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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14210

ELEVATORS, ELECTRIC

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SECTION 14210

ELEVATORS, ELECTRIC

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 176	(1996) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 366/A 366M	(1996) Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
ASTM A 568/A 568M	(1996) Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A 569/A 569M	(1996) Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
ASTM A 666	(1996a) Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM E 84	(1996a) Surface Burning Characteristics of Building Materials

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A17.1	(1993) Safety Code for Elevators and Escalators
ASME A17.2.1	(1993) Inspectors' Manual for Electric Elevators
ASME QEI-1	(1993; Addenda: QEI-1a-1995) Standard for the Qualification of Elevator Inspectors

CODE OF FEDERAL REGULATIONS (CFR)

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

FEDERAL STANDARDS (FED-STD)

FED-STD 795	(Basic) Uniform Federal Accessibility Standards

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.11	(1993) IEEE Standard Metal-Oxide Surge Arresters for AC Power Circuits
IEEE C62.41	(1991) Surge Voltages in Low-Voltage AC Power Circuits
IEEE C62.45	(1992) IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage 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-01	(1994) Uniform Building Code (3 Vol.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA LD 3	(1995) High-Pressure Decorative Laminates
NEMA MG 1	(1993; Rev 1; Rev 2; Rev 3) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996; Errata) National Electrical Code
NFPA 252	(1995) Fire Test of Door Assemblies

UNDERWRITERS LABORATORIES (UL)

UL 1449	(1985; Errata Apr 1986) Transient Voltage Surge Suppressors

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation. Submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Training Data; FIO.

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; FIO.

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 meets requirements for seismic loading of zone 1 in accordance with ICBO-01; 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 four 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.

SD-04 Drawings

Elevator System; FIO

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-06 Instructions

Framed Instructions; FIO.

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

SD-08 Statements

Qualification Certificates; FIO.

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-09 Reports

Testing; FIO.

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-14 Samples

Finishes; GA.

Samples of materials and products requiring color or finish selection.

SD-18 Records

Test Procedures; GA.

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

SD-19 Operation and Maintenance Manuals

Elevator System; GA.

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

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 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)

Number of Elevators Required:	1.
Type:	Geared.
Service:	Passenger.
Capacity:	1 134 kg (2 500 pounds).
Speed:	1.02 m/s (200 fpm).

Clear Car Inside:	2 032 wide by 1295 deep.
Net Travel:	22 400.
Landings:	8.
Openings: Front	8.
Openings: Rear	0.
Entrance Type:	Single speed horizontal sliding; 1 066 mm wide by 2 185 mm high .

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 Ground Level.

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 PROTECTION

At time of substantial completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

1.8.1 Temporary Use:

There shall be no use until inspected, tested and certified. Once this has been done, the operating keys shall be turned over to the Government and use of the elevator shall be subject to prior approval by the Contracting Officer’s representative and availability of Government inspectors. Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage. Temporary construction use shall not in any way restrict or limit required warranty.

1.8.1.1 Maintenance Service

Provide full maintenance service by skilled, competent employees of the elevator Installer for elevators used for construction purposes. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper

elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.

1.8.1.2 Temporary Protective Measures

Provide protective coverings, barriers, devices, signs, or other procedures to protect elevators. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

1.8.2 Final Protection

Provide final protection and maintain conditions, in a manner acceptable to elevator manufacturer and Installer, that ensure elevators are without damage or deterioration at the time of completion.

1.9 WARRANTY

Warranty service shall be provided for each elevator for a period of 12 months after date of final 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, and seismic requirements, 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

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 208 volt, 60-Hertz, 3-phase, 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 16415 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 Hazardous Products

Materials and products required for manufacturing and installing elevators shall not contain asbestos or other hazardous materials identified by the US Enviromental Protection Agency.

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 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

Car doors for passenger elevators shall be constructed from 1.519 mm 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 thick Exposure 1 plywood secured to structural steel frame with metal fire protection secured to underside of structural steel frame.

