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SECTION 14240

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06/04

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SECTION 14240

HYDRAULIC ELEVATORS
06/04

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers hydraulic passenger and freight elevators and their installation. The basics of structure for the support of elevators and elevator equipment must be adequately covered on the drawings.

In addition, the drawings must indicate:

Location, dimensions, lighting, and ventilation of the machine room

Hoistway, including structural systems for support of the elevator and its mechanism

Concrete pit; waterproofing; any necessary access ladders; drains; screens; lighting. Pit construction shall be such that the vertical loads imposed by the operation of the elevator under full load and maximum rate of rise will be borne by the pit structure; the operating cylinder shall be supported entirely by the pit floor. Sumps shall be provided in the pit.

Locations of and necessary recesses for hall indicators, buttons, lanterns, and switches

Complete electric service to and including a power panel in the elevator machine room

Include appropriate sections of Division 16, "Electrical."

Configuration of entrance jambs; structural supports for elevator doors

Size and capacity of elevators

Interior construction, decor, materials, and lighting of cab

Door size and locations

Hoistway and hoistway-associated construction requirements are covered in detail in ASME A17.1, Section 100; section 101, rules 102.1A and 102.1B of section 102; section 105; section 106; section 108, and rule 111.10, including supplements of section 111. Design must reflect these requirements as they apply to the specific types and sizes of the elevators to be installed. Drawings must detail this construction.

Items pertaining to installation and inspection practices for recommended tolerances and qualifications are contained in ASME A17.2.

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

****

The publications listed below form a part of this section to the extent referenced:

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(1990; R 2000) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(1990; R 2000) Load Ratings and Fatigue Life for Ball Bearings

AMERICAN WELDING SOCIETY (AWS)

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

ASM INTERNATIONAL (ASM)

ASM 06542G	(1999) Pure Metals Properties: A Scientific and Technical Handbook

ASME INTERNATIONAL (ASME)

ASME A17.1	(2002) Safety Code for Elevators and Escalators; (Includes Interpretations)

ASTM INTERNATIONAL (ASTM)

ASTM A 325	(2004) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 325M	(2004) Standard Specification for High Strength Bolts for Structural Steel Joints (Metric)
ASTM A 568/A 568M	(2003) Standard Specifications for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2002) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 102	(1982) Black Alkyd Paint
SSPC SP 6	(2000) Surface Preparation Specification No. 6 - Commercial Blast Cleaning

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330, "Submittals," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

****

The following shall be submitted in accordance with Section 01330, "Submittals," in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Notice to the Contracting Officer shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

SD-02 Shop Drawings

Connection Diagrams and Fabrication Drawings shall be submitted for hydraulic passenger and freight elevator systems in accordance with paragraph entitled, "General Requirements," of this section.

Schematics shall be submitted for hydraulic elevator systems in accordance with paragraph entitled, "General Requirements," of this section.

Installation Drawings shall be submitted for hydraulic passenger and freight elevator systems accordance with the paragraph entitled, "General," of this section.

SD-03 Product Data

Equipment and performance data shall be submitted for the following items consisting of load ratings, design speeds, car and platform dimensions, and opening and closing speeds.

Car Frame and Platform
Power Unit
Motor
Pump
Valves
Plunger, Cylinder, and Casing
Tanks
Entrances
Hoistway Doors
Doors
Car Gates
Operation and Control Systems
Operating System
Elevator Car
Door and Gate Operators

Manufacturer's catalog data shall be submitted for the following items, in additional to the ones above:

Entrance Frames
Entrance Sill
Paint Materials
Inspection and Maintenance Switch

SD-06 Test Reports

Test reports on the following tests shall be submitted for elevator systems in accordance with the paragraph entitled, "Testing," of this section.

Continuous-Operating Test
Temperature Rise Test
Acceptance Inspection
Hydraulic oil purity tests

SD-07 Certificates

Results of Tests shall be submitted in accordance with the paragraph entitled, "Testing," of this section.

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals shall be submitted in accordance with paragraph entitled, "Operation and Maintenance," of this section.

1.3 ELEVATOR CONSTRUCTION

Elevators, accessory equipment, and the complete installation shall conform to the requirements of ASME A17.1, as they pertain to hydraulic passenger and freight elevators.

Associated electrical equipment and installation shall comply with the requirements of Division 16, "Electrical," as specified.

Freight elevators shall be designed for a maximum speed of [60] feet per minute [0.30] meter per second [_____] when traveling up under full-rated load.

Passenger and freight elevators shall be designed for a maximum speed of [100] [150] feet per minute [0.51] [0.76] meter per second [_____].

Passenger elevators shall be designed for a maximum speed of 200 feet per minute 1.02 meter per second.

1.4 WELDING

****
NOTE: If Section 05095, "Welding Steel Construction," is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.
****

[Section 05095, "Welding Steel Construction," applies to work specified in this section.]

