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USACE / NAVFAC / AFCESA **UFGS-14210A (August 2001)**

Preparing Activity: USACE **Superseding**
UFGS-14210A (October 1993)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 25 June 2004

Latest change indicated by CHG tags
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SECTION 14210A

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08/01

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SECTION 14210A

ELEVATORS, ELECTRIC
08/01

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NOTE: This guide specification covers the requirements for electric passenger and freight elevators, and associated controls, door hardware and installation.

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

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

Use of electronic communication is encouraged.

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

****

PART 1 GENERAL

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NOTE: The following will be shown on the contract drawings to accompany this specification:

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

2. Proper size of openings into hoistway walls for installing hoistway door assemblies.

3. Storage facilities for elevator equipment during construction.

4. Electrical service requirements for elevators, including sizings in compliance with codes and locations for fused and unfused disconnect switches.

5. Sill supports, including steel angles, sill recesses, and grouting of door sills.

6. Structural steel door frames with extensions to beams.

7. Locations for hall stations and hall lanterns.

8. Emergency power supply with automatic time-delay transfer switch and auxiliary contacts with wiring to elevator controller.

9. Telephone and or Intercom connections to elevator hoistway.

10. Location of smoke detectors required for Firefighters' Service. The designer will also indicate wiring of the smoke detectors to the elevator control system and to the building fire alarm system.

11. Wiring to elevator alarm bells and fire-fighters' service.

12. Lighting, ventilation and heat to machine room. Ambient temperature of 10 degrees C (50 degrees F) min., 32 degrees C (90 degrees F) max.

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1.1 REFERENCES

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NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

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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.

ASME INTERNATIONAL (ASME)

ASME A17.1	(2002) Handbook on Safety Code for Elevators and Escalators
ASME A17.2.1	(1994) Checklist for Inspection and Test of Electric Elevators
ASME QEI-1	(2001) Standard for the Qualification of Elevator Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A 176	(1999) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 366/A 366M	(1997e1) Commercial Steel, Sheet, Carbon,(0.15 Maximum Percent Cold-Rolled**
ASTM A 568/A 568M	(2003) Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A 569/A 569M	(1998) Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial
ASTM A 666	(2000) Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM E 84	(2003) Surface Burning Characteristics of Building Materials

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.11	(1999) Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1KV)
IEEE C62.41	(1991) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
IEEE C62.45	(2002) Surge Testing for Equipment Connected to Low-Voltage (1000v and less)AC Power Circuits
IEEE Std 304	(1977; R 1991) Test Procedure for Evaluation and Classification of Insulation Systems for Direct-Current Machines

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO UBC	(2000) Uniform Building Code (3 Vol.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3	(2000) High-Pressure Decorative Laminates
NEMA MG 1	(2003) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2003) Fire Tests of Door Assemblies
NFPA 70	(2002) National Electrical Code

U.S. ARMY CORPS OF ENGINEERS (USACE)

TI 809-04	(1998) Seismic Design for Buildings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD 795	(Basic; Am 1) Uniform Federal Accessibility Standards

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

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

UNDERWRITERS LABORATORIES (UL)

UL 1449	(1996; Rev thru Jul 2002) Transient Voltage Surge Suppressors

1.2 SUBMITTALS

****

NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy 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.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with

Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Elevator System

Detail drawings including dimensioned layouts in plan and elevation showing the arrangement of elevator equipment, anchorage of equipment, clearances for maintenance and operation; and details on hoistway, doors and frames, operation and signal stations, controllers, motors, guide rails and brackets, and points of interface with normal power [fire alarm system] [HVAC or exhaust systems] [and] [interface with emergency power systems]. Drawings shall show any revised building electrical system required to make supplied elevator system function as specified. Drawings shall contain complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operation and functions of system devices. Drawings shall include the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes.

SD-03 Product Data

Training Data

Information describing the training course for operating personnel, training aids and samples of training aids and samples of training materials to be used, training schedules, and notification of training.

Elevator System

A complete list of equipment and material, including illustrations, schedules, manufacturer's descriptive data and technical literature, performance charts, catalog cuts, installation instructions, brochures, diagrams, and other information required for fabrication and installation of the equipment. Data shall include calculations for reaction loads imposed on building by elevator systems. Calculations to demonstrate compliance with ASME A17.1, Rule XXIV, and to demonstrate that the proposed elevator system conforms to paragraph SEISMIC REQUIREMENTS; certified copies of test reports may be submitted on lieu of calculations. Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than [_____] weeks prior to date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended to be replaced and replacement interval required. Data shall include the appropriate sizing of electrical protective devices.

Framed Instructions

Diagrams, instructions, and other sheets, proposed for posting.

Test Procedures[; G][; G, [_____]]

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

SD-04 Samples

Finishes

Samples of materials and products requiring color or finish selection.

SD-06 Test Reports

Testing

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.

SD-07 Certificates

Qualification Certificates

Certificates of experience of elevator mechanics employed to install, supervise and test the elevator shall certify mechanics to have not less than 5 years experience installing, supervising and testing elevators of the type and rating specified. Certificate shall certify that elevator system installer is acceptable to elevator manufacturer, prior to installation of elevators.

SD-10 Operation and Maintenance Data

Elevator System[; G][; G, [_____]]

[Six] [_____] copies of operation manual outlining the step-by-step procedures for system startup, operation and shutdown. Manuals shall include manufacturer's name, model number, service manual parts list and brief description of all equipment, including basic operating features. [Six] [_____] copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Manuals shall include equipment layout and complete wiring and control diagrams of the system as installed. Operation and maintenance manuals shall be approved prior to training course.

1.3 QUALIFICATIONS

Electric elevators shall be pre-engineered elevator systems, and provided by a company regularly engaged in the manufacture of elevator systems. The manufacturer shall either install the elevator system or provide letter of endorsement certifying that the elevator-system installer is acceptable to the manufacturer.

1.4 REGULATORY REQUIREMENTS

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NOTE: Freight elevators will be required to satisfy requirements for accessibility and usability for the physically handicapped if they are used as combination passenger and freight elevators.

****

Design and fabrication shall be in accordance with ASME A17.1. Each car shall have the capacity to lift a live load, exclusive of the car and cable at a speed as specified in the following schedule. The approximate travel, terminal floors, number of stops and openings, and the car sizes shall be as shown in the schedule. The elevators shall serve the floors with stops and openings in accordance with the requirements indicated. [Passenger] [Freight] elevators shall provide accessibility and usability for physically handicapped in accordance with the requirements for the handicapped in FED-STD 795 and 36 CFR 1191.

1.4.1 Elevator Schedule (Passenger)

****

NOTE: Specify geared elevators for speeds up to 2 m/s (400 feet per minute) and gearless elevators for speeds greater than 2 m/s (400 feet per minute). Size platform in accordance with Table 207.1, ASME A17.1.

Passenger elevators will be grouped for maximum economy and efficiency of operation. Hoisting machinery for electric traction type elevators will be located on top of shafts, preferably in penthouse type equipment rooms or adjacent to the hoistway if overhead space is not available.

****

Number of Elevators Required:	[_____].
Type:	[Geared] [Gearless].
Service:	[Passenger] [Hospital].
Capacity:	[_____] kg ([_____] pounds).
Speed:	[_____] m/s ([_____] fpm).
Platform Size:	[_____] wide by [_____] deep.
Clear Car Inside:	[_____] wide by [_____] deep.
Net Travel:	[_____].
Landings:	[_____].
Openings: Front	[_____].
Openings: Rear	[_____].
Entrance Type:	[Center-opening horizontal sliding] [Single speed horizontal sliding] [2 speed horizontal sliding].
Number of Elevators Required:	[_____].
Type:	[Geared] [Gearless].

Service:	[Passenger] [Hospital].
Capacity:	[_____] pounds.
Speed:	[_____] fpm.
Platform Size:	[_____] wide by [_____] deep.
Clear Car Inside:	[_____] wide by [_____] deep.
Net Travel:	[_____].
Landings:	[_____].
Openings: Front	[_____].
Openings: Rear	[_____].
Entrance Type:	[Center-opening horizontal sliding] [Single speed horizontal sliding] [2 speed horizontal sliding].

1.4.2 Elevator Schedule (Freight)

****

NOTE: Refer to ASME A17.1, Rule 207.2B for proper freight loading classification for the intended use. Size platform in accordance with 207.1 of ASME A17.1.

Freight elevators will be grouped for maximum economy and efficiency of operation. Hoisting machinery for electric traction type elevators will be located on top of shafts, preferably in penthouse type equipment rooms or adjacent to the hoistway if overhead space is not available.

****

Number of Elevators Required:	[_____].
Loading Classification:	ASME A17.1 Class [A] [B] [C1] [C2] [C3].
Capacity:	[_____] kg ([_____] pounds)
Speed:	[_____] m/s ([_____] fpm)
Platform Size:	[_____] wide by [_____] deep.
Clear Car Inside:	[_____] wide by [_____] deep.
Net Travel:	[_____] floor to [_____] floor.
Landings:	[_____].

Openings: Front	[_____].
Openings: Rear	[_____].
Number of Elevators Required:	[_____].
Loading Classification:	ASME A17.1 Class [A] [B] [C1] [C2] [C3].
Capacity:	[_____] pounds.
Speed:	[_____] fpm.
Platform Size:	[_____] wide by [_____] deep.
Clear Car Inside:	[_____] wide by [_____] deep.
Net Travel:	[_____] floor to [_____] floor.
Landings:	[_____].
Openings: Front	[_____].
Openings: Rear	[_____].

1.5 DESIGNATED LANDING

For the purposes of firefighter's service and emergency operations, as required by Section 211, ASME A17.1, the designated landing or level shall be the [first floor] [_____]. The alternate landing or level shall be the [_____] floor.

1.6 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variations; and dirt, or other contaminants.

1.7 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and advise the Contracting Officer of any discrepancy before performing any work.

1.8 WARRANTY

****
NOTE: If elevator system is not a new installation, revise the following as required. Following acceptance of the elevator, the government immediately becomes responsible for its maintenance.
****

Warranty service shall be provided for each elevator for a period of 12 months after date of acceptance by Contracting Officer. Warranty service shall be performed only by trained elevator mechanics during regular working hours, and shall include manufacturer's warranty requirements

including but not limited to adjusting, labor and parts needed to keep the elevator in proper operation. Testing and adjustments shall be in accordance with the applicable provisions of ASME A17.1 and ASME A17.2.1. Emergency callback service shall be included and available 24 hours a day, 7 days per week, with an initial telephone response time of [one] [_____] hour and a response time of [4] [_____] hours for a mechanic to the site. Inspection and service for fire service operation [seismic requirements], [and hospital emergency service] shall be performed every [6] [_____] months. Documentation of inspection and testing, and certification of successful operation shall be provided with each visit.

PART 2 PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

2.1.1 Standard Products

Material and equipment shall be the standard products of manufacturers regularly engaged in the fabrication of elevators and/or elevator parts, and shall essentially duplicate items which have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is available 24 hours a day, 7 days per week, with a response time of [4] [_____] hours.

2.1.2 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, and electrical and mechanical characteristics on a plate secured to the item of equipment.

2.1.3 Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.

2.1.4 Electrical Work

****
NOTE: Drawings will show wattage (horsepower) of motors for sizing electric feeder and electrical devices. Delete requirement for monitor if not required by length of travel.
****

Changes to the electrical distribution system required for coordination with elevator equipment shall be performed and coordinated by the Contractor, at Contractor's expense. Electrical service for elevator machines shall be [_____] volt, 60-Hertz, 3-phase, [3 wire ungrounded] [4 wire solid neutral grounded] alternating current. The elevator machine feeder for each elevator shall have a circuit breaker or fused disconnect switch located in the elevator machine room, and shall terminate at the control panel for that elevator. Electrical work shall conform to requirements in Section 16415A ELECTRICAL WORK, INTERIOR. A feeder with circuit breaker or fused disconnect switch located in the elevator machine room, shall be terminated at the control panel for each elevator. A telephone junction box and an elevator car lighting junction box shall be provided adjacent to each controller. A single-phase electrical circuit with grounded connection for video monitor shall be provided in machine room. A disconnect switch that will shutoff power to the elevator car

lighting shall be provided in the elevator machine room adjacent to the elevator control panel.

2.1.5 Use of Asbestos Products

Materials and products required for manufacturing and installing elevators shall not contain asbestos.

2.2 MISCELLANEOUS MATERIALS

2.2.1 Materials for Car Enclosures

Materials for car enclosures shall meet flame spread rating 0 to 75 and smoke development 0 to 450 as tested in accordance with requirements of ASTM E 84 and as established by ASME A17.1, Rule 204.2.

2.2.2 Structural Steel

Structural steel shall be hot-rolled commercial quality carbon steel, pickled, oiled, complying with ASTM A 569/A 569M and ASTM A 568/A 568M.

2.2.3 Cold-Rolled Sheet Steel

Sheet steel shall be cold-rolled commercial quality low-carbon steel, Class 1, exposed matte finish, oiled, complying with ASTM A 366/A 366M and ASTM A 568/A 568M.

2.2.4 Stainless Steel

Stainless steel shall be ASTM A 176 Type 302/304, austenitic, corrosion-resistant with grain of belting in direction of longest dimension. Surfaces shall be smooth and without waves and shall be in compliance with ASTM A 666 and ASTM A 568/A 568M.