2.3.4 Walls

Walls for passenger elevators shall be 2426 mm) high from floor to the underside of lighting fixtures. Side and rear panels shall be 1.519 mm thick sheet steel panels. Side and rear removable panels shall be applied to car walls and shall be manufactured from 18 mm 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 reveal standard with manufacturer. Vent around base shall be concealed behind removable panels.

2.3.5 Car Top, Ceiling and Light Fixtures

Car top for passenger elevators shall be manufactured from 2.657 mm thick sheet steel and shall be not less than 140 mm high with drop-ceiling and light fixtures. Ceiling shall be egg crate white plastic fire-retardant light diffuser supported by polished aluminum 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 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 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. 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 thick or flexible-type homogeneous vinyl tile not less than 3 mm thick as specified in Section 09650 RESILIENT FLOORING. Tile shall be laid flush with the extruded aluminum platform threshold.

2.3.8 Base

Base for passenger elevators shall be cove type stainless steel, 150 mm 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.

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 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

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 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 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 at a point 1 220 mm above the floor, 300 mm in front of car station.

b. Fixture frame of stainless steel .

c. Frosted acrylic lenses, 6 mm 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 Top of Car Controls

The top of the elevator car must have an operating device to allow slow speed movement of the car.

2.3.14 Protection Pads

Passenger Elevator: Car shall be provided with wall protection pads, with inconspicuous stainless steel pad hooks spaced not over 460 mm 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.

2.3.15 Certificate Frame

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) and maximum number of persons allowed.

2.3.16 Car and Counterweight Guides and Guide Shoes

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.

2.3.17 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

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 thick with 1.519 mm thick face sheet-steel and stainless steel cladding with 1.519 mm thick 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. .

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 sheet-steel 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.

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 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 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 for car doors and not less than 57 mm 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 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

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 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. Car and hoistway doors shall be opened and closed simultaneously in a maximum time of 2.9 seconds. When on automatic operation the door closing time shall not exceed 4.1 seconds and door closing force shall not exceed 130 N. 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

Elevator fixtures and panels for passenger elevators shall be constructed of 3 mm thick faceplates 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

Car operating panel for passenger elevators shall be provided with the necessary raised (0.8 mm) markings for the handicapped, and shall include a series of minimum 20 mm 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 . 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 operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 5 mm 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 .

f. Emergency stop switch 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 diameter signal bell outside of elevator hoistway at Ground Level and Eighth Level located as shown or as directed.

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.

2.6.3 Hall-Call Station

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 vandal-resistant, metal encased and back-lighted to permit illumination when a call is registered. Buttons shall be designed with 0.8 mm operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 5 mm beyond the faceplate with beveled edges to prevent damage from side blows.

2.6.3.1 Fire Service Switch

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

2.6.4 Direction Lanterns

Lanterns for passenger elevators shall be in accordance with FED-STD 795 and 36 CFR 1191, and shall be provided in each car entrance column. Lanterns shall be vandal-resistant design.

2.6.5 In-Car Position Indicator

Indicator numerals and directional arrows for passenger elevators shall be flush-mounted faceplate with black-filled engraved numerals not less than 25 mm high and 10 mm 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 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.

2.6.6 Audible Signals

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.

2.6.7 Combination Hall-Position Indicator and Directional Arrows

A digital-readout position and direction indicator (minimum 50 mm (2 inch) high indication) for passenger elevators shall be provided over each 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 (SINGLE-CAR SELECTIVE/COLLECTIVE)

Passenger Elevator: 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.

2.8 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 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.

d. After car has moved to the designated landing 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.

2.9 AUTOMATIC ELEVATOR OPERATION

2.9.1 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.

2.9.2 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.

2.9.2.1 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.

2.9.2.2 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.

2.9.2.3 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.

2.9.2.4 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.

2.9.3 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.

2.9.4 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 per passenger.

2.9.5 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.