[Welding shall conform to AWS D1.1/D1.1M.]

1.5 GENERAL REQUIREMENTS

Connection Diagrams shall be submitted for hydraulic passenger and freight elevator systems indicating the relations and connections of devices and apparatus by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, and internal tubing, wiring, and other devices.

Schematics shall be submitted for hydraulic elevator systems including annotated ladder logic diagrams for [programmable] [pre-programmed] logic controllers.

Fabrication Drawings shall be submitted for hydraulic passenger and freight elevator systems consisting of fabrication and assembly details to be performed in the factory.

Notice to the Contracting Officer shall be given at least [14] [_____] calendar days prior to date proposed for conducting each training course.

PART 2 PRODUCTS

2.1 POWER UNIT

Power unit shall be self-contained and shall consist of pump, motor, adjustable drive, and oil reservoir and necessary relief, check, and bypass valves mounted on a structural steel base. Rotating equipment shall be covered with a soundproofed steel enclosure.

Arrangement shall be such that power unit adjustments are accessible without disturbing oil lines or connections.

2.2 PUMP

****
NOTE: When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is over lubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.
****

Pump shall be positive-displacement pulsation-free designed for not more than 10 percent variation in output between no load and full load.

2.3 MOTOR

****
NOTE: When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is over lubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.
****

Motor shall be high-starting-torque, single-speed, totally enclosed or semienclosed with grease-lubricated ball or roller bearings. Bearings shall have a minimum rating life of 20,000 hours under full operating load as defined by ABMA 9 or ABMA 11, as applicable. Motor shall comply with NEMA MG 1, and Section 16225, "Motors," and be UL listed.

2.4 VALVES

Valve assembly shall include those valves necessary to:

Protect the system against excessive pressures by an appropriate bypass

Reduce the motor load during starting, and provide smooth starting of elevator ascent under all operating conditions

Control the rates of acceleration and deceleration for smooth starting and stopping on both ascent and descent

Valves shall be located to make them readily accessible for servicing. Provisions shall be incorporated to securely lock adjustments.

2.5 PLUNGER, CYLINDER, AND CASING

Plunger and cylinder shall be designed to lift the gross weight of the fully loaded elevator at full acceleration.

Plunger shall be constructed of seamless-steel tubing, turned smooth and true and finished to a fine polished surface, with a stop plate welded to the plunger bottom.

Cylinder shall be fabricated of steel tubing. Exterior shall be blast cleaned in accordance with SSPC SP 6, primed, and given a topcoat of black alkyd paint conforming to SSPC Paint 102, applied to a minimum dry-film thickness of 3 mils 0.08 millimeter in not less than two coats. When the coating system (primer and topcoat) is effectively cured, the cylinder shall be given a wrapping of 10-mil 0.25 millimeter self-adhesive

polyethylene tape half-lapped to provide a minimum of 20 mils 0.51 millimeter over the entire surface. Tape shall be wrapped to a snug fit without stretching.

Cathodic protection shall be provided for the casing. Method of protection shall be submitted for approval.

Cylinder shall be placed in a heavy steel casing sized to allow clearance for final alignment and plumbing. Casing shall extend a minimum of 3 feet 915 millimeter below the bottom of the cylinder. After the casing is in place and cleaned of debris and water, the bottom shall be sealed with concrete as follows:

Casing shall be filled to a depth of 1 foot with 3,000-pound per square inch 300 millimeter with 20.6 Megapascal, 28-day compressive-strength concrete. After a 24-hour cure period, a polyamide epoxy fluid grout shall be poured into the casing in an amount sufficient to produce a depth of 2 inches 50 millimeter. After a cure period of not less than 20 minutes nor more than 30 minutes, another foot of specified concrete shall be placed over the grout.

After the cylinder is in place in the casing, the space between the cylinder and the casing shall be filled with sand solidly packed in place. Cylinder shall be stabilized in position with a minimum of three radial spacer pins 5 feet 1524 millimeter from the bottom, welded to the cylinder. Tape wrapping shall be carried at least half the distance from cylinder to casing and shall be applied to prevent voids at the base of the pins. For elevators whose total travel exceeds 28 feet 8535 millimeter, spacers shall be provided at midpoint.

2.6 TANKS

Tanks necessary for the elevator shall conform to the requirements of ASME A17.1.

2.7 CAR FRAME AND PLATFORM (PASSENGER ELEVATORS)

Car and platform shall be designed and built in conformance with ASME A17.1. Platform floor shall be either of steel or .25-inch to .32-inch 6.4 to 8.1 millimeter thick maple flooring over a steel base.

****

NOTE: There is no established standard for the interior arrangements of a passenger elevator car, except for a few minimal safety-related requirements of ASME A17.1. There is a broad latitude within which the architect can make his choices of materials and finishes to conform to the aesthetic tone of the building the elevators are to serve.

