
USACE / NAVFAC / AFCEA / NASA UFGS-14 21 23 (February 2009)

Preparing Activity: USACE Superseding
UFGS-14 21 23 (July 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2009

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DIVISION 14 - CONVEYING EQUIPMENT

ELECTRIC TRACTION PASSENGER ELEVATORS

02/09

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SECTION 14 21 23

ELECTRIC TRACTION PASSENGER ELEVATORS 02/09

NOTE: This guide specification covers the requirements for electric traction passenger elevators.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

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).

PART 1 GENERAL

NOTE: All Navy facility designs which include elevators must comply with the "NAVFAC Elevator Design Guide". This guide is available from the Whole Building Design Guide web site, DoD page (<http://dod.wbdg.org>), from the NAVFAC drop down menu - Interim Technical guidance.

Use Section 14 21 13 for ELECTRIC TRACTION FREIGHT ELEVATORS.

NOTE: Any editing of non-bracketed requirements in this specification must be approved through the NAVFAC Elevator Program.

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 B2.1/B2.1M	(2009) Welding Procedure and Performance Qualification
AWS D1.1/D1.1M	(2008; Errata 2009) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1	(2007; Addenda 2008) Safety Code for Elevators and Escalators
ASME A17.2	(2007) Guide for Inspection of Elevators, Escalators, and Moving Walks
ASME A17.3	(2008) Safety Code for Existing Elevators and Escalators-Interpretations No. 6
ASME QEI-1	(2007) Standard for the Qualification of Elevator Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM E 2074	(2000e1) Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
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INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2006; Errata 2006; Errata 2007; Supplement 2007; Errata 2007)
International Building Code

ICC IPC (2006; Supplement 2007) International
Plumbing Code

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (2007; Errata 2008) Standard for Motors
and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2008) Life Safety Code, 2006 Edition

NFPA 70 (2007; AMD 1 2008) National Electrical
Code - 2008 Edition

NFPA 72 (2006) National Fire Alarm 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 SYSTEM DESCRIPTION

Provide a pre-engineered elevator system, by manufacturer regularly engaged in the manufacture of elevator systems, that complies with ASME A17.1 and ASME A17.2 in their entirety, and additional requirements specified herein.

1.2.1 Fire Protection System

**NOTE: Hoistway vents may be activated elevator
lobby smoke detectors. Detectors do not have to be
placed in hoistways per IBC/NFPA 72.**

Provide a fire protection system complying with the applicable provisions of NFPA 72, NFPA 101, and ASME A17.1.[Detailed specification information is stated in Section 28 31 74.00 20 INTERIOR FIRE DETECTION AND ALARM SYSTEM.] Additional fire protection requirements are found in Section [28 31 02.00 20 FIRE ALARM REPORTING SYSTEMS - DIGITAL COMMUNICATORS;] [21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION]; and Section [26 20 00 INTERIOR DISTRIBUTION SYSTEM].

1.2.2 Miscellaneous Requirements

Submit one set of wiring diagrams, in plastic or glass cover, framed and mounted in elevator machine room for revised building electrical system, if needed, to make supplied elevator system function as specified. Deliver other sets to Contracting Officer. Coded diagrams are not acceptable

unless adequately identified. Submit calculations for the [Reaction Loads](#) imposed on the building by the elevator system and [Heat Loads](#) generated by the elevator system.

[1.2.3 Provisions for Earthquake Protection

NOTE: Provide seismic protection as covered by ASME A17.1, Part XXIV. Provide fastenings, attachments, and restraints for prevention of seismic damage in detail by registered structural engineer whose seal is applied to drawings or sketches. Use forces of 1.0 G horizontal and 1.0 G vertical or heavier.

This facility is located in seismic zone [3] [4], and shall comply with all [ASME A17.1](#), Part XXIV requirements as applicable by location.

