

SECTION 14 2150

GEARLESS MACHINE-ROOM-LESS TRACTION ELEVATORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes seven gearless machine-room-less (MRL) traction elevators as follows:
 - 1. Building A:
 - a. One kitchen service elevator.
 - b. Two passenger elevators, Tenant 1 and Tenant 2.
 - 2. Building B:
 - a. One lobby shuttle passenger elevator.
 - b. Two passenger elevators, Tenant 3 and Tenant 4.
 - 3. Building C: One passenger elevator, Tenant 5.
- B. Products Installed but Not Furnished Under This Section:
 - 1. CCTV camera provisions.
 - 2. Elevator related security devices, control unit, mounting brackets, wiring materials, logic circuits, security system interface terminals, boxes, and relays.

1.2 REFERENCES

- A. Definitions: Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.
- B. American National Standard Institute (ANSI): A117.1, Accessible and Usable Buildings and Facilities
- C. American Society of Mechanical Engineers:
 - 1. ASME A17.1, Safety Code for Elevators and Escalators.
 - 2. ASME A17.2, ASME A17.5, ASME A17.6, ASME A17.7, Inspector's Manual for Electric Elevators.
- D. ASTM International:
 - 1. ASTM A36/A36M, Standard Specification for Carbon Structural Steel.
 - 2. ASTM A240.
- E. National Fire Protection Association (NFPA): NFPA 101, Life Safety Code.
- F. US Department of Justice: 2010 ADA Standards for Accessible Design.

1.3 SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems. Include product data for signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.
- B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating openings at each landing, control space layout, coordination with building structure, relationships with other construction, and locations of equipment.
 2. Include large-scale layout of car operating panel and standby power operation control panel.
 3. Indicate maximum dynamic and static loads imposed on building structure at points of support and maximum and average power demands.
 4. Power Confirmation Information: Include motor horsepower, code letter, starting current, full load running current, and demand factor. Provide maximum and average power consumption.
- C. Samples for Initial Selection: For finishes involving surface treatment, paint, or color selection.
- D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes:
1. Samples of sheet materials: 3" (75 mm) square.
 2. Running trim members: 4" (100 mm) lengths.
- E. Delegated Design Submittals:
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data:
1. For elevators to include in emergency, operation, and maintenance manuals.
 2. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard five-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
- 1.5 QUALITY ASSURANCE
- A. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
1. ASME A17.1.
 2. ASME A17.2.
 3. ASME A17.5.
 4. NFPA 70.
 5. 2010 ADA Standards for Accessible Design ANSI A117.1.
 6. Local Fire Authority.
 7. Requirements of most stringent provision of local authority having jurisdiction.
 8. NFPA101.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver material in Contractor's original unopened protective packaging.
- B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture

damage.

- C. Protect equipment and exposed finishes from damage and stains during transportation and construction.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
- B. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
- C. Warranty Period: One year from date of Substantial Completion.

1.8 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall provide twelve months full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of ninety minutes or less.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. MRL Systems:
 - a. KONE Incorporated: MonoSpace 500
 - b. Otis Elevator Company: Gen2 Underslung Series
 - c. Schindler Elevator Corporation: 5500
 - d. TK Elevator Corporation: EVO 200

2.2 ELEVATORS

- A. Building A: Gearless MRL Service Elevator: Building A, Kitchen Service Elevator
 - 1. Capacity: 4,000 lbs.
 - 2. Class of Loading: Class A
 - 3. Contract Speed: 150 fpm
 - 4. Roping: 2:1 Underslung
 - 5. Machine: Gearless
 - 6. Machine Location: Overhead machine-room-less
 - 7. Counterweight Location: Side
 - 8. Operational Control, Microprocessor-Based: Selective collective
 - 9. Stops and Openings: 3, all front
 - 10. Floors Served: B, P2A, 1A
 - 11. Minimum Clear Interior: 5'-8" wide x 7'-8" deep x 9'-0" high