Specifications presented are a middle of-the-road approach for the situation where a specific aesthetic tone to match general building decor is not necessary.

****

Sides and rear of the car from floor to the decorative ceiling shall be constructed of 5-ply, plastic-laminate-surfaced wood core of not less than 1-1/8-inch 28.6 millimeter total thickness. Plywood base shall be

exterior-grade western softwood plywood. Plastic-laminate facing shall be fiber-reinforced phenol-formaldehyde base with wood-grained melamine overlay, color and pattern as selected.

Front and sides of car shall be fire-retardant protected with No. 26 U.S. standard gage black-iron sheathing.

Rear corners of the car shall be rounded to a radius of not less than 4 inches 100 millimeter nor more than 6 inches 150 millimeter.

Base of the car shall be of 6-inch 150 millimeter high 14-gage 2.0 millimeter corrosion-resistant steel, recessed under the car panels.

Directly above the base, within the recessed section, continuous vent slots shall be provided around the perimeter of the paneling for exhausting the air of the ventilation system. Directly above this slot a 14-gage 2.0 millimeter corrosion-resistant steel cover shall be provided for the edge of the paneling.

Side emergency exit doors, where required, shall be flush-panel hinged type.

Front return panel and entrance columns shall be integral, shall extend from the floor to the fascia, and shall be constructed of 14-gage 2.0 millimeter corrosion-resistant steel with No. 6 finish, as defined in ASM 06542G Metals Handbook.

Directly above the opening, a fascia panel shall be provided with the front section splayed sufficiently to accommodate the box and operating parts of the car position indicator. Entire splayed section shall be designed for relamping by hinging or other equally suitable device. Fascia shall be constructed of 14-gage 2.0 millimeter corrosion-resistant steel with No. 6 finish.

Handrails shall be corrosion-resistant steel with No. 6 finish, continuous around sides and back, except at side emergency exit doors where the handrail shall be attached to the door and swing with the door. Rails shall be corrosion-resistant steel not less than 3/16 inch by 2 inches 4.88 by 50 millimeter in section and attached to the car body on corrosion-resistant steel brackets. Both brackets and attachment shall be consistent with the stresses and safety factors involved.

Car canopy shall be constructed of stretcher-level cold-rolled furniture steel of not less than 14-gage 2.0 millimeter, reinforced to support a 400-pound 1780 newton load applied to 2 square feet 0.185 square meter anywhere on its surface without plastic deformation of any member of the canopy construction. Corners and reinforcing shall be welded or bolted to present one-piece construction.

Directly below the ceiling, a subceiling shall be mounted forming a plenum to distribute the air from the ventilating system around the perimeter of the car at the suspended ceiling height. This ceiling shall also support the fluorescent lighting equipment. Below this plenum chamber, a decorative ceiling shall be installed with diffusing acrylic grille suspended on a reinforced aluminum channel framing system. Entire ceiling system shall conform to the contour of the car body. An emergency exit shall be provided in the ceiling system.

A forced ventilating system shall be provided incorporating a three-speed squirrel-cage blower delivering a minimum of 100 cubic feet per minute 47

liter per second per person of rated elevator capacity at top speed. Blower shall be sized to deliver the air requirement at a fan speed of not more than 1,600 revolutions per minute. Mounting shall be designed and installed to prevent any discernible vibration of the surface on which the blower is mounted.

Car lighting shall provide a minimum of 30 foot-candles 320 lux of diffused illumination.

Car floor shall be covered with 1/8-inch 3 millimeter vinyl tile in colors as specified. Attachment shall be by waterproof adhesive recommended by the tile manufacturer for bonding floor to either steel or wood substrate; emulsion adhesives will not be accepted.

Wherever corrosion-resistant steel is indicated for elevator cars, it shall be AISI Type 316. Finish for corrosion-resistant steel shall be No. 6 as defined in the ASM 06542G Metals Handbook.

2.8 CAR FRAME AND PLATFORM (FREIGHT ELEVATORS)

Car frame and platform shall be designed and built in conformance with the requirements of ASME A17.1. Platform floor shall be steel overlaid with tongue-and-groove maple planking, 1-1/2-inch 40 millimeter minimum net thickness.

****
NOTE: Class A is for general-freight loading; Class B is for motor-vehicle loading; Class C is for industrial-truck or other concentrated loading.
****

Car frame and platform shall be designed for [Class A loading. Design shall be based upon loading of 75 pounds per square foot 3600 pascal.] [Class B loading. Design shall be based upon loading of 50 pounds per square foot 2400 pascal.] [Class C2 loading. Design shall be based upon loading of 75 pounds per square foot 3600 pascal.]