]1.3 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section [01 33 00 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.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section [01 33 00](#)

SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings[; G][; G, [____]]
Passenger Elevators and accessories[; G][; G, [____]]
Supporting systems[; G][; G, [____]]
Machinery and controls, Heat Loads[; G][; G, [____]]
Wiring diagrams[; G][; G, [____]]
Sequence of operations[; G][; G, [____]]

SD-03 Product Data

Passenger Elevators and accessories[; G][; G, [____]]
Elevator supporting systems[; G][; G, [____]]
Data sheets[; G][; G, [____]]
Maintenance and diagnostic tools[; G][; G, [____]]
Logic control[; G][; G, [____]]

SD-05 Design Data

NOTE: Use ASME A17.1, Appendix F, for locations in
seismic risk zone 3 or greater. Use ASME 17.3 for
Existing Elevators.

Reaction loads[; G][; G, [____]]

SD-07 Certificates

Quality Assurance for Elevator Inspector and Specialist
Welders' Qualifications[; G][; G, [____]]

SD-10 Operation and Maintenance Data

Passenger Elevators, Data Package 4[; G][; G, [____]]

Submit in accordance with Section 01 78 23 OPERATION AND
MAINTENANCE DATA.

Maintenance and Repair Action Plan[; G][; G, [____]]

1.4 QUALITY ASSURANCE

1.4.1 Elevator Specialist

Work specified in this section shall be performed in compliance with ASME A17.3 under the direct guidance of the Elevator Specialist who is regularly engaged in the installation and maintenance of the type and complexity of elevator system specified in the contract documents, and who 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. Elevator system manufacturer shall provide a letter of endorsement certifying that the Elevator Specialist is acceptable to manufacturer. The Elevator Specialist shall oversee the acceptance inspections and tests, and sign and certify the successful results, and after completion of the acceptance inspections and tests, certify in writing that the installation is accordance with the contract requirements. Bring any discrepancies 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 Elevator Inspector is available 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 other DoD member projects.

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 Government furnished, delete the submittal requirements for the Elevator Inspector's Qualifications that is part of SD-07 above.

[The Elevator Inspector shall be [certified in accordance with the requirements of [ASME A17.1](#) and [ASME QEI-1](#)] [and licensed by the State of [_____] in elevator inspection]. The Certified Elevator Inspector shall inspect the installation of the elevator(s) to ensure that the installation conforms with all contract requirements. The Elevator Inspector shall be directly employed by the Prime Contractor and be independent of the Elevator System Manufacturer and the Elevator Specialist and shall witness the acceptance inspections and tests, approve all results and shall sign and certify 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, including any safety related deficiencies, to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.]

[The Elevator Inspector will be provided by the Government to inspect the installation of the elevator(s) and to ensure that the installation conforms with all contract requirements. A NAVFAC Certified Elevator Inspector will be utilized as required on NAVFAC projects. The Elevator Inspector will witness the acceptance inspections and tests, approve all results, and sign and certify the successful results. The Elevator Inspector, after completion of the acceptance inspections and tests, will certify in writing that the installation is in accordance with the contract requirements. Bring any discrepancy, including any safety related deficiencies, to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.]

1.4.3 Welders' Qualifications

Comply with [AWS D1.1/D1.1M](#), Section 4, and [AWS B2.1/B2.1M](#). Provide

certified copies of welders' qualifications and a list of welders' names with corresponding code marks to identify each welder's work.

1.4.4 Detail Drawings

a. Submit Detail Drawings, including dimensioned layouts in plan and elevation, showing the arrangement of elevator equipment, accessories, and data sheets showing all:

- 1). supporting systems,
- 2). Anchorage of equipment,
- 3). Clearances for maintenance and operation;
- 4). Details on hoistway,
- 5). Doors and frames,
- 6). Operation and signal stations,
- 7). Machinery and Controls,
- 8). Motors,
- 9). Guide rails and brackets,
- 10). Points of interface with normal power.
- 11). [Fire alarm system]
- 12). [HVAC or exhaust systems]
- 13). [Interface with emergency power systems].

b. Include in the Drawings complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operations and functions of system devices, and the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes. Drawings shall show any revised building electrical system required to make supplied elevator system function as specified.