12. Entrance Size: 4'-0" wide x 8'-0" high
 13. Entrance Type: Two-speed side-opening
- B. Building A: Two Gearless MRL Passenger Elevators: Building A, Tenant Elevators 1 and 2
1. Capacity: 4,000 lbs.
 2. Class of Loading: Class A
 3. Contract Speed: 200 fpm
 4. Roping: 2:1 Underslung
 5. Machine: Gearless
 6. Machine Location: Overhead machine-room-less
 7. Counterweight Location: Side
 8. Operational Control, Microprocessor-Based: Selective collective
 9. Stops and Openings:
 - a. Tenant 1: 7 front, 1 rear
 - b. Tenant 2: 8 front, 1 rear
 10. Floors Served:
 - a. Tenant 1: Front: B, P2A, 1A, 1-5; Rear: 1
 - b. Tenant 2: Front: B, P2, 1-6; Rear: 6
 11. Minimum Clear Interior: 7'-8" wide x 5'-5½" deep x 9'-0" high
 12. Entrance Size: 4'-0" wide x 8'-0" high
 13. Entrance Type: Single-speed center-opening
- C. Building B: Gearless MRL Lobby Shuttle Passenger Elevator: Building B, Lobby Shuttle
1. Capacity: 2,500 lbs.
 2. Class of Loading: Class A
 3. Contract Speed: 150 fpm
 4. Roping: 2:1 Underslung
 5. Machine: Gearless
 6. Machine Location: Overhead machine-room-less
 7. Counterweight Location: Side
 8. Operational Control, Microprocessor-Based: Selective collective
 9. Stops and Openings: 1 front, 2 rear
 10. Floors Served: Front: P1; Rear: P1, 1
 11. Minimum Clear Interior: 6'-8" wide x 4'-3½" deep x 9'-0" high
 12. Entrance Size: 3'-6" wide x 8'-0" high
 13. Entrance Type: Single-speed center-opening
- D. Building B: Two Gearless MRL Passenger Elevators: Building B, Tenant Elevators 3 and 4
1. Capacity: 4,000 lbs.
 2. Class of Loading: Class A
 3. Contract Speed: 200 fpm
 4. Roping: 2:1 Underslung
 5. Machine: Gearless
 6. Machine Location: Overhead machine-room-less
 7. Counterweight Location: Side
 8. Operational Control, Microprocessor-Based: Selective collective
 9. Stops and Openings:
 - a. Tenant 3: 10 front, 1 rear
 - b. Tenant 4: 10 front, 1 rear
 10. Floors Served:
 - a. Tenant 3: Front: B, P2-P1, 1-7; Rear: 7

- b. Tenant 4: Front: B, P2-P1, 1A, 2-6; Rear: 1
- 11. Minimum Clear Interior: 7'-8" wide x 5'-5½" deep x 9'-0" high
- 12. Entrance Size: 4'-0" wide x 8'-0" high
- 13. Entrance Type: Single-speed center-opening

E. Building C: Gearless MRL Passenger Elevator: Building C, Tenant Elevator 5

- 1. Capacity: 4,000 lbs.
- 2. Class of Loading: Class A
- 3. Contract Speed: 200 fpm
- 4. Roping: 2:1 Underslung
- 5. Machine: Gearless
- 6. Machine Location: Overhead machine-room-less
- 7. Counterweight Location: Side
- 8. Operational Control, Microprocessor-Based: Selective collective
- 9. Stops and Openings: 8 front, 7 rear
- 10. Floors Served: Front: P, 2-8; Rear: 1-7
- 11. Minimum Clear Interior: 7'-8" wide x 5'-5½" deep x 9'-0" high
- 12. Entrance Size: 4'-0" wide x 8'-0" high
- 13. Entrance Type: Single-speed center-opening

2.3 MATERIALS

A. Steel:

- 1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
- 2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
- 3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 302, 304, or 441 complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.

- 1. No. 4 Satin: Directional polish finish. Graining directions as shown or, if not shown, in longest dimension.
- 2. Textured: .050" mean pattern depth with bright directional polish (No. 4 satin finish).
 - a. 5WL as manufactured by Rigidized Metals.
 - b. 5-SM as manufactured by Rimex Metals.
- 3. Burnished: Non-directional, random abrasion pattern.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick, color and texture as follows:

- 1. Exposed Surfaces: Color and texture selected by Architect.
- 2. Concealed Surfaces: Manufacturer's standard color and finish.

E. Fire-Retardant Treated Particle Board Panels: Minimum 3/4" thick backup for natural finished wood and plastic laminate veneered panels, edged and faced as shown, provided with suitable anti-warp backing; meet ASTM E84 Class "I" rating with a flame-spread rating of 25 or less, registered with Local Authorities for elevator finish materials.