2.9 ELEVATOR CAR (FREIGHT ELEVATORS)

Car shall be completely enclosed, on sides not used for entrances, with 14-gage 2.0 millimeter sheet steel extending from the platform to a height of at least 6 feet 1830 millimeter. Remainder of the sides and the top shall be covered with heavy welded 10-gage 1-1/2-inch 3.5 by 40 millimeter diamond wire mesh, or perforated 16-gage 1.6 millimeter steel sheets reinforced and secured for heavy duty service. Top shall be reinforced to withstand 400-pound 1780 newton loading concentrated on any 2-square-foot 0.185 square meter area without plastic deformation of the top or top members. A hinged emergency door shall be provided in the top.

Not less than two electric car lights sized for a minimum of 10 foot-candles 108 lux of diffused light shall be provided at the loading edge of the platform.

2.10 CAR GATES (FREIGHT ELEVATORS)

Car gate shall be the counterbalanced vertical-rise type, at least 5 feet 6 inches 1675 millimeter high, extending the full width of the car. Gate shall be constructed of at least 10-gage 1-1/2-inch 3.5 by 40 millimeter diamond mesh or expanded metal in reinforced steel T-frame. Gate shall be

equipped with not less than four guide shoes to run on tracks integral with or fastened to gate posts.

Counterweight system shall include the counterweighting of both ends of the gate to provide complete freedom of travel. Gate ends shall be connected to guided counterweights in each gate post by a guided stranded-steel cable and pulley system designed to preclude cable displacement and counterweight bind. Counterweight guidance system shall be cushioned to prevent noises resulting from impact with their enclosure.

A mechanical interlock shall prevent opening the gate except when elevator is in position at the landing. Electrical control shall prevent operation of the elevator unless the gate is closed.

2.11 DOORS (PASSENGER ELEVATORS)

Car and hoistway doors shall be motor-operated, two-speed, horizontal-sliding type and shall be flush construction of furniture steel rolled to stretcher-level standard of flatness as defined in ASTM A 568/A 568M. Door panels shall be filled with sound-deadening mineral filler to maintain the planar nature of the door surfaces in use.

Car door shall be equipped with removable door guides to run in slots in the car sill.

Doors shall be carried on concealed overhead tracks secured to the structural steel of car frame and to the structural steel of the door framing. Hangers shall be ball-bearing sheave type with sealed bearings. Sheave diameter shall be commensurate with the door operating requirements but in no instance less than 2-1/4 inches 57 millimeter. Adjustable upthrust rollers shall be of steel with sealed ball bearings. Tracks shall be of cold-drawn steel formed to contour of sheave and roller tracks; track thickness shall be at least 1/2 inch 13 millimeter.

Ferrous surfaces, except doors and other surfaces visible from the car and its approaches, as well as sliding surfaces, tracks, and roller treads, shall be cleaned, primed with the manufacturer's standard rust-inhibitive primer, and finished with the manufacturer's standard enamel system.

Doors shall be finished with three coats of the manufacturer's baked acrylic or melamine-alkyd enamel. Substrate shall be sand-blasted to white metal then given successive applications of mineral filler as required for visually smooth surface, each application baked and sanded smooth; then given a baked-on coat of the manufacturer's standard primer, sanded and rubbed smooth.

Doors shall operate under the control of the operational system as specified. Hoistway-door closure shall lead car-door closure; car-door opening shall lead hoistway-door opening under the automatic control of the operation system.

Lead doors of both hoistway and car shall be provided with full-height safety edges whose operation is integrated with the elevator operation system in such a way that when an obstruction is encountered while closing, the doors will reopen; pressure against this device, while doors are open, shall hold the doors open. Construction of these edges shall be such that, even in the event of failure of either or both of the doors to stop, there will be no injury to a body member which may be in the plane of closure.

Door design and safety edge operation shall meet requirements of ASME A17.1.

[The unlocking device keyway shall be located not more than 6 feet, 11 inches 2100 millimeter above the floor.] [The operating means for unlocking the doors shall be kept on the premises by personnel responsible for elevator maintenance and operation, in a location readily accessible to qualified individuals, in case of emergency.]

Both hoistway and car doors shall be provided with a positive electromechanical interlock and auxiliary door-closing device to permit elevator operation only after interlock circuits have been closed.

2.12 ENTRANCES (PASSENGER ELEVATORS)

Complete hollow metal entrances shall be provided, including frames, sills, struts and closer angles, hanger supports, hanger cover plates, fascia plates, toe guards, track hangers, and hardware necessary to the installation thereof.

[Unit frames shall be made of not less than 14-gage 2.0 millimeter, furniture steel finished in the elevator manufacturer's standard three-coat baked acrylic or melamine-alkyd enamel. Substrate shall be prepared by sandblasting to white metal, applying a succession of coats of mineral filler each of which is baked and sanded smooth, and applying the enamel manufacturer's recommended baked primer, sanded and rubbed smooth. Each coat of enamel shall be fine-sanded and rubbed before application of the succeeding coat.]

[Unit frames shall be made of not less than 14-gage 2.0 millimeter, Type 302 corrosion-resistant steel in No. 6 finish.]