1.5 SCHEDULING

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, Rule 1206.7. Provide written results of each test operation to the Contracting Officer.

1.6 WARRANTY

**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 the manufacturer's warranty requirements, for a period of [12][____] months after the date of acceptance by Contracting Officer. [Perform work during regular working hours]. During the warranty service period, include 24-hour emergency service, with [1] [____] hour response time, without additional cost to the Government. Include adjustments, greasing, oiling, and cleaning. Provide routine inspection and tests of elevators in accordance with ASME A17.1 (Sections 1001 and 1002) and ASME A17.2. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. Maintain a maintenance log of all service orders performed during the warranty period and submit it to the

Contracting Officer [21] [_____] days prior to the end of the warranty period.

1.7 MAINTENANCE AND REPAIR ACTION PLAN

Provide plan of action by the Elevator Installation Contractor to provide emergency and routine maintenance in accordance with paragraph titled WARRANTY. In addition to Data Package SD-19 "Operation and Maintenance Manuals", provide a list of phone numbers, personnel contacts, and all tools to be provided to the Contracting Officer. Submit elevator manuals in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.7.1 Maintenance and Diagnostic Tools

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

1.7.2 Keys for Elevator Key Switches

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

PART 2 PRODUCTS

2.1 PASSENGER ELEVATORS

Provide elevator system that complies with ASME A17.1, ASME A17.2, and ASME A17.3 in their entirety, and additional requirements specified herein.

[2.1.1 Basic Requirements

NOTE: Only specify gearless traction elevators for
buildings more than 10 stories tall and speeds of
500 fpm or more.

- a. Type: [Geared] [Gearless]
- b. Rated load: [_____] kg lbs.
- c. Rated Speed: [_____] m/s fpm.
- d. Travel Length: [_____] m ft..
- e. Number of Stops: [_____]
- f. Number of Hoistway Openings: [_____] Front; [_____] Rear

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.

g. Car Inside Dimensions: [_____] mm ft.-in. wide, [_____] mm ft.-in. deep and [_____] mm ft.-in. high.

NOTE: 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.

h. Car Door Opening: [_____] mm ft.-in. wide and [_____] mm ft.-in. high.

NOTE: 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.

i. 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 side panels and wall trim in hospital cars.

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

a. Floor; [carpet] [vinyl composition tile] [vinyl sheet tile] [____].

b. Walls; [prefinished steel] [laminated plastic] on particleboard [stainless steel] [____]. Provide each cab wall with equally spaced and equally sized wall panels. Conceal all wall panel fasteners.

(1) Wall trim; [prefinished steel] [stainless steel] [____].

(2) Accessories; [hand rails] [____].

c. Interior face of door(s); [prefinished steel panels] [stainless steel] [Laminated plastic on particleboard with rounded stainless steel angle edges] [____].

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 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 and a key control lock for each operation system.

2.2.1 Firefighters' Service

NOTE: Firefighters' Service is required on all passenger elevators. Coordinate the firefighters' designated floor level with the local base Fire Department.

Provide equipment and signaling devices in accordance with [ASME A17.1](#), Section 211, Rule 211.3. The designated level for firefighters' key operated switch is the [ground] [____] floor.

2.2.2 Smoke Detectors

Smoke detectors are specified in [Section [28 31 74.00 20](#) INTERIOR FIRE DETECTION AND ALARM SYSTEM] [____], including conduit and wiring from each detector to elevator machinery space control panel. 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. If sprinkler is provided in the hoistway, provide dual-contact smoke detector at top of hoistway. Include only these smoke detectors in the circuit for elevator controller actuation of Firefighters' Service. In lieu of dual-contact smoke detectors, an addressable fire alarm system with listed smoke detectors can be used in the above stated locations. Ensure that all smoke detectors are mounted on finished ceiling. Smoke detector system shall comply with [ASME A17.1](#).

