONVEYING SYSTEMS

14240

#### HYDRAULIC ELEVATORS

11/04

#### PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 ELEVATOR SYSTEM
- 1.4 QUALIFICATIONS
  - 1.4.1 Elevator Specialist
  - 1.4.2 Elevator Inspector
  - 1.4.3 Welders' Qualifications
- 1.5 NEW INSTALLATION SERVICE
  - 1.5.1 Special Operations
  - 1.5.2 Documentation
  - 1.5.3 Maintenance and Diagnostic Tools
  - 1.5.4 Keys for Elevator Key Switches
- 1.6 MAINTENANCE AND REPAIR ACTION PLAN

#### PART 2 PRODUCTS

- 2.1 PASSENGER ELEVATORS
  - 2.1.1 Basic Requirements
  - 2.1.2 Cab Enclosures and Door Finishes
- 2.2 FREIGHT ELEVATORS
  - 2.2.1 Basic Requirements
  - 2.2.2 Cab Enclosures and Door Frame Finishes
- 2.3 SPECIAL OPERATION AND CONTROL
  - 2.3.1 Firefighters' Service
  - 2.3.2 Smoke Detectors
  - 2.3.3 Fire Sprinklers
  - 2.3.4 Top-of-Car Operating Device
  - 2.3.5 Hoistway Access Switches
  - 2.3.6 Independent Service
  - 2.3.7 Elevator Operation
    - 2.3.7.1 Single, Two-Stop, Automatic Operation

- 2.3.7.2 Selective Collective Automatic Operation
- 2.3.7.3 Duplex Selective Collective Automatic Operations
- 2.3.7.4 Group Automatic Operation
- 2.3.8 Parking Switch
- 2.3.9 Hospital Emergency Commandeering Service
- 2.4 ELEVATOR DRIVE SYSTEM
  - 2.4.1 Hydraulic Pump Unit
  - 2.4.2 Hydraulic Controls and Equipment
    - 2.4.2.1 Manual Shutoff Valves
    - 2.4.2.2 Manual Lowering Valve
    - 2.4.2.3 Pump Discharge Strainer
    - 2.4.2.4 Muffler
    - 2.4.2.5 Pressure Switch
    - 2.4.2.6 Scavenger Pump Unit
    - 2.4.2.7 Piping and Accessories
    - 2.4.2.8 Low Oil Condition
    - 2.4.2.9 Oil Characteristics
    - 2.4.2.10 Oil Temperature Device
  - 2.4.3 Cylinder-Plunger Unit
  - 2.4.4 Cylinder Protection
  - 2.4.5 Automatic Shutoff Valve
  - 2.4.6 Cylinder Well System
    - 2.4.6.1 Well Casing
    - 2.4.6.2 PVC Liner
    - 2.4.6.3 Pressure Test
    - 2.4.6.4 Cylinder Installation
    - 2.4.6.5 Casing Fill
    - 2.4.6.6 Liner Inspection and Test Tube
    - 2.4.6.7 Cylinder Bottom Location Fill
    - 2.4.6.8 Seal
    - 2.4.6.9 Containment
  - 2.4.7 Motors
    - 2.4.7.1 Insulation Resistance and Motor Nameplate Data
    - 2.4.7.2 Maximum Allowable Motor Amperage
- 2.5 CONTROL EQUIPMENT
  - 2.5.1 Logic Control
  - 2.5.2 Self-Leveling and Anti-Creep Device
- 2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS
  - 2.6.1 Capacity and Data Plates
  - 2.6.2 Car and Hall Buttons
  - 2.6.3 Hall Station Door Operating Buttons
  - 2.6.4 Passenger Car-Operating Panel
- 2.7 PASSENGER CONTROLS
  - 2.7.1 Passenger Car-Operating Panel
    - 2.7.1.1 Service Controls
    - 2.7.1.2 Certificate Window
  - 2.7.2 Freight Car-Operating Panel
    - 2.7.2.1 Passenger Controls
    - 2.7.2.2 Service Controls
    - 2.7.2.3 Certificate Window
  - 2.7.3 Semi-Selective Door Operation
  - 2.7.4 Full-Selective Door Operation
  - 2.7.5 Switches and Devices
  - 2.7.6 In-Car Position and Direction Indicator and Signal
    - 2.7.6.1 In-Car Position Indicator and Signal
    - 2.7.6.2 In-Car Direction Indicator and Signal
  - 2.7.7 Landing Position and Direction Indicator and Signal
    - 2.7.7.1 Landing Position Indicator and Signal
    - 2.7.7.2 Landing Direction Indicator and Signal

- 2.8 HOISTWAY AND CAR EQUIPMENT
  - 2.8.1 Guide Rails and Fastenings
  - 2.8.2 Car Buffers
  - 2.8.3 Pit Equipment
    - 2.8.3.1 Pit "STOP" Switch
    - 2.8.3.2 Ladders
    - 2.8.3.3 Lighting of Pits
- 2.9 TERMINAL STOPPING DEVICES
  - 2.9.1 Wiring and Traveling Cables
  - 2.9.2 Emergency Signaling Device
- 2.10 PASSENGER CAR AND HOISTWAY DOOR ACCESSORIES
- 2.11 PASSENGER ELEVATOR GUIDES, FRAME, PLATFORM, AND ENCLOSURE
  - 2.11.1 Roller Guides
  - 2.11.2 Car Enclosure, Car Door, and Car Illumination
    - 2.11.2.1 Car Shell, Return Panels, Entrance Columns, Cove Base, and Transom
    - 2.11.2.2 Car Top
    - 2.11.2.3 Car Door
    - 2.11.2.4 Car Entrance Sill
    - 2.11.2.5 Carpet
- 2.12 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES
  - 2.12.1 Hoistway Entrance Frames
  - 2.12.2 Hoistway Entrance Sills
  - 2.12.3 Hoistway Entrance Doors
  - 2.12.4 Entrance Fascias and Dust Covers
  - 2.12.5 Hoistway Ventilation
- 2.13 FREIGHT ELEVATOR GUIDE SHOES, PLATFORM, AND ENCLOSURE
  - 2.13.1 Roller Guides
  - 2.13.2 Car Enclosure
- 2.14 FREIGHT ELEVATOR HOISTWAY DOORS AND ENTRANCES
  - 2.14.1 Door Panel
  - 2.14.2 Door Operation
- 2.15 HANDICAPPED AND MEDICAL SERVICES ACCESS
  - 2.15.1 Provision For Handicapped
  - 2.15.2 Emergency Medical Service
- 2.16 EMERGENCY POWER OPERATION
- 2.17 PROVISIONS FOR EARTHQUAKE PROTECTION

## PART 3 EXECUTION

- 3.1 INSTALLATION
  - 3.1.1 Traveling Cables
  - 3.1.2 Automatic Shutoff Valve
  - 3.1.3 Structural Members
  - 3.1.4 Safety Guards
  - 3.1.5 Miscellaneous Requirements
  - 3.1.6 Firefighters' Service
- 3.2 FIELD QUALITY CONTROL
  - 3.2.1 Testing Materials and Instruments
  - 3.2.2 Field Tests
    - 3.2.2.1 Endurance Tests
    - 3.2.2.2 Automatic Shutoff Valve Tests
    - 3.2.2.3 Speed Tests
    - 3.2.2.4 Leveling Tests
    - 3.2.2.5 Pressure Tests
    - 3.2.2.6 Insulation Resistance Tests
    - 3.2.2.7 Temperature Rise Tests
    - 3.2.2.8 Motor Ampere Tests
- 3.3 OPERATION AND MAINTENANCE TRAINING

-- End of Section Table of Contents --

```
*****  
USACE / NAVFAC / AFCESA / NASA                                UFGS-14240 (November 2004)  
-----  
Preparing Activity: USACE                                     MasterFormat™ 2004 - 14 24 00  
Superseding  
UFGS-14240 (September 2002)
```

# UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags

\*\*\*\*\*

14240

## HYDRAULIC ELEVATORS

11/04

\*\*\*\*\*

NOTE: This guide specification covers the requirements for hydraulic passenger and freight elevators.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

\*\*\*\*\*

## PART 1 GENERAL

\*\*\*\*\*

NOTE: For NAVFAC projects, any editing of non-bracketed paragraphs in this specification shall be approved through the NAVFAC Elevator Program.

The designer will incorporate the following features into the design and will show in the drawings as applicable.

1. Complete design of the hoistways, pits, machine rooms including all structural requirements, sizing, access, fire-resistant rating, ventilation,

waterproofing and drainage.

2. Proper size of openings into hoistway walls for installing hoistway door assemblies.
3. Storage facilities for elevator equipment during construction.
4. Electrical service requirements for elevators, including sizings in compliance with codes and locations for fused and unfused disconnect switches.
5. Sill supports, including steel angles, sill recesses, and grouting of door sills.
6. Structural steel door frames with extensions to beams.
7. Locations for hall stations and hall lanterns.
8. Emergency power supply with automatic time-delay transfer switch and auxiliary contacts with wiring to elevator controller.
9. Telephone and or Intercom connections to elevator hoistway.
10. Location of smoke detectors required for Firefighters' Service. The designer will also indicate wiring of the smoke detectors to the elevator control system and to the building fire alarm system.
11. Wiring to elevator alarm bells and fire-fighters' service.
12. Lighting, ventilation and heat to machine room.  
Ambient temperature of 10 degrees C (50 degrees F) min., 32 degrees C (90 degrees F) max.

\*\*\*\*\*

## 1.1 REFERENCES

\*\*\*\*\*

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically  
be deleted from this section of the project  
specification when you choose to reconcile  
references in the publish print process.

\*\*\*\*\*

The publications listed below form a part of this specification to the  
extent referenced. The publications are referred to within the text by the  
basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2004) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1 (2004) Handbook on Safety Code for  
Elevators and Escalators

ASME A17.2.2 (1999) Checklist for Inspection of  
Hydraulic Elevators

ASME B16.11 (2002) Forged Fittings, Socket-Welding and  
Threaded

ASME B16.9 (2003) Factory-Made Wrought Steel  
Buttwelding Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A 106/A 106M (2004b) Seamless Carbon Steel Pipe for  
High-Temperature Service

ASTM A 53/A 53M (2004a) Pipe, Steel, Black and Hot-Dipped,  
Zinc-Coated, Welded and Seamless

ASTM D 92 (2002b) Flash and Fire Points by Cleveland  
Open Cup Tester

ASTM D 97 (2004) Pour Point of Petroleum Products

ASTM E 2074 (2000) Fire Tests of Door Assemblies,  
Including Positive Pressure Testing of  
Side-Hinged and Pivoted Swinging Door  
Assemblies

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2003) International Building Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2003; R 2004) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2005) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders
36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

1.2 SUBMITTALS

\*\*\*\*\*

NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

\*\*\*\*\*

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings[; G][; G, [\_\_\_\_\_]]

Detail drawings including dimensioned layouts in plan and elevation showing the arrangement of elevator equipment, accessories, supporting systems, anchorage of equipment, clearances for maintenance and operation; and details on hoistway,



doors and frames, operation and signal stations, controllers, motors, guide rails and brackets, cylinder and plunge unit, and points of interface with normal power [fire alarm system] [HVAC or exhaust systems] [and] [interface with emergency power systems]. Provide drawings to show any revised building electrical system required to make supplied elevator system function as specified. Prepare drawings with complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operations and functions of system devices. Drawings shall include the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes. Submit one set of wiring diagrams in plastic or glass cover, framed and mounted in elevator machine room. Deliver other sets to Contracting Officer. Coded diagrams are not acceptable unless adequately identified.

#### SD-03 Product Data

Passenger Elevators[; G][; G, [\_\_\_\_]]  
Freight Elevators[; G][; G, [\_\_\_\_]]

Include information on motor, pump, gages, piston and cylinder, piping and valves, hall station, and buffer on elevators and accessories. For elevator supporting systems, include information on car control [and emergency power] systems. On data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening.

Field Quality Control[; G][; G, [\_\_\_\_]]

A plan detailing the testing procedures shall be submitted [60] [\_\_\_\_] days prior to performing the elevator tests.

Logic Control[; G][; G, [\_\_\_\_]]

Microprocessor control system, including appropriate hardware and software and other specified requirements.

#### SD-05 Design Data

Reaction Loads[; G][; G, [\_\_\_\_]]

Calculations of reaction loads imposed on building by elevator system that comply with ASME A17.1. Calculations shall be certified by a Registered Professional Engineer. Do not fabricate materials nor perform construction until approved by Contracting Officer.

Heat Loads[; G][; G, [\_\_\_\_]]

Calculations for total anticipated heat loads generated by all the elevator machine room equipment. A Registered Professional Engineer will provide certified calculations. Do not fabricate materials nor perform construction until approved by the Contracting Officer.

#### SD-06 Test Reports

Field Tests Reports[; G][; G, [\_\_\_\_]]

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of installed system shall be submitted [14] [\_\_\_\_\_] days after the successful completion of testing.

#### SD-07 Certificates

Qualifications[; G][; G, [\_\_\_\_\_] ]

[A letter no later than 14 days [\_\_\_\_\_] after the Notice to Proceed providing the name and Statement of Qualifications, including ASME A17.1 Certificate and all required state and local licenses of the individual who will perform the duties specified herein for the Elevator Inspector.] [Copies of Elevator Inspectors State of Hawaii Licenses.] A letter of endorsement from the elevator manufacturer certifying that the Elevator Specialist is acceptable to manufacturer no later than 14 days [\_\_\_\_\_] after the Notice to Proceed providing the name and Statement of Qualifications of the individual who will perform the duties specified herein for the Elevator Specialist. Copies of certified welders' qualifications, demonstrating compliance with AWS D1.1/D1.1M, Section 5; list welders' names with corresponding code marks.

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals[; G][; G, [\_\_\_\_\_] ]  
Maintenance and Diagnostic Tools[; G][; G, [\_\_\_\_\_] ]  
Maintenance and Repair Action Plan[; G][; G, [\_\_\_\_\_] ]

[Submit data package in accordance with Section 01781 OPERATION AND MAINTNENANCE DATA.] Submit [Three] [\_\_\_\_\_] Operation and Maintenance Manuals, [28] [\_\_\_\_\_] days prior to the Operation and Maintenance Training. Include a list of phone numbers, personnel contacts, and all tools required for operation and maintenance.

Operation and Maintenance Training[; G][; G, [\_\_\_\_\_] ]

Proposed Onsite Training schedule, submitted concurrently with the Operation and Maintenance Manuals.

### 1.3 ELEVATOR SYSTEM

Provide pre-engineered elevator system by manufacturer regularly engaged in the manufacture of elevator systems and that complies with ASME A17.1 in its entirety, ASME A17.2.2 in its entirety, and additional requirements specified herein. The Contractor shall submit: 1) Detail Drawings as required in the Submittals paragraph; 2) calculations for the Reaction Loads imposed on the building by and 3) Heat Loads generated by the elevator system.

### 1.4 QUALIFICATIONS

#### 1.4.1 Elevator Specialist

Work specified in this section shall be performed under the direct guidance of the Elevator Specialist. The Elevator Specialist shall be regularly

engaged in the installation and maintenance of the type and complexity of elevator system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 24 months. Provide endorsement letter from the elevator manufacturer certifying that the Elevator Specialist is acceptable to manufacturer. The Elevator Specialist oversees the acceptance inspections and tests, signs and certifies the successful results. The Elevator Specialist, after completion of the acceptance inspections and tests, shall certify in writing that the installation is in accordance with the contract requirements. Bring any discrepancy to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

#### 1.4.2 Elevator Inspector

\*\*\*\*\*

NOTE: Use the first bracketed paragraph where the Elevator Inspector will be furnished by the Contractor. Use the second bracketed paragraph for all Navy projects where a NAVFAC Certified Inspector is available (except in Hawaii) or for Army or Air Force projects where the services of a Government furnished Elevator Inspector is available and preferable to the designer and customer. The services of a NAVFAC Certified Inspector may be available for an Army and Air Force project. Use the reference to licensing by the state of [\_\_\_\_\_] only in the State of [\_\_\_\_\_]. Note that the source of the Elevator Inspector will impact the funding required, therefore the options should be thoroughly considered and decided upon as early in the design process as possible, preferably at the Predesign Conference. Where the Elevator Inspector is not required, delete the submittal requirement for Certificates listed under SD-07. Similarly, delete the submittal requirement for under SD-07 for projects not in Hawaii.

\*\*\*\*\*

1) [The Elevator Inspector shall be [certified in accordance with the requirements of ASME A17.1] [and licensed by the State of [\_\_\_\_\_] in elevator repair]. The Certified Elevator Inspector shall inspect the installation of the elevator(s) to assure that the installation conforms with all contract requirements. The Elevator Inspector is directly employed by the Prime Contractor and is independent of the Elevator System Manufacturer and the Elevator Specialist, witnesses the acceptance inspections and tests, approving all results signs and certifies the successful results. The Elevator Inspector, after completion of the acceptance inspections and tests, shall certify in writing that the installation is in accordance with the contract requirements. Bring any discrepancy to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.]

2) [The Elevator Inspector is provided by the Government to inspect the installation of the elevator(s) to assure that the installation conforms to all contract requirements. The Elevator Inspector is responsible for witnessing the acceptance inspections and tests, approving all results, signing and certifying the successful results. The Elevator Inspector, after completion of the acceptance inspections and tests, will certify in

writing that the installation is accordance with the contract requirements.]

#### 1.4.3 Welders' Qualifications

Comply with AWS D1.1/D1.1M, Part 4 Qualifications. Provide certified copies of welders' qualifications. List welders' names with corresponding code marks to identify each welder's work.

#### 1.5 NEW INSTALLATION SERVICE

\*\*\*\*\*  
**NOTE: If elevator is located in remote location,  
confirm the necessity for the 1 hour response time  
required below with activity.**  
\*\*\*\*\*

Provide routine warranty service in accord with manufacturer's warranty requirements, for period of [12] [\_\_\_\_\_] months after date of acceptance by Contracting Officer. [Perform work during regular working hours]. Include 24-hour emergency service, with 1 hour response time, during this period without additional cost to Government. Include adjustments, greasing, oiling, and cleaning. Provide routine inspection and tests of elevators in accordance with ASME A17.1 Section 8.11.3 and ASME A17.2.2. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. The Contractor shall maintain a maintenance log of all service orders performed during the warranty period and shall submit it to the Contracting Officer 21 days prior to the end of the warranty period.

##### 1.5.1 Special Operations

Every six months, test systems for [Emergency Power Operation,] [Earthquake Emergency Operations,] [Hospital Emergency Commandeering Service Operations] [and] Firefighters' Service. Schedule to not interfere with building operations. For Firefighters' Service, test monthly in accordance with ASME A17.1, Section 8.6.10.1. Provide written results of each test operation to the Contracting Officer.

##### 1.5.2 Documentation

Document all inspection and testing. Maintain copy of documentation in machine room.

##### 1.5.3 Maintenance and Diagnostic Tools

Provide all special tools and software necessary to service and maintain each elevator; deliver at time of final acceptance. Provide one of each tool per group of elevators. Include solid state or microprocessor diagnostic tools if unavailable on the open market. Provide necessary diagnostic software where the solid state or microprocessor diagnostic tools are available on the open market

##### 1.5.4 Keys for Elevator Key Switches

Provide minimum of twelve keys per unique cylinder used on all key switches for single elevator. If more than one elevator, additional keys not required unless there are additional unique cylinders. Keys shall be provided with brass or fiberglass tags marked 'PROPERTY OF THE U. S. GOVERNMENT' on one side with function of key or approved code number on

other side.

#### 1.6 MAINTENANCE AND REPAIR ACTION PLAN

Provide plan of action prepared by the Elevator Specialist to provide emergency and routine maintenance in accordance with paragraph titled NEW INSTALLATION SERVICE. Provide a list of phone numbers, personnel contacts, and all tools to the Contracting Officer.

### PART 2 PRODUCTS

#### 2.1 PASSENGER ELEVATORS

##### 2.1.1 Basic Requirements

\*\*\*\*\*

**NOTE:** Provide all elevators of size to accommodate handicapped access as a minimum. For all buildings of four stories or more in height, provide at least one elevator of size to accommodate emergency medical services.

For car door opening of passenger and service elevators, 1065 mm (3 ft. 6 in.) is standard, except with 1800 kg (4000 lb.) passenger cars, use 1200 mm (4 ft. 0 in.). For special purposes, 1525 mm (5 ft. 0 in.) opening may be used.

Use two speed center opening option restrictively for elevators where larger door opening is needed and hoistway space is not available for single-speed. Otherwise, use single-speed side slide, single-speed center opening, or two-speed side slide.

\*\*\*\*\*

- a. Rated Load: [\_\_\_\_\_] kg lbs.
- b. Rated Speed: [\_\_\_\_\_] mps fpm
- c. Travel Length: [\_\_\_\_\_] m ft.
- d. Number of Stops: [\_\_\_\_\_]
- e. Number of Hoist Way Openings: [\_\_\_\_\_] Front; [\_\_\_\_\_] Rear
- f. Car Inside Dimensions: [\_\_\_\_\_] mm wide, [\_\_\_\_\_] mm deep and [\_\_\_\_\_] mm high [\_\_\_\_\_] ft.-in. wide, [\_\_\_\_\_] ft.-in. deep and [\_\_\_\_\_] ft.-in. high
- g. Car Door Opening: [\_\_\_\_\_] mm wide and [\_\_\_\_\_] mm high [\_\_\_\_\_] ft.-in. wide and [\_\_\_\_\_] ft.-in. high
- h. Car Door Types: [Single-speed side slide] [Single-speed center opening] [Two-speed side slide] [Two-speed center opening] Horizontal sliding.

## 2.1.2 Cab Enclosures and Door Finishes

\*\*\*\*\*

**NOTE:** Indicate finish colors of elevator materials  
in finish schedule on drawings.

Use stainless steel door facing and side panels and  
wall trim in hospital cars and for moist  
environments such as humid or moist areas such as  
hydroelectric plants, locks, and dams.

\*\*\*\*\*

Provide finishes [as indicated.] [as listed below:

- a. Floor; [carpet] [vinyl composition tile] [vinyl sheet tile]  
[\_\_\_\_\_].
- b. Walls; [prefinished steel panels] [laminated plastic on  
particleboard] [laminated plastic on particleboard with rounded  
stainless steel angle edges] [stainless steel] [\_\_\_\_\_]. Provide  
each cab wall with equally spaced and equally sized wall panels.  
Conceal all fasteners. Wall trim; [prefinished steel] [stainless  
steel] [\_\_\_\_\_]. Accessories; [hand rails] [\_\_\_\_\_].
- c. Interior face of door(s); [prefinished steel panels]  
[stainless steel] [\_\_\_\_\_].
- d. Ceilings; [supported] [prefinished steel panels] [anodized  
aluminum] [eggcrate] [\_\_\_\_\_]. Ceiling frame; [prefinished steel]  
[stainless steel] [anodized aluminum] [\_\_\_\_\_].
- [e. Hoistway Doors and Frame Finishes; provide finishes on  
exterior of hoistway as follows:
  - (1) Frame; [prefinished steel] [stainless steel] [\_\_\_\_\_].
  - (2) Exterior face of door; [prefinished steel] [stainless steel]  
[\_\_\_\_\_].]]

## 2.2 FREIGHT ELEVATORS

### 2.2.1 Basic Requirements

\*\*\*\*\*

**NOTE:** For details of loading classes, refer to ASME  
A17.1, Sections 2.16.2.2 and 3.23.

\*\*\*\*\*

- a. Rated Load: [\_\_\_\_\_] kg lbs.
- b. Rated Speed: [\_\_\_\_\_] mps fpm
- c. Travel Length: [\_\_\_\_\_] m ft.
- d. Number of Stops: [\_\_\_\_\_]
- e. Number of Hoist Way Openings: [\_\_\_\_\_] Front; Rear [\_\_\_\_\_]
- f. Car Inside Dimensions: [\_\_\_\_\_] mm wide, [\_\_\_\_\_] mm deep and  
[\_\_\_\_\_] mm high [\_\_\_\_\_] ft.-in. wide, [\_\_\_\_\_] ft.-in. deep and

[\_\_\_\_\_] ft.-in. high

g. Hoistway Door Type & Size: [Manual] [Power Operated] Vertical [Bi-Parting] [Rising] [\_\_\_\_\_] mm wide and [\_\_\_\_\_] mm high [\_\_\_\_\_] ft.-in. wide and [\_\_\_\_\_] ft.-in. high

h. Car Gate Type: [Manual] [Power Operated] Vertical rising

i. Loading Type: Class [A] [B] [C]

#### 2.2.2 Cab Enclosures and Door Frame Finishes

\*\*\*\*\*

**NOTE: Indicate finish colors of elevator materials in finish schedule on drawings.**

**Use stainless steel door facing and side panels and wall trim in hospital cars and for moist environments such as humid or moist areas such as hydroelectric plants, locks, and dams.**

\*\*\*\*\*

Provide finishes [as indicated.] [as listed below:

a. Floor; [mill finish steel diamond plate] [painted steel diamond plate] [aluminum diamond plate] [tongue and groove hardwood] [\_\_\_\_\_] .

b. Walls; [prefinished steel panels] [stainless steel] [\_\_\_\_\_] .  
Wall trim; [prefinished steel] [stainless steel] [\_\_\_\_\_] .  
Accessories; [handrails] [\_\_\_\_\_] .

c. Interior face of doors; [prefinished steel] [stainless steel] [\_\_\_\_\_] .

d. Ceiling; [prefinished steel panels] [stainless steel] [anodized aluminum] [\_\_\_\_\_] .

[e. Hoistway Doors and Frame Finishes; provide finishes on exterior of hoistway as follows:

- (1) Frame; [prefinished steel] [stainless steel] [\_\_\_\_\_] .
- (2) Exterior face of door; [prefinished steel] [stainless steel] [\_\_\_\_\_] .]]

