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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	(1999) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
ASTM A 666	(1999) Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
ASTM E 84	(2000a) Surface Burning Characteristics of Building Materials
ASTM E 152	(1981a) Fire Tests of Door Assemblies
ASTM F 1344	(1993) Specification for Rubber Tile

ASME INTERNATIONAL (ASME)

ASME A17.1	(1998a) Safety Code for Elevators and Escalators
ASME QEI-1	(1997) Standard for the Qualification of Elevator Inspectors

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

28 CFR 36	Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD 795	(Basic) Uniform Federal Accessibility Standards

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.11	(1999) IEEE Standard Metal-Oxide Surge Arresters for AC Power Circuits
IEEE C62.41	(1991; R 1995) 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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1998) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1449 (1996; Rev thru Dec 1999) Transient Voltage Surge Suppressors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Elevator System; G

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, and exhaust system with normal/emergency power, fire alarm, exhaust system, and normal/emergency power. Drawings shall show any revised building electrical system required to make supplied elevator system function as specified. Drawings shall contain complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operation and functions of system devices. Drawings shall include the appropriate sizing of electrical protective devices which are frequently different from National Electrical Code standard sizes.

SD-03 Product Data

Operator Training

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; G

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 4 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 8 weeks prior to date of beneficial occupancy. Data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended to be replaced and replacement interval required. Data shall include the appropriate sizing of electrical protective devices.

Framed Instructions

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

Test Procedures; G

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

SD-04 Samples

Finishes; G

Samples of materials and products requiring color or finish selection.

SD-06 Test Reports

Testing

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of installed system.

SD-07 Certificates

Qualifications

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

SD-10 Operation and Maintenance Data

Elevator System; G

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 28 CFR 36.

1.4.1 Elevator Schedule (Passenger)

Number of Elevators Required:	1.
Type:	Geared.
Service:	Passenger.
Capacity:	2,000 pounds.
Speed:	350 fpm.
Platform Size: (Nominal)	6'-0" wide by 5'-0" deep.
Clear Car Inside: (Minimum)	5'-8" wide by 4'-3" deep.
Net Travel:	96'-0".
Landings:	4.
Openings: Front	4.
Entrance Type:	Single speed horizontal sliding.

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 596'-0". The alternate landing or level shall be the 500'-0".

1.6 DELIVERY AND STORAGE

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

1.7 FIELD MEASUREMENTS

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

1.8 WARRANTY

Warranty service shall be provided for each elevator for a period of 12 months after date of acceptance by Contracting Officer. Warranty service shall be performed only by trained elevator mechanics during regular working hours, and shall include manufacturer's warranty requirements including but not limited to adjusting, labor and parts needed to keep the elevator in proper operation. Testing and adjustments shall be in accordance with the applicable provisions of ASME A17.1 and ASME A17.2. Emergency callback service shall be included and available 24 hours a day, 7 days per week, with an initial telephone response time of 1 hour and a response time of 4 hours for a mechanic to the site. Inspection and service for fire service operation 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 480 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 disconnect switch that will shutoff power to the elevator car lighting shall be provided in the elevator machine room adjacent to the elevator control panel.

2.1.5 Use of Asbestos Products

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

2.2 MISCELLANEOUS MATERIALS

2.2.1 Materials for Car Enclosures

Materials for car enclosures shall meet flame spread rating 0 to 75 and smoke development 0 to 450 as tested in accordance with requirements of ASTM E 84 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 and ASTM A 568.

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 and ASTM A 568.

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.

2.3 PASSENGER ELEVATOR CAR

2.3.1 Car Fronts

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

2.3.2 Car Doors

Car doors for passenger elevators shall be constructed from 16 gauge sheet steel and stainless steel cladding. Each door shall be sound-deadened and

reinforced to receive required operating mechanism and hardware, and have two removable door guides per panel. Seams, screws or binding strips shall not be visible from within the car. Threshold shall be extruded aluminum with grooves for door guides. Exposed 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. 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.

2.3.4 Walls

Walls for passenger elevators shall be 7 feet 11-1/2 inches high from floor to the underside of lighting fixtures. Side and rear panels shall be 16 gauge sheet steel panels. Lower portion of side and rear wall panels shall be provided with a 12 gauge stainless steel wainscoting from top of car base to a point 2 inches above top of handrail. Vent around base shall be provided.

2.3.5 Car Top, Ceiling and Light Fixtures

Car top for passenger elevators shall be manufactured from 12 gauge sheet steel and shall be not less than 5-1/2 inches 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 10 footcandles measured at the car threshold with the door closed. Part of car light fixture shall be removable to permit use of the emergency exit in top of

car.

2.3.6 Emergency Exit

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

2.3.7 Floor Finish

Floor finish for passenger elevators shall be 1/8 inch thick rubber tile conforming to ASTM F 1344 Class 1, homogeneous, black 12 inches square with raised round low profile studs with chamfered edges. 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, 6 inches high.

2.3.9 Handrails

Handrails for passenger elevators shall be mounted on rear wall and shall comply with ASME A17.1, FED-STD 795 and 28 CFR 36.

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.

2.3.12 Car Emergency Lighting System

Emergency car lighting system for passenger elevators shall consist of an emergency power pack on top of elevator and a remote lighting fixture inside elevator car located in 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 6 inch diameter alarm bell connected to the elevator alarm and emergency push-button.

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

c. Testing circuit and pilot light.

d. Low-wattage pilot light indicator.

e. Battery low-voltage disconnect.

2.3.12.2 Emergency Light Fixture

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

a. A minimum of two lamps capable of providing a minimum level of illumination of 1.0 footcandle at a point 4 feet above the floor, 1 foot in front of car station.

b. Fixture frame of stainless steel.

c. Frosted acrylic lenses, 1/4 inch thick.

2.3.12.3 Remote Light Fixture

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

2.3.13 Protection Pads

Car shall be provided with wall protection pads, with inconspicuous stainless steel pad hooks spaced not over 18 inches apart near ceiling. Pads shall be heavy quality fire-retardant treated canvas with two layers of sewn cotton batting with metal eyelets for each pad hook. Pads shall cover the entire wall surface except operating devices.

2.3.14 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 pounds and maximum number of persons allowed.

2.3.15 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. Car roller guides shall be not less than 6 inches in diameter.

2.3.16 Car Guide Rails

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

2.4 PASSENGER ELEVATOR HOISTWAY ENTRANCES

2.4.1 Hoistway Doors

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 ASTM E 152 and shall bear the label of an approved testing laboratory. Door panels shall be hollow metal type with plain panel design, not less than 1-1/4 inches thick with 16 gauge face sheet-steel and with 16 gauge sight guards. Each door shall be reinforced with continuous vertical members and filled with sound-deadening material. Doors shall be reinforced to accept the required operating mechanism and hardware. Doors shall have 2 removable door guides per panel. Seams, binding strips or screws shall not be visible from landing. Exposed steel shall be finished with rust-inhibitive primer and baked-enamel in a color to be selected, unless otherwise specified.

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 ASTM E 152 and shall bear the label of an approved testing laboratory. Frames for passenger elevators shall be formed 14 gauge sheet-steel with head and jamb in flush alignment and corners welded and ground smooth. 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 28 CFR 36 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 concrete hoistway construction.

2.4.5 Strut Angles

Strut angles for passenger elevators shall be structural steel of size not less than 3 by 3 by 3/16 inch extending from sill to concrete wall above and anchored to building structure with structural steel fastenings.

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 3/16 inch thick bolted to strut angles.

2.4.7 Door Rollers

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

2.4.8 Hanger Track

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

2.4.9 Covers and Guards

Hanger covers, dust covers, toe guards, and fascia plate shall be fabricated from 16 gauge reinforced steel and finished with baked-enamel. Hanger covers shall extend the full door travel and shall be mounted in sections for ease of servicing door hangers. Dust covers shall be provided over top terminal landing door only and shall be secured to hanger housing and building structure. Toe guards shall be secured to sill. Fascia plates shall be provided between each door hanger housing and sill.