Sills shall be cast iron not less than 7/16 inch 11 millimeterthick with nonslip surface. Grooves for the door guides shall be accurately machined for free door travel with 3/32-inch 2.4 millimeter clearances. Each sill shall be supported on steel anchors from the floor-supporting steel.

Structural-steel angle struts shall support the unit frame and the door-operating hardware and structurally integrate the entrance with the hoistway structural system.

Fascia plates and dust covers shall be not less than 14-gage 2.0 millimeter stretcher-level-flatness steel reinforced to retain this flatness in service, securely fastened to the entrance structural system, and provided with facilities for convenient removal for servicing.

Exposed surfaces of fascia plates, dust covers, cover plates, and other exposed ferrous entrance accessory items other than corrosion-resistant steel shall be finished in the manufacturer's standard baked acrylic or melamine-alkyd enamel. Substrate shall be prepared by sandblasting to white metal, applying a succession of coats of mineral filler each of which is baked and sanded smooth, and applying the enamel manufacturer's recommended baked primer, sanded and rubbed smooth. Each coat of enamel shall be fine-sanded and rubbed before applying the succeeding coat.

Nonexposed ferrous surfaces of the entrance accessory items shall be wire brushed to remove rust, solvent-cleaned of oil and grease, and protected by a two-coat rust-inhibitive paint system consisting of a primer and a finish coat of black alkyd paint conforming to SSPC Paint 102.

2.13 HOISTWAY DOORS (FREIGHT ELEVATORS)

****
NOTE: Drawings must indicate whether single-section or multiple-section horizontal slide doors are required.
****

[Hoistway entrances shall be provided with power-operated, horizontally operating, sliding doors.]

[Hoistway entrances shall be provided with power-operated, counterbalanced, vertically operating biparting doors. Provision shall be made for manual operation of doors, subject to the positioning of the elevator at the landing involved.]

[Vision panels, 6 by 10 inches 150 by 250 millimeter, shall be provided in the hoistway doors within 6 inches 150 millimeter of the door edge adjacent to the landing pushbutton and centered at a height of 5 feet 6 inches 1675 millimeter. Glass shall be wire reinforced.]

Steel guides, fitted with roller-bearing wheels, shall provide positive stable door travel. Design shall preclude any possibility of the door guides failing to control door operation.

Doors shall be made of embossed steel panels set in heavy tubular or channel frames. Panel width shall not exceed 2 feet 600 millimeter and panel thickness shall be at least 0.050 inch 1.3 millimeter. Embossing pattern shall be wavy-line and embossing depth at least 0.025 inch 0.64 millimeter. Reinforcement shall be provided as required to withstand, without plastic deformation, a concentrated load of 200 pounds 890 newton successively applied to the corners and the center points of the peripheral frame in a direction normal to the plane of the door, and a concentrated load of 125 pounds 556 newton similarly applied at any point on the interior framing. Embossed panels shall be securely integrated into the door construction by welding.

Vertical biparting doors shall be equipped with positive safety devices to prevent the falling of the upper section of the door in the event of failure of the counterbalance system.

Doors shall be finished in the manufacturer's standard baked-on system consisting of a baked primer and three coats of baked enamel. Substrate shall be sand-blasted to white metal and given a phosphate pretreatment before application of the primer. Color shall be as selected.

2.14 DOOR AND GATE OPERATORS (FREIGHT ELEVATORS)

Vertical-rise car gates shall be provided with an electric operator for opening and closing the gate. Car gates shall be equipped with a safety device designed to reopen the gate if any object interferes with free closure.

Hoistway doors shall be operated for both opening and closing by motor-driven operators. Motors shall conform to NEMA MG 1, Section 16225, "Motors," and be UL listed.

2.15 ENTRANCE FRAMES (FREIGHT ELEVATORS)

Entrance frames shall be of at least 12-gage 2.8 millimeter steel formed to the configuration shown and reinforced as required to produce the rigidity and impact resistance consistent with the expected rough usage as the entrance to a freight elevator.

From the floor to a height of 4 feet, a 14-gage 1220 millimeter, a 2.0 millimeter liner conforming to the entrance frame configuration shall be spotwelded to the frame to increase impact resistance.

Exposed surfaces shall be finished with the same system as the hoistway doors and in the color selected.

2.16 ENTRANCE SILL (FREIGHT ELEVATORS)

Entrance sill shall be a malleable or nodular cast-iron member not less than 7/16 inch 11.11 millimeter thick, with a 1/4-inch 6 millimeter steel facing angle securely anchored into the floor construction.

2.17 OPERATION AND CONTROL SYSTEMS (PASSENGER ELEVATORS)

2.17.1 Operation

****

NOTE: Only selective collective operation systems are specified because of their inherent advantages.