2.3 PASSENGER ELEVATOR CAR

2.3.1 Car Fronts

Fronts for passenger elevators shall be combination door post and return panels manufactured of 1.9837 mm thick (14 gauge) 14 gauge stainless steel provided with necessary cutouts for operating devices. Operating panel shall be recessed into front return panel with surface-applied operating panel cover. Position indicator in front return shall be recessed with a surface-applied cover plate. Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified.

2.3.2 Car Doors

****
NOTE: Edit paragraph to omit finishes not required.
****

Car doors for passenger elevators shall be constructed from 1.519 mm thick (16 gauge) 16 gauge sheet steel and stainless steel cladding. Each door shall be sound-deadened and reinforced to receive required operating mechanism and hardware, and have two removable door guides per panel. Seams, screws or binding strips shall not be visible from within the car. Threshold shall be extruded aluminum with grooves for door guides. [Exposed steel shall be finished with rust-inhibitive primer and

baked-enamel in a color to be selected.] [Exposed stainless steel shall be finished with No. 4 Satin Finish.] Car doors shall be equipped with a proximity-type infrared car door protective device having the following operation:

a. When doors are in full-open position, doors shall be unable to initiate closing if a person comes within the detection zone. The detection zone moves with the doors, so that if a person or object enters the zone after the doors have begun to close, the doors shall stop, then reverse to reopen. The doors shall reclose after a brief time. A passenger entering or leaving the cars shall not cause the doors to reopen unless the doors reach a predetermined proximity to the passenger.

b. After a stop is made, the doors shall remain open for a time to permit passenger transfer, after which they shall close automatically. This time interval shall be less for a car call than for a hall call or a coincident car/hall call.

c. If there is either a hall call anywhere in the group or a car call in the car in question and the doors are prevented from closing for a fixed time period, the door protective device shall be rendered inoperative, a buzzer shall sound in the car and the doors shall close at approximately half speed. Normal door operation shall resume at the next landing reached by the car.

2.3.3 Car Platform

Car platform for passenger elevators shall be fabricated from steel plates secured to a steel frame or plywood secured to a steel frame. Steel car platforms shall be assembled into a one-piece platform with top and bottom steel plates welded to structural steel frame and covered with felt and sound-isolation. Plywood car platform shall be 18 mm (3/4 inch) 3/4 inch thick Exposure 1 plywood secured to structural steel frame with metal fire protection secured to underside of structural steel frame.

2.3.4 Walls

****

NOTE: Specify removable panels for office environment, and baked-enamel enclosures for residential and institutional type facilities. Edit paragraph to eliminate panel types not required.

****

Walls for passenger elevators shall be 2426 mm (7 feet 11-1/2 inches) 7 feet 11-1/2 inches high from floor to the underside of lighting fixtures. Side and rear panels shall be 1.519 mm thick (16 gauge) 16 gauge sheet steel panels. [Lower portion of side and rear wall panels shall be provided with a 2.7788 mm thick (12 gauge) 12 gauge stainless steel wainscoting from top of car base to a point 50 mm (2 inches) 2 inches above top of handrail.] [Side and rear removable panels shall be applied to car walls and shall be manufactured from 18 mm (3/4 inch) 3/4 inch plywood or composition board finished on front, back and edges faced with plastic laminate conforming to NEMA LD 3, general purpose type.] Panels shall be mounted on car walls in a manner permitting their reversing. Panels shall be evenly spaced with not less than two panels on each side and three panels at the rear with [9.5 mm (3/8 inch) 3/8 inch separations backed up with stainless steel dividers] [reveal standard with manufacturer]. Vent

around base shall be [provided] [concealed behind removable panels].

2.3.5 Car Top, Ceiling and Light Fixtures

****
NOTE: Coordinate with designer and specify number of footcandles required to get lighting level in passenger car to match lighting level in elevator lobby/building corridors.
****

Car top for passenger elevators shall be manufactured from 2.657 mm thick (12 gauge) 12 gauge sheet steel and shall be not less than 140 mm 5-1/2 inches high with drop-ceiling and light fixtures. Ceiling shall be [3 mm (1/8 inch) 1/8 inch thick translucent] [egg crate] white plastic fire-retardant light diffuser supported by [polished aluminum] [baked enamel] perimeter frame and dividers to form the drop-ceiling light fixture. Light fixtures shall be fluorescent type, flush with car ceiling, manufactured of sheet steel with flange and enclosed sides and top, baked-enamel reflector, mounted directly to outlet box. Bottom of fixtures shall be flush with car ceiling. Fluorescent light fixtures shall be dual lamp with quick-starting high-power factor, Class P ballasts, with safety lamp guard clamps on fluorescent tubes. Light level shall average at least [108 lx (10 footcandles)] [_____] lx ([_____] footcandles) [10] [_____] footcandles measured at the car threshold with the door closed. Part of car light fixture shall be removable to permit use of the emergency exit in top of car.

2.3.6 Emergency Exit

Car top for passenger elevators shall be manufactured with a hinged emergency exit panel of 2.657 mm thick (12 gauge) 12 gauge steel which opens up to clear the crosshead and car door operator. Emergency exit panel shall be hinged and held in place with nonremovable fastening devices at each corner, and manually openable from top of car and key-operable from inside. A minimum of 2 sides of exit panel shall lap the exit opening by 25 mm. 1 inch. Exits shall be equipped with electrical contacts which will prevent operation of car when exit door is open and cause the alarm bell to ring.

2.3.7 Floor Finish

Floor finish for passenger elevators shall be finished with resilient tile flooring not less than 5 mm (3/16 inch) 3/16 inch thick or flexible-type homogeneous vinyl tile not less than 3 mm (1/8 inch) 1/8 inch thick as specified in Section 09650 RESILIENT FLOORING. Tile shall be laid flush with the extruded aluminum platform threshold.

2.3.8 Base

****
NOTE: Use stainless steel only with stainless steel option for side walls.
****

Base for passenger elevators shall be [plastic laminate] [cove type stainless steel], 150 mm (6 inches) 6 inches high.

2.3.9 Handrails

Handrails for passenger elevators shall be mounted on each wall and shall comply with ASME A17.1, FED-STD 795 and 36 CFR 1191. For elevators with 2-speed horizontal-slide openings the handrails shall be turned back to wall.

2.3.10 Exhaust Fan

Exhaust fan for passenger elevators shall be 2-speed exhaust type ventilating unit mounted in car ceiling and shall be provided with a [stainless steel] [chrome-plated steel] grille. Units shall be suitably isolated from car ceiling and shall provide at top speed a minimum of 6 air changes per hour for car volume and car occupancy. Switches for the operation of exhaust unit shall be located in car station locked cabinet or key-switched.

2.3.11 Communications

****

NOTE: Emergency communication in passenger elevators is required to be connected to a station which will initiate an emergency response and which is manned continuously. The designer will indicate and provide details of this connection. Refer to ASME A17.1 Rule 211.1.

****

A telephone system in stainless steel cabinet shall be provided for passenger elevators. A vandal-resistant speaker type intercom with push-button to activate shall be installed in car station behind a stainless steel perforated grille and connected to a programmable auto-dialer located in machine room. Auto-dialer shall be provided with a solid-state charger unit which will automatically provide emergency power and an immediate transfer in the event of failure of normal power supply. The push-button located in the car station or in separate cabinet shall be at the prescribed handicapped height and shall be identified as "Emergency Phone (Push to Activate)". The entire communication assembly shall be approved for an elevator installation. The telephone communication shall not be terminated until one of the communicating parties hangs up the receiver or manually disconnects the communications link.

2.3.12 Car Emergency Lighting System

Emergency car lighting system for passenger elevators shall consist of an emergency power pack on top of elevator and a remote lighting fixture inside elevator car located [in] [above] car operating panel.

2.3.12.1 Power Pack

Power pack for car emergency lighting system shall be sealed lead-cadmium or nickel-cadmium 6-volt rechargeable batteries with solid-state controls and an integral regulating charger connected to normal power supply. Power pack unit shall contain the following:

a. Minimum 150 mm (6 inch) 6 inch diameter alarm bell connected to the elevator alarm and emergency push-button.

b. Top of car light fixture with protective wire guard.

c. Testing circuit and pilot light.

d. Low-wattage pilot light indicator.

e. Battery low-voltage disconnect.

2.3.12.2 Emergency Light Fixture

Emergency light fixture for passenger elevators shall be located in car station inside elevator car, with flush-mounted lens and shall consist of the following:

a. A minimum of two lamps capable of providing a minimum level of illumination of 10.8 lx (1.0 footcandle) 1.0 footcandle at a point 1220 mm (4 feet) 4 feet above the floor, 300 mm (1 foot) 1 foot in front of car station.

b. Fixture frame of [stainless steel] [chrome-plated steel] [steel with baked-enamel finish].

c. Frosted acrylic lenses, 6 mm (1/4 inch) 1/4 inch thick.

2.3.12.3 Remote Light Fixture

Upon interruption of normal power, remote light fixture for passenger elevators shall automatically and immediately illuminate and permit operation of the bell, subject to the activation of the emergency stop-switch or alarm button. Emergency power pack shall be capable of providing a minimum of 1 hour emergency bell operation and 4 hours of continuous illumination.

2.3.13 Protection Pads

****
NOTE: Delete this paragraph in its entirety if building has a freight elevator. If freight elevator is not provided, at least one passenger elevator with pads and pad hooks shall be provided.
****

Passenger elevator No. [_____]: Car shall be provided with wall protection pads, with inconspicuous stainless steel pad hooks spaced not over 460 mm 18 inches apart near ceiling. Pads shall be heavy quality fire-retardant treated canvas with two layers of sewn cotton batting with metal eyelets for each pad hook. Pads shall cover the entire wall surface except operating devices. Pads shall be flame retardant in accordance with ASME A17.1 (Rule 204.2).

2.3.14 Certificate Frame

****
NOTE: Provide and locate where required by local permit and inspection agency.
****

A stainless steel certificate frame with translucent plexiglass lens of the appropriate size to receive certificate issued by inspecting agency shall be provided for passenger elevators. Frame shall be engraved to show name

of elevator manufacturer, carrying capacity in kilograms (pounds) pounds and maximum number of persons allowed.

2.3.15 Car and Counterweight Guides and Guide Shoes

****
NOTE: Specify not less than 150 mm (6 inch) diameter rollers for passenger type cars with speeds up to 3.5 m/s (700 feet per minute), and 250 mm (10 inch) diameter rollers for hospital type service elevators and elevators with speeds in excess of 3.5 m/s (700 feet per minute).
****

Roller guides shall consist of minimum 3 tires mounted on top and bottom of car and counterweight frame. Roller guides shall be held in contact with guide rail by adjustable devices and shall run on dry, unlubricated rails.

2.3.16 Car Guide Rails

Guide rails for passenger elevator shall be planed steel tee or omega shaped sections with structural channel rail backing as required, tongue-and-groove matched joints reinforced with fitted splice plates. Guide rails shall extend from bottom of pit to underside of roof over hoistway.

2.4 PASSENGER ELEVATOR HOISTWAY ENTRANCES

2.4.1 Hoistway Doors

****
NOTE: Specify stainless steel only when required.
****

Hoistway doors for passenger elevators shall be designed and fabricated as part of a Class B 1-1/2 hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory. Door panels shall be hollow metal type with plain panel design, not less than 32 mm (1-1/4 inches) 1-1/4 inches thick with 1.519 mm thick (16 gauge) 16 gauge face sheet-steel and stainless steel cladding with 1.519 mm thick (16 gauge) 16 gauge sight guards. Each door shall be reinforced with continuous vertical members and filled with sound-deadening material. Doors shall be reinforced to accept the required operating mechanism and hardware. Doors shall have 2 removable door guides per panel. Seams, binding strips or screws shall not be visible from landing. [Exposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified]. [Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified].

2.4.2 Hoistway Frames

Hoistway frames for passenger elevators shall be designed and fabricated as part of a Class B 1-1/2 Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory. Frames for passenger elevators shall be formed 1.897 mm thick (14 gauge) 14 gauge [sheet-steel] [and stainless steel cladding] with head and jamb in flush alignment and corners welded and ground smooth. Head and jamb section shall be bolted assembly with bolts, washer and locking nut or

lock washer. Frame assembly shall be securely fastened to structure. Frames shall return to wall. Combination buck and jamb frames may be provided with knockdown back flanges to permit installation in concrete walls. [Exposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified.] [Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified.]

2.4.3 Symbols

Raised stainless steel symbols as required by FED-STD 795 and 36 CFR 1191 of color selected, shall be provided for passenger elevators at each floor to indicate the floor location. Symbols shall be attached with concealed fasteners. Symbols shall be placed in a location which can be seen by passengers from the opened passenger doors.

2.4.4 Sills

Sills for passenger elevators shall be extruded aluminum with slip-resistant surface and machined grooves for door guides, secured to floor beams.

2.4.5 Strut Angles

Strut angles for passenger elevators shall be structural steel of size not less than 76 x 76 x 5 mm (3 x 3 x 3/16 inch) 3 x 3 x 3/16 inch extending from sill to beam above and anchored to building structure with structural steel fastenings and bracings of structural members with a cross section of not less than strut angles.

2.4.6 Door Hangers and Housing

Each door panel shall be provided with not less than 2 sheave-type hangers designed for required door operation. Hanger housing and support shall be fabricated from formed Z-shaped steel angles of size not less than 5 mm (3/16 inch) 3/16 inch thick bolted to strut angles.