2.2.3 Fire Sprinklers

NOTE: Virtually all new elevator installations require fire sprinklers in each elevator machinery room. Electric traction elevators are required to have a 2 hour rated hoistway, which does not require sprinklers. If a 2 hour rated hoistway cannot be achieved, sprinklers are required and include the bracketed options for hoistway sprinklers in the

following paragraph.

Provide fire sprinklers in accordance with Section 21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION; providing dual contact flow switch, check valve, and shutoff valve in each sprinkler line immediately outside of each machine room [and hoistway] in accordance with ASME A17.1. Provide electrical connection to fire sprinkler system in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. 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, flow switch shall instantaneously send a signal to cause opening of shunt-trip equipped mainline circuit breaker, in compliance with ASME A17.1, Rule 102.2(c)(4), and send a signal to fire alarm control panel to indicate water flow condition. Machine room sprinkler flow switch actuation shall shunt trip all elevators served by the machine room.[Hoistway sprinkler flow switch actuation shall shunt trip all elevators in the hoistway.]

2.2.4 Top-of-Car Operating Device

Provide, in accordance with ASME A17.1, Section 306, Rule 306.2 an operating device, mounted on or from the car crosshead, to permit car operation at a speed not exceeding 0.75 mps 150 fpm for purposes of adjustment, maintenance, testing, and repair. Include an integral or remote safety device, "UP" and "DOWN" switches or buttons, an emergency stop switch, and inspection switch.

2.2.5 Hoistway Access Switches

Provide key-operated hoistway according to ASME A17.1, Section 110, rule 111.9. access switches that permit limited movement of the car at terminal floors for car door opening and car positioning, operative only when the "INSPECTION" switch in car operating panel is in inspection position. Locate switch 1800 mm 6 feet above floor level, within 300 mm 12 inches of hoistway entrance frame of an elevator or with the ferrule exposed when located in entrance frame.

2.2.6 Independent Service

NOTE: Use the last sentence in brackets 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 calls.]

2.2.7 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

Refer to **ASME A17.1**, Introduction, Section 3, Definitions.

[2.2.7.1 Single, Two-Stop, Automatic Operation

NOTE: Specify for single, two-stop elevator only.

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

] [2.2.7.2 Selective Collective Automatic Operation

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

Provide Selective Collective Automatic Operation. Provide illuminating push buttons.

] [2.2.7.3 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 car functioning as a single car Selective Collective elevator until the out-of-service car is returned to the system. Provide a push button riser adjacent to each elevator.

] [2.2.7.4 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 out-of-service car is returned to the system. Provide a push-button riser adjacent to each elevator.

] [2.2.8 Parking Switch

NOTE: Specify parking switch if there is a definite reason to change the parking station daily or for security purposes. For example, to provide night

shut down of a car for security purposes.

Refer to [ASME A17.1](#), Rule 111.8. Provide a two-position parking switch in the car station service cabinet. One position causes car to remain parked at the floor landing where last used; the other position causes car to park at [main] [_____] floor.

]2.2.9 Hospital Emergency Commandeering Service

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 doors will close and car will automatically return to normal service. Indicator lights shall automatically illuminate during emergency service. Key shall be removable only in "OFF" position.

]2.3 ELEVATOR MACHINE

NOTE: Use geared traction machines up to nine floors with moderate-to-heavy traffic demand, generally not more than three or four cars in a group and for speeds not exceeding 1.75 mps (350 FPM). Use gearless traction for speeds beyond 1.75 to 2.00 mps (350 to 400 FPM), for ten floors or more and where intensive traffic is anticipated, i.e., high-rise hospitals, busy headquarters, office buildings. Gearless elevators are often used in large hospitals for six or more stops. However if 2.00 mps (400 FPM) is required, the elevator industry usually supplies 2.50 mps (500 FPM) as the standard entry for gearless traction machines. Use generator field control for all applications of gearless elevators and most geared elevators. For motors greater than 11 kw (15 hp), use power factor correcting capacitors to increase power factor to minimum 90 percent.