2.5 PASSENGER ELEVATOR DOOR OPERATION

Car and hoistway doors for passenger elevators shall be operated simultaneously by an electric door operator. Doors shall operate smoothly in the opening direction and closing direction and be electrically or hydraulically cushioned to stop at both the full-open and full-closed position. Operators shall be high speed direct current, heavy-duty type providing an average door opening speed of 2-1/2 feet per second. Car and hoistway doors shall be opened and closed simultaneously in a maximum time of 7.0 seconds. When on automatic operation the door closing time shall not exceed 4.1 seconds and door closing force shall not exceed 30 pounds. Reversal of the doors when closing shall be accomplished by the "DOOR OPEN" button, car door safety edge, or interception of the photoelectric light beams. Doors shall be arranged so that doors can be opened manually in the event of power failure.

2.6 PASSENGER ELEVATOR OPERATING AND SIGNAL FIXTURES

2.6.1 General

Elevator fixtures and panels for passenger elevators shall be constructed of 1/8 inch 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 28 CFR 36 for passenger elevators only. Handicapped markings shall be integral with faceplate in accordance with FED-STD 795 and 28 CFR 36. 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 (0.03 inch) markings for the handicapped, and shall include a series of minimum 3/4 inch diameter 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 telephone. Operating buttons shall be vandal-resistant metal encased and embossed to permit illumination when a call is registered. Buttons shall be designed with 1/32 inch operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 3/16 inch beyond the faceplate and shall have beveled edges to prevent damage from side blows. Buttons and switches not required for automatic or fire service operation shall be key-operated and mounted on front-return car operating station. Elevator number and "NO SMOKING" shall be international symbol engraved on upper portion of car station. Operating panel in the car shall consist of a flush-mounted panel containing the following operating devices:

a. "DOOR OPEN" button.

b. "DOOR CLOSE" button.

c. Key-operated car fan/light switch.

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

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

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 6 inch diameter signal bell outside of elevator hoistway at top floor located as shown or as directed.

h. Key-operated independent operation switch.

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

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

k. Key-operated hospital emergency switch.

2.6.3 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 1/32 inch operating clearance to seat on faceplate in lieu of the button mechanism. Buttons shall have maximum protrusion of 3/16 inch 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 landing Elev. 596.0 in the Hall-Call station.

2.6.4 Direction Lanterns

Lanterns for passenger elevators shall be in accordance with FED-STD 795 and 28 CFR 36, and shall be provided in slide 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 1 inch high and 3/8 inchdiameter 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. Number corresponding to car position shall remain illuminated when motor drive is shut down.

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.

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

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

c. After car has moved to the designated landing car shall operate at rated speed to serve car and landing calls.

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 28 CFR 36.

2.9.3 Independent Service

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

2.9.4 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.

2.10 FIREFIGHTERS' SERVICE

Firefighter service shall be in accordance with ASME A17.1 for automatic elevators. Elevator lobby and machine room smoke detectors shall be photoelectric spot-type smoke detectors. Smoke detectors shall be powered from the building fire alarm system and shall be equipped with alarm contacts for connecting to the elevator control system and building fire alarm system. Elevator lobby and machine room smoke detectors shall be in accordance with Section 13851 FIRE ALARM DETECTION SYSTEM.

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 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 sheaves, suitable sheet metal guards with required service openings, sheave beams and supports to place deflector above machine room floor shall be provided as required.

2.11.3 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.

2.11.4 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.

2.11.5 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.

2.11.6 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 0.005 inches. Brake shoes shall be lined with a fireproof friction material shaped to shoes so that the drum will run free with normal clearance. Brake springs shall be helical and operated in compression and shall apply the brake when released by the magnet. Brake magnet shall be designed to release quickly.

The brake application shall be automatically controlled by magnetic retardation to obtain noiseless, smooth and gradual stops under all loading conditions. Release magnet coil circuit shall be opened by the various safety devices, power failure, failure of equipment to function in the proper manner for safe operation of car and upon normal stopping of the car.