- F. Natural Finish Wood Veneer: Standard thickness, 1/40" thoroughly dried conforming to ASME/HPMA HP-1983, Premium Grade. Place veneer, tapeless spliced with grain running in direction shown, belt, and polish sanded, book-matched.
 - 1. Species and Finish: As shown on Drawings.
- G. Paint Finishes, General: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. Galvanized metal need not be painted.
- H. Prime Finish: Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.
- I. Baked Enamel Finish: Prime finish per above. Unless specified "prime finish" only, apply and bake two additional coats of enamel in the selected solid color.

2.4 CAR AND GROUP PERFORMANCE

- A. Car Speed: $\pm 3\%$ of contract speed under any loading condition.
- B. Car Capacity: Safely lower, stop and hold 125% of rated load.
- C. Car Stopping Zone: $\pm 1/4$ " under any loading condition.
- D. Door Times: Seconds from start to fully open or fully closed:
 - 1. Kitchen Service Elevator: Door Open: 3.5 seconds. Door Close: 5.4 seconds.
 - 2. Tenant Elevators 1-5: Door Open: 2.7 seconds. Door Close: 3.7 seconds.
 - 3. Lobby Shuttle Elevator: Door Open: 2.1 seconds. Door Close: 2.9 seconds.
- E. Car Floor-to-Floor Performance Time: Seconds from start of doors closing until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors, and car is level and stopped at next successive floor under any loading condition or travel direction:
 - 1. Kitchen Service Elevator: 12.8 seconds (8'-9" average floor height).
 - 2. Tenant Elevators 1-5: 11.5 seconds (12'-0" typical floor height).
 - 3. Lobby Shuttle Elevator: 10.7 seconds (12'-0" typical floor height).
- F. Car Ride Quality:
 - 1. Acceleration and Deceleration: Smooth constant and not less than 2.5 feet/second² with an initial ramp between 0.5 and 0.75 second.
 - 2. Sustained Jerk: Not more than 6 feet/second³.
 - 3. Horizontal and vertical acceleration within car during all riding and door operating conditions. Not more than 15 mg peak-to-peak (adjacent peaks) in the 1-10 Hz range.
 - 4. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.
- G. Noise and Vibration Control:
 - 1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed. Limit noise level in the control space relating to elevator equipment and its operation to no more than 80 dBA. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the "A" weighted scale.
 - 2. Vibration Control: All elevator equipment shall be mechanically isolated from the building

structure and other components to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.

2.5 OPERATION

A. Collective Microprocessor-Based, All Elevators:

1. Operate car without attendant from pushbuttons in car and at each floor. When car is available, automatically start car, and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
2. Reverse car direction only when all car calls have been answered, or all hall and car calls ahead of car and corresponding to the direction of car travel have been answered.
3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

B. Other Items:

1. Load Weighing: Provide means via cable tension monitors for weighing car passenger load. Control system to provide dispatching at main floor in advance of normal intervals when car fills to capacity. Provide hall call by-pass when the car is filled to preset percentage of rated capacity and traveling in down direction. Field adjustment range: 10% to 100%.
2. Independent Service: Provide controls for operation of each car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.

C. Firefighters' Service: Provide equipment and operation in accordance with code requirements.

D. Automatic Car Stopping Zone: Stop car no more than 1/4" above or below the landing sill. Maintain stopping accuracy regardless of load in car, direction of travel, distance between landings, hoist rope slippage or stretch.

E. Motion Control: Microprocessor-based AC variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking. Limit the difference in car speed between full load and no load to not more than $\pm 3\%$ of the contract speed.

F. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum five-year life expectancy. Provide constant pressure test button in service compartment of car operating panel. Provide lighting integral with portion of normal car lighting system.

G. Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, close doors.

H. Standby Power Operation: Upon loss of normal power, adequate standby power will be supplied via building electrical feeders to start and run one car in group simultaneously at contract car speed and capacity.