Provide elevator machines which are [[worm] geared] [or] [gearless] traction, direct-drive machines according to [ASME A17.1](#), Section 208. Paint or finish ferrous surfaces with minimum one coat of rust-inhibiting paint conforming to manufacturer's standard practice. Provide hoisting motor with separately excited direct current (dc) generator conforming to [NEMA MG 1](#), Part 18, and NEMA PEEMP. Provide drive motor with Class F insulation, and rated for continuous duty.

2.4 CONTROL EQUIPMENT

2.4.1 Motor Control Equipment

NOTE: At sites where power fluctuations are routinely experienced, specify only variable-voltage

with motor generator set.

ASME A17.1, Section 210. Provide variable-voltage with motor-generator set, variable voltage with silicon controlled rectifier (SCR), or variable-frequency alternating current (ac) drive control. Enclose control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with removable or hinged doors with ventilation louvers.

2.4.1.1 Motor Generator Set

NEMA MG 1, Part 18. Provide motor-generator set with Class F insulation, and rated at 120 starts per hour for elevator service. Maximum acceptable generator voltage is 600 volts. Indicate direction of rotation by an arrow painted on the frame. Enclose electric connections at motor generator set in conduit boxes. Provide adjustable timing device which will automatically shut the set off at [20 to 30 seconds] [3-minute] predetermined time after the elevator has answered the last registered call.

2.4.1.2 SCR Control or VVVF AC Control

Provide individual isolation transformers and individual choke reactors for each individual hoist motor. Provide filtering to maintain harmonic distortion below IEEE standards as measured at the elevator machine room disconnect.

2.4.2 Logic Control

NOTE: Use microprocessors for elevator logic control. However, in a remote location where necessary diagnostic tools and qualified service personnel are not available in the immediate area, do not allow this type of equipment. In addition, solid state control is not desirable for any facility which is subject to an erratic building power supply. In either situation, specify an electromagnetic switch, relay logic controller. If a microprocessor is allowed, 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, and software documentation required to maintain and utilize microprocessor is provided and training is provided to Government Personnel by the equipment manufacturer and supplier.] [Provide electromagnetic switch, relay logic control.]

[2.4.2.1 On-Board Diagnostic Panel

Provide, for each individual elevator microprocessor controller, an on-board diagnostic control and LCD display panel that allows unrestricted access to the comprehensive range of adjustable parameters necessary to perform installation, adjusting, maintenance, and testing of the elevator.

For each elevator group control, provide a separate on-board diagnostic control and LCD display panel that allows unrestricted access to the comprehensive range of options and adjustments necessary to perform installation, adjusting, maintenance, and testing of the elevator group. Provide LCD displays which also provide the capability to display, monitor, and diagnose any and all fault logs, fault history, trouble calls, and diagnostics. Provide three (3) copies of the complete manufacturer's software program, with complete software documentation, that enables the same level of unrestricted access to all controllers of the same make and model, regardless of the installation date or location. Provide signed certification, from the manufacturer's corporate headquarters, that guarantees the microprocessor software and access system will not terminate the unlimited and unrestricted access at any future date.

][2.4.2.2 External Port

For each individual elevator microprocessor controller, and elevator group microprocessor controller, provide a USB port or an RS 232 port that allows connection to an on-site or a remote portable laptop computer. Provide the same level of unrestricted access as the on-board diagnostic panel. Provide three (3) copies of the complete manufacturer's software program, with complete software documentation, that enables the same level of unrestricted access to all controllers of the same make and model, regardless of the installation date or location. Provide signed certification, from the manufacturer's corporate headquarters, that guarantees the microprocessor software and access system will not terminate the unlimited and unrestricted access at any future date.

]2.4.2.3 Repair Requirements

**NOTE: When microprocessor control system is used,
mechanical design for the project must provide the
HVAC heating and cooling required by control
manufacturer for elevator machinery space.**

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. Store programs in non-volatile memory. Tools and software may be factory programmed to operate only with this project's identification serial number.