2.11.7 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 10.3 seconds for a speed of 350 feet per minute. Time from door close to start of car motion shall not exceed 0.7 second with a balanced load. Cycle time, which is the time from start of door close to door fully open at the next typical floor, shall not exceed 17.3 seconds, with a maximum premature door opening of 3 inches from the floor for geared elevators with a speed of 350 feet per minute. Prior to the termination of maintenance period included in the Base Contract, elevators shall be readjusted as required to meet performance requirements. All performance times specified in this section are based on 36 feet floor height, and 3 feet 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 Solid-State Motor-Control

The following described system shall be a AC/DC conversion system using silicon controlled rectifiers to produce operating DC current. A system producing Variable Voltage Variable Frequency (VVVF) to produce AC operating currents may be substituted. Proposal for a VVVF system must provide a detailed specification for protection systems similar to the following and 2.13.3.1, 2.14, 2.15, and 2.16.

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 1449and 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.

2.13.3.1 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 3 feet of the building cable entrance. Fuses shall not be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

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

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

500 amperes.

2.16 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 150 feetof travel for 1:1 roping, or 130 feet 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 6 feet high, shall be provided as a protective guard at bottom of hoistway, except where the type of hoisting rope compensation prevents this type of installation.

2.19 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 1/4 inch.

2.20 BUFFERS

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

2.21 LUBRICATION POINTS

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

2.22 SEISMIC REQUIREMENTS

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

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 , 144 inches. Steel plate shims shall not be used for aligning equipment. Guide rail sections shall be joined rail sections, joined together in accordance with ASME A17.1. Guide rails shall be thoroughly cleaned and made smooth before elevator is put into operation. During installation machined 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 05501 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISION.

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 protected 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 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, 7 days prior to the time of performing the acceptance test, that the system is complete and is ready

for final acceptance testing. The Contractor after receiving written approval from the Contracting Officer will conduct a complete acceptance test of the system. Acceptance testing will be witnessed by a certified State of California Division of Industrial/Safety elevator inspector, provided by the Elevator Contractor. 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 20 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 14320

GATE ROOM UNDERHUNG CRANE

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SECTION 14320

GATE ROOM UNDERHUNG CRANE

PART 1 GENERAL

1.1 GENERAL INFORMATION

The work to be done under this section consists of furnishing all plant, equipment, labor and materials, and performing all work necessary to complete the design and to fabricate, deliver, erect, install, paint, and test the regulating outlet (RO) gate room underhung bridge crane complete with underhung beams, monorail beam, hoist and controls.

1.1.1 Specification Drawings

The specification drawings indicate the extent and general arrangement of the hoisting equipment in the RO gate chamber. The electrical requirements for the hoisting equipment shall be as specified in SECTION: ELECTRICAL WORK, GENERAL. Equipment shall fit into the space provided and shall allow adequate and acceptable clearance for servicing and maintenance. The materials and equipment shall be new and unused and shall be the products of reliable manufacturers regularly engaged in the manufacture of such equipment. Where two or more items of the same type of equipment are required, they shall be the product of the same manufacturer.

1.2 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 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

Shop drawings with sufficient details, technical data and descriptive data shall be submitted in accordance with SECTION 01330: SUBMITTAL PROCEDURES. Shop drawings shall show the hook

coverage limits, high hook elevations and low hook elevations for all hoists. Shop drawings shall also show the bridge beam, runway beams, including layout, beam size, and details of the beam supports and connections.

SD-05 Design Data

Design Calculations; G

Design calculations for both static and seismic loading conditions shall be submitted in accordance with SECTION SUBMITTAL PROCEDURES. Seismic loading conditions shall be in accordance with SECTION 13080: SEISMIC PROTECTION FOR MECHANICAL AND ELECTRICAL EQUIPMENT. The crane shall be designed and constructed to CMAA Class A requirements. Forces due to earthquake shall be accounted for in the design, based upon requirements in Section 13080 of these Specifications.

SD-07 Certificates

Manufacturer's Certification; G

Crane manufacturer shall submit certification that fabrication of the 15-ton bridge crane equipment meet the requirements of CMAA specifications, SECTIONS 05120 and 13080: STRUCTURAL STEEL AND MISCELLANEOUS METAL and SEISMIC PROTECTION FOR MECHANICAL AND ELECTRICAL EQUIPMENT.