1. Automatically return cars, nonstop to designated floor, open doors for approximately 3.0 seconds, close doors, and park car. During return operation, car and hall call pushbuttons shall be inoperative. As cars park, system shall immediately select the next car until all cars have returned to the designated floor. If a car fails to start or return within 30 seconds, system shall automatically select the next car in the group to return.
 2. When all operable cars have returned to the designated floor, one car in each group shall be designated for automatic operation. When demand exists for 30 seconds and designated car fails to start, next available car in the group shall be automatically selected for operation.
 3. Provide separate group selection switches in firefighters' control panel.
 - a. Switches shall be labeled "STANDBY POWER OVERRIDE" with positions marked "AUTO" and appropriate car numbers controlled by each respective switch. Key shall be keyed the same as from the key utilized for firefighters' Phase I and II key switch. Key shall be removable in "AUTO" position only.
 - b. Switch shall override automatic return and automatic selection functions and cause the manually selected car to operate. Manual selection shall cause car to start and proceed to designated floor and open and close its doors before standby power is manually transferred to next selected car.
 - c. Provide "STANDBY POWER" indicator lights, one per car, in firefighters' panel. Indicator light illuminates when corresponding car is selected, automatically or manually, to operate on standby power.
 4. Provide control logic, conduit, and wiring to provide required sequences, between all cars and groups.
 5. Successive Starting: When normal power is restored or there has been a power interruption, individual cars in each bank shall restart at five-second intervals.
- I. Card/Proximity Reader Security System: Provide provisions inside all elevators for reader unit. Mount reader unit as directed by Architect and make cross connects to card reader terminal interface and relays in equipment space. Elevator control systems shall provide output signal of selected floor to facilitate system tracking of floor access.

2.6 EQUIPMENT SPACE

- A. Arrange equipment in spaces shown on drawings.
- B. Solid State Power Conversion and Regulation Unit: Provide solid-state, alternating current, variable voltage, variable frequency (ACV³F), IGBT converter/inverter Power Factor1 drive.
1. Design unit to limit current, suppress noise, and prevent transient voltage feedback into building power supply. Provide internal heat sink cooling fans for the power drive portion of the converter panels. Conform to IEEE standards 519-1992 for line harmonics and switching noise.
 2. Mechanically isolate unit to minimize noise and vibration transmission.
 3. Provide isolation transformers, filter networks, and choke inductors.
 4. Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative transients induced into the mainline feeders or the building standby power generator.
 5. Supplemental direct-current power for the operation of hoist machine brake, door operator, dispatch processor, signal fixtures, etc., from separate static power supply.
 6. ACV³F drives shall be regenerative and utilize IGBT converter/inverter and dynamic braking during overhauling condition.
- C. Encoder: Direct drive, solid-state, digital type. Update car position at each floor and automatically restore after power loss.

- D. Controller: UL/CSA labeled. Locate in control space provided.
1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.
 2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
 3. Microprocessor Hardware:
 - a. Provide built-in noise suppression devices that provide a high level of noise immunity on all solid-state hardware and devices.
 - b. Provide power supplies with noise suppression devices.
 - c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
 - d. Design control circuits with one leg of power supply grounded.
 - e. Safety circuits shall not be affected by accidental grounding of any part of the system.
 - f. System shall automatically restart when power is restored.
 - g. System memory shall be retained in the event of power failure or disturbance.
 - h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
 4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
 5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
- E. Machine and Equipment Support Beams: Rail supported.
1. Isolate machine and overhead sheave beams to prevent noise and vibration transmission to building structure.

2.7 HOISTWAY EQUIPMENT

- A. Gearless Traction Hoist Machine:
1. AC induction or P.M.S.M. ACV³F gearless traction type motor with brakes, drive sheave, and deflector sheave mounted in proper alignment on a common, isolated bedplate.
 2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
- B. Machine and Equipment Support Beams: Rail supported or structural by Elevator Contractor.
1. Provide structural steel beams required for direct support of and attachment to building structure of hoist machine, deflector sheaves, overhead sheaves, governor, and hoist rope dead-end hitch assemblies.
 2. Provide bearing plates, anchors, shelf angles, blocking, embedment, etc., for support and fastening of machine beams or equipment to the building structure.
 3. Isolate machine and overhead sheave beams to prevent noise and vibration transmission to building structure.
- C. Governor: Centrifugal-type, car driven with pull-through jaws and bi-directional shutdown switches. Provide required bracketing and supports for attachment to building structure. Provide ladders and platforms with handrails and toeboards if required for governor access. Provide remote reset capability.
- D. Emergency Brake: Provide means to prevent ascending car over-speed and unintended car movement per Code.