2.4.7 Door Rollers

Door rollers shall be constructed with grease-packed ball-bearings and shall be tired with a sound-reducing material. Diameter of rollers shall be not less than 83 mm (3-1/4 inches) 3-1/4 inches for car doors and not less than 57 mm (2-1/4 inches) 2-1/4 inches for hoistway doors. Upward thrust shall be taken by a hardened and ground ball-bearing roller assembled on an eccentric stud to provide adjustment.

2.4.8 Hanger Track

Hanger track shall be of high carbon cold-drawn steel, round at top to receive door rollers, and round at bottom to receive up-thrust rollers, of size engineered to accommodate load requirements.

2.4.9 Covers and Guards

Hanger covers, dust covers, toe guards, and fascia plate shall be fabricated from 1.579 mm thick (16 gauge) 16 gauge reinforced steel and finished with baked-enamel. Hanger covers shall extend the full door travel and shall be mounted in sections for ease of servicing door hangers. Dust covers shall be provided over top terminal landing door only and

shall be secured to hanger housing and building structure. Toe guards shall be secured to sill. Fascia plates shall be provided between each door hanger housing and sill.

2.5 PASSENGER ELEVATOR DOOR OPERATION

NOTE: 1. Car "start" motion at one floor, to floor level at next consecutive floor, shall be 4.5 seconds for gearless equipment, and 5.4 seconds for geared equipment based on 3.5 m (11 feet 6 inch) floor heights. Add or subtract 0.17 second for each 0.3 m (one foot) change in floor height. For cycle time, add the aforementioned values, plus 0.07 second, plus the appropriate door times (open and close) listed below.

2. Passenger door times (seconds) are as follows:

Opening (Size mm) (Type)	915	965	1025	1065	1115	1170	1220
Center Opening - Open	1.5	1.6	1.6	1.7	1.8	1.8	1.9
Center Opening - Close	2.1	2.2	2.3	2.4	2.5	2.7	2.9
2-Speed Ctr Open - Open	--	--	--	1.8	1.9	2.0	2.1
2-Speed Ctr Open - Close	--	--	--	2.1	2.2	2.4	2.5
2-Speed Slide - Open	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2-Speed Slide - Close	3.3	3.5	3.6	3.7	3.9	4.2	4.5
Single Slide - Open	2.6	2.7	2.8	2.9	--	--	
Single Slide - Close	3.6	3.8	3.9	4.1	--	--	

Opening (Size Inches) (Type)	36	38	40	42	44	46	48
Center Opening - Open	1.5	1.6	1.6	1.7	1.8	1.8	1.9
Center Opening - Close	2.1	2.2	2.3	2.4	2.5	2.7	2.9
2-Speed Ctr Open - Open	--	--	--	1.8	1.9	2.0	2.1
2-Speed Ctr Open - Close	--	--	--	2.1	2.2	2.4	2.5
2-Speed Slide - Open	2.1	2.2	2.3	2.4	2.5	2.6	2.7
2-Speed Slide - Close	3.3	3.5	3.6	3.7	3.9	4.2	4.5
Single Slide - Open	2.6	2.7	2.8	2.9	--	--	
Single Slide - Close	3.6	3.8	3.9	4.1	--	--	

Car and hoistway doors for passenger elevators shall be operated simultaneously by an electric door operator. Doors shall operate smoothly in the opening direction and closing direction and be [electrically] [or] [hydraulically] cushioned to stop at both the full-open and full-closed position. Operators shall be high speed direct current, heavy-duty type providing an average door opening speed of 0.76 m/s (2-1/2 feet per second). 2-1/2 feet per second. Car and hoistway doors shall be opened and closed simultaneously in a maximum time of [_____] seconds. When on automatic operation the door closing time shall not exceed [_____] seconds and door closing force shall not exceed 130 N (30 pounds). 30 pounds. Reversal of the doors when closing shall be accomplished by the "DOOR OPEN" button, car door safety edge, or interception of the photoelectric light beams. Doors shall be arranged so that doors can be opened manually in the event of power failure.

2.6 PASSENGER ELEVATOR OPERATING AND SIGNAL FIXTURES

2.6.1 General

****
NOTE: Gasketed cover plates will not be used in office buildings.
****

Elevator fixtures and panels for passenger elevators shall be constructed [of 3 mm (1/8 inch) 1/8 inch thick faceplates] [in swing return] of stainless steel. Fastenings for all exposed fixtures shall be secured with tamper-proof spanner-head screws of same material and finish as fixture. Hall and car-call buttons shall be of the call register type with a low-voltage power supply not to exceed 48 volts. Pressure on a button shall illuminate button to indicate that a call in the desired direction has been registered. Car and hall fixtures shall be designed and located at the prescribed height to accommodate the handicapped in accordance with FED-STD 795 and 36 CFR 1191 for passenger elevators only. Handicapped markings shall be integral with faceplate in accordance with FED-STD 795 and 36 CFR 1191. Surface-applied markings are unacceptable. Engraving shall be black filled except for fire service identification which shall be red filled. Operating and signal fixture contacts and lamps shall be completely enclosed in steel boxes finished with baked-enamel. Boxes for hall landing devices shall be equipped for proper adjustment to wall. Lamps shall be installed in light-tight compartments. Cover plates shall be provided with rubber gaskets when exposed to weather or harmful contaminants. Replacement bulbs shall be readily available from 3 sources.

2.6.2 Car Operating Panel

****
NOTE: If a single passenger elevator or single hospital service elevator is installed, select 2-stop collective if only two floors are served, and simplex selective/collective if more than two floors are served. If two passenger elevators are served by a single passenger lobby at each landing, or two hospital service elevators are served by a single service lobby at each landing, select duplex selective/collective. If three or more passenger elevators are served by a single passenger lobby at each landing, select group operation.
****

Car operating panel for passenger elevators shall be provided with the necessary raised (0.8 mm (0.03 inch) 0.03 inch) markings for the handicapped, and shall include a series of minimum [20 mm (3/4 inch) 3/4 inch diameter] [or] [square] push-buttons numbered to correspond to the floor served and various additional switches, buttons and light jewels, including emergency stop, alarm button, "DOOR OPEN" button and [communication speaker] [telephone]. [Operating buttons shall be manufacturer's standard design.] [Operating buttons shall be vandal-resistant metal encased and embossed to permit illumination when a call is registered. Buttons shall be designed with 0.8 mm (1/32 inch) 1/32 inch operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 5 mm (3/16 inch) 3/16 inch beyond the faceplate and shall have beveled edges to prevent damage from side blows.] Buttons and switches not required for automatic or fire

service operation shall be key-operated and mounted on front-return car operating station. Elevator number and "NO SMOKING" shall be international symbol engraved on upper portion of car station. Operating panel in the car shall consist of a flush-mounted panel containing the following operating devices:

a. "DOOR OPEN" button.

b. "DOOR CLOSE" button.

c. Key-operated car fan/light switch.

d. Key-operated ventilating blower switch/call-light.

e. Communication [speaker phone, grille and push-to-call button] [telephone].

f. Emergency stop switch [key-operated] [behind locked cover] when operated will stop the car independently of normal stopping devices. Operation of emergency stop switch shall not cause any power variance or surge that may affect the operation or condition of the control panel or its components.

g. Emergency signal-switch connected to a 150 mm (6 inch) 6 inch diameter signal bell outside of elevator hoistway at [first floor] [_____] located as shown or as directed.

h. Key-operated independent operation switch (for multi-car only).

i. Key-operated inspection switch which will render normal operation inoperative for the purpose of using the hoistway access switch.

j. Key-operated fire service switch and light jewel.

k. Key-operated hospital emergency switch.

2.6.3 Auxiliary Car Operating Panel

****

NOTE: Specify auxiliary car operating panels for passenger elevators only, when moderate to heavy traffic is anticipated.

****

Auxiliary car operating panel for passenger elevators shall be similar in design to main car panel, and shall include all devices necessary for automatic operation, such as emergency stop switch, alarm bell, door open button, and call car buttons.

2.6.4 Hall-Call Station

****

NOTE: The number of hall-call stations per landing will be indicated on drawings. Specify vandal-resistant operating and signal fixtures for all facilities other than office environments. Specify for hospital or other institutional type facility when immediate access to elevators is mandatory for emergency purposes.

****

Hall-call operating devices for passenger elevators at landing shall consist of an "UP" push-button at bottom landing, a "DOWN" push-button at top landing and "UP" and "DOWN" push-buttons at all other landings. Push-buttons shall be [manufacturer's standard design] [vandal-resistant, metal encased and back-lighted to permit illumination when a call is registered.] Buttons shall be designed with 0.8 mm (1/32 inch) 1/32 inch operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 5 mm (3/16 inch) 3/16 inch beyond the faceplate with beveled edges to prevent damage from side blows.

2.6.4.1 Commandeering Switch

****

NOTE: Determine from local facility if this feature is needed, and if security can be maintained by controlling duplicate keys.

****

Key-operated commandeering switch for passenger elevators shall be provided at [each landing] [designated landings] and located in landing call-button cover plate. Switch shall be momentary pressure type with the key removable only in "OFF" position and shall be keyed to match the independent operation switch specified for car operating devices.

2.6.4.2 Fire Service Switch

Fire service switch for passenger elevators shall be located at the designated landing.

2.6.5 Direction Lanterns

****

NOTE: Hall lanterns are recommended for two or more elevators operating in a common group. Car lanterns satisfy handicapped design requirements when there is only one passenger elevator.

****

Lanterns for passenger elevators shall be in accordance with FED-STD 795 and 36 CFR 1191, and shall be provided at all floor landings and in each car entrance column. Lanterns shall be [the manufacturer's standard] [vandal-resistant] design.

2.6.6 In-Car Position Indicator

****

NOTE: Specify vandal-resistant operating and signal fixtures for all facilities other than office environments. Omit transom panel position indicator if not desired.

****

Indicator numerals and directional arrows for passenger elevators shall be [25 mm (1 inch) 1 inch high white translucent plastic] [flush-mounted faceplate with black-filled engraved numerals not less than 25 mm (1 inch) 1 inch high and 10 mm (3/8 inch) 3/8 inch diameter vandal-resistant light jewels directly beneath each number]. As car travels through hoistway the

car position shall be indicated by illumination of light jewel corresponding to landing at which the car is stopped or passing. Necessary light baffles shall be provided. Floor numerals and letters shall illuminate white. A position indicator of the digital-readout or dot-matrix type (minimum 50 mm (2 inch) 2 inch high indication) shall be provided in car transom panel. Number corresponding to car position shall remain illuminated when motor drive is shut down. Illumination shall be shrouded in an approved manner to protect against glare from car lighting.

2.6.7 Audible Signals

[An automatic voice announcement of the floor landing at which the car stops shall be provided inside each car. In addition, an audible signal shall be provided at each floor landing and shall sound coincident with the landing lantern illumination indicator.] [An audible signal shall be provided at each floor landing and in each car and shall sound coincident with the lantern illumination indicators.] The audible signal shall be no less than 20 decibels with a frequency no higher than 1500 Hz. The audible signal shall sound once for UP direction and twice for DOWN direction.

2.6.8 Combination Hall-Position Indicator and Directional Arrows

****

NOTE: Specify hall-position indicators at main lobby for two or fewer elevators. Specify typical direction lanterns over each elevator when three or more elevators operate in a common group.

****

[Combination hall-position indicator and directional arrows for passenger elevators shall be provided at [first floor] [_____] landing directly over entrance frame.] [A digital-readout position and direction indicator (minimum 50 mm (2 inch) 2 inch high indication) for passenger elevators shall be provided over [first floor] [_____] entrance.] As elevator travels in hoistway, elevator position shall be indicated by illumination in alpha-numeric characters corresponding to the landing where elevator is stopped or passing. Number corresponding to position of car shall remain illuminated when the motor drive is shut down. An audible signal shall sound in the elevator car to indicate that the elevator car is stopping or passing a floor served by elevator. Fixture design and operation shall be similar in design to that specified for Car Position Indicator.

2.7 PASSENGER CAR OPERATION (TWO-STOP AUTOMATIC CAR OPERATION)

****

NOTE: If a single passenger elevator or single hospital service elevator is installed, select two-stop collective if only two floors are served, and simplex selective/collective if more than two floors are served. If two passenger elevators are served by a single passenger lobby at each landing, or two hospital service elevators are served by a single service lobby at each landing, select duplex selective/collective. If three or more passenger elevators are served by a single passenger lobby at each landing, select group operation.

****

Passenger Elevator No. [_____]: The operating device at each of two

hoistway landings shall consist of a single illuminating push-button. The system shall be designed for operating elevator from push-buttons at landings and car buttons marked for corresponding landings. Pressure on a car or landing button shall dispatch or call the car to other landings if interlock circuits have been established. A call shall remain registered if a lower floor landing button is pressed while car is making an upward trip. After car has reached the upper landing and interlock circuits have been reestablished the car shall automatically reverse and respond to lower landing call. Elevator shall operate similarly for DOWN direction of travel. A time-limit relay shall be provided to hold the car for a predetermined period at landing where car stops. When all calls are completed the elevator shall park [at lower floor] [at upper floor] [at last floor served] [_____]. A landing button pressed momentarily at same floor at which the car is parked shall automatically open car and hoistway doors.

2.8 PASSENGER CAR OPERATION (SINGLE-CAR SELECTIVE/COLLECTIVE)

****

NOTE: If a single passenger elevator or single hospital service elevator is installed, select two-stop collective if only two floors are served, and simplex selective/collective if more than two floors are served. If two passenger elevators are served by a single-service lobby at each landing, select duplex selective/collective. If three or more passenger elevators are served by a single-passenger lobby at each landing, select group operation.

****

Passenger Elevator No. [_____]: Car shall be arranged so that by pressing one or more car buttons the car will start automatically and stop at [first floor] [_____] for which the button has been pressed corresponding to the direction in which the car is traveling. Car shall stop in the order in which floors are reached by car at all floors for which calls have been registered, irrespective of the sequence in which buttons have been pressed, provided the button for a given floor has been pressed sufficiently in advance of car's arrival at that floor to permit the stop to be made. If car buttons have not been pressed, and car starts UP in response to several DOWN calls, car shall travel to highest DOWN call first and then reverse to collect other UP calls. UP calls shall be collected in the same way when car starts DOWN in response to UP calls by first stopping for the lowest UP call registered. When a car has stopped in response to the pressing of a landing button and a car button is pressed corresponding to the direction in which the car has been traveling, within a predetermined interval of time after the stop, car shall continue in that direction regardless of other landing calls registered. While car is in motion, landing calls in the opposite direction of car movement shall not affect operation of car but calls shall remain registered. After the last car call in the direction the car is traveling has been answered the car shall automatically reverse and answer registered landing calls and all car calls in the order the landings are reached. When all calls have been answered, the car shall stop at the last floor served and shall have the doors closed.

2.9 PASSENGER CAR OPERATION (DUPLEX SELECTIVE/COLLECTIVE)

Passenger Elevators No. [_____] and [_____]: Cars shall be arranged so

that when all calls have been answered, one car will park at the main entrance floor, the other car will remain at last floor served. A car at [first floor] [_____] or traveling UP shall continue UP until all UP landing calls are answered provided the landing buttons are pressed in time to make the stop and shall answer all DOWN landing calls behind the other car traveling DOWN. A car at the top floor traveling DOWN shall continue DOWN until all DOWN landing calls are answered provided the landing buttons are pressed in time to make the stop and shall answer all UP landing calls behind the other car traveling UP. When both cars are in operation, landing calls shall be answered by the car nearest the call and set in the direction of call. Only one car shall answer any one landing call. Operation of each car shall be such that the momentary pressing of one or more car buttons shall close the car doors in an adjustable, predetermined time after the buttons are pressed and start the car. Cars shall stop at all landings for which car or landing buttons have been pressed in the order in which the landings are reached, irrespective of the sequence in which the buttons have been pressed. If one car is out of service or fails to start, the other car shall automatically answer all calls. When cars are parked at home landing with doors closed, pressing a hall button at those floors shall illuminate lights and shall open the car doors.

2.10 GROUP SUPERVISORY SYSTEM (THREE OR MORE ELEVATORS)

2.10.1 General

Each group of elevators shall be provided with a programmable automatic supervisory group system of the microprocessor-based logic type with multiple-zoning features arranged to coordinate effectively the movement of individual elevators of the group to provide the maximum efficiency in serving the passenger service requirements. Group supervisory system shall be based upon a state of the art network of microcomputers linked together with the group supervisory computer through a high-speed data communication link.

2.10.2 Car Operation

Supervisory system shall automatically coordinate the building traffic demand from hall-call buttons to make proper assignments of calls to cars. Assignment shall provide for handling of varying traffic demands in terms of passenger waiting time and passenger transit time. As conditions change in the building, the system shall continuously update, assign and reassign hall calls to cars to keep up with the most current conditions. Group supervisory computer shall read in and evaluate system and car parameters at a rate of approximately 10 times per second.

2.10.3 Elevator Controller

Elevator controller shall utilize a microprocessor-based logic system in compliance with ASME A17.1. System shall provide comprehensive means to access the computer for elevator diagnostic purpose without need for any external devices and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller. Failure of any single magnetically-operated switch, contact or relay to release in the intended manner; or the failure of any static control device, speed measuring circuit, or speed pattern generating circuit to operate as intended; or the occurrence of a single accidental ground or short circuit shall not permit the car to start or run if any hoistway door or gate interlock is unlocked or if any hoistway door or car door or cartop contact is not in the made position. While on cartop inspection or hoistway access

operation, failure of any single magnetically-operated switch, contactor or relay to release in the intended manner; or the failure of any static-control device to operate as intended, or the occurrence of a single accidental ground shall not permit the car to move even with the hoistway door locks and car contacts in the closed or made position. Dedicated permanent status indicators shall be provided on the controller to indicate when the safety string is open, when the door locks are open, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on fireman's service, when the elevator has failed to successfully complete its intended movement. In addition the means of displaying other special or error conditions that are detected by the microprocessor shall be provided.

2.10.4 Leveling

Leveling system shall utilize a device to establish incremental car position to an accuracy of 4.75 mm 0.1875 inches or better using quadrature signal for the entire length of hoistway. Absolute floor number encoding with parity shall be provided at each floor in order to establish exact floor position to the computer. System shall not require movement to a terminal landing for the purpose of finding the correct car position. System shall utilize an automatic 2-way leveling device to control leveling of the car within 6 mm 1/4 inch above or below landing sill. Over travel, under travel or rope stretch shall be compensated and car brought level to landing sill. Individual car controller shall be capable of learning the position of each floor in building to an accuracy of 4.75 mm. 0.1875 inches.

2.10.5 Car Controller

The individual car controller shall have software program that uses mathematical methods to create an idealized optimum velocity profile of car travel from any floor to any other floor providing a smooth and stepless elevator ride. System motion parameters such as jerk, acceleration, deceleration rates, etc., shall be field programmable with parametric limitations for the system dynamics and be capable of being stored as non-volatile memory. Drive-control system shall utilize the optimized velocity profile in a dual-loop feedback system based on car position and speed. A velocity feedback device shall permit continuous comparison of car speed with the calculated requirements. A solid-state motor control unit shall be provided for each elevator with electrical characteristics to suit the power supply.

2.10.6 Switches

A switch with static control shall be provided on the governor of all elevators. Switch shall be set at no more than 90 percent of the tripping speed of the governor and shall be activated by overspeed in either direction of travel. Power feed lines to the brake shall be opened by an electromechanical switch and a single ground, or short circuit or solid-state control failure shall not prevent the application of the brake in the intended manner. Systems that do not apply the brake when the car stops at a landing are not acceptable. Isolation transformers or line inductors plus proper filtering shall be provided to eliminate both electrical and audible noise of silicone control rectifier (SCR) drives. A means shall be provided for removing regenerated power from the drive dc power supply. Power shall be dissipated in resistors or returned to the 3 phase ac power line. Failure of the system to remove the regenerated power shall cause drive output to be removed from the hoist motor. A contactor shall be used to disconnect the hoist motor from the output of the drive

unit each time the elevator stops. Contactor shall be monitored and the elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

2.10.7 Dispatching

Dispatching through algorithm shall solve the problem of hall-call allocation utilizing the mathematical modeling or queuing theory to optimize elevator service. This sophisticated mathematical solution to elevator dispatching shall perform 3 separate minimization tasks to optimally minimize call waiting time and maximize the system performance. The algorithm shall compile the required physical and statistical data and parameters which are necessary to perform assigned minimization tasks. First minimization algorithm shall assign hall-calls to cars based upon minimizing the average waiting time by calculating the estimated time of arrival (ETA). As traffic becomes busier, minimization of mean waiting time can cause a few hall-call waiting times to get beyond their "long wait hall-call threshold time". At this time the second minimization algorithm shall minimize the "maximum waiting time". As traffic becomes even heavier there will be a tendency to cause too many hall-calls to become late calls thus increasing the total average waiting time. A third algorithm shall minimize the "number of late hall-calls".

2.10.8 Troubleshooting

The microprocessor board shall be equipped with enhanced on-board diagnostics for ease of troubleshooting and field programmability of specific control variables. The microprocessor board shall provide the following minimum features:

a. On-board diagnostic switches and alphanumeric display. Switches and displays shall provide user-friendly interaction with the controller.

b. On-board real time clock. The real time clock shall display the time and date (field adjustable).

c. Display of calls on a per floor basis. All types of calls shall be conveniently entered and/or displayed using on-board switches and buttons.

d. Field programmability of specific timer values (i.e., door times, MG/Scr shutdown time, etc.). The value of these timers may be viewed and/or altered through use of the on-board switches and buttons.

e. Display of the status of all the inputs, outputs and internal control variables and flags listed in order of their English mnemonics.

f. The user shall be able to view and alter the security codes for security operations.

2.10.9 Elevator Control Panel

The panel shall conform to the general requirements for passenger elevator operating and signal fixtures and shall be located in the [_____].

2.10.9.1 Indicator Panel

Indicator panel shall be the cathode ray type capable of displaying the following information:

a. A waiting passenger indicator consisting of a double row of numerals corresponding to floors served by each group of elevators. Each indication shall remain registered until the call has been answered.

b. A position indicator shall be provided for each elevator in the group which will indicate position of each elevator as it passes through hoistway. Elevator position shall be indicated by number corresponding to landing at which the car is stopped or passing. Direction of travel shall be indicated by UP and DOWN indications below each column of position indicators. Position of car shall remain registered when motor drive is not energized.

c. Nonstop indicators numbered to correspond with designated number of elevator which shall indicate when the car is nonstopping or bypassing hall-calls.

d. Indicators shall flash to identify a delayed car condition after a predetermined period of time.

e. Indicators to identify emergency dispatch.

f. Indicators to identify which elevators are on independent service.

2.10.9.2 Control Panel

a. Selection push-buttons [for each elevated] for each group to operate elevators on emergency power and pilot light to indicate emergency power manual select.

b. Key-operated switches to permit selection of individual elevators for independent service. Activation of this key-switch when the elevator is not at [_____] shall permit the elevator to serve all car calls in its present direction of travel and then return nonstop to [first floor] [_____] and remove itself from group operation.

c. A key-operated switch for each elevator with pilot light numbered to correspond with designated number of elevator. Operation of this switch shall take car out of service or place it in service as previously described. Pilot light, when illuminated, shall show which elevators are in an energized condition.

2.11 FREIGHT ELEVATOR CAR

****
NOTE: Specify 6 mm (1/4 inch) plate when Class B or Class C freight loading is provided.
****

Freight elevator car shall have plain steel panel sides [to top of car, fabricated of not less than 2.657 mm thick (12 gauge) 12 gauge steel. Panels shall be not more than 915 mm 36 inches wide] [of 6 mm (1/4 inch)

1/4 inch steel plate from the floor to 1220 mm (4 feet) 4 feet above the floor and not less than 1.897 mm thick (14 gauge) 14 gauge panels from top of 6 mm (1/4 inch) 1/4 inch plate to top of car.] Top of car shall be not less than 1.897 mm thick (14 gauge) 14 gauge steel panels with a removable panel for emergency exit. Exit in top of car shall have an electric contact which will prevent operation of elevator when exit is in the open position. Top exit shall be provided with a latch-type lock operable from outside the elevator car and operable with a specially designed tool from within the car.

2.11.1   Car Platform

Car platforms for freight elevators shall be of steel construction with a finish floor of raised-pattern steel floor plate welded or bolted to platform framing members. Bolted platform shall be attached with countersunk flat head bolts. A steel subfloor will not be required if the raised-pattern steel floor plate is of a thickness which will accommodate the capacity of elevator and required type of loading.

2.11.2   Sling

****

NOTE: Maximum speed for Type A instantaneous safety is 0.76 m/second (150 feet per minute).

****

Sling for freight elevator shall be designed for the proper class and loading capacity, constructed of structural or formed steel shapes welded or bolted together, consisting of double channel cross head and bolster with channel uprights, gusset plates and diagonal bracing. Sling shall be provided with [Type A-instantaneous] [Type B-gradual wedge clamp] safety which is activated by an overspeed governor connected to the safety with a governor cable. Sling shall be connected to counterweight frame with steel hoist ropes which run over hoist machine traction sheave. Ropes shall be of a sufficient number to obtain the factor of safety required by ASME A17.1, complete with rope equalizers.

2.11.3   Bumper Guards

Bumper guards for freight elevators shall be fabricated of 150 x 50 mm (6 x 2 inch) 6 x 2 inch thick oak mounted on rear and sides of elevator car, beveled back to side walls at entrance columns. Bottom edges of bumper guards shall be 150 mm 6 inches and 760 mm 30 inches above floor.

2.11.4   Light Fixtures

****

NOTE: Coordinate with designer and specify number of luxes (footcandles) required to get lighting level in freight car to match lighting level in elevator lobby/building corridors.

****

Lighting fixtures for freight elevators shall be recessed fluorescent type. Fixtures shall be manufactured of sheet steel with flange and enclosed sides and top, shall have a baked-enamel reflector, and shall be mounted directly to outlet box. Bottom of fixtures shall be flush with car ceiling. Fluorescent lighting fixtures shall be dual lamp with quick-starting high-power factor, Class P ballasts with safety lamp guard

clamps on fluorescent tubes. Light level shall average at least [_____] lx ([_____] footcandles) [_____] footcandles measured at car threshold with doors closed.

