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USACE / NAVFAC / AFCEC / NASA UFGS-14 21 13 (February 2009)  
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Preparing Activity: USACE Superseding  
UFGS-14 21 13 (July 2007)

## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2014

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02/09

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### SECTION 14 21 13

#### ELECTRIC TRACTION FREIGHT ELEVATORS 02/09

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

Adhere to [UFC 1-300-02](#) Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

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

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a [Criteria Change Request \(CCR\)](#).

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#### PART 1 GENERAL

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NOTE: Freight elevators are defined by ASME A17.1/CSA B44 as elevators used primarily for carrying freight and not accessible to the general public. Use Section 14 21 23 for ELECTRIC TRACTION PASSENGER ELEVATORS.

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

All Navy facility designs which include elevators must comply with (1) the "NAVFAC Elevator Design Guide"; this guide is available from the NAVFAC facilitator ([www.navfacilitator.navfac.navy.mil](http://www.navfacilitator.navfac.navy.mil)) under Interim Technical Guidance.

Incorporate the following features into the design and 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 and after 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 (if applicable) with extensions to beams.
7. Locations for hall position indicators, hall button and key access 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. 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.
13. Padding connectors, chair rail, or bumper guard type and location.

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#### 1.1 REFERENCES

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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.

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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) Specification for Welding Procedure and Performance Qualification
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44	(2013) Safety Code for Elevators and Escalators
ASME A17.2	(2012) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks
ASME A17.3	(2011) Safety Code for Existing Elevators and Escalators
ASME QEI-1	(2010) Standard for the Qualification of Elevator Inspectors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code
ICC PCBF	(2012) INTERNATIONAL CODE COUNCIL PERFORMANCE CODE® For buildings and facilities

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2011; Errata 2012) Motors and Generators
NEMA PREMIUM	(2007) General Specification for Consultants, Industrial and Municipal: NEMA Premium Efficiency Electric Motors

(600 Volts or Less)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2012; Amendment 1 2012) Life Safety Code

NFPA 13 (2013) Standard for the Installation of Sprinkler Systems

NFPA 252 (2012) Standard Methods of Fire Tests of Door Assemblies

NFPA 70 (2014; AMD 1 2013; Errata 2013; AMD 2 2013) National Electrical Code

NFPA 72 (2013) National Fire Alarm and Signaling 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; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SYSTEM DESCRIPTION

Provide a pre-engineered elevator system, by manufacturer regularly engaged in the production of elevator systems, that complies with ASME A17.1/CSA B44 and ASME A17.2 in their entirety, and additional requirements specified herein.

1.2.1 Fire Protection System

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NOTE: Hoistway vents may be activated elevator lobby smoke detectors. Detectors do not have to be placed in hoistways per IBC/NFPA 72.  
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Provide a fire protection system complying with the applicable provisions of NFPA 72, NFPA 101, and ASME A17.1/CSA B44.[ 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 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION] [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, certified by a Registered Professional Engineer, for the Reaction Loads that comply with

ASME A17.1/CSA B44, imposed on building by elevator system. And calculations, certified by a Registered Professional Engineer, of total anticipated heat loads generated by all the elevator machine room equipment. Do not fabricate materials nor perform construction until approved by the Contracting Officer.

### 1.2.3 Provisions for Earthquake Protection

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NOTE: Provide seismic protection as covered by ASME A17.1/CSA B44, Section 8.4. 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.

Use ASME A17.1/CSA B44, Appendix F, for locations in seismic risk zone 3 or greater. Use ASME A17.3 for Existing Elevators.

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The facility shall comply with all ASME A17.1/CSA B44, Part 8.4 requirements as applicable by location.

### 1.3 SUBMITTALS

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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.

The Guide Specification technical editors have designated those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, 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.