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

Catalog data, parts lists, and operating and maintenance instructions for all equipment furnished under this section shall be submitted in accordance with SECTION 01330: SUBMITTAL PROCEDURES.

1.4 GUARANTEE

All hoisting equipment shall be warranted by the manufacturer to be free from defects in material, design, workmanship, installation, and operation for a period of five years from the date of acceptance thereof. Upon receipt of notice from the Contracting Officer of failure of this equipment during the warranty period, new replacement parts shall be furnished and installed promptly. Such repairs shall restore the operation of the hoisting equipment to its original level at no cost to the Government.

PART 2 PRODUCTS

2.1 NAMEPLATES

Each unit of operating equipment shall have the manufacturer's name, address and model number on a plate securely attached to the item of equipment. Equipment and material sizes, dimensions, quality or capacities shall not be less than those indicated, regardless of tolerances allowed in testing and rating Standards or Codes.

2.2 DESIGN STRESSES

2.2.1 Beam

The beam used for the bridge beam structure shall be sized to accommodate end trucks and trolleys according to manufacturer's instructions. Materials shall be properly selected for the stresses to which they will be subjected according to SECTION 05120: STRUCTURAL STEEL AND MIS-CELLANEOUS METAL and CMAA Specification No. 74. Load carrying parts shall be designed so that the calculated static stress in the material, based on rated load, shall not exceed 20 percent of the assumed average ultimate strength of the material. This limitation of stress provides a margin of strength to allow for variations in the properties of materials and under no condition should imply authorization or protection for user to load the hoist beyond capacity.

2.2.2 Runway Beam Sizes

Runway beam sizes shown on the drawings must be verified by the manufacturer; beam design calculations and certification must be submitted by the manufacturer for both static and seismic loading conditions as specified in SECTION 13080: SEISMIC PROTECTION FOR MECHANICAL AND ELECTRICAL EQUIPMENT. Particular care shall be used in designing the beams and anchorage/supports for the beams spanning across the open area of the vertical tower.

2.3 BRIDGE

A bridge girder standard I-beam shape shall be fabricated for attachment to the crane end trucks. Adequately sized gusset plates shall be used at the end truck connection. The bridge girder shall be fitted with end stops to limit the hoist trolley travel. An outrigger support of either a structural steel channel or an outrigger truss of fabricated structural angles shall be furnished and be connected to the main girder to provide lateral reinforcement which will also form a horizontal truss and will provide supports for the squaring shaft bearings. A heavy structural steel motor mount shall be fabricated at the center of the span supported by structural steel cross-members that connect the main girder to the outrigger girder.

2.4 END TRUCKS

End trucks shall be fabricated of structural channels, gusset plates, axle bearing blocks, and heavy U-shaped end plates. The end trucks shall be welded in jigs to form a rigid structure and are designed to hold each crane wheel in a fixed position to prevent flange friction that would otherwise occur if the truck wheels were permitted to oscillate. The crane trucks shall be jig-bored to assure perfect alignment of all axles and jack shafts. Removable safety plates shall be furnished which will be bolted to the heavy U-shaped end plate.

2.5 BRIDGE DRIVE

The bridge drive shall consist of a motor reducer specially designed for crane and hoist duty, mounted at the center of the span. The crane shall be propelled by means of steel shafting supported in self-aligning precision ball bearing pillow blocks with hardened steel pinions keyed to the shafting driving two wheels at each end truck. All connections shall be flexible couplings keyed to the shafting.

2.6 TRUCK WHEELS

Crown tread, single flange, heavy-duty truck wheels machined from ASTM A 504 steel shall be furnished on the crane. The crown tread wheels shall provide point contact essential for smooth, efficient operation. The steel wheels shall be bored and machined to accommodate the wheel bearings and snap ring bearing retainers.

2.7 GEARS AND PINIONS

The flanges of the steel driver wheels shall be machined and hobbed for gear service. Gear teeth shall be 14-1/2 degrees involute full depth. The end truck pinions shall be keyed to the jackshafts, hardened to a Rockwell C44-48.