2.11.5 Car Emergency Lighting Fixture

[A single unit consisting of a sealed-beam light source, battery and an integral-battery charger, relay and cord and plug connected to a nonswitched standard grounding receptacle shall be provided for freight elevators near the location of the emergency lighting unit.] [Power package as specified for passenger car emergency lighting shall be provided for freight elevators.] Not less than two lamps of equal wattage shall be used to provide a minimum 10.8 lx (1.0 footcandle) 1.0 footcandle of illumination at a point 1220 mm (4 feet) 4 feet above floor and 300 mm (1 foot) 1 foot in front of main car operating device for a period of at least 4 hours.

2.11.6 Communications

****
NOTE: Emergency communication in freight elevators is required to an area manned 24 hours per day, or to a central telephone service. Normally use telephone except where vandalism is a problem. Refer to ASME A17.1, Rule 211.1.
****

A telephone system in stainless steel cabinet shall be provided for freight elevators. A vandal-resistant speaker type intercom with push-button to activate shall be installed in car station behind a stainless steel perforated grille and connected to a programmable auto-dialer located in machine room. Auto-dialer shall be provided with a solid-state charger unit which will automatically provide emergency power with an immediate transfer in the event of failure of the normal power supply. The [telephone] [push-button] located in car station or in separate cabinet shall be located at the prescribed handicapped height and shall be identified as "Emergency Phone (Push-to-Activate)." The entire communication assembly shall be approved for an elevator installation. The telephone communication shall not be terminated until one of the communicating parties hangs up the receiver or manually disconnects the communications link.

2.11.7 Freight Signs

Identification signs for freight elevators shall be fabricated of stainless steel and engraved to show the elevator capacity, class of loading and passenger limitations in the format required by ASME A17.1.

2.11.8 Certificate Frame

****
NOTE: Provide and locate where required by local permit and inspection agency.
****

A stainless steel certificate frame with translucent plexiglass lens shall be provided in the size to receive the certificate issued by the inspecting agency. Frame shall be engraved to show name of elevator manufacturer and carrying capacity in kilograms (pounds). pounds.

2.11.9 Car and Counterweight Guide Shoes

****
NOTE: Specify not less than 150 mm (6 inch) diameter rollers for passenger type cars with speeds up to 3.5 m/s (700 feet per minute), and 250 mm (10 inch) diameter rollers for hospital type service elevators and elevators with speeds in excess of 3.5 m/s (700 feet per minute).
****

Roller guides shall consist of minimum 3 tires mounted on top and bottom of car and counterweight frame. Roller guides shall be held in contact with guide rail by adjustable devices and shall run on dry, unlubricated rails.

2.11.10 Car Guide Rails

Guide rails for freight elevators shall be planed steel tee or omega shaped sections with structural channel rail backing as required and tongue-and-groove matched joints reinforced with fitted splice plates. Guide rails shall extend from bottom of pit to underside of roof over the hoistway.

2.12 FREIGHT ELEVATOR ENTRANCES

2.12.1 Hoistway Frames

Hoistway frames for freight elevators shall be designed and fabricated as part of a Class B 1-1/2-hour fire-rated door/frame assembly to meet requirements of NFPA 252, and shall bear the label of an approved testing laboratory. For installation in gypsum board walls hoistway frames shall be 1.897 mm thick (14 gauge) 14 gauge [carbon sheet-steel] [carbon sheet-steel with stainless steel cladding]. Head and jamb section shall be bolted assembly with bolts, washer and locking nut or lock washer. Frame assembly shall be securely fastened to structure. Frames shall return to wall. For installation in concrete walls knock-down type hoistway frames may be used.

2.12.2 Hoistway Doors

****
NOTE: Specify 0.5512 mm thick (26 gauge) galvanized sheet steel doors with wood core when sound deadening is required. Vestibules should be provided to protect exterior opening panels from the weather.
****

Hoistway doors for freight elevators shall be designed and fabricated as part of a Class B 1-1/2-Hour fire-rated door/frame assembly to meet requirements of NFPA 252 and shall bear the label of an approved testing laboratory. Door panels shall be [vertical bi-parting] [pass-type] counterbalanced, power-operated which shall consist of 2 sections designed to balance each other and move simultaneously. Door panel construction shall be [2.657 mm thick (12 gauge) 12 gauge sheet steel with formed edges and vertical reinforcing back ribs spaced 450 mm (18 inches) 18 inches on center] [0.5512 mm thick (26 gauge) 26 gauge galvanized sheet steel with visible vertical seams cladded to a laminated wood core]. Each door shall

be reinforced on the periphery with a frame of built-up steel angles or other suitable sections not less than 5 mm (3/16 inch) 3/16 inch thick for mounting the necessary guide shoes and chain-suspension system. Door panels shall be securely bolted, riveted or welded into the door panel frames. [Exposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified.] [Exposed stainless steel shall be finished with No. 4 Satin Finish, unless otherwise specified.]

2.12.2.1 Upper Door Panel

Upper panel of each freight elevator hoistway door shall be equipped with a clear wire glass vision panel placed on side closer to car operating station. Vision panel shall be sized as required by ASME A17.1. Bottom edge of panel will be provided with a fire-resistant approved safety astragal which shall be nonshearing and noncrushing and will not damage foreign objects 20 mm 3/4 inch or less when door is in the closed position. Rubber bumpers shall be provided on lower edge of panel near each jamb mounted to provide safety action specified. Rubber bumpers and safety astragals shall be designed for easy replacement.

2.12.2.2 Lower Door Panel

Lower panel of each freight elevator door shall be provided with a 13 mm (1/2 inch) 1/2 inch thick steel toe guard beveled toward hoistway wall at a 60 degree angle to the horizontal. Upper edge of lower door panel shall be equipped with a truckable steel sill designed to be level with landing when doors are in the fully-open position. Truckable sills shall be of sufficient size and adequate strength to bridge the space between building sill and car platform and to support a trucking load equal to the rated capacity of elevator car. Truckable sill shall extend the full width of door opening and shall be supported by stationary adjustable stops fastened to each door guide rail. Shearing hazard shall not exist on bottom door panel during the door opening operation.

2.12.2.3 Door Guide Rails

Guide rails for freight elevator hoistway doors shall consist of suitable structural shapes for each door section securely fastened to door frame and hoistway construction. Guide rails shall be designed and fabricated in accurate alignment so that door guide shoes will operate freely upon rails. Each door frame shall be equipped with four fixed or adjustable steel or malleable-iron grooved shoes of proper depth and vertical side contact on each side of rail. Shoes shall be attached to vertical structural door frame members and shall be spaced the maximum possible distance apart. Shoes shall be constructed to relieve door and guide shoe supporting members of all frictional contact with guide rails.

2.12.2.4 Door Interlocks

Hoistway doors for freight elevators shall be equipped with a tamper-proof interlock system which shall prevent operation of car until doors are locked in the closed position as defined by ASME A17.1. Interlocks shall lock the two door sections together to prevent doors from opening at corridor side unless car is at rest at landing or is traveling through the leveling zone or the hoistway access switch is used. Retiring cams for hoistway door interlocks shall be provided and securely fastened to supports on car enclosure.

2.12.2.5 Door Unlocking Device

Hoistway doors for freight elevators shall be complete with unlocking devices as described in ASME A17.1 and shall be provided at all floors. Parking device shall be located at a floor selected by Contracting Officer.

2.12.3 Car Gates

Car gates shall be provided at each freight elevator entrance to protect the entire width of opening to a height of 2 m 6 feet above sill. Car gates shall be heavy-duty [pass type] [vertical-sliding type constructed of minimum 10 gauge wire mesh or flat-expanded metal attached to steel angle frame with hardware and accessories as required.] Car gates shall be equipped with weights for closing or balancing the gates. The guide shoes shall be designed to run on vertical tracks rigidly fastened to car enclosure. When fully raised the bottom edge of gates shall not protrude into clear opening of hoistway entrance. Lower edge of gate panel shall be equipped with a safety edge to stop the downward motion of gate when gates encounter an obstruction. Car gates shall be pass-type 2-speed power operated if there is insufficient clearance available when the elevator is at the top floor. Pass-type car gates shall be provided in conjunction with pass-type hoistway doors.

2.13 FREIGHT ELEVATOR DOOR AND CAR GATE OPERATION

****

NOTE: Select either automatic open and close, or automatic open with continuous pressure close. Specify full-selective door operations for power-operated hoistway doors when two openings occur at the same floor.

****

Each hoistway door and car gate for freight elevators shall be equipped with an individual electric operator. Operators shall open and close car gate and hoistway doors at a panel speed of not less than 0.3 m/s (1 fps) one foot per second without slamming. Limit switches shall be provided to stop the motors as doors approach their limit of travel. Provisions shall be made for manual operation of the doors from inside the car in the event of power failure. Door operators shall be arranged to open doors automatically after the car enters the automatic leveling zone at the designated landing. "Open" and "Close" operating buttons and any additional devices required shall be provided in car and at each hoistway entrance. Constant pressure on the "close button" shall close the door. Momentary pressure on the "open button" shall reopen the door provided the car is at a landing. Electric operators shall be of the highest quality and quiet in operation and shall be provided with all parts designed and constructed to meet the severe requirements of electrical service. Gates shall be provided with reversing edge and passenger sequence operation. Car doors shall be equipped with an infrared proximity-type car door protective device having the following operation:

a. When doors are in the full-open position, doors shall be unable to initiate closing if a passenger comes within the detection zone. The detection zone moves with doors, so that if a passenger or object enters the zone after doors have begun to close, doors shall stop and then reverse to reopen. Doors shall reclose after a brief time. A passenger entering or leaving car shall not cause doors to reopen unless doors reach a predetermined proximity to

passenger.

b. After a stop is made, doors shall remain open for a time to permit passenger transfer after which the doors shall close automatically. This time interval shall be less for a car call than for a hall call or a coincident car/hall call.

c. If there is either a hall call anywhere in the group or a car call in the car in question and the doors are prevented from closing for a fixed period, the door protective device shall be rendered inoperative, a buzzer shall sound in the car and the doors shall close at approximately half speed. Normal door operation shall resume at the next landing reached by car.

2.14 FREIGHT ELEVATOR OPERATING AND SIGNAL FIXTURES

****
NOTE: If elevator is combination passenger and freight FED-STD 795 and 36 CFR 1191 will apply.
****

Operating and signal fixtures for freight elevators shall conform to the general requirements for passenger elevator operating and signal fixtures, with the exception that complying with FED-STD 795 and 36 CFR 1191 is not required.

2.14.1 Car Operating Panel

Operating panel in freight elevators shall consist of a recess-mounted panel near car gate containing the following operating devices:

a. Emergency stop switch (pull to activate), when operated, will stop the car independently of the normal operating devices and sounds the emergency signal bell.

b. Key-operated car light/fan switch.

c. Emergency signal button connected to a 150 mm (6 inch) 6 inch diameter signal bell outside elevator hoistway at [first floor] [_____] located as shown or as directed.

d. Communication [speaker phone, grille and push-to-talk button] [telephone].

e. Key-operated inspection switch which will render normal operating devices inoperative for purpose of using hoistway access switches.

f. Key-operated fire-service switch and light jewel.

g. [Continuous] [Momentary] pressure "DOOR CLOSE" button and momentary pressure "DOOR OPEN" push button for power-operated doors.

2.14.2 In-Car Position Indicator

In-car position indicator in freight elevators shall consist of engraved black-filled numerals not less than 25 mm 1 inch high, and 10 mm (3/8 inch) 3/8 inch diameter vandal-resistant light jewels directly beneath each number. As car travels through hoistway the car position shall be

indicated by illumination of light jewel corresponding to landing at which the car is stopped or passing. Necessary light baffles shall be provided.

2.14.3 Car Push-Buttons

Car push-buttons in freight elevators shall be numbered to correspond to landings served. Faceplates shall be provided with raised indicators to the right of floor buttons. Buttons shall be encased with metal and embossed to permit illumination when a call is registered. Buttons for car and hall operating stations shall be designed to seat on faceplate in lieu of button mechanism with 0.8 mm (1/32 inch) 1/32 inch operating clearance. Buttons shall have maximum protrusion of 5 mm 3/16 inch beyond faceplate with beveled edges to prevent damage from side blows.

2.14.4 Hall-Call Station

Operating devices for freight elevators at each landing shall consist of a recess-mounted momentary pressure car call-button [and momentary pressure "DOOR OPEN"] [and continuous pressure "DOOR CLOSE"] buttons.

2.14.4.1 "IN USE" Light

****
NOTE: "IN USE" light is used only when manually-operated freight elevator doors are used.
****

A red jewel "IN USE" light shall be illuminated when freight elevator is in motion and also when car is standing at any floor with hoistway door opened or car gate opened.

2.14.4.2 Fire Recall Key

Fire Recall key-switch for freight elevators shall be located at the designated landing faceplate.

2.14.4.3 Hoistway Access Switches

Hoistway access switches for freight elevators shall be located in lower and upper terminal floor hall stations.

2.15 FREIGHT ELEVATOR OPERATION

2.15.1 General

When freight elevators are not in use and the door-locking circuit is established, the momentary pressing of a landing call-button shall bring the car to that landing. Momentary pressing of a car dispatching button in car panel shall send the car to designated landing if car gate and hoistway doors are closed and the door-locking circuit is established.

2.15.2 Car Operation

Freight elevators shall operate as an automatic [2-stop collective] [simplex] [duplex] [selective/collective] as described for passenger elevator. A nonstop button in car station shall be provided.

2.15.3 Service-Demand Bell

A service-demand bell shall be provided in freight elevator which will sound when a landing button is pressed while a door is in the open position.