#### 2.3 SPECIAL OPERATION AND CONTROL

Provide all special operations and control systems in accordance with ASME A17.1. Provide special operation key switches with [5] [6] pin cylinder locks with removable cores. Provide a key control lock for each operation system.

##### 2.3.1 Firefighters' Service

\*\*\*\*\*

**NOTE: Firefighter Service is required on all freight and passenger elevators. Coordinate the Firefighters' designated floor level with the local base Fire department and edit following paragraph**

\*\*\*\*\*

Provide equipment and signaling devices. The designated level for Firefighters' key operated switch is the [ground] [\_\_\_\_] floor.

#### 2.3.2 Smoke Detectors

Provide connections directly to elevator controls which will, when smoke is detected by any smoke detector, actuate Firefighters' Service and send each elevator to the correct floor as required by ASME A17.1. Provide dual-contact smoke detectors located in the elevator lobbies and the elevator machine room. Provide dual-contact smoke detector at top of hoistway. Include only these smoke detectors with the circuit for elevator controller actuation of Firefighters' Service. In lieu of dual-contact smoke detectors, use an addressable fire alarm system with listed smoke detectors in the above stated locations. Ensure that all smoke detectors are mounted on finished ceiling.

#### 2.3.3 Fire Sprinklers

\*\*\*\*\*

**NOTE: Virtually all new elevator installations require fire sprinklers in each elevator machinery room. Hydraulic elevators require sprinklers in the hoistway. All hydraulic elevators require sprinklers in the pit, and at the top of the hoistway when the cylinder or supply line extends above the second floor finish.**

\*\*\*\*\*

For each elevator, provide control wiring connecting the flow switch to the shunt trip equipped circuit breaker within the electrical panel serving the main line disconnect. Upon flow of water, equip flow switch to instantaneously send a signal to cause opening of shunt-trip equipped mainline circuit breaker, in compliance with ASME A17.1, Section 2.8.2, and send a signal to fire alarm control panel to indicate water flow condition.

Provide machine room sprinkler flow switch actuation to shunt trip all elevator(s) served by the machine room. Provide hoistway sprinkler flow switch actuation to shunt trip all elevator(s) in the hoistway.

#### 2.3.4 Top-of-Car Operating Device

Provide operating device mounted on or from car crosshead, to permit operation of car at 0.75 mps 150 fpm maximum for adjustment, maintenance, testing, and repair. Include integral or remote safety device, continuous pressure "UP" and "DOWN" switches or buttons, emergency stop switch, and inspection switch.

#### 2.3.5 Hoistway Access Switches

Provide key-operated hoistway access switch to permit limited movement of car at terminal floors for car positioning, operative only when "INSPECTION" switch in car operating panel is in the "INSPECTION" position. Locate switch 1800 mm 6 feet above floor level, within 300 mm 12 inches of hoistway entrance frame or with only ferrule exposed when located in entrance frame.



### 2.3.6 Independent Service

\*\*\*\*\*  
**NOTE: Use the last bracketed sentence when there  
are two or more cars in group.**  
\*\*\*\*\*

Provide exposed key-operated switch in car operating panel to enable independent service and simultaneously disable in-car signals and landing-call responses. Provide indicator lights that automatically illuminate during independent service. [If one car is removed from group, provide other car(s) responding to its hall call.]

### 2.3.7 Elevator Operation

\*\*\*\*\*  
**NOTE: Choose one of the following four types of  
operations: Single Two-Stop Automatic, Selective  
Collective Automatic, Duplex Selective Collective or  
Group Automatic**  
\*\*\*\*\*

#### 2.3.7.1 Single, Two-Stop, Automatic Operation

\*\*\*\*\*  
**NOTE: Specify for Single, Two-Stop elevator only.**  
\*\*\*\*\*

Provide Single Two-Stop Automatic Operation. Provide illuminating push buttons.

#### 2.3.7.2 Selective Collective Automatic Operation

\*\*\*\*\*  
**NOTE: Specify for single elevator serving three or  
more landings.**  
\*\*\*\*\*

Provide Selective Collective Automatic Operation. Provide illuminating push buttons.

#### 2.3.7.3 Duplex Selective Collective Automatic Operations

\*\*\*\*\*  
**NOTE: Specify for two adjacent elevators.**  
\*\*\*\*\*

Provide Duplex Selective Collective Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. In each car operating panel, provide push buttons numbered to correspond to each landing. If a car is taken out of service, or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to the other elevator functioning as a Selective Collective elevator until the out-of-service car is returned to the system. Provide a push-button riser adjacent to each elevator.

#### 2.3.7.4 Group Automatic Operation

\*\*\*\*\*  
**NOTE: Specify for three or more adjacent elevators.**  
\*\*\*\*\*

Provide Group Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. In each car operating panel, provide push buttons numbered to correspond to each landing. If a car is taken out of service, or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to another car until the out-of-service car is returned to the system. Provide a push-button riser adjacent to each elevator.

#### 2.3.8 Parking Switch

\*\*\*\*\*  
**NOTE: Specify parking switch if there is a definite reason to change parking station daily or for security purposes. For example, to provide night shut down of a car for security reasons. Indicate parking floor.**  
\*\*\*\*\*

Provide two-position parking switch in car station service cabinet. One position causes car to remain parked at floor landing where last used; other position causes car to park at [main] [\_\_\_\_\_] floor.

#### 2.3.9 Hospital Emergency Commandeering Service

\*\*\*\*\*  
**NOTE: Commandeering Service can be used for priority service. Duplication of keys by unauthorized persons is possible. The designer must determine whether security of individuals or quickness in obtaining car is governing consideration for each project. Verify with facility personnel that control of key duplication can be maintained.**  
\*\*\*\*\*

Provide "ON-OFF" key switch and indicator light at [designated] [all] landings to cause one elevator to respond directly to the landing activated. Turning switch to "ON" position cancels previously registered "CAR" calls and requires car to bypass hall calls while in route to activated landing. On arrival, car will remain at landing with hoistway and car doors open for predetermined time to permit car to be placed on emergency service. If the person decides not to use car during predetermined time period, car door will close and car will automatically return to normal service. Provide indicator lights that automatically illuminate during emergency service. Remove key only when key is in "OFF" position.

#### 2.4 ELEVATOR DRIVE SYSTEM

Provide hydraulic pump unit, piping, cylinder/plunger assembly, and rated equipment in accordance with ASME A17.1, which will operate at a maximum working pressure of less than 2756 kPag 400 psig.

#### 2.4.1 Hydraulic Pump Unit

Provide self-contained unit including oil-hydraulic elevator pump, electric motor, drive assembly, oil strainer in suction line, structural steel outer base with tank and supports, oil-tight drip pan, and inner pump-mounting base. Limit acoustic output of elevator machine to 80 dbA. Provide sound-insulating panels to isolate airborne noise from non oil-immersed pump-motor assembly. Provide ventilation to cool hydraulic pump unit. Finish ferrous surfaces with rust-inhibiting paint. Provide tank capacity for full plunger displacement plus at least 38 liters 10 gallons.

#### 2.4.2 Hydraulic Controls and Equipment

Provide electrically operated "UP" valve, constant velocity "DOWN" valve, "UP" and "DOWN" leveling valves, "BYPASS UPON STARTING" valve, check valve, vacuum relief valve, automatic shutoff (rupture) valve, safety relief valve, manually operated lowering valve, and scavenger pump unit.

##### 2.4.2.1 Manual Shutoff Valves

Provide 1/4 turn ball valve rated at 2 MPa 300 psi at elevator hydraulic pump suction inlet if pump is mounted outside the oil reservoir and the suction line exits the reservoir below the maximum oil level in the reservoir. Provide 1/4 turn ball valve rated at 4 MPa 600 psi at elevator pump discharge line in the machine room and in the oil supply line next to and on the pump side of the automatic shutoff valve in the pit.

##### 2.4.2.2 Manual Lowering Valve

Limit car descending speed under manual operation to 0.10 mps 20 fpm. Provide rigid plastic red tag for valve identification, inscribed "MANUAL LOWERING VALVE."

##### 2.4.2.3 Pump Discharge Strainer

Provide strainer in pump discharge to prevent foreign materials from entering control system and cylinder-plunger unit (jack).

##### 2.4.2.4 Muffler

Provide blowout-proof muffler, containing pulsation-absorbing materials in oil line between pump unit and jack.

##### 2.4.2.5 Pressure Switch

Where cylinders are installed with top of cylinder above top of oil reservoir, provide pressure switch in oil line between cylinder and electric lowering valve(s) to prevent operation of lowering valve(s) unless positive pressure exists at top of cylinder.