2.8 BEARINGS

The crane wheels shall operate on precision double row, permanently lubricated ball bearings. The squaring shaft shall be supported on self-aligning precision ball bearings equipped with dust seals and grease fittings. Self-aligning squaring shaft bearings shall be used to prevent bearing damage that might otherwise occur due to stress set up by bridge deflection under an overload condition.

2.9 AXLES

Removable wheel axle shall be furnished. The removable axle will permit the assembly of the crane wheels after the end trucks have been welded into a rigid structure and been jig-bored. The removable axle feature shall permit the removal of any crane wheel without the need for dismantling the crane end truck or the removal of the crane from the runway.

2.10 COUPLINGS

The jack shafts of each truck, the bridge drive shafts, the motor shafts and the squaring shafts shall be connected by means of flexible couplings. The sprocket teeth of these couplings shall be hardened to provide long wear. Flexible couplings shall be used at these points to relieve the stress that might otherwise occur on the shafts and bearings in the event of bridge deflection under an overload condition. All couplings shall be keyed to the shafts.

2.11 BRIDGE MOTORS

The bridge motor shall be of NEMA standard crane duty, enclosed ball bearing type and 30 minute, 55 degree rating design. Single speed alternating current motors shall be the squirrel cage type. The squirrel cage rotor windings shall be designed for frequent starting duty. The stator windings will have the proper number of terminal leads carried into the terminal box to allow reconnecting of those motors for either of the above voltages.

2.12 CONTROLS

The Contractor shall be responsible to design and furnish all electrical components and controls for travelling, traversing and hoisting operations of the crane. Pendant pushbutton station for raise and lower, and trolley controls shall be furnished and installed on, and move with the hoist. Length of pendant cable shall be 4 feet above the floor when hanging free. Pendant shall be supported by means of a strain chain or wire rope cable of

corrosion resistant steel. Control shall include pushbutton station control, magnetic reversing motor starters and fused control transformers.

2.13 TRANSFORMER

In the case of alternating current, a transformer shall be furnished to reduce the pushbutton control circuit to 110 volts. This transformer shall have the proper number of input leads to allow reconnecting for either 220 or 440-volt service.

2.14 CRANE WIRING

The crane shall be wired throughout using insulated standard copper wire in conduit. The crane shall be wired to meet the standard of the National Electrical Code.

2.15 BRIDGE CONDUCTOR

Unless otherwise specified, bridge current conductors shall be provided. Conductors shall be festooned flat cable suspended from a track system along the span.

2.16 SAFETY FACTOR

The factor of safety shall be a minimum of five (5) on all mechanical parts in accordance with normal conservative practice. All structural materials used in the construction of this crane shall conform to the specifications adopted by the American Institute of Steel Construction. The girder selected shall be of such size that the stresses produced by the full rated load, together with the weight of the hoist and trolley, shall not exceed one-fifth of the ultimate of the materials employed.

2.17 BRIDGE CRANE

The hoist shall be designed for heavy-duty industrial use and shall be a wire rope electric hoist with a 15-ton capacity. The hoist shall be of the electric-driven trolley low headroom type. Hoist lift shall be 60 feet. Hoist lifting speed shall be 20 feet per minute. Hoist power shall be 460 volt, 3 phase. Bridge structure for the 15-ton bridge crane shall be an underhung, single girder fabricated assembly. End trucks shall have two wheels with one wheel on each truck driven by a common chain fall and shall allow bridge movement sufficient for the minimum coverage envelope as shown on the drawings. End trucks shall be custom designed as needed to accommodate the runway beams shown on the drawings. The ends of the bridge beam and runway beams shall be provided with end stops capable of stopping the hoist and the load at full traveling speed.

2.18 CORD REELS

A cord reel shall be furnished for each hoist with swivel-type mounting base, 340 degrees free rotation to follow hoist. The cord reel for the 15-ton bridge crane shall be supplied with adequate length of cable to enable about 150 feet crane travel. Cord reels shall include adjustable 4-roller cable outlet, guide, factory assembled modular type collector ring and brush block assembly for proper alignment and brush tension, and shall be weather protected.