2.15.4 Inspection and Maintenance Switch

An inspection and maintenance switch for freight elevator shall be mounted in car-control panel to disconnect the landing buttons. When the switch is closed the car may be operated by continuous pressure on UP and DOWN buttons on top of car which will operate the car at a reduced speed.

2.16 AUTOMATIC EMERGENCY POWER OPERATION

Elevator control system shall be arranged to operate on emergency power supply upon failure of the normal power supply. Elevators operating on dedicated service, such as [hospital service] [and] [fire service], will not be required to return to the designated landing when emergency power becomes available for respective elevator. Elevators shall operate as follows:

a. When normal power supply fails, all cars shall shut down.

b. One car shall automatically start and travel at full-rated speed to the designated landing stop, open the car and hoistway doors and then shut down.

c. After first car shuts down, other cars in the group shall individually operate as described above.

d. After all cars have moved to the designated landing a preselected car shall operate at rated speed to serve car and landing calls. Automatic selection can be overridden manually. Emergency power selector buttons and light jewels shall be provided in a stainless steel faceplate at the designated landing. Emergency power selector buttons shall be operable after automatic return has been completed, and shall permit the selection of a maximum of [one] [_____] elevator at a time.

2.17 AUTOMATIC ELEVATOR OPERATION

2.17.1 General

The operating device shall consist of a series of push-buttons in car numbered to correspond to various landings, "UP" and "DOWN" buttons at intermediate landings, and a single button at terminal landing. To meet the elevator operation requirements specified in this section, all buttons shall be connected electrically to the control system which governs the floor selection, car selection, direction of travel and governs the acceleration and retardation.

2.17.2 Operation

Car calls shall be registered within the car by pressing the button corresponding to the designated floors. Hall calls shall be registered by pressing buttons in the corridor push-button fixture. Once the demand for elevator service has been established and the car has received a start signal the car operation shall be as follows.

2.17.2.1 Door Closing

Doors shall close automatically. When doors are fully closed and the interlock circuit established, the car shall start to move in the direction established by control system. Car shall accelerate and decelerate automatically and stop at [first floor] [_____] for which a car button has been registered or at the [first floor] [_____] for a corridor demand which has been assigned to car. Car shall stop at all floors for which car calls are registered in the order in which the floors are reached and shall stop for any corridor demands assigned to the cars in the order in which the floors are reached.

2.17.2.2 Door Opening

Doors shall open automatically as car reaches the landing. After a predetermined time the doors shall close and the car shall proceed to answer the remaining car or assigned corridor calls. A protective device such as a safety edge and light beam device shall be provided on car door and when activated will prevent closing of doors. Cars shall become available for assignment at whatever floor the last car demand has been satisfied in the direction in which car is traveling.

2.17.2.3 Car Dispatch

When car does not receive a demand dispatch at dispatching floor for an adjustable time period up to 10 minutes set initially at 5 minutes, the motor drive unit shall be switched off. If the car's switched-off motor drive unit receives a demand dispatch the motor drive unit shall automatically restart.

2.17.2.4 Door Dwell-Time

Door open dwell-times shall be adjustable so that the open time for a car call is shorter than the open time for corridor calls and second passengers. If a longer time is needed for passenger entry, doors can be prevented from closing or reversing by the light beam door control, the protective leading edge on car door, or by pressing "DOOR OPEN" button in car. Door dwell-times shall comply with FED-STD 795 and 36 CFR 1191.

2.17.3 Independent Service

****
NOTE: Provide only if two cars or more.
****

Freight elevators shall be arranged for independent service operation with a key-switch located in the locked section of car operating panel. When the car key-switch is placed in the "ON" position the key-switch shall remove car from corridor button operation to permit operation from car-buttons only. Elevator direction lanterns shall be inoperative when elevator is in this mode of operation.

2.17.4 Automatic Load Weighing

Passenger elevators shall be provided with load-weighing devices which will cause elevator to bypass hall calls when elevator is filled to an adjustable percentage. Corridor calls shall remain registered until the next available car responds to the call.

2.17.5 Anti-Nuisance

Passenger elevators shall be provided with a system which will cancel all car calls in the event that between 3 and 5 times the number of car calls are registered as there are passengers in car, allowing 70 kg 150 pounds per passenger.

2.17.6 Door Operation

Double-door operation shall not be permitted for passenger elevators. If an UP traveling car has a passenger for an intermediate floor and a DOWN call is registered at that floor with no-calls above car, the car shall travel to floor, open the door and let passenger out, then light the DOWN direction arrow in hall lantern and accept the waiting passenger who registered the DOWN call. Doors shall not perform the open-close cycle before elevator proceeds to next call.

2.17.7 Automatic Power Shutdown Upon Fire Sprinkler Activation

****

NOTE: Delete this paragraph if the elevator machine room or the hoistways are not provided with automatic fire sprinklers. The designer may modify paragraph to use established local or state codes for automatic power shutdown in lieu of the procedures listed below, if approved by the installation.

1. In buildings required to be sprinklered, elevator machine rooms and hoistways will be sprinklered as required by NFPA 13. In the hoistways, sprinkler heads may required at the top and near the bottom of the hoistway.

2. Automatic power shutdown will be accomplished by activation of dedicated sprinkler waterflow switch(es) which only supervise the sprinklers located in the hoistway and in the elevator machine room. A waterflow switch, O.S.& Y. valve and check valve assembly will be provided for elevator sprinklers. Each hoistway enclosure shall be separately zoned for power shutdown. Waterflow switches and valves will be located outside of and adjacent to the elevator machine room and hoistway(s). Control valves will be readily accessible. An inspector's test connection with outside discharge will be provided for each waterflow switch. Sprinklers will be standard sprinklers with intermediate temperature rating. The waterflow switch(es) will be connected to a shunt trip breaker or other suitable device to shutdown power to the affected elevator(s).

3. A heat detector will be provided adjacent to each sprinkler located in the elevator machine room and in the hoistway. Activation of the heat detector will send the elevator cab to the nearest floor away from the fire. Heat detectors will be zoned to direct elevator cab to safe landing prior

to power shutdown by the sprinkler waterflow switch..

4. The designer will indicate all switches, valves, sprinklers, piping, inspector's test connections, detectors, electrical equipment and wiring needed to achieve automatic shutdown.

****

Automatic power shutdown of the elevators will be initiated by a waterflow switch supervising sprinklers located in the elevator machine room or in the elevator hoistway. Provide heat detectors which are fixed-temperature-rate-of-rise, rated at 57 to 60 degrees C 135 to 140 degrees F adjacent to each sprinkler head in the hoistway(s) and in the machine room. Heat detectors shall be connected to the elevator control system which shall cause the following to the affected elevator(s), upon activation of the heat detector.

a. Elevators which are in motion will proceed to the nearest available landing away from the fire floor, and shall cause power-operated doors to open and remain open until manually reset. The fire floor is considered the floor where the heat detector is located.

b. Elevators which are standing at a landing with open doors will remain open at the floor. If power-operated doors are closed, the elevator will cause the doors to open.

2.18 HOSPITAL EMERGENCY SERVICE OPERATION

****

NOTE: Specify for hospital or other institutional type facility when immediate access to elevators is mandatory for emergency purposes. Indicate which elevator requires this. Delete if not required.

****

2.18.1 General

Provisions shall be made for calling elevators [_____] to any floor on an emergency basis which are operating independently from dispatch signals and landing call signals.

2.18.2 Key-Switches

Landing key-switch shall be spring-return momentary-contact type installed [in floor landing push-button fixture box above push-buttons] [at a remote location] at [all] [_____] floors. Car hospital emergency key-switches shall be two-position ON-OFF type located in the upper section of car operating panel for elevator numbers [_____]. All key-switches shall be provided with an appropriately engraved call-registered light jewel. Keys shall be removable in the off-position only. Landing key-switch and hospital emergency key-switch in car shall be keyed the same for all elevators in building and shall not be operable with any other key which will operate any other lock or device used for any other hospital purpose. Keys shall be provided for each type of cylinder furnished.

2.18.3 Operation of Assigned Elevator Response

When switch is activated at any floor the call-register light jewel at

respective floor shall illuminate and the elevator group dispatching system shall immediately assign an elevator in group service with the shortest response time to hospital emergency call. Immediately upon assignment registered car calls within the respective elevator shall be canceled. Landing calls previously assigned to selected elevator shall be transferred to another elevator. If the assigned elevator is traveling away from the hospital emergency call the car shall slow down and stop at the nearest floor, and without opening the car doors, the car shall reverse direction and proceed nonstop to hospital emergency call floor. If the assigned elevator is traveling toward hospital emergency call floor, the car shall proceed to the assigned floor nonstop unless the car is slowing down for a stop, where the elevator shall stop without opening car doors and immediately start toward the hospital emergency call floor. Should all cars be unavailable to respond to the landing call the register light shall not illuminate. Upon arrival at hospital emergency floor the elevator shall remain with doors open for an adjustable dwell-time interval in the range of 10 to 60 seconds initially set at 30 seconds. After this interval has expired the car shall automatically return to normal service if the car has not been placed on hospital emergency operation from within the car. Any elevator selected to respond to a hospital emergency call shall be removed from group service and shall not accept additional calls, emergency or otherwise, until the car has completed the total hospital emergency function. Any car operating in group service may be selected. Additional hospital emergency calls that are registered in the system shall cause additional cars to respond as described above, always on the basis of one hospital emergency call per car.

2.18.4 In-Car Operation

Activation of the in-car hospital emergency key-switch shall override dwell-time and permit the assigned elevator to accept a car call for any floor, automatically close the doors and proceed nonstop to the selected floor. Elevator shall remain disconnected from group hall-button riser during this operation. The return of key-switch to normal position shall extinguish the call-register light and restore elevator to normal service.

2.18.5 Signals

Top section of each car operating panel and in the center of rear cab panel (approximately 2 m 6 feet 0 inches above floor) the backlighted "HOSPITAL EMERGENCY" indicators shall be provided to flash on-and-off continuously when car is assigned to this operation until restored to normal service. "HOSPITAL EMERGENCY" indications shall be a photographic negative type with 6 mm (1/4 inch) l/4 inch high letters which are legible only when illuminated.

2.18.6 Graphics

Exposed position of each switch faceplate shall have legible indelible legends engraved or etched to indicate its identity and positions. All letters in faceplate shall be not less than 6 mm (1/4 inch) l/4 inch high and filled with black or red paint.

2.19 FIREFIGHTERS' SERVICE

****

NOTE: Reference Section 13850A and/or 13851A, dealing with Fire Detection and Alarm System, only to specify the smoke detectors if the detectors are

to be provided by the Alarm Contractor; however, they should not specify the firefighter service.

****

Firefighter service shall be in accordance with ASME A17.1 for automatic elevators. Elevator lobby and machine room smoke detectors shall be [photoelectric] [ionization] spot-type smoke detectors. Smoke detectors shall be powered from to the building fire alarm control panel. Elevator lobby and machine room smoke detectors shall be in accordance with Section [13850A FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP.] [13851A FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE.]

2.20 ELEVATOR MACHINE (GEARED)

****

NOTE: Specify geared elevators for speeds up to 2 m/s (400 feet per minute) and gearless for speeds greater than 2 m/s (400 feet per minute). Gearless elevators are located in paragraph ELEVATOR MACHINE (GEARLESS).

****

2.20.1 Hoisting Machine

Machine shall be worm-geared traction type with motor, brake, worm gearing, traction sheave and bearings mounted on common bed plate. Worm shall be of steel and integral with the worm shaft and shall be provided with a ball-thrust bearing with self-alignment blocks or preloaded thrust bearing designed to take the end thrust of the worm in both directions. Main gear shall be hobbed from a bronze rim accurately fitted and bolted to gear spider. Gears shall be fitted to minimize the noise, vibration and wear. Roller bearings shall be complete with drive sheave shaft and provisions for lubrication. Design and construction of equipment and parts subject to wear shall be completely repairable and replaceable.

2.20.2 Hoisting Ropes

Hoisting ropes shall be the independent wire-rope type, regular lay, preformed, non-coated, improved plow steel of 6 x 37 construction. Hoisting ropes shall be suited for service requirements to be provided. Hoisting rope connections shall be by tapered babbitted socket connections and shall be rated in strength equal to or greater than the strength rating of the rope. Hoisting ropes shall be selected so that the rated capacity load plus the load block weight divided by the number of parts of rope will not exceed 20 percent of certified breaking strength of rope. Hoisting ropes shall be secured to the hoist drum so that no less than two wraps of rope remain at each anchorage of hoist drum at extreme low position.

2.20.3 Sheaves

Drive sheave shall be steel or semi-steel finished with grooves to receive hoist ropes and shall give maximum traction and minimum wear. Grooved nonmetallic inserts on drive sheave may be provided at Contractor's option. Deflector and overhead sheaves, suitable sheet metal guards with required service openings, sheave beams and supports shall be provided as required.

2.20.4 Hoist Motor (Geared)

Motor shall be a geared type, [direct-current for variable voltage with

Class B insulation,] [alternating-current for rheostatic control with Class F insulation,] designed for elevator service to develop the required high-starting torque with low-starting current in accordance with NEMA MG 1. Motor shall be designed to meet requirements of elevator service and be capable of starting cold and carrying the full-rated load in car for a period of 1 hour of continuous UP and DOWN runs, stopping at all floors and standing not more than 10 seconds at each floor without overheating. Speed regulation of the car, with full-rated load shall not exceed plus or minus 5 percent of average on a round trip.