- E. Guide Rails:
 - 1. Planed steel T-sections for car and counterweight of suitable size and weight for the application, including seismic reactions, including brackets for attachment to building structure. No additional structural points of attachment other than those shown on the Contract Documents will be provided.
 - 2. Provide any additional structural steel or supports to achieve code-required rail deflection limits, as required by manufacturer's design and system. Provide intermediate structural supports as required for manufacturer's design and system. No additional structural points of attachment other than those shown on the Contract Documents will be provided.
- F. Buffers: Spring type with blocking and support channels.
- G. Sheaves: Machined grooves and sealed bearings. Provide mounting to machine beams, machine bedplate, car and counterweight structural members, or building structure.
- H. Counterweight: Steel frame with metal filler weights.
- I. Counterweight Guide Shoes: solid guides with oilless inserts.
- J. Counterweight Guard: Metal guard in pit.
- K. Governor Rope and Encoder Tape Tensioning Sheaves: Mount sheaves and support frame on pit floor or guide rail. Provide frame with guides or pivot point to enable free vertical movement and proper tension of rope and tape.
- L. Suspension Means:
 - 1. 8 x 19 or 8 x 25 Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated wedge type shackles.
 - 2. Coated, flat belt with imbedded steel cables.
- M. Terminal Stopping: Provide normal and final devices.
- N. Electrical Wiring and Wiring Connections:
 - 1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the equipment space.
 - 2. Conduit: Galvanized steel conduit, EMT, or duct. Flexible conduit length not to exceed 3'-0". Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
 - 3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
 - a. Provide five pair of shielded wires of minimum 18-gauge for card reader.
 - b. Provide for CCTV two pair of shielded 18-gauge wire within traveling cable from car controller to car top junction box, plus 3'-0" excess loop at both ends.
 - c. Provide two pair of 18-gauge wire for CCTV power.
 - d. Provide four pair of spare shielded communication wires in addition to those required to connect specified items.
 - e. Tag spares in equipment space. Provide cables from controller to car top.
 - 4. Auxiliary Wiring: Provide conduit, wiring and connections for fire alarm initiating devices, emergency two-way communication system, CCTV, card reader interface terminals and

relays, intercom, from equipment space junction box to each car controller in equipment space.

O. Entrance Equipment:

1. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.
2. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.
3. Door Interlocks: Operable without retiring cam. Paint interlock box flat black.
4. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to insure smooth, quiet mechanical close of doors.

P. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors and hoistway fascia visible from within car.

2.8 HOISTWAY ENTRANCES

A. Complete entrances bearing fire labels from a certified testing laboratory approved by authority having jurisdiction.

B. Frames: 14-gauge hollow metal at all floors. Bolted and lapped head to jamb assembly at all floors. Provide Arabic floor designation/Braille plates, centered at 60" above finished floor, on both side jambs of all entrances. Provide plates at main egress landing with "Star" designation. For designated emergency car, provide "Star of Life" cast designation plates at height of 78"-84" above finished floor on both side jambs at all floors. Braille indications shall be below Arabic floor designation. Provide cast floor designation/Braille plates as manufactured by SCS Elevator Products, Inc. with permanent rear fasteners.

C. Door Panels: 16-gauge steel, formed construction without binder angles. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs.

D. Sight Guards: 14-gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges.

E. Sills:

1. Passenger Elevators: Extruded stainless steel.
2. Service Elevator: Extruded stainless steel.

F. Sill Supports:

1. Structural or formed steel designed to support door sill based upon car loading classification.
2. Mount to eliminate need for grout under the sill.
3. Kitchen Service Elevator: Provide 5" x 5" x 1/2" structural steel angle, extending full width of hoistway. Fasten to building structure at maximum 18" O.C.

G. Fascia, Toe Guards, and Hanger Covers: 14-gauge furniture steel with Contractor's standard finish. Delete fascia for and provide car door interlock to prevent opening of car doors outside the unlocking zone.

H. Struts and Headers: Provide all support of entrances and related material to building structure. Provide door open bumpers on entrances equipped with vertical struts.

- I. Elevator Identification Signage: Provide alpha-numerical car label at designated floor. Provide metal plate, finish to match designated fixture finish.
- J. Finish of Frames and Doors: Satin finish stainless steel.
- K. Hoistway Access:
 - 1. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.
 - 2. Hoistway Access Switches: Mount in entrance frame side jamb at top and bottom floors. Provide switch without faceplate.