2.9.6 Automatic Power Shutdown Upon Fire Sprinkler Activation

Elevator control system shall cause automatic power shutdown of the elevators in the event that a heat detector or sprinkler head located in the elevator machine room or in the elevator hoistway activates. Heat detector shall be fixed-temperature-rate-of-rise type, rated at 57 to 60 degrees C. Activation of a heat detector or a waterflow switch, which monitors only the sprinkler heads in the elevator machine room and in the hoistway, shall cause the following operations to the affected elevators:

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. The fire floor is considered the floor where the fused sprinkler head or 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.

c. Power to the elevators will be automatically shutdown by operating the shunt-trip breaker(s) in main line power supply. Shutdown will occur only after the elevators are stopped at a landing, and

power-operated doors are opened.

d. Automatic shutdown will override Phase I Emergency Recall Operations, ASME A17.1, Rules 211.3a and 211.3b, but will not override Phase II Emergency In-Car Operation, ASME A17.1, Rule 211.3c if Phase II operation is in effect.

2.9.7 Automatic Operation Upon Smoke Detector Activation

Elevator control system shall cause automatic operation upon smoke detector activation shall conform with Smoke Detectors ASME A17.1, Rule 211.3b.

a. The activation of a smoke detector in any elevator lobby, other than at the designated level, shall cause all cars that serve that lobby to return nonstop to the designated level. The activation of a smoke detector in any elevator hoistway shall cause all elevators having any equipment located in the hoistway to return nonstop to the designated level, except that smoke detectors in hoistways installed at or below the lowest landing of recall, when activated, shall cause the car to be sent to the upper level of recall. The operation shall conform to the requirements of ASME A17.1 Rule 211.3a.

b. When the smoke detector at the designated level is activated, the operation shall conform to the requirements of ASME A17.1 Rule 211.3a, except that the cars shall return to an alternate level approved by enforcing authority, unless the designated-level three-position Phase I switch is in the "ON" position.

c. The activation of a smoke detector in any elevator machine room, except a machine room at the designated level, shall cause all elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to return nonstop to the designated level. The activation of a smoke detector in any elevator machine room at the designated level shall cause all elevators having any equipment located in that machine room to return nonstop to the alternate level, or the appointed level when approved by the authority having jurisdiction.

d. Elevators shall only react to the first smoke detector zone which is activated for that group.

e. Phase I operation, when initiated by a smoke detector, shall be maintained until canceled by moving the Phase I Switch to the "BYPASS" position. Smoke detectors and/or smoke detector systems shall not be self-resetting.

f. Coordinate with requirements of Section 13851 FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE.

2.10 FIREFIGHTERS' SERVICE

Firefighter service shall be in accordance with ASME A17.1 for automatic elevators. Elevator lobby and machine room smoke detectors shall be in accordance with Section 13851 FIRE DETECTION AND ALARM SYSTEM, ADDRESSIBLE.

2.11 ELEVATOR MACHINE (GEARED)

2.11.1 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.

2.11.2 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.

2.11.3 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.

2.11.4 Hoist Motor (Geared)

Motor shall be a geared 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 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.

2.11.5 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.

2.11.6 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.

2.11.7 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. 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.

2.11.8 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.

2.12 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.

2.13 VARIABLE VOLTAGE CONTROL

2.13.1 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. Maximum time from start of car motion to floor level at the next floor for geared machines shall be 20 seconds for a speed of 1.02 m/s. 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 30 seconds. 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 3 200 mm floor height, and 1 066 mm wide single-speed slide doors.

2.13.2 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.

2.13.3 Motor Generator Set

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.

2.13.3.1 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.

2.13.3.2 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.

2.13.3.3 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.

2.13.3.4 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.

2.13.3.5 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.

2.13.3.6 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.

2.13.3.7 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.

2.13.3.8 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.

2.13.3.9 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.

2.13.4 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.

2.13.4.1 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.

2.14 SENSOR AND CONTROL WIRING SURGE PROTECTION

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.

2.15 COMMUNICATIONS LINKS SURGE PROTECTION

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 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.

2.16 COMMUNICATIONS LINKS OVER VOLTAGE PROTECTION

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.