2.5 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

2.5.1 Capacity and Data Plates

Refer to [ASME A17.1](#), Rule 207.3a, Rule 207.3b, and Rule 207.3c. Attach faceplates with spanner security screws. On car panel, provide stainless steel capacity and data plates, with name of elevator manufacturer.

2.5.2 Car and Hall Buttons

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

2.5.3 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.

Refer to ASME A17.1, Section 211 and 306. 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 shall be passenger accessible. Provide service cabinet or keyed switches for those controls that should not be passenger accessible. Allow maximum 1200 mm 48 inches between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designators. Do not use attached signs.

2.5.3.1 Passenger Controls

- a. Illuminated 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 button location.
- b. "DOOR OPEN" and "DOOR CLOSE" buttons.
- c. Keyed "STOP" switch in accordance with ASME A17.1, rule 210.2(v).
- d. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1, rule 211.1. Alarm button shall be red with engraved legend "ALARM." Alarm button shall 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, Figure 211.3a. 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. Visual and audible signal shall remain 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.
- 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.]

NOTE: Omit the following paragraph, "...phone jack," unless specifically requested by the activity.

[h. Sound-actuated firefighter phone jack.]

2.5.3.2 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. Infra-red curtain unit cutout switch.
- f. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.
- g. Device for communication between car and elevator machine room.
- [h. Parking switch.]

2.5.3.3 Certificate Window

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

[2.5.4 Freight Car-Operating Panel

ASME A17.1, Section 211 and 306. Provide 3 mm 1/8 inch thick stainless steel face plate with edges relieved. 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 shall be passenger accessible. Provide service cabinet or keyed switches for those controls that should not be passenger accessible. Allow maximum 1200 mm 48 inches between car floor and centerline of bottom button. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

2.5.4.1 Passenger Controls

- a. Illuminated 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 the button location.
- b. Manual "STOP" switch in accordance with ASME A17.1, Rule 210.2 (e).
- c. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1 Alarm button shall be red with engraved legend "ALARM." Alarm button shall 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, in accordance with ASME A17.1 Figure 211.3a. 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. Visual and audible signal shall remain 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 SERVICES" switch.]

NOTE: Omit the following paragraph, "...phone jack," unless specifically requested by the activity.

[g. Sound-actuated firefighter phone jack.]

2.5.4.2 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. Infra-red curtain unit cutout switch.

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

g. Communication device between car and elevator machine room.

[h. Parking switch.]

NOTE: Use for power-operated doors and gate.

[i. "DOOR OPEN" and "DOOR CLOSE" buttons.]

2.5.4.3 Certificate Window

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

]2.5.5 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 freight elevators.

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

]2.5.6 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 the button was operated opens or closes.

]2.5.7 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.

2.5.8 In-Car Position and Direction Indicator and Signal

Include in-car direction indicator in the in-car position indicator fixture.

2.5.8.1 In-Car Position Indicator and Signal

Provide horizontal electrical or electronic digital position indicator located minimum of 2135 mm 84 inches above car floor. Arrange indicator to show floor position of car in hoistway and its traveling direction. Indicate position by illumination 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 decibels with frequency not higher than 1500 Hz.

2.5.8.2 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 inches 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.

2.5.9 Landing Position and Direction Indicator and Signal

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

2.5.9.1 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.

2.5.9.2 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 not less than 65 mm 2 1/2 inches 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.

2.6 HOISTWAY AND CAR EQUIPMENT

Refer to ASME A17.1, Parts I and II.

2.6.1 Car and Counterweight Guide Rails and Fastenings

Refer to ASME A17.1, Section 200. Paint rail shanks with one coat of black enamel. Provide pit channel for anchoring main guide-rail brackets and mounting buffers. Only T-section type guide rail is acceptable.

2.6.2 Car and Counterweight Buffers

NOTE: Use spring buffers for speeds up to and
including 1.00 mps (200 fpm).

Refer to ASME A17.1, Section 201. Provide data plate on each buffer.