Select from the following two paragraphs whether individual or integrated operation is required. If individual or single elevator operation is required, delete the second paragraph and following paragraphs; if integrated multiple elevator unit operation is required, delete the first paragraph.

****

Operation system shall be the selective collective automatic type. Car shall automatically return to the first-floor landing after all calls have been satisfied, where it shall remain with doors open until either a car call or corridor call is registered. This will be referenced as "single selective collective operation."

Operation system shall be the multiple selective collective automatic type with each car operating under a system conforming to the definition of "selective collective automatic operation" with the following additional features under key-operated selector switch:

When no calls are registered, both cars are stationed at the first floor; one car shall be fully lighted, the other with 20 to 30 percent of the normal illumination. Car with reduced illumination shall display on its car station or at the rear of the car, near the ceiling, an illuminated sign, OTHER CAR PLEASE. When the fully lighted car leaves the first floor in response to a registered call, the illumination of the second car shall return to normal and the illuminated sign shall be deactivated.

When one car is standing in the ready position at the first floor landing while the other car is answering calls, the standing car shall respond to any corridor calls for up travel that are registered on

floors below the active elevator when it is traveling in the up direction; it shall also respond to any corridor calls for down travel that are registered on floors above the active elevator when the active elevator is traveling in the down direction.

First elevator to return to the first floor after both have been answering calls shall remain there unless there are unanswered up corridor calls registered on floors below the active elevator while it is traveling in the up direction, or unanswered down corridor calls from floors above the active elevator when it is traveling in the down direction.

When, with one elevator in the ready position at the first-floor landing, the second car arrives at the first-floor landing with all corridor calls answered, the second car shall become the reserve car with dimmed illumination and OTHER CAR PLEASE sign.

Keyed switches shall be provided to place the cars on single selective collective service and to remove either car from service while the other remains in single selective collective operation.

When in multiple selective collective operation, each car, after it has left the first floor landing in response to car or corridor calls, shall operate in "selective collective automatic operation" mode, which shall be referenced as "single selective collective operation."

2.17.2 Control Panel

A control panel or panels shall be provided and installed where indicated. Panels shall include relays, switches, and accessory electrical items necessary to the specified operation. Panels located in finished area shall be flush-mounted with covers finished in baked enamel in color indicated or as directed. If installed in corridors, lobbies, or other locations accessible to the public, panels shall be equipped with cylinder locks.

Control devices shall conform to Section 16286, "Overcurrent Protective Devices," and be UL listed.

2.17.3 Car Stations

Cars shall be equipped with an operating station incorporating individually illuminated operating push buttons numbered to correspond to the floors served, an EMERGENCY STOP switch, an emergency signal-device button or telephone, and light switches. Depressing a pushbutton shall produce illumination of that pushbutton from the rear; illumination shall continue until a stop has been made at the indicated floor.

Car station shall include DOOR OPEN and DOOR CLOSE buttons. Depressing the DOOR OPEN button shall temporarily open the doors unless car travel has started. Depressing the DOOR CLOSE button shall initiate the closing of doors, subject to the door-edge controls as specified.

****
NOTE: Delete the following paragraph if multiple selective collective operation is not to be used.
****

Car stations shall also incorporate key-operated INDEPENDENT SERVICE

operation switches and lighted OTHER CAR PLEASE sign switches.

2.17.4 Corridor Stations

A flush-mounted corridor station of a design consistent with the decor of the area and incorporating a rear-illuminated UP pushbutton shall be installed 42 inches 1065 millimeter above the floor, adjacent to the elevator, at the first floor landing. A matching station incorporating DOWN pushbutton shall be installed adjacent to the elevator at the top floor.

In the corridors of floors other than the first and top floors, corridor stations shall be installed, matching the one on the first floor but incorporating both UP and DOWN illuminated pushbuttons.

Face plates shall be metal, finished to match the adjacent exposed metal at entrances.

2.17.5 Car-Position Indicators

Car shall be equipped with a front overhead illuminated panel that identifies the floor being approached by the elevator; numerals shall be at least 1 inch 25 millimeter high and shall be of a lighting intensity that is easily readable from any point in the car under operating car lighting. Panels shall be 18-gage 1.3 millimeter Type 302 corrosion-resistant steel with an ASM No. 6 finish.

Each indication shall be illuminated from the rear by an individual light of sufficient intensity to permit easy reading of the numeral without glare. Light for each numeral shall be enclosed in a light-tight compartment which confines the light supply to the numeral it serves. Change of illuminations shall be continuous, shall be anticipatory of the floor being approached, and shall change as the car leaves the indicated floor.

2.17.6 Alarms

An emergency signal device shall be provided.

****

NOTE: ANSI code requires that outdoor alarms be provided for nonresidential buildings in which attendants, watchmen, or tenants are not continuously in the building and available to take action in case the emergency signal is operated. Otherwise, indoor alarms are permitted.

Code also permits the use of a car telephone connected to a central exchange system in either instance instead of alarms. Telephone lines must appear on the drawings.