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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.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

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

#### SD-03 Product Data

Freight Elevators[; G][; G, [\_\_\_\_\_]]  
Accessories[; G][; G, [\_\_\_\_\_]]  
Data sheets[; G][; G, [\_\_\_\_\_]]  
Maintenance and diagnostic tools[; G][; G, [\_\_\_\_\_]]  
Wiring Diagrams  
Sequence of Operation  
Field Quality Control[; G][; G, [\_\_\_\_\_]]  
Logic Control[; G][; G, [\_\_\_\_\_]]

#### SD-05 Design Data

Reaction loads[; G][; G, [\_\_\_\_\_]]  
Heat loads[; G][; G, [\_\_\_\_\_]]

#### SD-06 Test Reports

Field Tests

#### SD-07 Certificates

Quality Assurance

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

### 1.4 QUALITY ASSURANCE

#### 1.4.1 Elevator Specialist

Perform work specified in this section 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. 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

discrepancies to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered. Submit 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.

#### 1.4.2 Elevator Inspector

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NOTE: Use the first subparagraph where the Elevator Inspector will be provided by the Contractor. Use the second subparagraph 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 project.

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.

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##### 1.4.2.1 Inspector Provided by Contractor

[The Elevator Inspector shall be [certified in accordance with the requirements of ASME A17.1/CSA B44 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, 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.] Submit a letter, no later than [14] [\_\_\_\_\_] days after the Notice to Proceed, providing the name and Statement of Qualifications, including ASME A17.1/CSA B44 and ASME QEI-1 Certificate and all required state and local licenses of the individual who will perform the duties specified herein for the Elevator Inspector.

##### 1.4.2.2 Inspector Provided by Government

[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.] Submit copies of Elevator Inspectors State of [\_\_\_\_\_] Licenses.

#### 1.4.3 Welders' Qualifications

Comply with AWS D1.1/D1.1M, Section 4, and AWS B2.1/B2.1M. Submit certified copies of welders' qualifications, demonstrating compliance with AWS D1.1/D1.1M, Section 4; 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 Controllers,
- 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 Operation and functions of system devices, and the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes.

#### 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/CSA B44, Section 8.6.10.1. Provide written results of each test operation to the Contracting Officer. Document all inspection and testing. Maintain copy of documentation in machine room.

#### 1.6 WARRANTY

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

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Provide routine warranty service in accordance with 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/CSA B44** Section 8.11.3 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 prepared by the Elevator Specialist for emergency and routine maintenance in accordance with paragraph titled WARRANTY. Provide a list of phone numbers, personnel contacts, and all maintenance and diagnostic tools provided by paragraph "Maintenance and Diagnostic Tools", to the Contracting Officer.

##### 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. Provide necessary diagnostic software in cases where the solid state or microprocessor diagnostic tools are available on the open market. Submit information on motor, hall station, and buffer on elevators and accessories. For elevator supporting systems, include information on car control [and emergency power] systems. Include information for maintenance and diagnostic tools for all components. On data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening.

##### 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 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 other side.

## PART 2 PRODUCTS

### 2.1 FREIGHT ELEVATORS

#### 2.1.1 Basic Requirements

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**NOTE: For details of loading classes, refer to ASME A17.1/CSA B44, Sections 2.16.2.2 and 3.23.**

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- 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 Hoist Way Openings: [\_\_\_\_\_] Front; [\_\_\_\_\_] Rear
- g. Car Inside Dimensions: [\_\_\_\_\_] mm ft.-in. wide, [\_\_\_\_\_] mm ft.-in. deep and [\_\_\_\_\_] mm ft.-in. high.
- h. Hoistway Door Type & Size: [Manual] [Power Operated] Vertical [Bi-Parting] [Rising] [\_\_\_\_\_] mm ft.-in. wide and [\_\_\_\_\_] mm ft.-in. high.
- i. Car Gate Type: [Manual] [Power Operated] Vertical rising

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**NOTE: Refer to ASME A17.1/CSA B44, Rule 207.2b for  
 Classes of loading.**  
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- j. Loading Type: Class [A] [B] [C]

#### 2.1.2 Cab Enclosures and Door Frame Finishes

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

Use stainless steel door facing, 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.

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

##### 2.1.2.1 Floor

[mill finish steel diamond plate] [painted steel diamond plate] [aluminum  
 diamond plate] [tongue and groove hardwood] [\_\_\_\_\_]

##### 2.1.2.2 Walls

[prefinished steel panels] [stainless steel] [\_\_\_\_\_] and wall trim;  
 [prefinished steel] [stainless steel] [\_\_\_\_\_]

##### 2.1.2.3 Accessories

[handrails] [\_\_\_\_\_]

##### 2.1.2.4 Interior Face of Doors

[prefinished steel] [stainless steel] [\_\_\_\_\_]

#### 2.1.2.5 Ceiling

[prefinished steel panels] [stainless steel] [anodized aluminum] [\_\_\_\_\_]

#### 2.1.2.6 Hoistway Doors and Frame Finishes

Provide finishes on exterior of hoistway as follows:

##### 2.1.2.6.1 Frame

[prefinished steel] [stainless steel] [\_\_\_\_\_]

##### 2.1.2.6.2 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/CSA B44**. 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

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**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.**  
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Provide equipment and signaling devices. 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 that 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/CSA B44**. Provide dual-contact smoke detectors located in the elevator lobbies and the elevator machine room. If a sprinkler is provided at the top of 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.

#### 2.2.3 Fire Sprinklers

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**NOTE: Elevator installations in buildings protected in accordance with NFPA 13 require sprinklers in each elevator machinery room, except buildings protected in accordance with NFPA 13R. Electric**

traction elevators are required to have a 2 hour rated hoistway, which does not require sprinklers. If a two hour rated hoistway cannot be achieved, sprinklers are required and the bracketed option for sprinklers in the hoistway will be included. Sprinklers in elevator machine rooms, hoistways, or elevator pits are not permitted in Italy.

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Provide fire sprinklers complying with NFPA 13 in accordance with Section [21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION] [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 top of hoistway]. 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/CSA B44, Section 2.8.2, and send a signal to fire alarm control panel to indicate water flow condition. Machine room sprinkler flow switch actuation shall shunt trip all elevator(s) served by the machine room. Machine room heat detector spacing shall comply with NFPA 72. [ Hoistway sprinkler flow switch actuation shall shunt trip all elevator(s) in the hoistway.]

#### 2.2.4 Top-of-Car Operating Device

Provide, in accordance with ASME A17.1/CSA B44, 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.

#### 2.2.5 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.

#### 2.2.6 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.]

## 2.2.7 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.  
\*\*\*\*\*

### [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 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.

### ] [2.2.7.4 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 the 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 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 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. Paint or finish ferrous surfaces with minimum one coat of rust-inhibiting paint conforming to manufacturer's standard practice. Direct current drive motor shall conform to NEMA MG 1, Part 18, and NEMA PREMIUM hoisting motor with separately excited direct current (dc) generator. 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/CSA B44, Section 2.26. Provide [variable voltage with silicon controlled rectifier (SCR)], [variable-voltage with motor-generator set], 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 [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.]

#### 2.4.1.2 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 embossed, engraved, stamped, or cast on the frame. Enclose electric connections at motor generator set in conduit boxes. Provide adjustable timing device that will automatically shut the set off at [20 to 30 seconds] [3-minute] predetermined time after the elevator has answered the last registered call.]

#### 2.4.2 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, or at a remote/island location. 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 commercially available microprocessor controller to enable programmable control of call allocation, logic functions, door control, speed sensing and car position. Provide a comprehensive and unrestricted method of accessing the microprocessor memory for elevator diagnostic purposes and a method of reprogramming adjustable parameters of computerized controls. Store all programming in non-volatile memory. The microprocessor control system is acceptable only if all hardware, software, and software documentation required to maintain and utilize the microprocessor is provided, and training is provided to Government Personnel by the equipment manufacturer and supplier.]

#### [2.4.2.1 On-Board Diagnostic Panel

\*\*\*\*\*

**NOTE: Use this and the following paragraph only for large scale commercial freight elevator operations.**

\*\*\*\*\*

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 that 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 that the microprocessor software and access system will not terminate the unlimited and unrestricted access at any future date.