2.9 CAR EQUIPMENT

- A. Frame: Welded or bolted, rolled, or formed steel channel construction to meet load classification specified.
- B. Safety Device: Type “B” flexible guide clamp.
- C. Platform: Isolated type, constructed of steel, or steel and wood that is fireproofed on underside. Design and construct to accommodate load classification requirements. Provide Class “A” construction for passenger elevators, Class “A” construction for service elevator. Provide recess to accommodate a minimum 2" floor thickness. Allow 500 lbs. for floor weight.
- D. Platform Apron: Minimum 14-gauge steel, reinforced and braced to car platform, front and rear, with Manufacturer’s standard finish.
- E. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe.
- F. Finish Floor Covering: Furnished under other sections.
- G. Sills: One-piece extrusion with extruded extension between car entrance columns to face of car front return. Extruded extension to match finish of sill.
 - 1. Passenger Elevators: Stainless steel.
 - 2. Service Elevator: Stainless steel.
- H. Door Panels: 16-gauge steel, formed construction without binder angles. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs.
- I. Door Hangers: Two-point suspension. Hanger roller with non-metallic surface and eccentric roller adjustment.
- J. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.
- K. Door Header: Construct of minimum 12-gauge steel, shape to provide stiffening flanges.
- L. Door Electrical Contact: Prohibit car operation unless car door is closed. Provide car door interlock to prevent opening of car doors outside the unlocking zone.
- M. Door Clutch: Heavy-duty clutch, linkage arms, vane assembly and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, with hoistway doors open.

- N. Restricted Opening Device: Provide mechanical car-door restrictor to prevent opening of doors when outside unlocking zone.
- O. Door Operator: High-speed heavy-duty door operator capable of opening doors at no less than 2.5 fps. Accomplish reversal in no more than 2½" of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Provide a minimum of four controller-based motion profiles, per floor, per door, to maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.
- P. Door Reversing Device:
1. Infrared Reopening Device: Black fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open.
 2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0-25.0 seconds), warning signal shall sound, and doors shall attempt to close with a maximum of 2.5 foot-pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
 3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0-1.5 seconds after beams are reestablished.
 4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
 - a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
 - b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use hall call time when car responds to coincidental calls.
- Q. Car Operating Panel:
1. Passenger: One car operating panel without faceplate, consisting of a metal box containing the vandal resistant operating fixtures, mounted behind one car swing front return panels constructed of No. 4 satin finish stainless steel.
 - a. Provide "door open" button to stop and reopen doors or hold doors in open position.
 - b. Provide "door close" button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters' operation.
 - c. Locked panel including Phase II fire access switch and hidden floor buttons, call cancel button, door open, door close, switch, stop switch, light jewel, within locked panel, for fire officer use and use of car on independent service only.
 - d. Provide a lockable service panel with recessed, flush cover plate matching return panel. Cabinet door shall be provided with a flush horizontal window of required size to hold elevator operating permit. Include the following controls:
 - 1). Inspection switch, per code, for disconnecting automatic operation, limiting the car speed and activating hoistway access switch when car is at terminal landing.
 - 2). Light switch.
 - 3). Two-position fan switch.
 - 4). Independent service switch to permit selection of independent or automatic operation.
 - 5). Duplex 120-volt, AC, electrical convenience outlet.
 - 6). Emergency light test switch.