2.20.5 Armature

Armature shall be electrically balanced and the armature and brake drum shall be mechanically balanced as a unit. Field coils shall be spool or form wound. Windings in both armature and field shall permit easy removal.

2.20.6 Commutator

Commutator and brushes shall be of sufficient size, area and designed to perform under full-load with sparks barely visible and without overheating. Brushes shall have individual tension adjustment with provisions for adjusting and positively locking the brush holder in place as a unit.

2.20.7 Brake Assembly

Brake shall be spring-applied, electrically released and designed for automatic application in the event of interruption of power supply. Brake drum shall have a wearing surface and edge of flange turned smooth and wearing surface shall run within a maximum variation of 0.13 mm (0.005 inches). 0.005 inches. Brake shoes shall be lined with a fireproof friction material shaped to shoes so that the drum will run free with normal clearance. Brake springs shall be helical and operated in compression and shall apply the brake when released by the magnet. Brake magnet shall be designed to release quickly. The brake application shall be automatically controlled by magnetic retardation to obtain noiseless, smooth and gradual stops under all loading conditions. Release magnet coil circuit shall be opened by the various safety devices, power failure, failure of equipment to function in the proper manner for safe operation of car and upon normal stopping of the car.

2.20.8 Bed Plate

Bed plate shall be cast iron or steel in one piece with stiffening ribs to accurately maintain alignment of parts or be heavy rigid structural steel shapes securely welded together. Pads accurately planed or milled shall be provided as seats for parts secured to bed plate.

2.21 ELEVATOR MACHINE (GEARLESS)

****

NOTE: Specify geared elevators for speeds up to 2 m/s (400 feet per minute) and gearless elevators for speeds greater than 2 m/s (400 feet per minute). Geared elevators are specified in paragraph ELEVATOR MACHINE (GEARED).

****

2.21.1 Hoisting Machine

Hoisting machine shall be of gearless type consisting of a motor, traction sheave and brake compactly grouped on a single shaft supported by two bearings rigidly mounted. Design and construction of equipment and parts subject to wear shall be completely repairable and replaceable.

2.21.2 Shafts

Shafts shall be forged steel or bar stock with tensile strength not less than 414 MPa (60,000 psi) 60,000 psi manufactured true to size. Bearing mounting and the method of machining and assembly shall provide accurate bearing alignment. Bolts shall be wrought or mild steel with a tensile strength of not less than 345 MPa (50,000 psi). 50,000 psi.

2.21.3 Sheaves

Sheaves, including governor sheave, shall be turned and grooved and flanges shall run true and be free from cracks, sand holes or other imperfections which might injure the cable. Traction hoisting sheave shall be hard cast iron or semi-steel suitably grooved to produce proper traction and shall be thick enough to provide future wear in grooves. Sheaves shall be of the proper diameter for cables used. Deflector sheaves, when used, shall be similar to traction sheaves with semi-circular grooves at bottom to provide a smooth bed for cables. Nonmetallic groove inserts on drive sheave may be provided at Contractor's option. Deflector sheave, if used, shall be securely mounted below machine beams in proper alignment with traction sheave and with bearings as specified in this section for hoisting machine shaft. Where deflector sheaves are used, wire screen guards and drip pans fabricated of 0.5512 mm thick (26 gauge) 26 gauge galvanized steel under bearings shall be provided. Fastenings for removal of drip pans shall be of type which can be easily removed.

2.21.4 Bearings

Shaft bearings shall be anti-friction bearing metal, ball or roller-bearing type. Bearings shall be rigidly fastened to main structure of bed plate and shall be self-aligning or machined integral with the base to assure positive alignment. Anti-friction bearings shall be of ample size for loads imposed and shall be provided with oil reservoirs, automatic oil feed lubrication, oil gauges and an approved means of draining and flushing bearings. Bearing pressures shall not exceed 2758 kPa (400 psi) 400 psi for babbitt and 4137 kPa (600 psi) 600 psi for bronze. Outer ends of bearings shall be closed with a suitable oil-tight cap or plate. Inner ends of bearings shall be provided with oil wipers or shaft shall be flanged to prevent oil leakage. Ball and roller bearings shall be provided with provisions for greasing, except for the roller bearings which are immersed in an oil bath or are oil lubricated by splash or positive feed.

2.21.5 Bed Plate

Bed plate shall be cast-iron or steel fabricated in one piece with stiffening ribs to accurately maintain the alignment of parts or bed plates can be heavy rigid structural steel shapes securely welded together. Pads accurately planed or milled must be provided as seats for parts secured to bed plate.

2.21.6 Hoist Motor (Gearless)

Motor shall be a gearless type, direct-current for variable voltage with Class B insulation, designed for elevator service to develop the required high-starting torque with low-starting current in accordance with NEMA MG 1. Motor shall be capable of carrying full-rated load in car for a period of one hour continuous run, starting cold, stopping at all floors, UP and DOWN and standing not more than 10 seconds at each floor. At the end of the run, the temperature rise of insulated winding shall not exceed 50 degrees C ambient. Commutator shall not exceed 55 degrees C rise. Motor shall provide continuous regular elevator service of not less than 140 actual floor stops per hour with the insulated windings not to exceed 50 degrees C ambient temperature rise. Speed regulation of car with full-rated load shall not exceed plus or minus 5 percent of the average round trip speed. Acceleration under full-load, UP and DOWN shall be not less than 1.5 meters per second per second (5 feet per second per second) 5 feet per second per second and not over 1.8 meters per second per second (6 feet per second per second), 6 feet per second per second, measured from start of car motion to the time of attaining 80 percent of full-rated speed. Acceleration control shall be adjustable. Motor shall run in either direction under full-load with only normal heating and with minimum amount of sparking with the same brush setting for all loads and speeds within the capacity range.

2.21.7 Armature

Armature shall be electrically balanced and the armature and brake drum shall be mechanically balanced as a unit. Field coils shall be spool or form wound. Windings in both armature and field shall permit easy removal.

2.21.8 Commutator

Commutator and brushes shall be of sufficient size and area, and shall be designed to perform under full-load with sparks barely visible and without overheating. Brushes shall have individual tension adjustment with provisions for adjusting and positively locking the brush holder in place as a unit.

2.21.9 Brake Assembly

Brake shall be electro-mechanical consisting of a brake drum cast integral with traction sheave, shall have two or more brake shoes suitably secured to machine bed, shall have springs to apply the brake and shall consist of a direct-current electro-magnet to release the brake. Brake drum shoes and springs shall be of sufficient size and strength to stop and hold the car when carrying the maximum load. Shoes shall be lined with a fireproof friction material shaped to shoes so that the drum will run free. Brake springs shall apply brake when released by magnet. Brake magnet shall be designed so that the release is smooth, quick and complete. Release magnet coil circuit shall be opened by the safety devices, power failure, or the failure of equipment to function. Wearing surface shall run within a maximum variation of 0.13 mm (0.005 inch). 0.005 inch.

2.22 SOUND AND VIBRATION ISOLATION

Sound and vibration isolating foundation shall effectively prevent the transmission of machine vibration and sound to building structure. Location and deflection characteristics of isolation units shall produce a uniform and nonexcessive loading on units under all operating conditions.

2.23 AC RHEOSTATIC CONTROL

****
NOTE: Rheostatic ac control should be specified for intermittent operation light-duty low-rise passenger or freight elevators with a maximum speed of 0.75 m/s (150 feet per minute).
****

2.23.1 General

Hoisting machine motor shall conform to NEMA MG 1, for alternating current, 2-speed (4 to 1 ratio) Class AH3, reversible induction type motor, either tandem slip-ring squirrel cage or double-wound stator squirrel cage type having Class A insulation and a 30-minute rating. Motor shall be designed for elevator service. Capacity shall be adequate for operation of elevator at rated-load and speed for 30 minutes without overheating. Ratio of high speed to low speed shall be 4 to 1 and shall provide car operation at no more than 0.13 m/s (25 fpm) 25 fpm at low speed.

2.23.2 Windings

Insulation of all windings shall be impregnated and baked to prevent the absorption of moisture and oil.

2.23.3 Bearings

Motor bearings shall be either anti-friction bearing metal sleeve type with oil reservoirs, automatic self-lubrication, oil gauges, capped filler openings and drains, or motor bearings shall be ball or roller type arranged for grease lubrication and fitted with grease-gun connections and drain plugs. Bearings and lubricant reservoirs shall be dust tight and shall incorporate effective lubricant seals or other means to prevent lubricant leakage.

2.24 VARIABLE VOLTAGE CONTROL

2.24.1 Performance

Control system shall govern the starting, stopping and direction of travel of elevator and provide the operation specified. Control shall be accomplished by an individual generator or solid-state motor control for each elevator where the voltage applied to hoist motor is variable. Control equipment shall be of type suitable for motors and type of operation specified to provide smooth acceleration from stop to full speed, deceleration and landing stops under any load condition from no load to full-rated load. Smooth operation shall be obtained under stable conditions which provide for a maximum time of [_____] seconds from start of car motion to floor level at the next floor for gearless elevators. Maximum time from start of car motion to floor level at the next floor for geared machines shall be [_____] seconds for a speed of 1.78 m/s (350 feet per minute. 350 feet per minute. Time from door close to start of car motion shall not exceed 0.7 second with a balanced load. Cycle time, which is the time from start of door close to door fully open at the next typical floor, shall not exceed [_____] seconds, with a maximum premature door opening of 3 inches from the floor for all gearless elevators, [_____] seconds for geared elevators with a speed of 1.78 m/s per feet per minute. 350 feet per minute. Prior to the termination of maintenance period included in the Base Contract, elevators shall be readjusted as required to

meet performance requirements. All performance times specified in this section are based on [_____] m ([_____] feet [_____] inches) [_____] feet [_____] inches floor height, and [_____] mm ([_____] feet [_____] inches) [_____] feet [_____] inches wide [center-opening] [two-speed slide] [single-speed slide] doors.

2.24.2 Controller

Electric controller shall be microprocessor-based logic type with battery backup system with charger and charge time for a depleted battery, battery reserve and a low-voltage disconnect. Components required for proper performance of elevator shall be neatly mounted and wired and completely enclosed in a cabinet with a mechanically-latched door.

2.24.3 Motor Generator Set

****

NOTE: Select the following "Motor Generator Set" or "Solid-State Motor Control". Do not specify both.

****

Elevator control shall be effected by means of a uniformly varying dc voltage applied to elevator motor. An individual motor generator set shall be provided for each elevator.

2.24.3.1 Vibration Isolators

Generator set shall be located in elevator machine room and provided with a vibration-isolated foundation or a vibration-absorbing device which shall be effective in preventing the transmission of vibration to building structure.

2.24.3.2 Mounting

Motor generator shall be compact in design with all units mounted on same rigid cast iron or structural steel bed plate. Motor and generator units shall be mounted on a single rigid steel shaft.

2.24.3.3 Start Sequence

Motor generator set shall start automatically by registration of a car or landing call and shall stop automatically in a predetermined time adjustable from 1 to 12 minutes after all calls have been answered. Motor generators shall be arranged for sequence starting to prevent more than one motor generator from starting simultaneously.

2.24.3.4 Duty Rating

Design of apparatus shall be in accordance with the NEMA MG 1 specifications for 50 degrees C temperature rise, continuous-duty rating and IEEE Std 304 rules for Class A insulation and 50 degrees C continuous operation.

2.24.3.5 AC Contacts

Main ac contacts on starting panel shall be copper to carbon. Contacts breaking the main ac line current shall be provided with magnetic blow-outs.

2.24.3.6 Commutator

Sparks from the commutator shall be barely visible when elevator is accelerating or retarding from full-speed with a load in car ranging from no-load to full-load.

2.24.3.7 No-Load Speed

The no-load synchronous speed of motor generator set shall not exceed 1800 rpm. Proper direction of rotation shall be indicated by an arrow on frame.

2.24.3.8 Bearing Lubrication

Bearings shall be anti-friction bearing metal type with oil reservoirs, automatic self-lubrication and gauges, or of the ball-bearing type arranged for grease lubrication and fitted with grease connections.

2.24.3.9 Automatic Remote Control Starting Panel

Automatic remote control starting panel shall contain the necessary switches and overload devices. Starter may be separate or be incorporated in controller.