#### ] 2.4.2.3 Repair Requirements

For repair of the microprocessor control system(s), provide maintenance tools, supporting computer software, and software documentation required for complete maintenance of elevator system including diagnostics and adjustments. On-board diagnostic panels shall not require recharging to maintain their memory or authorization for use. Software requiring periodic reprogramming, or reauthorization is not permitted. Store programs in non-volatile memory.[ Provide electromagnetic switch, relay logic controller, complete with three (3) copies of the ladder diagram, fully cross-referenced and annotated, with the complete sequence of operations.]

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

#### 2.5.1 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.

#### 2.5.2 Car and Hall Buttons

Provide tamper-proof push buttons identical in size and design to hall call buttons, but not illuminating.

#### [2.6 FREIGHT CAR-OPERATING PANEL

Provide 3 mm 1/8 inch thick stainless steel face plate with edges relieved; a car operating panel (COP) for each car at each car entrance; exposed, flush mounted buttons for the controls that must be passenger accessible; and 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 top operating button. Allow 900 mm 35 inches 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.

#### 2.6.1 Freight Elevator Controls

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

Provide the following:

- 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/CSA B44, Section 2.27.1. Alarm button shall be red with engraved legend "ALARM" which illuminates 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 and 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. 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/CSA B44, UFAS, and the Americans with Disabilities Act.
- [ f. Key-operated on-off "HOSPITAL EMERGENCY COMMANDEERING SERVICE SWITCH".]
- [ g. Sound-actuated firefighter phone jack.]

#### 2.6.2 Service Controls

\*\*\*\*\*  
**NOTE: Use "DOOR OPEN" and "DOOR CLOSE" buttons for  
power-operated doors and gate.**  
\*\*\*\*\*

- 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.]

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

#### [2.6.3 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.

#### ] [2.6.4 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.

#### ] [2.6.5 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.

#### ] 2.6.6 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.

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

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

##### 2.6.7.1 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.

#### 2.6.7.2 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.

#### 2.6.8 Landing Position and Direction Indicator and Signal

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

##### 2.6.8.1 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. Provide 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.

##### 2.6.8.2 Landing Direction Indicator and Signal

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

#### 2.6.9 Infra-red Curtain Unit

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/CSA B44.

### ]2.7 HOISTWAY AND CAR EQUIPMENT

#### 2.7.1 Car and Counterweight Guide Rails and Fastenings

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

#### 2.7.2 Car and Counterweight Buffers

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

Provide data plate on each buffer.

#### 2.7.3 Pit Equipment

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. Pit channel for main guide rails shall also serve as mounting surface for car buffer(s). Pit channel for counterweight guide rails shall serve as mounting surface for counterweight buffer(s). Prevent pit waterproofing puncturing by method of installation of channels, brackets and buffer mounts. Fully grout both pit channels on completion of guide rail and buffer installation.

#### 2.7.3.1 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.

#### 2.7.3.2 Ladder

\*\*\*\*\*  
NOTE: Pits over 900 mm (3 feet) deep require a  
ladder which is usually included in Section 05 51 33  
METAL LADDERS.  
\*\*\*\*\*

[See Section 05 51 33 METAL LADDERS] [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. Extend pit ladders 1200 mm 48 inches above the door sill. Pits which are more than 2100 mm 83 inches below the underside of the car when it is at the lowest landing, require a maintenance personnel platform.

#### 2.7.3.3 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.

#### [2.7.3.4 Elevator Pit Sump Pump

\*\*\*\*\*  
NOTE: Use the following paragraph for elevator pits  
constructed in low areas relative to sea levels or  
adjacent fresh water levels. Check local and State  
code requirements for mandatory pit drainage  
requirements and Classification per NFPA.  
\*\*\*\*\*

Provide [wet-pit-mounted, vertical sump pump] [submersible sump pump] for each elevator pit. Refer to Section 22 14 29.00 40 SUMP PUMPS.