One of the following three paragraphs shall be selected to define the system to be used.

Basic wiring for the emergency signal device, except that in the hoistway and the car, must be shown on the electrical drawings. Specifications of this section include only hoistway and car wiring for the

emergency signal.
****

[Emergency signal device shall be an indoor alarm bell installed either in the hoistway or behind a grille consistent with the decor of the area in which it is located.]

[An outside alarm bell shall be provided for buildings that are not continuously attended.]

[Provide vandal resistant speaker telephone meeting requirements of telephone system and ASME A17.1.]

Provide car and hoistway wiring in accordance with ASME A17.1 and Section 16145, "Standard Wiring Systems." Provide junction boxes for connection to wiring outside car and hoistway.

2.17.7 Elevator Leveling

Operation system shall include automatic accelerating when cars are leaving stops and decelerating as cars approach a floor where a stop is to be made.

Acceleration and deceleration rates shall be not less than 3 nor more than 5 feet per second 0.9 nor more than 1.5 meter per second. System shall be designed for automatic flush leveling of the car at each stop, controlled by a sensing system which, once set, requires no periodic adjustment.

Door operation shall be integrated with the car-leveling system in a way to make elevator start dependent upon prior complete closing of the car doors and the doors of the hoistway at the platform from which the elevator is departing. Opening of the car door shall begin when the car is in its last foot 300 millimeter of travel before a stop; hoistway door opening shall not begin until the car is at a complete stop.

Leveling tolerance, as measured by a 6-foot 1830 millimeter straightedge laid flat on the higher of the two surfaces, shall be plus or minus 1/8 inch 3 millimeter.

2.17.8 Button Control

Car buttons which are depressed shall remain illuminated until the car has made its stop at the indicated floor; the illuminated buttons on the car station shall show the stops still to be made by the car in the direction in which it is traveling or about to travel.

Corridor buttons which have been actuated to call for a car stop shall remain illuminated until a car traveling in the direction of desired service, as indicated by the illuminated call button, has made a stop at the floor where the button is located. When a car traveling in the indicated direction has stopped, the button illumination shall be extinguished.

2.17.9 Elevator Controls

Elevator car and corridor stations shall be placed at a maximum height of 48 inches 1220 millimeter from the floor, or a supplemental panel shall be provided to accommodate the physically handicapped.

Elevator-cab and landing call buttons shall be identified with braille

markings to accommodate personnel with vision impairment, as specified in ASME A17.1.

2.18 OPERATING SYSTEM (FREIGHT ELEVATORS)

Operating system shall be "single automatic operation." When the car is not in use, the momentary depression of a landing button shall close the door and gate and dispatch car to the landing from which the call originated. After the car is positioned at the landing, the car gate and the hoistway door shall open. Car shall remain at this landing until a button in the car or at one of the other landings is depressed.

In addition to the call button there shall also be a CLOSE DOOR button at each landing. Depressing this button shall close the doors when unloading is finished. Depressing the call button at the landing where the car is stationed with the door closed shall reopen the door. Depressing the call button at any other landing while the door is closed and the elevator parked shall dispatch the elevator to the landing from which the call originated. If a call is made at another landing while car doors are open, a buzzer shall sound in the elevator to warn the user; if the DOOR OPEN button in the elevator is not depressed within 30 seconds, doors shall close and the elevator shall proceed to the landing from which the call originated. If the DOOR OPEN button is depressed within 30 seconds after warning buzzer sounds, there shall be an interval of 60 seconds until the buzzer sounds again. If the DOOR OPEN button is not depressed within 30 seconds, the gate and door shall close and the elevator shall answer the unsatisfied landing call unless the path of door closure is obstructed in any way. Depressing the landing DOOR CLOSE button when the elevator is free to respond to a landing call shall immediately close the doors and start the elevator on the way to satisfying the call.

After the elevator is underway in response to the depression of a dispatch button in the car, no landing calls shall be answered until there are no unsatisfied car calls; car calls shall have precedence over landing calls.

Car station shall contain dispatch buttons for each landing, a red EMERGENCY STOP button to interrupt the elevator power circuit, a car light switch, a DOOR OPEN button, and a DOOR CLOSE button. DOOR OPEN button shall open the gate and doors unless the elevator is in motion. DOOR CLOSE is supplementary to the automatic closure of the gate and doors when a car dispatch or landing call button is depressed.

2.18.1 Alarm

An emergency-signal device shall be provided.

****

NOTE: ANSI code requires that outdoor alarms be provided for nonresidential buildings in which tenants, watchmen, or attendants are not continuously in the building and available to take action in case the emergency signal is operated. Otherwise, indoor alarms are permitted.

Code also permits the use of a car telephone connected to a central exchange system in either instance instead of alarms. Telephone lines must appear on the drawings. Select one of the following three paragraphs to define the system to be used.