2.24.4 Solid-State Motor-Control

A solid-state motor-control unit shall be provided for each elevator, with electrical characteristics suitable to the available distribution system. The system shall consist of necessary 3-phase, full-wave bridge rectifiers or other devices and shall be full regenerative. A Transient Voltage Surge Suppressor (TVSS) device shall be provided to protect the solid-state motor-control unit and other electronic equipment in the facility. Solid-State control unit shall have the capacity to handle peak currents and shall contain a balanced and coordinated fault-protection system to protect the unit as follows:

a. Protection system shall protect complete power circuit (specifically the power semi-conductors) from failure under short circuit conditions.

b. Protection system shall protect unit from faults arising from partial grounds, partial shorts in motor armature, or in power unit.

c. Protection system shall protect drive motor against sustained overloads using a solid-state overload circuit.

d. Protection system shall protect motor and power unit against instantaneous peak overload.

e. Protection system shall protect phase sequence to ensure incoming line is phased properly.

f. Protection system shall protect unit against instantaneous overcurrent.

g. Protection system shall protect unit against low power line voltage (less than 75 percent of nominal).

h. Protection system shall protect unit against blown ac input fuse

and blown dc converter output fuses.

i. Protection system shall protect against excessive converter output voltage and excessive open-circuit voltage, and heat dissipation device.

j. The Transient Voltage Surge Suppressor (TVSS) device used to protect the solid-state motor-control unit shall be listed by UL 1449 and tested by manufacturer to meet requirements of IEEE C62.11, IEEE C62.41 and IEEE C62.45 Categories A, B and C. The system shall be connected in parallel with the protected system; series-connected elements which could constitute a single-point failure shall not be used. The protection modes for the TVSS device shall have as a minimum line-to-ground, neutral-to-ground, line-to-neutral and Delta Systems line-to-line. The TVSS surge current capacity, based on an 8 x 20 micro-second waveform, shall be a minimum of 75K amps per phase. The maximum UL 1449 clamping voltage for each protection mode shall not exceed 800 volts for 208, 240 and 277/480 volt system. The TVSS system shall provide a joule rating that meets or exceeds the requirements of IEEE C62.41 Category C delivery capability. The TVSS system shall provide a noise-attenuation of 40 db for electrical line noise. The TVSS system shall be a symmetrically balanced metal oxide varistor (MOV) array system, constructed with surge current diversion modules each capable of withstanding 25 KVA surge current based on standard 8 x 20 micro-second waveform. Each module shall be capable of withstanding over 1000 pulses of 10K amps in accordance with IEEE C62.41 Category C surge current without degradation of clamping voltage. The module shall consist of multiple gapless metal oxide varistor individually fused. Gas tubes or silicon avalanche shall not be used. When module performance is degraded, as if one or more fuses or varistors have failed, a light emitting diode (LED) indicator shall indicate a failed module.

2.24.4.1 Fault Conditions

Occurrence of any of the above fault conditions shall result in the immediate removal of the drive's run command, the clamping of the internal current regulator, the opening of armature loop and an emergency dynamic brake stop. Drive system shall also notify the car controller of shutdown via a drive status signal. Car controller shall respond to continuous-drive reset pulses which shall reset the drive as soon as fault condition clears, if it is not a hard failure such as blow fuse, and shall return elevator to service. The dc direct-drive system shall be designed to include input impedance to filter out electro-mechanical noise on SCR drive system.

2.25 SENSOR AND CONTROL WIRING SURGE PROTECTION

****
NOTE: Determine if additional control inputs or outputs require surge protection and show requirements on drawings, either in a schedule or on input/output summary tables.
****

Digital and analog inputs shall be protected against surges induced on control and sensor wiring. Digital and analog outputs shall be protected, as shown against surges induced on control and sensor wiring installed

outdoors. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An eight microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

2.26 COMMUNICATIONS LINKS SURGE PROTECTION

****
NOTE: Determine if additional communications inputs or outputs require surge protection and show requirements on drawings, either in a schedule or on input/output summary tables.
****

Communications equipment shall be protected against surges induced on any communications link. Cables and conductors, except fiber optics, which serve as communications links from motor control room (MCR) to field equipment, and between field equipments shall have surge protection circuits installed at each end. Protection shall be furnished at equipment and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 1 m 3 feet of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.

b. An eight microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

2.27 COMMUNICATIONS LINKS OVER VOLTAGE PROTECTION

****
NOTE: Determine if additional inputs or outputs require surge protection and show requirements on drawings, either in a schedule or on input/output tables.
****

Communications equipment such as MODEMs, line drivers, and repeaters shall be protected against overvoltage on communications link conductors. Cables and conductors, which serve as communications links, except fiber optics, shall have overvoltage protection for voltages up to 480 Vac rms, 60 Hz installed. Instrument fuses or fusible resistors are required for this application.

2.28 COMPENSATION

****

NOTE: Provide chain compensation for freight elevators having a travel in excess of 30 m (100 feet), and rope compensation for passenger elevators having a travel in excess of 40 m (130 feet) and speeds in excess of 2.5 m/s (500 feet per minute). Rope tie-down compensation is required for elevators having speeds in excess of 3.5 m/s (700 feet per minute).

****

Plastic-covered chains shall be provided to compensate for weight of hoisting ropes and unbalanced portion of traveling cables. [Compensation chains shall be securely fastened to underside of car and counterweight frame with double loops and "S" hooks to open, if chain should become taut for any reason]. [A 100 mm (4 inch) 4 inch minimum diameter, neoprene-covered roller with slotted brackets attached to counterweight rails shall be provided and located in the bight of the chain. A contact shall be provided on the assembly so that if the chain leaves its normal position, it will pull the roller out of its brackets, open the contact, and stop the elevator.]

2.28.1 Rope Compensation (Cables)

Ropes of same construction as hoisting ropes shall be provided. For cars with rated speed greater than 3.5 m/s, 700 fpm, tie down compensation shall be provided.

2.28.2 Solid-State Control with Integral Compensation

Solid-state control compensation up to and including 45 m 150 feet of travel for 1:1 roping, or 40 m 130 feet of travel for 2:1 roping shall be provided.

2.29 COUNTERWEIGHT

****

NOTE: When occupied space occurs beneath the elevator hoistway, counterweight speed governors and counterweight safeties must also be provided. Delete requirement for counterweight guard if either chain or rope compensation is specified.

****

Counterweight for each car shall equal the weight of car plus approximately 40 percent of specified load. Concrete weights are not acceptable. [Counterweight safeties shall be provided.] [Counterweight screen of metal construction, at least 2 m 6 feet high, shall be provided as a protective guard at bottom of hoistway, except where the type of hoisting rope compensation prevents this type of installation.]

2.30 LEVELING DEVICES

****

NOTE: Select either 6 mm (1/4 inch) for variable voltage control or 25 mm (1 inch) for ac rheostatic control.

****

Elevators shall be equipped with a 2-way leveling device to automatically

bring the car to the floor landings. Car shall automatically relevel at each landing to correct overtravel and undertravel, and maintain the level regardless of load on the car, rope slippage or stretch of cables. Electric stopping system shall be arranged so the car will stop level with the floor before brake is set. Stopping accuracy shall not exceed plus or minus [6] [25] mm. [1/4] [1] inch.

2.31 BUFFERS

****
NOTE: Oil buffers are required for speeds in excess of 1 m/s (200 feet per minute).
****

Buffers shall be of design suitable for depth of pit. Buffer anchorage at pit floors shall be provided for each car and counterweight and arranged to avoid puncturing of the pit waterproofing. Type of buffer used shall be tested and approved for compliance with elevator service requirements. Pipe struts and steadiers shall be provided as required by pit conditions. A metal plate with information concerning stroke and load-rating shall be permanently fastened to each buffer. Pit-mounted buffers shall have an adequate stroke designed to bring the fully-loaded car and counterweight to rest from governor tripping speed at an average rate of retardation not exceeding gravity. Moving portion of buffer shall be designed to be accelerated by the car without a noticeable peak retardation. [Oil buffers shall be of the spring-return type, except that counterweight buffers attached to counterweight may be the gravity-return type. Provisions shall be made for checking oil level. Switches shall be provided for spring-return oil buffers.] [Spring buffers shall be in accordance with ASME A17.1.]

2.32 LUBRICATION POINTS

Every part subject to movement friction shall be complete with provisions for oil and grease lubrication.

2.33 SEISMIC REQUIREMENTS

****
NOTE: Provide seismic details, if a Government designer (either Corps office or A/E) is the Engineer of Record, and show on the drawings. Delete the non-appropriate bracketed phrase.
****

Seismic protection shall be provided in conformance with TI 809-04 for general guidance and computation of forces (1.O G horizontal and 1.0 G vertical minimum), ASME A17.1, Rule XXIV, and ICBO UBC [as shown on the drawings]. [The Contractor shall hire a registered engineer to submit the stamped calculations and drawings.]

PART 3 EXECUTION

3.1 INSTALLATION

****
NOTE: ASME A17.1 must be consulted for information, such as vertical support spacing and loading conditions; the drawings should indicate supporting

devices.

****

Elevators and equipment shall be installed in accordance with ASME A17.1 and manufacturer's recommendation. Guide rails shall be set plumb and parallel and attached to guide rail brackets secured to building framing as indicated and at intervals not exceeding [_____] mm. [_____] inches. Steel plate shims shall not be used for aligning equipment. Guide rail sections shall be joined rail sections, joined together in accordance with ASME A17.1. Guide rails shall be thoroughly cleaned and made smooth before elevator is put into operation. During installation stainless steel surfaces shall be protected.

3.2 FIELD WELDING

When structural or load-bearing members are to be field-welded, welding and qualification of welders shall be as specified in Section 05090A WELDING, STRUCTURAL.

3.3 ELEVATOR WIRING

Wiring shall be provided for electrically-operated items of elevator equipment to comply with requirements of NFPA 70 and Section 16415A ELECTRICAL WORK, INTERIOR. For control and signal circuits wire shall be minimum No. 18 AWG. For power and lighting circuits wire shall be minimum No. [12] [_____] AWG. A work light fixture equipped with 150 watt 150 watt incandescent lamps and ground duplex receptacles shall be provided at both the top and bottom of the car. Work light fixtures and traveling cable junction boxes shall be located to provide illumination at junction boxes. Wiring shall terminate in junction boxes. Wires shall be identified and match symbols shown on wiring diagrams. Control and signal wires shall be brought to accessible numbered terminal blocks on controller. Intra-panel wiring shall be flame-resisting type.

3.3.1 Traveling Cables

Cables shall terminate at numbered terminal blocks in car and machine room. Traveling cable shall be provided with a separate shielded circuit for communication system and hang to obtain proper size of loop. Traveling cable shall be provided with 10 percent spare conductors for each car.

3.4 PAINTING

Except for factory finished items and corrosion-resistant items, machined surfaces shall be painted as specified in Section 09900, PAINTING, GENERAL.

3.5 TESTING

****

NOTE: The designer will determine if a certified government elevator inspector is available to witness final testing and certify the elevator. If a government elevator inspector is not available, the designer will specify that the Contractor provides an inspector to certify the elevators. the designer will also determine if inspection by local or state authorities is required and, if required, specify the requirements accordingly.

****

Testing shall be in accordance with requirements of ASME A17.1 and ASME A17.2.1 and as specified below. Contractor shall conduct a complete test of the system. After the system has passed all tests, the Contractor shall notify the Contracting Officer in writing, [_____] days prior to the time of performing the acceptance test, that the system is complete and is ready for final acceptance testing. The Contractor after receiving written approval from the Contracting Officer will conduct a complete acceptance test of the system. [Acceptance testing will be witnessed by a certified government elevator inspector.] [The Contractor shall provide the services of an elevator inspector, employed by an independent testing company to inspect the elevators, witness the acceptance testing and certify the elevators. The inspector shall meet all qualification requirements of ASME QEI-1 and shall be certified in accordance with ASME QEI-1. The Contractor shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 days after completion of all testing.]

3.5.1 Testing Period

Each elevator shall be tested with the specified rated-load in car continuously for a period of 35 percent of the duty time. During the test run the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor. A manual test of the final limits (UP and DOWN overtravel) shall also be performed.

3.5.2 Speed Load Testing

****
NOTE: Specify 10 percent for ac rheostatic control and 5 percent for variable voltage control.
****

The actual speed of elevator car in both directions of travel shall be determined with the rated-load and with no-load in the elevator car. Actual measured speed of car with the rated-load in the UP direction shall be within [5] [_____] percent of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined shall not exceed 10 percent of the total difference between the UP and DOWN speeds.

3.5.3 Car Leveling Testing

Elevator cars leveling devices shall be tested for accuracy of landing at all floors with no-load in car, with symmetrical load in car and with the rated-load in car in both directions of travel.

3.5.4 Brake Testing

Brake test shall be conducted with the rated-load in the car. Brakes shall stop and hold the car with the rated-load. In elevators using a Ward-Leonard type generator drive system it is critical to test the suicide circuit to assure that loop currents cannot cause the hoist motor to pull through the brakes.

3.5.5 Temperature Rise Testing

Temperature rise of hoistway motor, motor drive, exciter and booster shall be conducted during the full-load test run for minimum one hour. Under

these conditions the temperature rise of equipment shall not exceed the requirements established in NEMA MG 1 Chapter 12. Temperature rise testing shall be started when all parts of equipment are within the temperature required by NEMA at the time of starting the tests.

3.5.6 Insulation-Resistance Testing

Insulation-resistance testing shall be performed to ensure that the complete elevator wiring systems will be free from short circuits and grounds. Electrical conductors shall have an insulation-resistance of not less than one megohm between each conductor and ground, and not less than one megohm between each conductor and all other conductors. Prior to testing, provisions shall be made to prevent damage to electronic devices.

3.6 FRAMED INSTRUCTIONS

Two sets of instructions shall be typed and framed under glass or in laminated plastic, and posted side-by-side in the elevator room where directed, before acceptance of elevator systems. First set of instructions shall include wiring and control diagrams showing the complete layout of elevator system. Second set of instruction shall include the condensed operating instructions explaining preventive maintenance procedures, the methods for checking the elevator system for normal safe operation, and the procedures for safely starting and stopping the elevator system.

3.7 OPERATOR TRAINING

Contractor shall conduct a formal training course for operating Government personnel which shall include care, lubrication, adjustment and maintenance of the elevator equipment. Training period of the elevator equipment. Training period shall consist of a total of [_____] hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. Field instructions shall cover all of the items contained in the operating and maintenance instructions, including demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to date of starting the training course.

-- End of Section --