##### 2.4.2.6 Scavenger Pump Unit

Provide a scavenge oil reservoir, an electrically operated oil transfer pump, scavenge oil lines, a strainer, and pump controls. Connect the scavenge oil reservoir to the elevator cylinder between the plunger packing area and the plunger drip (wiper) ring, to capture the oil leaking by the plunger pressure packing. Provide a vacuum relief valve. Connect the scavenge oil pump suction to the scavenge oil reservoir and the strainer,

and the discharge to the elevator oil reservoir. Provide a scavenge oil reservoir level switch to control the scavenge oil pump. Scavenger pump shall operate independently of elevator hydraulic fluid pressure. Provide a manual-reset pit flood switch to prevent pump operation if pit is flooded. Anchor pump and oil reservoir to the pit floor.

#### 2.4.2.7 Piping and Accessories

Provide ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 80, black steel piping with ASME B16.9 and ASME B16.11 fittings. Extend Schedule 80 piping from the pump control valve body, inside the pump unit, to the hydraulic cylinder in the hoistway. Provide dielectric union at each end of the "pump to cylinder" oil supply line. Provide hangers or supports for all piping. Provide welded or threaded forged pipe fittings that are located between the shut off valve and the cylinder inlet.

#### 2.4.2.8 Low Oil Condition

Provide device for [each] elevator to protect pumping equipment in event oil level is too low. When device is in operation, the pump and motor shall stop, causing car to descend to lowest landing, open car doors and cease elevator operation except for door control circuits. Provide illuminating indicator on machine room control panel to alert upon a low oil condition.

#### 2.4.2.9 Oil Characteristics

- a. Viscosity, Saybolt Universal Seconds 145 to 160 at 38 degrees C 100 degrees F.
- b. Viscosity, Saybolt Universal Seconds 42 to 44 at 99 degrees C 210 degrees F.
- c. Pour Point, ASTM D 97, -26 degrees C -15 degrees F maximum.
- d. American Petroleum Institute (API) Gravity 29 to 33 at 15 degrees C 60 degrees F.
- e. Flash Point, ASTM D 92, 190 degrees C 375 degrees F minimum.

#### 2.4.2.10 Oil Temperature Device

Provide means to maintain oil temperature between 15 and 38 degrees C 60 and 100 degrees F regardless of ambient temperature.

#### 2.4.3 Cylinder-Plunger Unit

Provide a [direct] [indirect] plunger type hydraulic elevator. Provide a plunger of single-piece seamless steel construction. Provide stop plate or ring welded to bottom of the plunger. Provide packing and wiper (drip) ring with outlet for connection to the scavenge oil reservoir to collect leakage oil from cylinder for either inspecting for contamination or returning to tank. Use only standard packing glands with bolts that compress packing. Provide threaded 6 mm 1/4 inch bleeder valve at top of cylinder just below packing gland. Telescopic cylinder-plunger units are not acceptable.

#### 2.4.4 Cylinder Protection

Protect the cylinder with a pipe-manufacturer applied "Applied Extruded Coating." Include the following steps as a minimum for the AEC coating application process: blast clean the bare pipe exterior surfaces to white metal, apply a minimum of 0.25 mm 0.010 inch undercoating of heated butyl rubber adhesive; and apply a minimum of one mm 0.040 inch thickness overcoating of polyethylene, hot extruded over the undercoating. Free overcoating of surface blemishes, cracks, voids, and contamination from foreign substances. Provide field pipe joints and coating repairs with field applied coatings covered with heat-shrinkable pipe sleeves, following the cylinder manufacturer's instructions. Protect the AEC coating from damage until the cylinder is set into the cylinder well, plumbed, and aligned.

#### 2.4.5 Automatic Shutoff Valve

Provide automatic shut-off valve in oil supply line as close to cylinder inlet as possible. Provide threaded pipe connections to the valve. When there is ten percent drop in NO-LOAD operating pressure, activate the automatic shut-off valve. When activated, device shall immediately stop descent of elevator and hold elevator until lowered by use of manual lowering feature of valve. Arrange manual lowering feature of automatic shut-off valve to limit descending speed of elevator to 0.10 mps 20 fpm. Provide exposed adjustments of automatic shut-off valve with means of adjustment sealed by certified elevator inspector after being set to correct position and tested in accordance with Paragraph Automatic Shutoff Valve Tests.

#### 2.4.6 Cylinder Well System

The cylinder well system shall consist of a well casing and a liner.

##### 2.4.6.1 Well Casing

Drill well for hydraulic cylinder, providing adequate depth, as indicated. Line well with steel casing with minimum wall thickness of 6 mm 0.25 inch, and minimum inside diameter of not less than 125 mm 5 inch larger than PVC liner maximum outside diameter, including cap and couplings. Close bottom of well casing with steel plate at least twice as thick as casing wall thickness, welded continuously all around, prior to insertion into well, or close well casing bottom by plugging with minimum of 150 mm 6 inch of concrete, embedding casing bottom at least 50 mm 2 inch but not more than 100 mm 4 inch into the wet concrete. Install cylinder well casing not more than 25 mm 1 inch out of plumb over entire length. Backfill the well outside of the casing with fine, dry, salt-free sand, as required to maintain casing straight and plumb, or backfill with bentonite grout if more than one water-bearing strata are penetrated by well. Maintain well casing pumped dry throughout remaining installation of elevator.

##### 2.4.6.2 PVC Liner

Provide Schedule 80 PVC pipe liner with bottom cap and couplings; joints sealed watertight using PVC pipe manufacturer's recommended adhesive or heat welding methods. Liner inside diameter not less than 76 mm 3 inch larger than elevator cylinder maximum outside diameter. Set PVC liner into well casing, centered and plumb. Securely locate PVC liner bottom end within well casing with fine, dry, salt free sand.

#### 2.4.6.3 Pressure Test

Install pressure test cap onto PVC liner, equipped with at least: safety relief valve set to relieve at 205 kPag 30 psig; 114 mm 4.5 inch diameter dial pressure gage scaled for 0 to 690 kPag 0 to 100 psig and calibrated to 0.5 percent accuracy; and an air pressure admission throttling and shutoff valve. Perform air pressure test by slowly admitting dry compressed air to pressurize PVC liner to 205 kPag 30 psig. Shut off air supply at throttle/shutoff valve, disconnect compressed air source, observe and record air pressure in PVC liner every 5 minutes for not less than 30 minutes. Do not allow liner to drop in air pressure in excess of one kPag 0.5 psig over the 30 minute test period. Perform test in presence of the Elevator Inspector. Upon satisfactory completion of pressure test, remove test cap and dry interior of PVC liner. Upon failure of test, remove, repair, reinstall, and retest PVC liner until satisfactory. For safety, pressure test shall only be performed when liner is fully inserted in the well casing and well.

#### 2.4.6.4 Cylinder Installation

Remove surface moisture from inside of liner by wiping with dry cloth or purging with warm dry air prior to installing elevator cylinder. Install cylinder. Provide elevator manufacturer's recommended supports under cylinder head and attach cylinder head supports to cylinder and pit support channels in accordance with elevator manufacturer's instructions. Set cylinder into the pit. Plumb cylinder using "Spider-Bob" method.

#### 2.4.6.5 Casing Fill

Following cylinder installation, fill the space between PVC liner and steel casing with fine, dry, salt-free sand in 610 mm 24 inch lifts with tamping between each lift. Continue filling with sand up to the level at the pit floor seal.

#### 2.4.6.6 Liner Inspection and Test Tube

Provide a 19 mm 3/4 inch PVC test tube with strainer located within 152 mm 6 inch of bottom of liner. Exclude sand from strainer and admit air, water or oil. Provide top of test tube with removable cap to exclude foreign matter.

#### 2.4.6.7 Cylinder Bottom Location Fill

At the option of the contractor, clean dry sand may be used up to and not more than 610 mm 24 inch above the bottom of the cylinder, to stabilize the cylinder. Empty the remainder of the liner.

#### 2.4.6.8 Seal

Seal gap between cylinder and PVC liner and gap between liner and well casing with foam insert strong enough to retain and support final grouting. Provide 21 MPa 3000 psi grout to a minimum of 102 mm 4 inch thickness and level top of final grouting with pit floor.

#### 2.4.6.9 Containment

Protect exposed portions of hydraulic elevator oil supply line that are installed below ground, including portions encapsulated in concrete, or covered by construction, with continuous Schedule 80 PVC containment

system, extending from machine room to elevator cylinder head connection. Coat and wrap line similar to elevator cylinder. Cap and seal containment system annular space.

#### 2.4.7 Motors

Provide NEMA MG 1 induction motors with squirrel cage, motors with drip-proof enclosure, continuous rated, maximum 1800 rpm, and Class F insulation rated at 120 starts per hour.