Basic wiring for the emergency signal device, except in the hoistway and in the car, must be shown on the drawings. Specifications of this section include only hoistway and car wiring for the emergency signal.
****

[Emergency-signal device shall be an indoor alarm bell installed either in or adjacent to the hoistway. A red emergency pushbutton electrically connected to this bell shall be provided on the car station.]

[An outside alarm bell shall be provided for buildings that are not continuously attended. A red emergency pushbutton electrically connected to this bell shall be provided on the car station. Bell-cover design shall be consistent with the design level of the building and will be subject to approval.]

[Provide vandal resistant speaker telephone meeting requirements of telephone system and ASME A17.1.]

Provide car and hoistway wiring in accordance with ASME A17.1 and Section 16145, "Standard Wiring Systems." Provide junction boxes for connection to wiring outside car and hoistway.

2.18.2 Landing Stations

Pushbutton stations at the landings shall be equipped with a landing call button and a DOOR CLOSE button mounted on a suitable nonferrous plate flushmounted to the wall adjacent to the elevator entrance. Functions shall be as specified.

2.18.3 Elevator Leveling

Operation system shall include control of acceleration and deceleration to limit both to not less than 1 foot per second 0.3 meter per second nor more than 2 feet per second 0.6 meter per second under all loading conditions.

System shall provide automatic leveling of the car at each stop under all loading conditions. Leveling device shall be controlled by a position-sensing system that requires little adjustment with continued operation.

Door operation shall be integrated with the car-leveling system to make elevator start dependent upon prior complete closing of car gate and hoistway doors, and gate and door opening dependent upon prior elevator stop.

Leveling tolerance, as measured by a 6-foot 1830 millimeter straightedge laid flat on the higher of the two surfaces, shall be plus or minus 1/8 inch 3 millimeter under all loading conditions.

2.19 PAINTING

Paint materials shall meet referenced standards within this section.

Elevators for interior use shall be painted with the manufacturer's standard finish.

Elevators for exposed use shall be painted in accordance with Section 09970, "Coatings for Steel."

2.20 INSPECTION AND MAINTENANCE SWITCH

A key-operated inspection and maintenance switch whose closing deactivates the corridor buttons, cancels all car calls, and permits the operation of the car by continuous depression of the appropriate car station buttons shall be mounted on the control panel. This switch is required for passenger and freight elevators.

PART 3 EXECUTION

3.1 GENERAL

Install systems in accordance with the manufacturer's recommendations, and ASME A17.1.

Electrical wiring shall be in accordance with NFPA 70 and Section 16145, "Standard Wiring Systems."

Weld each connection between elevator structure, hoistway, and building in conformance with AWS D1.1/D1.1M.

In instances where removability is required, connection shall be with bolts conforming to ASTM A 325 ASTM A 325M.

Installation Drawings shall include hoistway layout in plan, in elevation, with guiderails, brackets, layout information, equipment room layout and design, and dimensions required by ASME A17.1.

3.2 TESTING

3.2.1 Testing Laboratory

Contractor shall employ an approved independent testing laboratory to conduct the tests as specified. Testing laboratory shall be experienced in and fully equipped for the testing procedures as specified. Contractor shall submit full and valid evidence of these qualifications, listing the equipment the laboratory has at its disposal and the elevator installations (in the past 5 years) they have tested in a manner similar to the one specified.

Weights required for testing will be furnished by the Government. Contractor shall arrange for their pickup, storage, and return.

3.2.2 Tests

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NOTE: Hydraulic oil purity test should include measurement of viscosity and ferrographic analysis to insure the oil is free from contaminates.

****

After completion of installation, the elevator shall be subjected to the following acceptance inspection and tests by the approved testing laboratory:

Inspection and tests required by applicable portions of ASME A17.1

A continuous-operating test in which the elevator under full-rated load is operated continuously for 1 hour over its entire operating range, stopping momentarily at every floor. There shall be no operational failure of any component. Temperature rise test shall ensure that the temperature within the driving machine enclosure shall not exceed 86 degrees F 27 degrees C above ambient temperature.

Hydraulic oil purity tests:

Viscosity value shall be within plus or minus 10 percent of the elevator manufacturer specifications. Ferrographic analysis shall show no particles over 5 microns in diameter and less than 25 ppm of particles less than 5 microns.

Contractor shall present certified copies of the results of tests required by Rule 1101.4 of ASME A17.1, that were conducted on identical equipment by an independent laboratory within the 2 previous years. Certified copies of the test results shall be accompanied by a certification by the manufacturer that the equipment installed is identical to that tested by the testing laboratory and reported by the laboratory in the submitted report of test results.

3.3 OPERATION AND MAINTENANCE

Provide [four] [_____] copies of Operation and Maintenance Manuals giving complete instructions for operation, inspection, testing, and maintenance of each system, including equipment malfunction checklists.

-- End of Section --