2.6.3 Pit Equipment

Refer to ASME A17.1, Section 106. Provide pit channel for anchorage of main guide rail brackets and also for anchorage of counterweight guide rail brackets. Each channel shall span distance between guides. In addition, pit channel for main guide rails shall serve as mounting surface for car buffer(s). Pit channel for counterweight guide rails shall serve as mounting surface for counterweight buffer(s). Method of installation of channels, brackets and buffer mounts shall be such that pit waterproofing is not punctured. On completion of guide rail and buffer installation, fully grout both pit channels .

2.6.3.1 Pit "STOP" Switch

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

2.6.3.2 Ladder

NOTE: Pits over 900 mm (3 feet) deep require a
ladder which is usually included in Section 05 50 13,
MISCELLANEOUS METAL FABRICATIONS. Use the second
bracketed option in the following paragraph when
Section 05 50 13 is not included in project

specification.

[Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.] [Galvanized steel. Provide ladder in accordance with 29 CFR 1910.27 with 178 mm 7 inches distance between rung and wall.] Locate ladder on hoistway side wall closest to hoistway door opening.

2.6.3.3 Lighting of Pits

Refer to ASME A17.1, Rule 106e. Locate 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.

2.6.4 Terminal Stopping Devices

Refer to ASME A17.1, Section 209.

2.6.5 Wiring and Traveling Cables

Refer to NFPA 70, Article 620 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Suspend traveling cables by means of self-tightening webbed devices.

2.6.6 Emergency Signaling Devices

Provide an audible signaling device, operable from the Car Operating Panel button marked "ALARM". Mount the audible signaling device in the hoistway conforming to the requirements of ASME A17.1, Rule 211.1(a).

2.7 PASSENGER CAR AND HOISTWAY DOOR ACCESSORIES

Refer to ASME A17.1, Sections 111, 112, and 204. Provide infra-red curtain unit. 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 specified time lapse with time out circuit as option for intensive service elevators.] Provide Infra-red Curtain Unit (ICU) with multiple infra-red beams that protect to the full height of the door opening. Minimum coverage shall extend from 50 mm 2 inches off the floor to 1778 mm 70 inches above floor level. Door operation shall meet the requirements of ASME A17.1, Rule 211.3a(5) and 112.5.

2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

NOTE: User roller guide assemblies on all passenger elevators.

2.8.1 Roller Guides

Refer to ASME A17.1, Section 200. Provide roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment at top and bottom of frames.

2.8.2 Car Frame and Platform

Refer to ASME A17.1, Section 203, Rule 301.6.

2.8.3 Car Enclosure, Car Door, and Car Illumination

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

Refer to **ASME A17.1**, Section 204, and Rule 301.7. Provide natural and forced ventilation, emergency exit, and stainless-steel hooks with fire retardant protective pads. Carpeting shall comply with **ASME A17.1**, Rule 204.2a (2) and (4).

2.8.3.1 Return Panels, Entrance Columns, Cove Base, and Transom

Provide 14 Gauge minimum nonperforated steel. Apply sound-deadening mastic on car shell and all exterior components.

2.8.3.2 Car Top

Provide reinforced 12 gauge minimum steel with hinged 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.

2.8.3.3 Car Door

Provide 16 gauge minimum stainless 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.

2.8.3.4 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.

2.8.3.5 Carpet

Provide carpet that complies with **ASME A17.1** Rule 204.2a.(2) and (4).

2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Refer to **ASME A17.1**, Sections 110 and 112. Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating in accordance with **ASTM E 2074**.

2.9.1 Hoistway Entrance Frames

NOTE: Coordinate materials with paragraph "ELEVATOR DESCRIPTION".

Provide **1.8 mm 14 gage** thick [stainless steel] [or] [prefinished carbon sheet steel]. Solidly grout uprights of entrance ways to height of **1500 mm 5 feet**.

2.9.2 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 materials for hoistway and car entrance sills.

2.9.3 Hoistway Entrance Doors

Refer to [ASME A17.1](#), Rule 110.11e, 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 edge with guides in the sill groove the entire length of travel. Provide sheet metal hoistway door track dust covers at each landing. Dust covers shall protect door locks and door roller tracks and extend the full width of the door track and associated hardware.