##### 2.4.7.1 Insulation Resistance and Motor Nameplate Data

Provide minimum of one megohm insulation resistance between conductors and motor frame. Provide motor nameplate listing rated wattage (horsepower), speed, and ampere, permanently mounted in position visible to viewer without use of special tools, such as a mirror. Provide motor and pump data on the outside of machine frame.

##### 2.4.7.2 Maximum Allowable Motor Amperage

Do not exceed its own nameplate amperage when motor is running and elevator is lifting rated load at rated speed.

#### 2.5 CONTROL EQUIPMENT

\*\*\*\*\*  
NOTE: The use of wye delta in lieu of resistance reduced-voltage starters depends upon manufacturer, elevator capacity, electrical power characteristics, and cost. Most manufacturers use wye delta reduced-voltage starters when three phase power is available. For motors greater than 11 kw (15 horsepower), use power factor correcting capacitors to increase power factor to unity.  
\*\*\*\*\*

NFPA 70 and ASME A17.1, Section 3.26. Provide elevator motor controller of magnetic reduced-voltage resistance or wye-delta start with overload relays in each line and reverse phase relay. Provide controls for [sequential] starting, stopping, and speed of elevator and to give specified operation. Enclose control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with removable or hinged doors and ventilation louvers.

##### 2.5.1 Logic Control

\*\*\*\*\*  
NOTE: Use microprocessors for elevator logic control. However, solid state control is not desirable for any facility which is subject to an erratic building power supply. In this situation, specify an electromagnetic switch, relay logic controller. The mechanical design for the elevator machine room must include the HVAC recommended by the control system manufacturer.  
\*\*\*\*\*

[Provide solid-state microprocessor controller to enable programmable control of call allocation, logic functions, door control, speed sensing and car position. Provide a method of reprogramming adjustable parameters

of computerized controls. Store all programming in non-volatile memory. The microprocessor control system is acceptable only if hardware and software required to maintain and utilize microprocessor is provided and training is provided to Government Personnel by the equipment manufacturer and supplier. For the repair of microprocessor control system, provide maintenance tools, supporting computer software, and software documentation required for complete maintenance of elevator system including diagnostics and adjustments. Tools may be hand held or built into control system. Provide tools which do not require recharging to maintain their memory or authorization for use. Do not use software which requires periodic reprogramming, or reauthorization. Programs shall be stored in non-volatile memory. Tools and software may be factory programmed to operate only with this project's identification serial number.] [Provide electromagnetic switch, relay logic controller.]

#### 2.5.2 Self-Leveling and Anti-Creep Device

Provide [each] elevator with two-way, automatic self-leveling device that brings car floor to within 6 mm 1/4 inch of level with floor landing regardless of load, position of hoistway door, or direction of travel.

### 2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

#### 2.6.1 Capacity and Data Plates

Attach faceplates with spanner security screws. On car panel, provide stainless steel capacity and data plates, with name of elevator manufacturer.

#### 2.6.2 Car and Hall Buttons

Provide recessed tamper-proof push buttons of minimum 20 mm 3/4 inch size satin-finish stainless steel, with illuminating jewel center.

#### 2.6.3 Hall Station Door Operating Buttons

\*\*\*\*\*  
NOTE: Use this paragraph for freight elevators with power-operated bi-parting doors. The number and size of hall car stations will be indicated on the drawings.  
\*\*\*\*\*

Identical in size and design to hall call buttons, but not illuminating.

#### 2.6.4 Passenger Car-Operating Panel

\*\*\*\*\*  
NOTE: Use two panels for busy passenger elevators in hospital buildings and office buildings. Use one car operating panel for single or two elevator system where traffic is moderate such as in barracks, warehouses, clinics or shops. For front and rear openings at a floor, provide two floor buttons marked "F" and "R" for operating door open and close.  
\*\*\*\*\*

Provide each car with [one] [two] car operating panel that contains



operation controls and communication devices. Provide exposed, flush mounted buttons for the controls that must be passenger accessible. Provide service cabinet or keyed switches for those switches that should not be passenger accessible. Allow maximum 1200 mm 48 inch height between car floor and center line of top operating buttons. Allow 900 mm 35 inch height between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

## 2.7 PASSENGER CONTROLS

### 2.7.1 Passenger Car-Operating Panel

\*\*\*\*\*  
**NOTE: Omit the paragraph regarding phone jack  
unless specifically requested by the activity.**  
\*\*\*\*\*

- a. Illuminating operating call buttons identified to correspond to landings served by elevator car. [For two openings at a floor, provide two buttons, marked "FRONT" and "REAR" above buttons.]
- b. "DOOR OPEN" and "DOOR CLOSE" buttons.
- c. Keyed "STOP" switch in accordance with ASME A17.1, rule 2.26.2.
- d. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1, Rule 2.27.1. Furnish a red alarm button with engraved legend "ALARM." Allow alarm button to illuminate when pushed. Locate "ALARM" button at panel bottom.
- e. "FIRE DEPARTMENT" key switch, with "OFF-HOLD-ON" positions, in that order with key to be removable in all positions. Provide fire sign or jewel, and audible signal device, in accordance with ASME A17.1 Section 2.27.3. Both visual and audible signals are activated when Phase I key switch in hall is activated or when smoke detector activates return of elevator(s) to main fire response floor. Keep visual and audible signal activated until car has reached main or designated alternate fire response floor. Upon arrival at fire response floor visual signal remains illuminated and audible signal becomes silent.
- f. Emergency two-way communication. Provide momentary pressure, single illuminating pushbutton operated communication device that complies with ASME A17.1, UFAS, and the Americans with Disabilities Act.
- [g. Key-operated on-off "HOSPITAL EMERGENCY COMMANDEERING SERVICE" switch.]
- [h. Sound-actuated firefighter phone jack.]

#### 2.7.1.1 Service Controls

- a. Inspection switch that transfers car control to top-of-car inspection operating controls and prevents car operation from in-car control panel.
- b. Independent service switch.

- c. Two car light switches, one for light in car and one for lights on top and bottom of car frame.
- d. Fan switch, two-speed.
- e. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.
- f. Device for communication between car and elevator machine room.
- [g. Parking switch.]

#### 2.7.1.2 Certificate Window

Provide 100 mm high by 150 mm wide 4 inch high by 6 inch wide certificate window in car operating panel for elevator inspection certificate.

#### 2.7.2 Freight Car-Operating Panel

Provide 3 mm 1/8 inch thick stainless steel face plate with edges relieved. Provide a car operating panel (COP) for each car at each car entrance. Provide exposed, flush mounted buttons for the controls that must be passenger accessible. Provide service cabinet or keyed switches for those controls that should not be passenger accessible. Allow maximum 1200 mm 48 inch height between car floor and center line of top operating button. Allow 900 mm 35 inch height between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

##### 2.7.2.1 Passenger Controls

\*\*\*\*\*  
**NOTE: Omit the paragraph regarding phone jack  
 unless specifically requested by the activity.**  
 \*\*\*\*\*

- a. Illuminating operating call buttons identified to correspond to landings served by elevator car. [For two openings at a floor, provide two buttons marked "FRONT" and "REAR" above buttons.]
- b. Manual "STOP" switch.
- c. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1, Section 2.27.1. Furnish a red alarm button with engraved legend "ALARM". Allow alarm button to illuminate when pushed. Locate "ALARM" button at panel bottom.
- d. "FIRE DEPARTMENT" key switch, with "OFF-HOLD-ON" positions, in that order with key removable in all positions. Provide fire sign or jewel and audible signal device. Both visual and audible signals are activated when Phase I key switch in hall is activated or when smoke detector activates return of elevator(s) to main fire response floor. Keep visual and audible signal activated until car has reached designated or alternate fire response floor. Upon arrival at fire response floor visual signal remains illuminated and audible signal becomes silent.
- e. Emergency two-way communication. Provide momentary pressure,

single illuminating pushbutton operated communication device that complies with ASME A17.1, UFAS, and the Americans with Disabilities Act.

[f. Key-operated on-off "HOSPITAL EMERGENCY COMMANDEERING SERVICE SWITCH".]

[g. Sound-actuated firefighter phone jack.]

#### 2.7.2.2 Service Controls

a. Inspection switch that transfers car control to top-of-car inspection operating controls and prevents car operation from in-car control panel.

b. Independent service switch.

c. Two car light switches, one for light in car and one for lights on top and bottom of car frame.

d. Fan switch, two-speed.

e. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

f. Communication device between car and elevator machine room.

[g. Parking switch.]

#### 2.7.2.3 Certificate Window

Provide 100 mm high by 150 mm wide 4 by 6 inches, certificate window in car operating panel for elevator inspection certificate.

#### 2.7.3 Semi-Selective Door Operation

\*\*\*\*\*  
**NOTE: Use semi-selective operation for elevators with rear openings but no landing with both front and rear openings. Use full selective if, at any floor, there are both front and rear openings. This applies to both passenger and to freight elevators.**  
\*\*\*\*\*

For elevator with rear opening at elevations that differ from front opening, provide semi-selective door operation so that only car door or gate opposite hoistway door opens when car stops.

#### 2.7.4 Full-Selective Door Operation

For elevator with one or more rear openings at same level as front opening, provide full-selective operation with car and door operating buttons clearly marked for front and rear openings, front and rear car button for each such floor, and front and rear "DOOR OPEN" and "DOOR CLOSE" buttons. Only door for which button was operated opens or closes.

#### 2.7.5 Switches and Devices

Provide elevator manufacturer's standard grade for switches and devices on

car operating panel. Legibly and indelibly identify each device and its operating positions. Locate car dispatching buttons in identical positions in car operating panels for corresponding floors.

#### 2.7.6 In-Car Position and Direction Indicator and Signal

In-car direction indicator shall be included in the in-car position indicator fixture.

##### 2.7.6.1 In-Car Position Indicator and Signal

Provide horizontal electrical or electronic digital position indicator located minimum of 2135 mm 84 inch above car floor. Arrange indicator to show floor position of car in hoistway and its traveling direction. Indicate position by illuminating of numeral or letter corresponding to landing at which car is passing or stopping. Provide audible signal to alert passenger that elevator is passing or stopping at a floor. Provide audible signals exceeding ambient noise level by at least 20 dbA with frequency not higher than 1500 Hz.

##### 2.7.6.2 In-Car Direction Indicator and Signal

Provide visual and audible car direction indicators in car, indicating car traveling direction. For visual directional signal, provide arrow of minimum 65 mm 2-1/2 inch in size. Use equilateral triangles for arrows, green for upward direction and red for downward direction. Provide audible signal that sounds once for upward direction and twice for downward direction.

#### 2.7.7 Landing Position and Direction Indicator and Signal

Provide a single fixture containing the landing position and direction indicator.

##### 2.7.7.1 Landing Position Indicator and Signal

Provide an electrical or electronic digital position indicator similar to the car position indicator. Arrange position indicator in wall horizontally above the door frame or vertically at the side of the door frame. Indicators to show floor position of car in hoistway. Indicate position by illumination of numeral or letter corresponding to landing at which car is passing or stopping.

##### 2.7.7.2 Landing Direction Indicator and Signal

Provide landing direction indicator with visual and audible signal devices. Provide single direction indicator at terminal floors; "UP" and "DOWN" direction indicator at intermediate floors. Provide equilateral triangles minimum 65 mm 2-1/2 inch in size, green for upward direction and red for downward direction. Provide electronic audible device that sounds once for upward direction and twice for downward direction. Provide audible signals exceeding ambient noise level by at least 20 decibels with frequency not higher than 1500 Hz.

#### 2.8 HOISTWAY AND CAR EQUIPMENT

##### 2.8.1 Guide Rails and Fastenings

Paint rail shanks with one coat black enamel. Only T-section type rail is

acceptable.

## 2.8.2 Car Buffers

Provide buffer data plate on each buffer.

## 2.8.3 Pit Equipment

### 2.8.3.1 Pit "STOP" Switch

Provide push/pull type pit "STOP" switch for stopping elevator motor, independent of regular operating device. Locate on same side of hoistway as ladder.

### 2.8.3.2 Ladders

\*\*\*\*\*  
**NOTE: Pits over 900 mm (3 feet) deep require a ladder which is usually included in Section 05500N METAL FABRICATIONS. Use the first sentence in the following paragraph when Section 05500N is not included in project specification.**  
\*\*\*\*\*

Provide galvanized steel ladder conforming to 29 CFR 1910.27 with minimum 178 mm 7 inch distance between rung and wall. Locate ladder on hoistway side wall closest to hoistway door opening.

### 2.8.3.3 Lighting of Pits

Locate pit light not less than 1800 mm 6 feet above pit floor. Locate switch on same side of hoistway as ladder. Provide GFCI duplex receptacle in each pit.

## 2.9 TERMINAL STOPPING DEVICES

Provide each elevator with a terminal stopping device.

### 2.9.1 Wiring and Traveling Cables

Suspend traveling cables by means of self-tightening webbed devices.

### 2.9.2 Emergency Signaling Device

Provide audible signaling device, operable from Car Operating Panel button marked "ALARM". The audible signaling device shall be mounted in hoistway. [In addition, for freight elevators, operation of the EMERGENCY STOP button shall sound audible signaling device.]

## 2.10 PASSENGER CAR AND HOISTWAY DOOR ACCESSORIES

ASME A17.1, Sections 2.12, 2.13, 2.14, and 3. Provide infra-red curtain unit (ICU) with multiple infra-red beams that protect to the full height of the door opening. Extend minimum coverage from 50 mm 2 inches off the floor to 1778 mm 70 inch above floor level. Door operation must meet the requirements of ASME A17.1 Rule 2.27.1 and 2.13.5. Provide high-speed electric operator, safety interlocks for car and hoistway doors, and electric safety contact to prevent car operation unless doors are closed. [Provide electrical circuitry that restores car to service at a specified

time lapse with time out circuitry as an option for intensive service elevators.]

## 2.11 PASSENGER ELEVATOR GUIDES, FRAME, PLATFORM, AND ENCLOSURE

\*\*\*\*\*  
**NOTE: Use roller guide assemblies on all passenger elevators.**  
\*\*\*\*\*

### 2.11.1 Roller Guides

Provide roller guide assemblies in adjustable mountings on each side of car in accurate alignment at top and bottom of car frame.

### 2.11.2 Car Enclosure, Car Door, and Car Illumination

\*\*\*\*\*  
**NOTE: For hospital service, consider providing separate elevators for routine hospital service and passenger service.**  
\*\*\*\*\*

Provide natural and forced ventilation, stainless steel hooks, with fire retardant pads.

#### 2.11.2.1 Car Shell, Return Panels, Entrance Columns, Cove Base, and Transom

Provide 14 gauge minimum non perforated steel. Apply sound-deadening mastic on all exterior components.

#### 2.11.2.2 Car Top

Provide reinforced 12 gauge minimum steel with hinged emergency exit openable by hand from car top only. Provide electrical contact which prevents operation of elevator when emergency exit is open. Provide sound-deadening mastic on all exterior components.

#### 2.11.2.3 Car Door

Provide 16 gauge minimum steel, sandwich construction without binder angles. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

#### 2.11.2.4 Car Entrance Sill

Provide one piece cast white bronze or nickel silver entrance sill. Set sills level and flush with floor finish. Use same material for hoistway and car entrance sills.

#### 2.11.2.5 Carpet

Unless otherwise specified, the elevator shall be carpeted.

## 2.12 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Provide hoistway entrance assemblies which have a minimum 1-1/2 hour fire rating.

### 2.12.1 Hoistway Entrance Frames

\*\*\*\*\*  
**NOTE: Coordinate materials with paragraph PASSENGER  
ELEVATORS.**  
\*\*\*\*\*

Frame of 1.8 mm (14 gauge) 14 gauge thick [stainless steel] [or]  
[prefinished carbon sheet steel]. Solidly grout uprights of entrances to  
height of 1500 mm 5 feet.

### 2.12.2 Hoistway Entrance Sills

Provide one-piece cast solid white bronze or nickel silver entrance sills.  
After sill is set level and flush with finished floor height, solidly grout  
under full length of sill. Use same material for hoistway and car door  
sills.

### 2.12.3 Hoistway Entrance Doors

Provide hoistway entrance door constructed with hollow metal non-vision  
construction with flush surfaces on car and landing sides. Provide a  
minimum of 2 door guide assemblies per door panel, one guide at leading edge  
and one at trailing door edge with guides in the sill groove the entire  
length of travel.

### 2.12.4 Entrance Fascias and Dust Covers

Provide sheet metal hoistway door track dust covers at each landing. Dust  
covers must cover door locks and door roller tracks and extend the full  
width of the door track and associated hardware.

### 2.12.5 Hoistway Ventilation

Provide hoistway ventilation directly to outside air by fixed louver  
through side wall of hoistway at top of hoistway. Net size of the louver  
shall be at least 3.5 percent of cross section of hoistway.

## 2.13 FREIGHT ELEVATOR GUIDE SHOES, PLATFORM, AND ENCLOSURE

### 2.13.1 Roller Guides

Provide roller guide assemblies in adjustable mounting on each side of car  
in accurate alignment at top and bottom of car frame.

### 2.13.2 Car Enclosure

\*\*\*\*\*  
**NOTE: Use two-section car gate if headroom is  
insufficient for single section.**  
\*\*\*\*\*

Complete with [two-section] [vertical rising] gate, power gate operator,  
emergency exit, emergency light, and lighting fixtures. Paint interior and  
exposed surfaces with manufacturer's standard finish. Provide certificate  
frame and recessed car station.

## 2.14 FREIGHT ELEVATOR HOISTWAY DOORS AND ENTRANCES

\*\*\*\*\*  
NOTE: If hoistway doors are for exterior uses,  
weather stripping does not provide practical  
protection. In lieu of weather-stripping,  
incorporate alcoves to protect edges and bottom  
surfaces of exterior doors from rain, snow, and ice.  
\*\*\*\*\*

Provide hoistway entrance with complete door assembly including door panels with truckable sill, frames, guide rails, and accessories. Provide hoistway entrance assemblies which have a minimum 1-1/2 hour fire rating.

### 2.14.1 Door Panel

ASTM E 2074, fire rated door panel, with minimum 100 mm wide by 225 mm high 4 inch wide by 9 inch high vision panel at upper door section.

### 2.14.2 Door Operation

\*\*\*\*\*  
NOTE: Use semi-selective if only one opening at any  
floor; full-selective if two openings at any floor.  
\*\*\*\*\*

[Semi-selective] [Full-selective].

## 2.15 HANDICAPPED AND MEDICAL SERVICES ACCESS

### 2.15.1 Provision For Handicapped

\*\*\*\*\*  
NOTE: Use on all elevators.  
\*\*\*\*\*

36 CFR 1191, Sections 4.10 for Elevators, 4.30 for Signage, and 4.31 for Telephones.

### 2.15.2 Emergency Medical Service

\*\*\*\*\*  
NOTE: Use this paragraph for buildings of four  
floors or more.  
\*\*\*\*\*

ICC IBC - Chapter 30, for elevators and signage

## 2.16 EMERGENCY POWER OPERATION

\*\*\*\*\*  
NOTE: Use in hospitals and buildings in which  
sufficient standby power is provided to operate one  
or more elevators.  
\*\*\*\*\*

Upon outage of normal power and initiation of emergency power, provide circuitry and wiring to operate elevator [telephone] [and] [intercom] to accomplish operation sequences. [In multiple elevator system, one elevator



travels automatically to the main floor, opens doors, and shuts down. Thereafter, each other elevator in group, one at a time returns automatically to main floor. After all cars have returned to main floor, provide automatically one [passenger] [freight] car in regular service.] [For single elevator system, elevator travels automatically to main floor, opens doors, and automatically places itself in regular service.] During emergency power operation, provide a sign reading "EMERGENCY POWER" flashing in each car station. [At the same time, provide operable Firefighters' Service.]

## 2.17 PROVISIONS FOR EARTHQUAKE PROTECTION

\*\*\*\*\*  
NOTE: Use in seismic Zones 3 and 4. Provide seismic protection as covered by ASME A17.1, Section 8.4. Provide fastenings, attachments, and restraints for prevention of seismic damage in detail by registered structural engineer with his seal applied to drawings or sketches. Use forces of 1.0 G horizontal and 1.0 G vertical or heavier.  
\*\*\*\*\*

The facility is located in a seismic zone [3] [4], comply with all ASME A17.1, Part 8.4 requirements.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install in accordance with manufacturer's instructions, ASME A17.1, 36 CFR 1191, and NFPA 70.

#### 3.1.1 Traveling Cables

Do not allow abrupt bending of traveling cables.

#### 3.1.2 Automatic Shutoff Valve

Locate in supply-return line, as close as possible to cylinder-plunger unit.

#### 3.1.3 Structural Members

Do not cut or alter. Restore any damaged or defaced work to original condition.

#### 3.1.4 Safety Guards

Selector cables or tapes exposed to possibility of accidental contact in machine room shall be completely enclosed with 1.5 mm 16 gage thick sheet metal or expanded metal guards, both horizontally and vertically. Protect exposed gears, sprockets, and selector drums from accidental contact in accordance with ASME A17.1.

#### 3.1.5 Miscellaneous Requirements

Include recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt,

water, or mechanical damage. At completion, clean all work, and spot paint.

#### 3.1.6 Firefighters' Service

Completion of firefighters' service includes installation and wiring of all smoke detectors in accordance with ASME A17.1, Section 2.27.3.2. Coordinate smoke detector installation for firefighters' service.

### 3.2 FIELD QUALITY CONTROL

\*\*\*\*\*  
**NOTE: Include all bracketed text in all Navy projects.**  
\*\*\*\*\*

After completing elevators system installation, notify Contracting Officer that elevator system is ready for final inspection and acceptance test. [Contracting Officer will obtain services of Naval Facilities Engineering Command certified elevator inspector.] Contractor shall perform all required tests and demonstrate proper operation of each elevator system and prove that each system complies with contract requirements and ASME A17.1. Inspection procedures in ASME A17.2.2 form a part of this inspection and acceptance testing. Conduct all testing and inspections in the presence of both the Elevator Specialist and the Elevator Inspector. Demonstrate the proper operation of all equipment at various date settings, selected by the Elevator Inspector, ranging from the date of contract award through 1 January 2099. The Elevator Inspector shall complete, sign and post the results of all tests and inspection results [and form NAVFACENGCOM 9-11014/23 (Rev. 7-88), Elevator Inspection Certificate] after successful completion of inspection and testing. The Contractor is responsible for all costs involved with reinspection and retesting required to correct discrepancies discovered during testing and the subsequent retesting required [,including all costs and expenses incurred by the Government Furnished Inspector.]

#### 3.2.1 Testing Materials and Instruments

Furnish testing materials and instruments required for final inspection. Include calibrated test weights, tachometer, 600-volt megohm meter, volt meter and ammeter, three Celsius calibrated thermometers, door pressure gage, spirit level, stop watch, hydraulic pressure test gauge, and a 30 meter 100 foot tape measure.

#### 3.2.2 Field Tests

The Contractor shall submit Field Tests Reports after completing each of the specified tests, as required in the Submittals paragraph.

##### 3.2.2.1 Endurance Tests

Test each elevator for a period of one hour continuous run, with specified rated load in the car. Restart the one hour test period from beginning, following any shutdown or failure. During the test run, stop car at each floor in both directions of travel for standing period of 10 seconds per floor. The requirements for Rated Speed, Leveling, Temperature Rise, and Motor Amperes testing specified herein shall be met throughout the duration of the Endurance test.

#### 3.2.2.2 Automatic Shutoff Valve Tests

Test the automatic shutoff valve twice. Once at beginning of acceptance test and again at conclusion of one-hour Endurance test to ensure consistent performance of shutoff valve, regardless of temperature of equipment and oil.

#### 3.2.2.3 Speed Tests

Determine actual speed of each elevator in both directions with rated load and with no load in elevator car. Make Speed tests before and immediately after Endurance test. Determine speed by tachometer reading, excluding accelerating and slow-down zones per ASME A17.2.2, Section 2.22.4. Minimum acceptable speed is the Rated Speed as specified. Maximum acceptable elevator speed is 110 percent of Rated Speed. [For Class C2 landing, comply with ASME A17.1 Section 2.16.2.2.4 for freight elevators. The maximum load on car platform during loading or unloading shall not exceed 150 percent of rated load.]

#### 3.2.2.4 Leveling Tests

Test elevator car leveling devices for landing accuracy of plus or minus 6 mm 1/4 inch at each floor with no load in car, symmetrical load in car, and with rated load in car in both directions of travel. Determine accuracy of floor landing both before and immediately after endurance tests. [For Class C2 landing, comply with ASME A17.1 Section 2.16.2.2.4 for freight elevators. The maximum load on car platform during loading or unloading shall not exceed 150 percent of rated load.]

#### 3.2.2.5 Pressure Tests

Check operating pressure at pump and cylinder head under no load and rated load. Test pressure at which relief valve operates.

#### 3.2.2.6 Insulation Resistance Tests

Perform tests to ensure wiring systems free from short circuits and grounds. Minimum acceptable insulation resistance for electrical conductors is one megohm between each conductor and ground and between each conductor and other conductors. Prior to megohm meter test, make provision to prevent damage to the electronic devices.

#### 3.2.2.7 Temperature Rise Tests

Determine the temperature rise of the hydraulic pump motor during the full load test run for a minimum of one hour. Under these conditions, do not exceed maximum acceptable temperature rise indicated on the manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

#### 3.2.2.8 Motor Ampere Tests

Measure and record motor amperage when motor is running and elevator is lifting at rated load and speed. Measure and record motor amperage at the beginning and the end of Endurance test.

### 3.3 OPERATION AND MAINTENANCE TRAINING

The Elevator Specialist shall train Government personnel in care,

adjustment, and maintenance of elevator equipment for a period of not less than [5] [\_\_\_\_\_] working days immediately following acceptance of system. The Contractor shall submit Operation and Maintenance Manuals as required in the Submittals paragraph.

-- End of Section --