- 7). Selection switch for automatic or manual fan and light shut down.
 - 8). One spare toggle.
 - e. Provide black paint filled engraving to meet applicable code as follows:
 - 1). Elevator number and capacity in pounds on service cabinet door.
 - 2). Provide building location on near telephone.
 2. Service: One car operating panel without faceplate, consisting of a metal box containing the vandal resistant operating fixtures, mounted behind the car swing front return panel. constructed of No. 4 satin finish stainless steel.
 - a. Provide “door open” button to stop and reopen doors or hold doors in open position.
 - b. Provide “door close” button to activate door close cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters’ operation.
 - c. Locked panel including Phase II fire access switch and hidden floor buttons, call cancel button, door open, door close, switch, stop switch, light jewel, within locked panel, for fire officer use and use of car on independent service only.
 - d. Provide a lockable service panel with recessed, flush cover plate matching return panel. Cabinet door shall be provided with a flush horizontal window of required size to hold elevator operating permit. Include the following controls:
 - 1). Inspection switch, per code, for disconnecting automatic operation, limiting the car speed and activating hoistway access switch when car is at terminal landing.
 - 2). Light switch.
 - 3). Two-position fan switch.
 - 4). Independent service switch to permit selection of independent or automatic operation.
 - 5). Duplex 120-volt, AC, electrical convenience outlet.
 - 6). Emergency light test switch.
 - 7). Selection switch for automatic or manual fan and light shut down.
 - 8). One spare toggle.
 - e. Provide black paint filled engraving to meet applicable code as follows:
 - 1). Elevator number and capacity in pounds on service cabinet door.
 - 2). Provide building location on near telephone.
 - R. Control Station: Mount to provide safe access and utilization while standing on car top.
 - S. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top and bottom of car. Include on/off switch and lamp guard.
 - T. Communication System:
 1. Two-way telecommunication instrument in car with automatic dialing, tracking, and recall features, with shielded wiring to car controller in equipment space. Provide dialer with automatic rollover capability with minimum two numbers.
 - a. Actuate two-way communication via “Help” button.
 - b. Button or adjacent light jewel shall illuminate and flash when call is acknowledged.
 - c. Button shall match car operating panel pushbutton design.
 - d. Provide “Help” button tactile symbol, engraved signage, and Braille adjacent to button mounted integral with car front return panel.
- 2.10 CAR ENCLOSURE
- A. Passenger Elevators: Provide complete as specified herein and detailed on architectural drawings. Maximum weight of finishes will be 800 lbs.
 1. Shell: Reinforced furniture steel formed panels with baked enamel interior finish as selected. Apply sound-deadening mastic to exterior. Provide concealed ventilation cutouts.

2. Canopy: Reinforced furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white baked enamel.
3. Front and Rear Return Panels and Integral Entrance Columns: Reinforced minimum 14-gauge satin stainless steel. Swing entire unit on substantial pivot points (minimum three) for service access to car operating panels. Locate pivot points to provide full swing of front return panel without interference with side wall finish or handrail. Secure in closed position with concealed three-point latch. Provide firefighters' and service compartments with recessed flush cover and cutouts for operating switches, etc.
4. Transom: Reinforced minimum 14-gauge satin stainless steel full width of enclosure.
5. Car Door Panels: Reinforced minimum 16-gauge satin finish stainless steel. Same construction as hoistway door panels.
6. Base: Stainless steel with concealed ventilation cutouts.
7. Interior Wall Finish: Include allowance of \$20,000 and 800 lbs. for interior car finishes.
8. Ventilation: Morrison Products, Inc., or equal, two-speed model exhaust blower mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet noise and vibration criteria.
9. Lighting: Provide as part of the car finish allowance above. Coordinate with emergency lighting requirements.
10. Suspended Ceiling: Special design included in allowance in Item 7 above.
11. Handrails: Minimum 1¼" diameter stainless steel tubular grab bar with backing plates and captive nuts across side walls. Bolt rails through car walls from back and mount on 1½" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls.
12. Pads and Buttons, All Tenant elevators: Three-piece removable pads. Two pads covering side walls and adjacent front returns and one covering rear wall. Provide cutouts to access main car operating panel.

B. Kitchen Elevator: Provide complete as specified herein.

1. Shell: Reinforced textured finish stainless steel formed panels no more than 18" wide with light-proof joints. Apply sound deadening mastic to exterior.
2. Canopy: Reinforced furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white reflective baked enamel.
3. Front and Rear Return Panels and Transom: Reinforced minimum 14-gauge satin finish stainless steel.
4. Car Door Panels: Reinforced minimum 16-gauge satin finish stainless steel. Same construction as hoistway door panels.
5. Ventilation: Morrison Products, Inc., or equal, two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet noise and vibration criteria.
6. Lighting: Minimum six LED fixtures flush mounted in canopy with protective diffuser and steel guard over fixtures on car top.
7. Handrails/Guardrails: Two lines. Top handrail line minimum 1½" diameter stainless steel grab bar with backing plates and captive nuts. Lower guardrail line 4" x 3/8" solid stainless steel flat stock bars mounted on both sides of the car. Locate bottom guardrail line at 8" above car floor and handrail line at 32" above the car floor. Bolt rails through car walls from back and mount on 1½" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls.

2.11 HALL CONTROL STATIONS

- A. Pushbuttons: Provide one riser per elevator with flush mounted faceplates. Include pushbuttons for each direction of travel that illuminate to indicate call registration. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency as part of faceplate. Pushbutton design shall match car operating panel pushbuttons. Provide vandal

resistant pushbutton and light assemblies. Provide LED illumination.