2.9.4 Entrance Fascias and Dust Covers

Refer to [ASME A17.1](#), Rule 110.10a and Rule 110.11a.

2.9.5 Hoistway Ventilation

Provide hoistway ventilation directly to outside air by fixed louver through side wall of hoistway at highest possible point in hoistway. Net size of louver to be at least 3.5 percent of hoistway cross section.

2.10 HANDICAPPED AND MEDICAL SERVICES ACCESS

Refer to [36 CFR 1191](#), Sections 4.10 for Elevator, 4.30 for Signage, and 4.31 for Telephones.

2.10.1 Provision for Handicapped

NOTE: Use on all elevators.

2.10.2 Emergency Medical Services

NOTE: Use the following for buildings of four stories or more in height.

Elevators and signage shall comply with [ICC IBC](#) and [ICC IPC](#).

[2.11 EMERGENCY POWER OPERATION

NOTE: Use in hospitals and any building 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] [and] to accomplish operation sequences.[In multiple elevator system, one

elevator travels automatically to 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, automatically provide 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.] For emergency power, operation, provide sign reading "EMERGENCY POWER" flashing in each car station.[At same time, provide operable Firefighters' Service.]

]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 Structural Members

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

3.1.3 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. Guard exposed gears, sprockets, tape or rope sheaves, floor controllers, or signal machines, and their driving ropes, chains or tapes, and selector drums from accidental contact in accordance with [ASME A17.1](#).

3.1.4 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.

3.1.5 Firefighters' Service

Firefighters' service shall be complete including installation and wiring of all smoke detectors in accordance with [ASME A17.1](#), Rule 211.3b. Coordinate smoke detector installation for Firefighters' Service.

3.2 FIELD QUALITY CONTROL

a. 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.

b. 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](#), and the applicable requirements of Part

XI, "Engineering and Type Tests". Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. Conduct all testing and inspections in the presence of 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.

c. Inspector shall complete, sign and post form NAVFACENGCOM 9-11014/23 (Rev. 7-88), Elevator Inspection Certificate, after successful completion of inspection and testing.

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, dynamometer, and 30 meter 100 foot tape measure.

3.2.2 Field Tests

3.2.2.1 Endurance Tests

Test each elevator for a period of one hour continuous run, with specified rated load in car. Restart the one hour test period from beginning, following any shutdown or failure. During 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 Test specified herein are to be met throughout the duration of the Endurance Test.

3.2.2.2 Speed Tests

Determine actual speed of each elevator in both directions of travel 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 in accordance with ASME A17.2. Minimum acceptable elevator speed is the Rated speed specified. Maximum acceptable elevator speed is 110 percent of Rated speed.

3.2.2.3 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.

3.2.2.4 Insulation Resistance Tests

Perform tests to ensure elevator wiring systems are 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 provisions to prevent damage to electronic devices.

3.2.2.5 Brake Test

Conduct brake test with 125 percent of rated load in elevator. Verify that brakes stop and hold elevator with 125 percent of rated load.

3.2.2.6 Buffer Tests

Test buffers for car and counterweight as outlined in ASME A17.1, Rule 1100.5.

3.2.2.7 Temperature Rise Tests

Determine temperature rise of elevator hoisting motor, motor-generator, exciter, and booster during full-load test run for one hour minimum. Under these conditions, maximum acceptable temperature rise shall not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C 9 degrees F of ambient temperature.

3.2.2.8 Balance Tests

Perform electrical and mechanical balance tests of car and counterweight.

3.2.2.9 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 beginning and end of Endurance test.

[3.3 MAINTENANCE SERVICE TRAINING

**NOTE: Specify elevator maintenance service
instructions for projects at isolated locations.**

Provide qualified representative of elevator manufacturer to instruct Government personnel in care, adjustment, and maintenance of elevator equipment for a period of not less than 5 working days immediately following acceptance of elevator system.

] -- End of Section --