2.17 COMPENSATION

2.17.1 Solid-State Control with Integral Compensation

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

2.18 COUNTERWEIGHT

Counterweight for each car shall equal the weight of car plus approximately 40 percent of specified load. Concrete weights are not acceptable. Counterweight screen of metal construction, at least 2 m 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.

2.19 LEVELING DEVICES

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 mm.

2.20 LUBRICATION POINTS

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

2.21 SEISMIC REQUIREMENTS

Seismic protection shall be provided to conform to ASME A17.1, Rule XXIV.

2.22 PIT STOP SWITCH

Provide pit stop switch in compliance with ASME A17.1, Section 106.1f.

PART 3 EXECUTION

3.1 INSTALLATION

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 3 200 mm. 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 05090 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 16415 ELECTRICAL WORK, INTERIOR. For control and signal circuits wire shall be minimum No. 16 AWG. For power and lighting circuits wire shall be minimum No. 12 AWG. A work light fixture equipped with 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

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, 14 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. 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

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 four 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 --

SECTION TABLE OF CONTENTS

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14622

DBRITE CARRIER TRACK AND MANUAL WINCH SYSTEM

-- End of Section Table of Contents --

SECTION 14622

DBRITE CARRIER TRACK AND MANUAL WINCH SYSTEM

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ANSI/ASME HST-4M (1991) Overhead Electric Wire Rope Hoists

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Track Suspension System and Winch; GA.

Submit manufacturers descriptive data for standard items including: winch, wire rope, controllers, and couplings.

Spare Parts Data; FIO.

After approval of the detail drawings and not later than one month prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Detail Drawings; GA.

Drawings shall be in the Contractor’s standard format and show the general arrangement of all components, clearances and principle dimensions, assemblies of track, winch, trolley, track suspension system.

SD-19 Operation and Maintenance Manuals

Manuals; GA.

Furnish 6 copies of the manual bound in hardback binders. The manual shall include the capacity and location of the track and winch, the name of the Contractor, track and winch manufacturer, and the contract number. The parts list for equipment shall indicate the sources of supply, recommended

spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories and associated appurtenances provided.

1.3 GENERAL REQUIREMENTS

1.3.1 Definition

Standard Commercial Product - A product which is currently being sold, or previously has been sold, in substantial quantities to the general public, industry or Government in the course of normal business operations. Nominal quantities, such as models, samples, prototypes or experimental units do not meet this definition.

1.3.2 Verification of Dimensions

Contractor is responsible for coordination and proper relation of all work to the building structure and to the work of all trades. The Contractor shall verify all dimensions of the building that relate to fabrication of the track and winch system and notify the Contracting Officer of any discrepancy before the order for the track and winch system is finalized.

1.4 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection form the weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 FABRICATION AND CONSTRUCTION

Provide manual wire rope winch and trolley, ANSI/ASME HST-4M, trolley track suspension. Trolley and wheels shall be suitable for operation on the roll formed steel track system provided, and shall have not less than four wheels. Provide removable track section as indicated on drawings.

2.1.1 Capacity

The winch shall have a minimum rated capacity of 225 kg. The track system shall have a minimum rated capacity of 225 kg.

2.1.2 Fabrication

DBrite Carrier, track, winch, and support shall be fabricated as indicated on drawings.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

The Contractor shall erect and install the winch, trolley and track suspension system in accordance with manufacturers written instructions, and the contract drawings.

3.2 FIELD INSPECTION AND TESTS

3.2.1 Operational Inspection and Tests

Upon completion, and before final acceptance, the winch, trolley, and track suspension system shall be given rated load test, carrying 125 percent of the rated capacity, and with the units spaced to obtain maximum possible loads in the track suspension system. Winch shall hold a static, as well as control a dynamic, 125 percent rated load. The systems shall be thoroughly tested in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship. The Contractor shall furnish operating personnel, instruments, and all other necessary apparatus at no additional cost to the Government. The test and final adjustments of the equipment will be under the supervision of the Contracting Officer. The Contractor shall furnish loads for testing. The Contractor shall rectify any deficiencies found and completely retest work affected by such deficiencies.

-- End of Section --