2.19 BEAM CONNECTIONS

All bolted beam connections that are indicated or specified shall be assembled with high-strength bolts, nuts, and washers, which meet the requirements of ASTM A 325.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 General

The hoists, bridge beam, runway beams, and cord reels shall be installed in accordance with the manufacturer's printed instructions. The installation shall be accomplished by workers skilled in the type of work required. All equipment shall be properly and securely installed such that undue stresses are not exerted on the equipment and connections.

3.1.2 Runway Beam Brackets and Anchor Bolts

The Contractor shall design and furnish all brackets and anchors for the runway beams. The brackets shall be fabricated and bolted to the beams with high-strength bolts, nuts, and washers as specified in SECTION 05120: STRUCTURAL STEEL AND MISCELLANEOUS METAL. The Contractor shall provide drawings showing location of all anchor bolts. All anchor bolts shall be of stainless steel.

3.1.3 Crane

Once the crane has been installed and tested as specified in this section and have proved satisfactory, as determined by the Contracting Officer, the Contractor will be permitted to use crane for construction purposes. The Contractor shall provide power, maintenance, operators and other items required for use of the hoist and crane during construction, and shall assume responsibility for such use. The hoist and crane shall be operated in accordance with the requirements of the manufacturer's maintenance instructions. Upon completion of use and prior to acceptance, the Contractor shall, at no additional expense to the Government, completely check the crane and repair or replace any damaged parts and any parts which are worn beyond normal wear and tear. The crane shall then be completely serviced as specified herein. Each gear case shall have its lubricant replaced with new lubricant meeting the manufacturer's recommended specification. All other crane parts shall be lubricated, replaced or adjusted as recommended in the manufacturer's written annual maintenance procedure.

3.2 PAINTING

After the equipment has been manufactured, all non-corrosion-resisting surfaces shall be prepared and painted according to the requirements of System No. 2 described in SECTION 09940: PAINTING: HYDRAULIC STRUCTURES AND APPURTENANT WORKS. All painted surfaces shall be protected from abrasion or other damage at all times.

3.3 TESTING

With rated loads, the hoists shall be raised and lowered through the full ranges for at least two cycles and the operation of the trolleys and bridge drive observed over the full length of their travel and back. Any defects noticed shall be rectified by the Contractor to the satisfaction of the Contracting Officer without any extra cost.

3.4 TOOLS AND SPARE PARTS

3.4.1 Tools

One set of tools required for assembly or disassembly of any of the equipment being supplied shall be furnished on an approved tool board. A list of all such tools shall be submitted with the Bid.

3.4.2 Spare Parts

A set of spare parts as recommended by the manufacturer shall be supplied. All spare parts shall be duplicates of the original parts they are intended to replace. Each spare part shall bear a tag or label securely attached clearly identifying the component for which it is intended. Spare parts shall include as a minimum:

1. One spare set motor brushes.

2. One spare motor starter for each motor.

3. One spare switch of each type.

4. One spare wheel and wheel bearing of each type supplied.

A complete list and description of spare parts shall be submitted with the Bid.

3.5 SERVICES OF MANUFACTURER'S REPRESENTATIVE

The equipment supplier shall be required to provide one or more competent manufacturer's representatives who shall supervise and be responsible for the correctness of the Contractor's assembly procedures, method of alignment, installation of equipment and testing. When so requested, he shall also supervise and be responsible for initial starting and all subsequent operation of the equipment until the field tests are completed. The manufacturer's representative shall instruct the Contracting Officer for a minimum of one full day in the operation and maintenance features of the equipment. The manufacturer's representative shall cooperate fully with the Contractor, however, the work and operation of the manufacturer's representative shall be needed and the contractor shall be held responsible for any work done in the absence of the manufacturer's representative. Any errors in work done in the absence of the manufacturer's representative, or work which does not conform to the instructions issued by the manufacturer, shall be corrected at no cost to the Government.

3.6 QUALITY ASSURANCE

In accordance with the provisions of these contract documents, quality control shall be established and maintained for the hoisting equipment to assure compliance with the contract requirements.

-- End of Section --