#### ]2.7.4 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.

#### 2.7.5 Emergency Signaling Devices

Provide audible signaling device, operable from Car Operating Panel button marked "ALARM". Mount audible signaling device in hoistway. [Operation of the EMERGENCY STOP button shall sound audible signaling device.]

## 2.8 FREIGHT ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

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

### 2.8.1 Roller Guides

Provide roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment to top and bottom of frames.

### 2.8.2 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.

## 2.9 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 that have a minimum 1.5 hour fire rating complying with NFPA 252.

### 2.9.1 Door Panel

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

### 2.9.2 Door Operation

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

Provide [semi-selective] [full-selective] door operation.

## 2.10 HANDICAPPED AND MEDICAL SERVICES ACCESS

### 2.10.1 Provision for Handicapped

\*\*\*\*\*



**NOTE: Use on all elevators.**

\*\*\*\*\*

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

## 2.10.2 Emergency Medical Services

\*\*\*\*\*

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

\*\*\*\*\*

**ICC PCBF** and **ICC IBC**, Chapter 30 for elevators and signage.

## 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] 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 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.]

## 2.12 ALTERNATIVE INSTALLATION

Upon approval of the customer on an individual basis, [and for Navy projects, only upon written prior approval by the Navy Elevator Program Manager,] a machine-room-less elevator system alternative may be utilized in-lieu-of elevators which require a machine room. Machine-room-less elevators can be specified where optimizing building and energy efficiency is desired. Machine-room-less type elevators can be selected for speeds from **0.75 up to 1.75 m/s 150 up to 350 feet/minute**. Hoisting machinery is located in the hoistway at the top of the shaft with controls located either in a control room or a control space at the top landing adjacent to the hoistway. Units shall comply with all applicable requirements of this specification in addition to the manufacturers specifications.

## PART 3 EXECUTION

### 3.1 INSTALLATION

\*\*\*\*\*

**NOTE: Use the bracketed reference for existing elevator projects.**

\*\*\*\*\*

Install in accordance with manufacturer's instructions, **ASME A17.1/CSA B44**, [

ASME A17.3,] 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

Completely enclose selector cables or tapes exposed to possibility of accidental contact in machine room with 1.5 mm 16 gage thick sheet metal or expanded metal guards, both horizontally and vertically. Guard exposed gears, sprockets, and selector drums from accidental contact in accordance with ASME A17.1/CSA B44.

#### 3.1.4 Other 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. Firefighters' service shall be complete, including installation and wiring of all smoke detectors in accordance with ASME A17.1/CSA B44, Section 2.27.3.2. Coordinate smoke detector installation for firefighters' service.

### 3.2 FIELD QUALITY CONTROL

\*\*\*\*\*  
**NOTE: Use the bracketed reference for existing  
elevator projects.**  
\*\*\*\*\*

- 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. Submit a plan detailing the testing procedures [60] [\_\_\_\_\_] days prior to performing the elevator tests. Perform all required tests and demonstrate proper operation of each elevator system and prove that each system complies with contract requirements[, ASME A17.3,] and ASME A17.1/CSA B44, including Section 8.10.3, "Acceptance Inspection and Tests of Passenger and Freight Hydraulic Elevators", and the applicable requirements of Section 8.3, "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 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. A plan detailing the testing procedures [60] [\_\_\_\_\_] days prior to performing the elevator tests.
- c. 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

Provide 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

Submit 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. Submit field test reports no later than [14] [\_\_\_\_\_] days after the successful completion of testing.

#### 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 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 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.

#### 3.2.2.5 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 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.

#### 3.2.2.7 Balance Tests

Perform electrical and mechanical balance tests of car and counterweight.

#### 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 beginning and end of Endurance test.

### 3.3 OPERATION AND MAINTENANCE TRAINING

The Elevator Specialist shall 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 system. [Submit Data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE 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, as required. Submit proposed Onsite Training schedule, concurrently with the Operation and Maintenance Manuals.

-- End of Section --