- B. Lobby Fixture: For all groups and individual elevators, include Phase I Fire Service fixture, including keyswitch, engraved operating instructions and illuminating jewel, illuminating jewels indicating standby power status, elevator communication failure keyswitch and jewel, and intercom station in a single faceplate at Lobby. Coordinate location with the Architect.

2.12 SIGNALS

- A. Car Direction Lanterns, All Elevators:
 1. Provide flush-mounted car lantern in all car entrance columns.
 2. Illuminate up or down LED lights and sound tone once for up and twice for down direction as doors open.
 3. Sound level shall be adjustable from 20-80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor.
 4. Provide adjustable car door dwell time to comply with ADA requirements relative to hall call notification time.
 5. Car direction lenses shall be arrow shaped without faceplates.
 6. Lenses shall be minimum 2½" in their smallest dimension.
 7. Kitchen Elevator: Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.
- B. Car Position Indicator: Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 1/2" high to indicate floor served and direction of car travel. Locate fixture in above each car operating panel. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel.
- C. Faceplate Material and Finish: Satin finish stainless steel all fixtures. Tamper resistant fasteners for all fastenings exposed to the public.
- D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.
- E. Passenger Elevators: Voice Synthesizer: Provide electronic device with easily reprogrammable message and female voice to announce car direction, floor, emergency exiting instructions, etc.

2.13 INTERCOM SYSTEM

- A. General: Provide intercommunication system for all cars. Include all wiring between elevator hoistways and control panels. Include the following stations:

Station Location	Type Station	Selection Buttons to Call
Elevator Equipment Space	Master	Control Panels, All Cars
Lobby Control Panel	Master	Equipment Space, All Cars
Cars (All)	Remote	

- B. Basic Equipment:
 1. Amplifier providing static-free voice transmission with adequate volume and minimum distortion at all stations,
 2. Master Stations:

- a. Speaker-microphone combination and/or handset for two-way communication.
 - b. Selection buttons to enable communication with all master stations. Maintain continual reception of hands-free reply from station when a selected button is depressed.
 - c. Two-Position "Talk/Listen" Button: Press to talk; release to listen.
 - d. Illuminate "in use" light when any master station is being used.
 - e. Reset button to make system available for use by any master station.
 - f. Volume control knob for adjustment of incoming volume.
 - g. Button to establish communications with all stations.
3. Remote Stations:
- a. Locate car microphone and speaker or transceiver/speaker combination in car canopy with shielded wiring to equipment space junction box.
- C. Station Housings:
1. House master station in equipment space in a metal compartment with baked enamel finish. Attach to the group elevator supervisory control panel or wall mount. Provide communication handset with 25'-0" long cord.
 2. Provide control center master intercoms with No. 4 satin finish stainless steel faceplates and engraved operating instructions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to beginning installation of equipment examine hoistway and equipment space areas. Verify no irregularities exist that affect execution of work specified.
- B. Verify electrical power location and characteristics in coordination with equipment requirements.
- C. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

- A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.
- B. Install equipment space equipment with clearances in accordance with referenced codes and specification.
- C. Install all equipment so it may be easily removed for maintenance and repair.
- D. Provide any required hoisting/safety beams. Remove if beams are encroaching on code clearances prior to final acceptance.
- E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.
- F. Remove oil, grease, scale, and other foreign matter from all equipment and apply one coat of field-applied machinery enamel for all equipment and metal work installed that does not have a factory applied paint or architectural finish. Neatly touch up damaged factory-painted surfaces with original paint color to protect factory finished surfaces against corrosion.
- G. Fill hoistway door frames, back boxes for hallway stations and signal devices, and sills.
- H. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.
- C. Independent review by Owner's Consultant.

3.4 ERECTION TOLERANCES

- A. Install rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure joints without gaps and file any irregularities to a smooth surface.

3.5 ADJUSTING

- A. Static balance car to equalize pressure of guide shoes on guide rails. Dynamically balance car and counterweight.
- B. Lubricate all equipment in accordance with Contractor's instructions.
- C. Adjust motors, power conversion units, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve specified performance levels.

3.6 CLEANING

- A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.
- B. Remove all loose materials and filings resulting from work.
- C. Clean equipment space equipment and floor.
- D. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.
- E. Clean pit equipment and floor.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate.
- B. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION