

SECTION 14 21 01 – MACHINE ROOM LESS PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The DFW Design Standards shall be considered part of the specification package and compliance with those documents is required.

1.2 SUMMARY

- A. Work Included: Provide materials, labor, and services necessary for the safe, orderly, professional, and complete installation, including operational verification, of four (4) MRL gearless traction elevators as shown and specified.

1.3 GENERAL REQUIREMENTS

- A. Respondent must clearly identify all exceptions, clarifications, or other variations from contract documents, citing the affected requirement by version date, sheet or section, paragraph or detail and page, providing the proposed substitution, alternative or economic credit represented in their response, prominently and conspicuously displayed with underline, or highlight, adjacent to or referenced in their offer pricing.
- B. Error in or conflict among requirements not specifically identified in the response shall be resolved by application of the most stringent and / or beneficial to the Owner, at the sole determination of the Design Team.

1.4 RELATED WORK:

- A. The work listed below pertains to all elevators and shall be provided and performed by contractors other than the elevator contractor, unless otherwise noted.
 - 1. Proper construction and code compliance of hoistways, pits and control rooms.
 - 2. Fire rated controller rooms and hoistways.
 - 3. Hoistways shall be plumb within +/-1/2 inch. Ledges projecting more than 4 inches inside hoistways shall be beveled at an angle of 75 degrees to the horizontal.
 - 4. Adequate and appropriate structural building support for machine assembly, overhead safety / hoist beams (if required), guide rail brackets, buffers, hoistway sills and entrance installation.
 - 5. Structural supports in pits to accommodate car and counterweight buffer reactions, in hoistways to support car and counterweight guide rails and at the top of hoistways to support machines on beams.
 - 6. Lighting and ventilation of pits, hoistways and control rooms.
 - 7. Pit light switch located at the top of each pit ladder (pit ladder by Elevator Contractor).
 - 8. Machine and controller room light switches located beside door strike jamb and in the hoistway overhead.
 - 9. Controller room and machine area (at top of hoistway) lighting in each room consisting of 4'-0" long double tube guarded T8 florescent light fixtures providing a minimum illumination of 20-foot candles.

10. Conditioning of the air in the controller rooms and hoistways to maintain temperature between 60- and 80-degrees F.
11. Installation of embeds or inserts as furnished and instructed by Elevator Contractor.
12. Electric power feeders and fused disconnect switches or circuit breakers connected within elevator controller panels. Three phase four wire feeder and fused and lockable mainline disconnect for each elevator. Disconnect shall be in machine/controller room within sight of respective controller.
13. One single phase, three wire and 20-amp circuit and fused and lockable disconnect for cab lights and fan on each elevator and one single phase, three wire and 15-amp circuit for each card reader and CCTV on each elevator. Disconnects shall be in respective controller room.
14. Provide an auxiliary contact in disconnect in the event emergency power is not provided to the elevators and an auto rescue device is installed (auto rescue device shall be the elevator contractor's responsibility).
15. 120-volt, 15-amp fused disconnect switch or circuit breaker for each elevator including feeder wiring to controller panels for car lights. One single phase, three wire and 20-amp circuit and fused and lockable disconnect for cab lights and fan on each elevator and one single phase, three wire and 15-amp circuit for each card reader and CCTV on each elevator. Disconnects shall be in respective controller room.
16. 120-volt G.F.C.I. convenience outlets in control rooms, overheads, and pits.
17. Emergency power provisions required as indicated, including Automatic Transfer Switches and pre-transfer signals.
18. Conduit to remote locations for elevator communication, emergency or security remote control and alarm systems. All remote wiring is installed under this section.
19. Indicated or required chases and openings.
20. Finish painting except as noted.
21. Guarding and protecting hoistway, including provision of OSHA-compliant barricades (maintained by Elevator Contractor), during construction.
22. Adequate and convenient on-site storage space for tools and materials and lay-down space in proximity to hoistways.
23. Permanent electric power for testing and adjusting equipment.
24. Appropriate telephone lines for audio, text and video connections, jacks and wiring to elevator controller panels.
25. Grouting under entrance sills, cutting, and patching of building surfaces; removal, repair, or replacement of fireproofing.
26. For elevators exposed to the exterior, the area in front of the elevator entrances shall be sloped away from the hoistway and a canopy over the entrances shall be installed.
27. Life safety speakers furnished by others and installed by the Elevator Contractor.
28. Signals from fire alarm initiating devices. Smoke detectors in hoistway machine area, controller room and elevator lobbies.
29. Where sprinklers are installed in the hoistways or control rooms, provide shunt trips and heat detectors to automatically remove power to the effected elevator prior to application of water.
30. Sump pump, sump pit and flush mounted steel grating in pit of each elevator.
31. Control room fire extinguishers.
32. CAT 5 wiring and communication jacks between each controller room and Fire Control Room/Security Center to permit 24-hour monitoring of elevators.
33. Cameras and Security Cable wiring to each elevator traveling cable coaxial cable for CCTV cameras mounted in the elevator cars. Cables shall be routed from the homerun location to the controllers inside the elevator control room.
34. CCTV cameras shall be provided by the security contractor installed by the Elevator Contractor.
35. Temporary communication devices for Construction Use elevators.
36. Temporary cab and entrance protection for Construction Use elevators.
37. Flooring: Passenger car flooring to be provided and installed by the Flooring Contractor.

1.5 QUALITY ASSURANCE

- A. Work in this section shall be subject to all applicable provisions of state and local building and safety codes and any other codes referenced herein.
- B. Applicable Codes (Latest Edition): Except for more stringent requirements as indicated or imposed by governing regulations, work and test shall conform to IBC 2009 and American Society of Mechanical Engineers Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks ASME A 17.1 latest edition.
 - 1. American Society of Mechanical Engineers: Safety Code for Elevators and Escalators (ASME A17.1).
 - 2. American Society of Mechanical Engineers: Guide for Inspection of for Elevators, Escalators and Moving Walks (ASME A17.2).
 - 3. American Society of Mechanical Engineers: Standard for the Qualification of Elevator Inspectors (ASME QE1-1)
 - 4. American Disabilities Act - ADAAG published in 28 CFR Part 36 Federal Register, ANSI A117.1 and Texas Accessibility Code.
 - 5. National Electrical Code - NFPA 70.
 - 6. National Fire Protection Association - NFPA 72.
 - 7. Fire Test of Door Assemblies NFPA 252
 - 8. American Welding Society (AWS) D1.1 - Structural Welding Code – Steel.
 - 9. American National Standard Accessible and Usable Buildings and Facilities (ANSI A117.1).
 - 10. DFW Design Criteria Manual.
 - 11. Local codes.
 - 12. Authorities having jurisdiction.

1.6 DEFINITIONS

- A. The following definitions apply to work of this Section:
 - 1. "Owner": as used herein, refers to DFW Airport Authority.
 - 2. "General Contractor": refers to the single point of contractual responsibility with the Owner to furnish labor and materials for the execution of work as specified herein.
 - 3. "Architect:" as used herein, refers to Mueller2 and HOK.
 - 4. "Manufacturer": refers to those parties responsible for fabrication, assembly, maintenance recommendations and initial warranty of individual elevator system components.
 - 5. "Elevator Contractor": refers to the Elevator Contractor having the subcontract with a General Contractor to furnish labor and materials for the execution of work as specified herein.
 - 6. "Consultant": refers to the Syska Hennessy Group.
 - 7. "Provide": to furnish and install, complete for safe operation, unless specifically indicated otherwise.
 - 8. "Install": to erect, mount and connect complete with related accessories.
 - 9. "Supply": to purchase, procure, acquire, and deliver complete with related accessories.
 - 10. "Work": labor and materials required for proper and complete installation.
 - 11. "Wiring": raceway, fittings, wire, boxes, and related items (excluding conduit).
 - 12. "Concealed": embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, underground, in crawl spaces or enclosures, or otherwise out of view in normal observation.
 - 13. "Exposed": not installed underground or "concealed" as defined above.
 - 14. "Indicated", "shown", or "noted": as indicated, shown, or noted on Drawings or as specified.
 - 15. "Similar" or "equal": of base bid manufacturer, equal in materials, weight, size, design, and efficiency of specified product, conforming to "Acceptable manufacturers."

16. "Reviewed", "satisfactory", "accepted", or "directed": as reviewed, satisfactory, accepted or directed, by or to Owner.

1.7 OPERATION PERFORMANCE

- A. The controller system shall provide smooth acceleration and deceleration with 1/8-inch leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for over travel and under travel. The car shall remain at the landing irrespective of load.
- B. The floor-to-floor performance time under the above criteria shall be 11.0 seconds (floor-to-floor time is measured from the start of door close at one floor to 3/4 open at the next floor).
- C. The door open time shall be 2.2 seconds (time measured from start of door open to fully open).
- D. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
1. $T = D / (1.5 \text{ feet/s})$
 2. T = Total time in seconds.
 3. D = Distance from a point in the lobby 5 feet-0 inches directly in front of the hall call station to the centerline of the door opening.
- E. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 3-seconds.
- F. The speed of the elevator shall not vary plus or minus 5-percent under loading conditions.
- G. Ride Quality requirements shall include a horizontal acceleration measured inside of the cab during all conditions to not exceed 15 mg peak-to-peak within the 1-10hz range.
- H. Vertical acceleration and deceleration shall free of bumps, jerk, and sway and shall not be slower than 2 feet-6 inches / second² with initial ramp of between 0.5 and 0.75-seconds.
- I. Prior to final acceptance and prior to the termination of the warranty maintenance period, the elevators shall be adjusted as required to meet these performance requirements.
- J. Limit overall elevator noise emissions to the building to the following maximum A-weighted sound pressure levels in any mode of operation:
1. 60-decibels measured 3 feet-0 inches from any piece of equipment in the control room.
 2. 50-decibels measured 5 feet-0 inches above the cab floor near the center during all sequences of operation, exhaust air blower and annunciators.
 3. 55-decibels measured in the elevator lobby 10 feet-0 inches from the elevator doors.

1.8 SUBMITTALS

- A. Submit information regarding power requirements (starting and running currents), heat dissipation rates, access requirements and lighting and outlet locations, within two weeks subsequent to Contract Award.

- B. Submit completion schedule for each phase showing equipment delivery dates and anticipated completion date for each elevator, including final group adjustment dates, within two weeks subsequent to Contract Award. Dates are to coincide with Construction Progress Schedule.
- C. Shop Drawings and Samples:
 - 1. Provide quantities per Submittal Section and as indicated herein. In the event of conflict, the more stringent provisions shall apply.
 - 2. Provide manufacturers and installer's current certifications that systems and major components proposed for installation are fully compliant with all applicable codes and have been approved for installation and accepted as complete on at least three recent installations by the local authority having jurisdiction.
 - 3. Shop Drawings: Submit three sets of shop and erection drawings. Include layouts of controller rooms, Provide complete and fully dimensioned shop drawings, to scale. Include layouts of pits, controller rooms, overhead requirements, power and heat data for all equipment, static and impact loads, reaction points and required clearances. Include details of buffer inspection platforms and ladders, overhead grating locations, job specific details of extended car frame details, cab design, details of entrances, signals, fixtures and panels, and control room slab block outs area requirements.
 - 4. Samples: Materials and finishes exposed to public view, submit six (6) 12" x 12" lengths of materials and finishes for review which will be exposed to public view before fabrication. Samples shall fully represent physical and chemical properties of materials to be supplied.
- D. Submit certification and proof of required fire endurance ratings by acceptable testing organization or evidence of UL label and testing for parts where required.

1.9 REQUIREMENTS FOR MAINTENANCE AND OPERATING MANUALS

- A. Provide three sets of manuals containing information described below.
- B. Description of elevator system's method of operation and control including, but not restricted to, control system, and special or non-standard features provided. Instructions and on-site demonstration for use of elevator control panels, emergency power operation, security system, emergency recall, elevator management and remote monitoring.
- C. Legible full-size schematic wiring diagrams stamped as Owner's property covering all electrical equipment as supplied and installed, including all changes made in final work, with all symbols listed corresponding to identity or markings on both control room and hoistway apparatus.
- D. Information on each piece of equipment shall be assembled in the following order:
 - 1. Equipment details such as:
 - a. Approved drawing number
 - b. Model, part, and serial number
 - c. Contract number, specification section and clause number
 - 2. Maintenance details:
 - a. Lubrication chart
 - b. Trouble shooting procedures
 - c. Adjuster's manual
 - d. Wiring diagrams
 - e. Service tool for accessing software and troubleshooting including door operator disable, hoistway learning run, commissioning for encoder replacement or board replacement, I/O displays, adjusting acceleration, deceleration, leveling speed and

- start time, load weighing and all safety tests including overspeed test.
 - f. Spare parts:
 - g. List or recommended spares to be kept on site
 - h. List of all special tools and appropriate unique application
 - i. Detail manufacturer and supplier names and addresses
 - j. All equipment is to be listed as to types
- E. Binders shall be approved by Owner before acceptance of installation.
- F. All documents other than circuit diagrams, larger than standard size (8 1/2" x 11") paper shall be neatly folded and inserted in labeled envelope. Any photocopies must be totally legible. Only pertinent details shall be acceptable.
- G. Closeout Submittals:
- 1. Upon completion of work, submit three sets of record wiring diagrams to Owner (for subsequent review and submittal to Owner) including all field wiring changes. Also provide complete maintenance and operating manuals, as specified herein, sufficiently detailed to allow the Owner to undertake maintenance of equipment in future.
 - 2. Maintenance Tools: Provide complete list of specialty tools required for general maintenance, including programmable and diagnostic tools.
 - 3. Control room Prints: Provide one (1) complete set of "record" field wiring and straight-line wiring diagrams showing all electrical circuits in the hoistway as well as the machine [area and controller room]. These diagrams shall be bound in an 8 1/2-inch by 11-inch binder and located in the elevator control room as directed.
 - 4. Keys: Before acceptance of work, furnish six (6) sets of keys for all key switches installed as part of this project, including controller cabinet, fire service, stop switch, service cabinet, and others if provided. Locate an additional set of keys in the elevator pit. All keys shall have manufacturer name and model number. Coordinate this requirement with a closeout submittal as required in Key Schedule specification section.

1.10 MANUFACTURER'S NAME

- A. Manufacturer's name and/or logo shall not appear in any elevator cab, entrance, sill, remote control panel or any other location visible to public.

1.11 FACTORY REVIEW/MOCKUPS

- A. Factory Visit: Factory mockups are the Elevator Contractor's responsibility:
- 1. The Installer shall coordinate a factory visit where units are being manufactured
 - 2. The Installer shall not ship the escalators or elevators without the approval of the airport's representative after the conclusion of the factory visit.
 - 3. The Installer shall submit test specifications for factory tests to ensure the equipment is manufactured in accordance with the specifications.
 - 4. Prior to manufacture, the Installer shall submit the factory acceptance test specification showing the components manufacturing program for the major components.
 - 5. The factory tests log shall be kept by the Contractor/Installer who will record the tests performed.
 - 6. A complete inspection and performance testing of the equipment, checking that electrical control and wiring has been connected to the equipment correctly and checking the calibration of each instrumentation loop as it relates to this scope of work. Test results are to be fully documented and copies provided to the owner's representative.
 - 7. The unit shall be tested and inspected with its own designated controller. Test data shall

be provided with factor data sheets.

1.12 WARRANTY

- A. The elevators and associated equipment shall be free of defective material, imperfect work, and faulty operation not due to ordinary wear and tear or improper use or care, for a period of twelve (12) months from Substantial Completion of all work. Defective work shall be repaired or replaced at no additional cost to the Owner.
- B. Elevator Contractor shall warrant those materials and workmanship, or apparatus installed are in accordance with Contract Document requirements, and that they will make good any defects not due to ordinary wear and tear or improper use, which may develop within one year from date of Substantial Completion.
- C. In event that equipment does not meet all requirements of Specifications, Elevator Contractor shall promptly remove from premises Work failing to comply and promptly replace or re-execute Work without expense to Owner. Bear expense of making good Work of Separate Contractors destroyed or damaged by such removal or replacement. Warranty work shall be undertaken at times convenient to the Owner.
- D. If work is not remedied within reasonable time, as fixed by written notice from Owner, Owner may correct such condemned Work at expense of Elevator Contractor and withhold such cost from final payment. In event remainder due is insufficient to cover such cost, Elevator Contractor shall, upon request, reimburse Owner in full for balance.

1.13 USE OF ELEVATORS FOR CONSTRUCTION PURPOSES

- A. Do not use elevators for construction purposes without written authorization from the Owner.
- B. Comply with General Contractor's requirements for use of elevators during construction.
- C. Construction cars will be provided temporary protection by others.
- D. Construction cars shall be subject to interim maintenance.
- E. All repairs and/or replacements not covered by interim maintenance which have been made necessary by use of elevator for construction purposes shall be completed on a time and material basis agreement. All repairs shall be completed prior to final acceptance.

1.14 INTERIM MAINTENANCE

- A. Maintenance for elevators shall commence on same date. Some units may be turned over for use of Owner before other units, necessitating interim maintenance of such elevators until all units are turned over. Interim maintenance is defined as maintenance provided, from time unit is put into service by Owner, to date when all units are turned over for Owner's use to commence warranty and warranty maintenance. Interim maintenance shall include full maintenance and twenty-four-hour callback service.

1.15 WARRANTY MAINTENANCE SERVICE

- A. Provide 12 months of warranty maintenance after date of Substantial Completion. Warranty maintenance shall start co-incidental with one year warranty.
- B. The maintenance shall be in accordance with the Owner's agreement.
- C. Warranty maintenance shall include emergency minor adjustment callback service shall be always available at no extra charge to Owner.
- D. Maintenance shall include systematic examination, adjustment and lubrication of all elevator equipment and apparatus, including repair or replacement of electrical and mechanical parts of elevator equipment and apparatus. Repair equipment whenever required and use only genuine standard parts produced and manufactured for equipment concerned.
- E. Maintenance mechanic shall be on site for a minimum of twelve (12) hours per week for the six elevators and three escalators installed under this contract and mechanic shall be on site for not less than six (6) continuous hours for each visit.
- F. Replace all wire ropes as often as necessary to maintain adequate factor of safety.
- G. Renewals or repairs necessitated by reason of misuse, abuse or negligence shall not be included. Repair and/or replacements necessitated by ordinary wear and tear shall be included.
- H. Supply all necessary lubricants, cleaning materials, and repair parts required to keep elevators in good working during warranty period.
- I. Adequate stock of spare parts shall be maintained locally, and elevator manufacturer and installer shall have personnel available at such places to ensure fulfillment of service without unreasonable loss of time in reaching job site.
- J. Work under this provision shall be performed by personnel under supervision and in direct employ of elevator manufacturer and installer.
- K. Repairs shall be performed during regular working hours.
- L. Owner shall have the right to postpone commencement of this warranty period in connection with any specific elevator providing that such elevator is not put into service at time of substantial completion.

1.16 FULL MAINTENANCE PROPOSAL

- A. Elevator manufacturer and supplier shall agree to enter a renewable, full maintenance type of contract.
- B. The full maintenance contract shall commence upon the termination of the warranty maintenance and shall cover all elevators supplied for the project.
- C. Submit separate price in the Bid Form to furnish complete maintenance for the elevator equipment for the first year of the maintenance contract following completion of the warranty maintenance, based on today's material and labor cost indices and the requirement that the maintenance contract with the Owner will be for a minimum period of five (5) years.

- D. The maintenance shall be in accordance with the Owner's agreement and minimally shall follow the requirements for warranty maintenance noted above.

1.17 IDENTIFIED, SEPARATE AND ALTERNATE PRICES

- A. State in Bid the price carried to provide 12 months of warranty maintenance.
- B. State in Bid as a separate price cost to provide monthly interim maintenance on each unit.
- C. State in Bid as a separate price cost to provide full maintenance for 1st year of five-year maintenance contract.
- D. State in Bid as a separate price cost for Factory Mock-ups.

1.18 ELECTRIC SERVICE

- A. Power: 480-volts, 3-phase, 60-hertz. Contractor/Installer to verify.
- B. Lighting: 120-volts, 1-phase, 60-hertz.

1.19 PERMITS AND SWITCHES

- A. Obtain and pay for necessary elevator permit, inspection and operating permits and make such tests as called for by regulation of such authorities. Tests shall be made in presence of authorized representatives of such authorities. All permits, and certificates as required shall be provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product of individuals, firms or corporations regularly engaged in manufacturing elevators comparable with this contract and in satisfactory operation for a period of not less than five (5) years.
- B. Qualified Bidders / Models (in alphabetical order); Use only components which are known to perform satisfactorily under expected use. Upon Owner's request, provide reference of similar installation.
- C. Bidders must be able to demonstrate their qualifications to supply, install, maintain and service comparable equipment in the DFW Airport area.
- D. Elevator controllers shall be Ethernet ready for UDP packet communication to the building management system. Controller Ethernet communication shall be independent of the building management system to facilitate communications to multiple backup Building Management Servers over a LAN, WAN, or the internet. Configuration of controller's internet parameters shall be network based for remote updates of Ethernet firmware, network configuration and management parameters. Controller Ethernet hardware (SWEC) must be an embedded solution requiring no computers, no moving parts such as hard drives and designed to industrial specifications for heat and reliability.

- E. Products listed below shall be provided subject to conformance with specifications on machine room less elevators.
1. KONE U.S. / MonoSpace 700
 2. Mitsubishi Elevator Company/Diamond Trac
 3. Otis Elevator Company / Gen3 – Over slung
 4. Schindler Elevator Corporation / 5500AE
 5. TK Elevator / synergy Performance Series
- F. The listing of the models is for general reference. Companies are required to meet all specification requirements regardless of model listed.

2.2 MATERIALS

- A. Aluminum: Extrusions as per ASTM B221.
- B. Plywood Backing: PS-1-83, A-D Interior Grade Douglas fir. Fire treat per AWPA with a suitable water-soluble fire-retardant formation; U.L. FR-S fire hazard classification.
- C. Sheet Steel (Painted): ASTM A1008; cold-rolled, stretcher-leveled, furniture grade; free from defects.
- D. Stainless Steel: As per ASTM A167, Type 316 series, with finish as specified.
- E. Patterned Stainless Steel: As per ASTM A167, Type 316, Rigidized or approved equal textured stainless-steel pattern 5WL®, with satin finish as specified.

2.3 OUTLINE OF EQUIPMENT

- A. Pier Elevators

Numbers:	Pier A: EV101 & EV102 Pier C: EV103 & EV104
Quantity:	Four (4); Single Elevators
Rise:	Verify on Drawings
Levels Served:	R & C; Verify on Drawings
Number of Stops:	One in Each Pier: Two (2) In Line One in Each Pier: Two; One Front and One Rear
Contract Load, in Pounds:	5000
Contract Speed, in FPM:	200
Class of Loading:	A
Machine Location:	Overhead in hoistway
Machine Type:	Gearless
Type of Control:	AC variable frequency
Operation:	Microprocessor Based Selective Collective
Stand By Power	Provisions to connect to generator and provide Auto Rescue Device
Clear Car Inside:	5'-8" wide x 8'-6" deep; Verify on Drawings
Car and Hoistway Door Size:	4'-6" wide x 8'-0" high
Car and Hoistway Door Type:	Two Speed Side Opening
Car and Hoistway Door Operation:	Power operated, high-speed

Door Protection:	Infrared Detector
Pit Access Ladder:	Provide and install for each elevator.
Hoistway Door:	Minimum 14-gauge Satin Stainless steel at all floors with Sight Guards
Hoistway Frames:	Minimum 14-gauge Mitered and Welded with Satin Stainless-Steel finish.
Hoistway Sills:	Extend full width so that doors remain in sill when in fully open position. Milled stainless-steel sills at all openings with a non-slip surface.
Hoistway Sill Angles:	Extend the complete length of the sill
Cab Enclosure:	Minimum 14-gauge car shell. All elevators shall be designed to accommodate the finishes as detailed on the architectural drawings. Provide satin stainless-steel handrails and bumper rails on side and rear walls.
Cab Fronts:	Doors and fronts shall be satin stainless steel; minimum 14 gauge.
Car Sills:	Provide milled stainless-steel sills and matching sill extensions to align edge of sill with face of front returns. Extend full width so that doors remain in sill when in fully open position.
Cab Flooring:	Provide 2-inch recess for flooring
Car Operating Panels:	Main and auxiliary; include with engraved signage and service cabinet. Auxiliary shall be mounted on the side wall.
Direction Indicators and Lanterns:	Combination position indicators and hall lanterns at all floors.
Hall Stations:	Single Riser for each elevator; In Case of Fire and Fire Instruction signs shall be engraved on faceplates.
Fire Control Panels:	One panel for all units under this contract. Display all functions and incorporate all switches.
Monitoring:	As specified.
Output Timers:	Cab Blower and Light
Emergency Car Light:	Required to power normal car lights.
Pads and Hooks:	Provide one set
Work Lights and Receptacles:	On top of each cab and under the car platform with activation switches in the service cabinet.
Communication Systems:	Hands-free, two-way with video capability. Two-way communication to/from the elevator cab within the building for emergency personnel and first responders.

B. \

2.4 CONTROL ROOM EQUIPMENT—CONTROLLER AND DRIVE TO BE MOUNTED IN JAMB.

- A. Provide equipment to fit space conditions shown; all costs for re-design of, and revisions to, building spaces and structure due to selection of Elevator Contractor, Manufacturer, change to equipment availability, production or selection shall be borne by Elevator Contractor. Jamb

mounted controllers shall not be provided.

- B. VVVF Motor Drive: Provide VVVF motor drive as follows:
1. Drive to be jamb mounted; do not mount drive in overhead space.
 2. The drive shall vary the torque on the motor during acceleration and deceleration.
 3. The drive shall be capable of on-site programming the volts per Hertz acceleration and deceleration ride profiles to adjust the ride quality to drive control characteristics.
 4. The flux vector drive shall control AC induction motors using a high resolution, dual channel optical reader.
 5. The flux vector drive shall deliver 100-percent rated motor torque from base speed down to zero speed.
 6. The flux vector drive shall not use DC injection for slowdown braking.
 7. The flux vector drive shall be adjustable to achieve the required current motor voltage and frequency to match the characteristics of the hoist motor.
 8. The drive shall not create excessive audible noise in the elevator motor.
 9. The drive shall deliver enough current to accelerate the elevator to contract speed at the rated load. The drive shall provide speed regulation within 3-percent during all phases of acceleration, deceleration and leveling.
- C. Isolation Transformer: Provide necessary isolation transformers, reactors, capacitors, and other devices to limit the overall Distortion Factor at the point of connection of the elevator converter feeders to the electrical distribution system to a maximum of 3-percent.
- D. Isolation shall be provided for the following:
1. Harmonic distortion
 2. Power factor
 3. Flicker
 4. Line notching
- E. Controller: Provide enclosed controller panels with ventilated cabinets and hinged or removable doors. Provide permanently marked symbols or letters identical to those on wiring diagrams adjacent to each component. Provide the following:
1. All high voltage (110-volt or above) contact points inside the controller cabinet shall be protected from accidental contact when the doors are open.
 2. Controller shall be separated into two distinct halves, Motor Drive side and Control side. High voltage motor power conductors shall be routed as to be physically segregated from the rest of the controller.
 3. Field conductor terminations shall be segregated; high voltage (greater than 30-volt DC and 100-volt AC) and low voltage (less than 30-volt DC).
 4. Controllers shall be designed, tested, and certified for Electromagnetic Interference (EMI) immunity in compliance with EN12015.
- F. Components: The microprocessor-based group dispatcher and communications network shall be designed and installed to meet the following requirements:
1. Provisions shall be made in the dispatch computer so that the elevator system dispatching can be modified at a future time. The system shall be so designed that the modifications to the software shall be all that is required to revise the dispatching. It shall be further designed so that there will be minimum shut down time should changes be required.
 2. The latching circuitry (outputs) shall be fail-safe design that turns off all the outputs in the event of a processor malfunction.
 3. Power Supplies: All power supplies utilized shall be UL recognized. They shall all have short circuit protection.
 4. Frame: All assemblies, power supplies, chassis, switches, relays, and other items shall be

- securely mounted on a substantial, self-supporting steel frame. The equipment shall be completely enclosed with covers. No equipment is to be mounted on the covers.
5. Wiring: All factory wiring shall utilize UL labeled copper wires. All wiring interconnections shall be neatly routed. All wiring connections to studs of terminals shall be made by means of solder or solder-less lugs.
 6. Marking: All components shall be clearly and permanently identified adjacent to each device and shall be identical to the wiring diagram.
 7. Provide extender boards when computing devices are used inside a computer chassis to have access to the printed circuit cards utilized.
 8. Electronic time delay devices shall use stable capacitor or crystals as the time base.

G. Printed Circuits and Related Hardware:

1. All solid-state hardware and devices shall have built-in noise suppression devices that provide a level of noise immunity compliant with EN12015.
2. All inputs from external devices (such as pushbuttons) and all outputs to external devices (such as indicators, relays) shall be isolated.
3. The use of relays as input/output devices is not acceptable.
4. A separate regulated power supply shall be used for each computer chassis.
5. The control circuits shall be so designed so that one side of the power supply is grounded to provide for testing.
6. Under no circumstances shall the safety circuits be affected by accidental grounding of any part of the system.
7. In the event of a power failure or interruption, the system shall be designed so that it will start properly when power is returned.
8. System memory shall be provided so that data shall not be lost in the event of a power failure or disturbance.
9. Note: Conduits or other wiring shall not be exposed in the lobby or other occupied parts of the building.

H. Speed Regulation:

1. The rate of acceleration and deceleration of the cars under any condition of load shall be as nearly constant as is possible with the method of control specified and employed and shall be independent of the operating devices in the car.
2. The acceleration, deceleration and velocity shall all be computer controlled. The detection of velocity and position of the car shall be fed into the computer. The computer shall compare this information with the velocity profile and adjust as necessary to insure a fast and smooth acceleration and deceleration curve. The maximum acceleration / deceleration shall not be slower than 2'-6" per second² and shall change uniformly.

I. Diagnostic Tools: Elevator Contractor shall provide all on-board diagnostic tools and documentation required for the adjustment, troubleshooting, and reprogramming of the elevator system upon completion, including:

1. Passwords or identification codes required to gain access to each software program to perform diagnostics or program changes.
2. A composite listing of the individual settings chosen for variable software parameters stored in the software programs.
3. A complete dictionary of fault codes with recommended steps for resolution, in sequence from highest to lowest probable cause.

2.5 OPERATING SYSTEMS

- A. Provide a closed-loop solid-state microprocessor system to provide operational control operation

as indicated.

B. Selective Collective:

1. The car shall park at landing last served with doors closed.
2. Registration of car call button shall cause the car to start. The car shall respond to its own car calls and corridor calls, in the direction of travel, and in order in which the landings are reached.
3. The car shall remain at the arrival floor for an adjustable interval to permit passenger transfer. Doors shall close after a predetermined interval, unless the car is parked at the main floor, after opening unless closing is interrupted by car door reversal device or door open button in car
4. The car shall remain at the arrival floor for an adjustable interval to permit passenger transfer. Doors shall close after a predetermined interval, unless the car is parked at the main floor, after opening unless closing is interrupted by car door reversal device or door open button in car.
5. Programmed Door Control: Separate adjustable times shall be provided for each car to establish minimum passenger transfer time for car stops, intermediate floor hall call stops, and lobby floor stops. All timing shall be computerized to coincide with traffic demands.
6. Provide the following system features:
 - a. Dispatch Protection: The system shall automatically provide dispatching in the event of failure of the primary system. A visible and audible alarm shall be provided to indicate loss of the dispatching computer.
 - b. Designated Parking: The system shall provide for car to park as designated by the Controller or park at its last call.

C. Security Operation:

1. Cameras shall be provided by others and installed by the elevator contractor.
2. Coordinate with the security subcontractor to ensure the proper wiring and space is provided.
3. Fire Service and Seismic Operation override the Security Service Operation.
4. All elevators shall have features as specified located at a security/lobby control panels in addition to the lock out features at the hall registration stations and inside the car.
5. Provide a key switch mounted on the car operating panel and at each hall pushbutton station.
6. Provide a 5 inch by 5-inch space within the main swing panel for a proximity reader.
7. Proximity reader shall be surface mounted on the car operating panel. The indication of a proximity reader shall activate the designated floor car call. Pressure on the designated floor car button illuminates and registers a call. The elevator proceeds to the designated floor, completes its operation and awaits the next demand.
8. Provide camera provisions, wiring and mounting.
9. Provide junction box or demarcation cabinet in control rooms to create a clean line of separation between the Security Contractor and Elevator Contractor.

D. Independent Service: Provide controls to remove elevators from normal operation and provide control of the elevator from car buttons only. Car shall rise at contract speed and shall not respond to corridor calls. Provide seismic indication in car as required by ANSI A17.1 – 2004, Rule 8.4.10.1.1.

E. Car Top Operation: Provide per Code requirements.

F. Emergency Recall Operation (Fire Service): Provide operation and equipment per Code requirements. Elevator Contractor shall provide relays, wiring, and terminal strips to receive signals from the fire alarm system.

1. Elevators shall be arranged to operate in accordance with local Fire Department and Elevator Code. Provide emergency recall switch for each group of elevators. Include for alternate floor recall in the event the alarm signal originates from ground floor. Locate three position Phase 1 key switches in ground floor hall button fixture.
 2. Provide engraved Phase 1 signage beside hall button fixture beside and provide Phase 2 signage in fire control cabinets.
- G. Ascending Car Overspeed and Unintended Car Movement Protection: Provide operation to prevent the elevator from striking the hoistway overhead or unintended car movement per the requirements of the Code.
- H. Fan and Light Output Timer: Provide an adjustable timer (range 1 to 10-minutes) that when activated will turn off the fan and light within the car. The time will start when the car becomes inactive.
- I. Door Hold Operation: Provide controls and a button within main car panel that shall hold the doors open for an adjustable period of 30 to 90-seconds. The following shall resume normal door operation:
1. Activation of door close button.
 2. Activation of any floor button within the elevator.
 3. Expiration of time.
- J. Standby / Emergency Power and Operation: Elevator Contractor shall provide operation as follows:
1. When emergency power is detected by an input, the car shall be returned to the main lobby and shall operate on emergency power.
 2. The elevator shall return to normal power as designated on the electrical drawings.
 3. Lobbies:
 - a. An illuminated sign indicating operation of emergency power shall be in the elevator lobby at the main return/designated level.
- K. Auto Rescue Unit: Provide this feature where emergency power is not available:
1. When loss of power occurs, the car shall descend to an adjacent landing and open the doors automatically. After a predetermined time, the doors shall close, and the elevator shall remain inoperative until normal power is restored.
 2. The door open button shall operate under battery power.
 3. The stand-by power sources shall be 12-volt DC battery units installed in the control room, including the solid-state charger, inverter, fail safe controls, and testing means in a metal container.
 4. Batteries shall be rechargeable lead acid or nickel cadmium with a 10-year life expectancy.

2.6 HOISTWAY EQUIPMENT

- A. Guide Rails: Planed steel, standard T-sections; formed rails are unacceptable. Extend rails from pit floor to underside of machine bedplate or cassette at top of hoistway as shown on Elevator Contractors drawings.
1. Provide necessary car and counterweight rail brackets of enough size and design to secure minimal and compliant deflection and prevent spreading or distortion of rails under any condition.
 2. Provide individual brackets of enough length to span between the guide rail assembly and the building structure. Provide any additional bracing or weld plates as required. No

- additional compensation shall be granted for Elevator Contractor's failure to provide brackets properly sized for the structure.
3. If concrete embeds are to be utilized for bracket attachment, they shall be furnished under this section and installed by others. A job specific installation detail shall also be provided.
 4. Guide rail loads shall be shown on Elevator Contractors drawings. Include safety application, running, and loading.
- B. Buffers: Provide struts and lateral bracing as required. Mount on continuous channels secured to guide rails.
- C. Machine: AC Gearless traction type machine with synchronous permanent-magnet motor. Provide dual solenoid service and emergency disc brakes. Mount within machinery space located in overhead of hoistway.
- D. Motor: The hoisting motor shall be an alternating current type, rated for 50- degree C during continuous operation and Class B insulation, and designed to develop high starting torque.
- E. Machine Assembly: Provide steel beams, channels and bearing plates to support overhead sheaves and rope hitches. Include any clip angles, tie rods, etc. as required to attach machine bedplate or cassette to surrounding structure. No additional compensation shall be granted for Elevator Contractor's failure to provide machine interface properly sized for supports. Machine shall be located for accessibility from car tops and as mandated by code.
- F. Isolation Mounts: Provide vibration isolation, of an approved type, which shall effectively prevent transmission of machine vibration to the building structure. Provide 40 durometer double deflection neoprene mounts sized for a static deflection under load of minimum 3/16-inch for mounting the motor and gear box. Acceptable mounts are Mason Industries Type BR or equivalent.
- G. Encoder: Provide solid-state, optical, digital-count type, mechanically coupled to car, machine or car governor.
- H. Overhead Sheaves: Provide cast iron machined and grooved for diameter of suspension means and supported by steel beams or channels. Provide guards designed to withstand shock and prevent suspension means from leaving their proper grooves. All bearings are to be shielded or sealed.
- I. Compensation: As required for speed and duty. Provide encapsulated chain type and pit mounted sway dampening devices. Position and secure compensation chains to eliminate interference with car or hoistway items. Regardless of contract speed, if compensation is provided, pit mounted sway dampening devices shall be provided with effective sound isolation to limit roller noise.
- J. Counterweight: Structural steel channel frame with metal filler weights. Provide metal guards as required by Code when compensation chain is not provided. Weights shall occupy a minimum of two – thirds (2/3) the height of the counterweight frame.
- K. Counterweight Guides: Provide manufacturers standard guides as part of model package. Either of the following shall be acceptable.
1. Roller type guides to provide smooth and quiet ride, substantially free of rumbles, bumps, vibrations, and excessive sway. Guides shall consist of three (3) or more "spring-mounted" rollers per guide assembly to maintain rail contact and include adjustable stops to control post-wise float. Rollers shall be constructed of neoprene or other similar sound deadening material with high "memory" characteristics, enabling them to regain their round shape after

- an elevator sits overnight or for a moderate period-of-time.
2. Sliding guides required for speed and duty, either solid or swivel type with replaceable gibs which assure that lateral motion is minimized while maintaining rail contact.
- L. Counterweight Sheaves: Provide cast iron machined and grooved for diameter of ropes and adequately supported. Provide guards designed to withstand shock and prevent suspension means from leaving their proper grooves. All bearings are to be shielded or sealed.
- M. Suspension Means:
1. Either steel type hoist ropes or belts shall be provided. They shall have the following characteristics:
- a. Provide traction steel type hoist ropes. Quantity, size, and type as required for duty; fasten and secure with adjustable shackles.
- b. Provide polyurethane coated belts with high-tensile-grade, zinc-plated, stranded steel cables, in adequate and appropriate size and quantity as required for duty. Where such belts are employed, the installation shall not be considered complete without demonstration of a permanent, self-calibrating means to accurately monitor and routinely communicate the condition of all belts as a parameter displayed in the primary means of controller or system diagnosis.
- N. Governor Ropes: Provide size and type required for duty; adequately fasten and secure.
- O. Governor: Overhead centrifugal type, car driven, with electrical shutdown switches. Locate the governor within the overhead as indicated with appropriate tail weight in pit. Provide a self-resetting tension-type governor. Where approved by the local authority having jurisdiction, the governor may be car mounted.
- P. Car Top Service Guardrail: Provide a 3'-6" high railing on the car top with intermediate rail, toe board and stationary posts per Code.
- Q. Automatic Terminal Stopping Device: Per Code.
- R. Pit Access Ladders: Provide Code compliant pit ladder in all pits. Coordinate location of sump pits, pit lighting, and pit light switches with other trades.
- S. Wiring:
1. Conductors: Provide copper insulated wiring with flame retarding and moisture resisting outer cover. Install in galvanized metal wireways and raceways. Conductors from shaft riser to door interlocks shall be SF-2 type or equal, maximum operating temperature 392-degrees F. All terminations shall be insulated to maintain integrity of wiring. Flexible conduit may be used for short connections. Provide 10-percent spare conductors throughout system.
2. Insulated wiring shall have flame retarding and moisture resisting outer cover and shall be run in metal conduit, metallic tubing, or wire ducts.
3. Traveling Cables: UL-labeled fire and moisture resistant outer braid and steel supporting strand as required for rise. They shall be flexible and shall be suitably suspended to relieve strains in individual conductors. Provide halfway junction boxes on elevators with travel more than 60 feet.
4. Provide three shielded pairs of wires and six pairs of unshielded wiring between each elevator controller and respective car stations for future use by maintenance contractor or Owner.
5. Provide three shielded pairs wires (total of six) from each group of elevators to Fire Control Room/Security Center.

6. Provide shielded wiring for public address speakers between control room and car top.
 7. Provide two CCTV video coax cables type RG 59-U in the traveling cables, terminated at both ends with a male compression connector type BNC. Provide two pair 18 AWG cables in the traveling cables, terminated, and labeled at a terminal strip at both ends for low voltage camera power.
 8. Provide two shielded 18 AWG stranded cable pairs in the traveling cables, terminated, and located at both ends as EMERGENCY PHONE at the traveler cable connection strips in accordance with specification standards. The cable pairs will carry low voltage supervised alarm point between the elevator emergency phone CALL push button and extended to the elevator equipment room termination where it will be extended (by others).
 9. All spare wires and cables shall be tagged and identified by their destination.
- T. Work Lights and Duplex Receptacles: Provide on top and bottom of car with lamp guards. Provide switch in service cabinet to control under car lighting.
- U. Stop Switches: Provide Code required stop switches in the pit and in the machinery space of machine room less elevators.

2.7 ENTRANCE EQUIPMENT

- A. General: Provide entrance assembly with a 1 1/2-hour rating. Include all support for entrances.
- B. Entrance Frames: Fabricate 14-gauge satin stainless steel welded and mitered to form a one-piece unit. Frames shall be of adequate depth to completely wrap the wall and shall be flush with the wall finish.
- C. Entrance Signage:
1. Floor Designation / Braille Plates: Provide cast, flush mounted floor designation signs for all elevators. Locate centerline of floor designation at a height of 5'-0" above finished floor. The plaques shall have a white character on a black background and include braille per local Accessibility Guidelines. Grade or main egress level shall be indicated by a 2-inch diameter star to the left of the character. Provide Entrada type VS2, or equal plates.
 2. Medical Emergency Identification: Provide cast, flush mounted medical emergency designation plaques identifiable by a 3-inch high "Star of Life" on each side jamb. Provisions shall match floor designation braille plates. Locate "Star of Life" at 7'-0" above finished floor.
 3. Elevator Car Identification: Provide cast 3-inch-high elevator number plates on the main egress level for all elevators. Locate identification at 6'-0" above finished floor on one side, centered horizontally. Finish and mounting provisions shall match floor designation braille plates.
- D. Hoistway Sills:
1. All sills shall be extended such that the door panels shall remain in the sill when the doors are in the fully open position.
 2. Provide milled stainless-steel sills at all openings with a non-slip surface.
- E. Sill Supports: Provide manufacturers standard integrated sill support angles designed for proper loading. Extend the entire length of the door travel. Ensure the sill angles are adequate to accommodate anticipated loads.
- F. Struts: Minimum 3-inch continuous hot rolled or formed steel angle with secure fastening to sill and floor beam above. Provide strut extensions for floor-to-floor heights greater than 12'-0". No

additional intermediate horizontal support will be provided. If intermediate header support is required, it shall be coordinated by the Elevator Contractor.

- G. Headers: Minimum 3/16-inch formed steel designed to support hangers. Header shall be bolted to supporting struts.
- H. Dust Covers: Removable, full length manufacturer's standard gauge steel. Covers shall be made in sections for convenient access to hangers.
- I. Fascia: Manufacturer's standard gauge steel plates extending from top of header to sill of door above or beam above if there is no door opening. Provide continuous blind fascia if front hoistway walls are not built out where openings do not exist. Alternatively, provide a car door interlock that prevents the doors from being opened unless the car is within the unlocking zone.
- J. Floor Numbers: Elevator hoistway doors shall have their floor number located on the hoistway side, placed at intervals such that a person in a stalled elevator, upon opening the car door, can determine the floor position. Floor numbers shall be no less than 4-inches in height.
- K. Hoistway Doors: Door panels shall be hollow metal flush door construction, minimum 14-gauge stainless steel. Provide reinforcement by formed vertical sections running full height of door. Doors shall be provided with two (2) removable, non-metallic gibs with fire tabs, located at the leading and trailing edge of the door panel. Center opening doors shall be provided with full length rubber astragal at leading edge of each door. Finishes to extend completely around door panels and overlap a minimum of 1-inch on the hoistway side. There shall be no visible exposed or protruding fasteners.
- L. Sight Guards: Provide for each landing door panel, constructed of 14- gauge furniture steel. Finish shall match doors.
- M. Hangers: Provide two-point suspension sheave type with provisions for vertical and lateral adjustments. Sheaves shall be minimum 2 1/4-inches in diameter with sealed ball or roller bearings.
- N. Tracks: Cold drawn steel shaped and finished to permit free movement of sheaves. Bottom of track shall be in contact with up thrust roller.
- O. Closers: Sash, spring or spirator type.
- P. Interlocks: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless hoistway doors are closed or within tolerances allowed by Code.

2.8 CAR EQUIPMENT

- A. Loading Classification and Requirements: The elevators shall be designed for Class A loading following the design data and formulas identified in the Code including, but not limited to, the car frame, platform, and guides.
- B. Car Frame: Welded or bolted steel channel construction; material thickness to be manufacturers standard for duty.
- C. Car Sheaves: Provide cast iron machined and grooved for diameter of ropes and adequately supported. Provide cable guards designed to withstand shock and prevent ropes from leaving their proper grooves. All bearings are to be shielded or sealed. Platform: Isolated type, steel frame

with steel or fire treated wood subfloor, fireproof on underside. Provide under-car work lighting and connect to a switch under the car and in the service cabinet.

- D. Car Guide Shoes: Provide manufacturers standard guides as part of model package. Either of the following shall be acceptable.
1. Roller type guides to provide smooth and quiet ride, substantially free of rumbles, bumps, vibrations, and excessive sway. Guides shall consist of three (3) or more "spring-mounted" rollers per guide assembly to maintain rail contact and include adjustable stops to control post-wise float. Rollers shall be constructed of neoprene or other similar sound deadening material with high "memory" characteristics, enabling them to regain their round shape after an elevator sits overnight or for a moderate period-of-time.
 2. Sliding guides required for speed and duty, either solid or swivel type with replaceable gibs which assure that lateral motion is minimized while maintaining rail contact.
- E. Toe Guards: Per Code.
- F. Hangers: Provide two-point suspension sheave type with provisions for vertical and lateral adjustments. Sheaves shall be minimum 2 1/4-inches in diameter with sealed ball or roller bearings.
- G. Tracks: Cold drawn steel shaped and finished to permit free movement of sheaves. Bottom of track shall be in contact with up thrust roller.
- H. Door Protection:
1. Infrared detector: Provide an infrared door edge that projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one (1) beam of the curtain is penetrated. Unit shall have Transmitters and Receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems which have the availability to turn off or on individual zones within the curtain will not be allowed. Provide a weather resistant device.
 2. Differential door timing feature: Provide adjustable timers to vary the time that the doors remain open in response to a car or hall call. The doors shall remain open for one second in response to a car call and five to eight-seconds for a hall call. This time shall be reduced to 1/2-second if the proximity detector is interrupted. The doors shall remain open if passengers are crossing the threshold.
 3. Nudging: When doors are prevented from closing for 20-seconds due to failure of the proximity device or obstruction, the doors shall close at reduced speed and a buzzer shall sound.
- I. Door Operators:
1. Provide heavy-duty linear operators master electric power door operators to automatically open and close the car and hoistway doors. The operator shall utilize velocity and distance feedback speed control. The doors shall be capable of smooth and quiet operation without slam or shock. Operator will be protected with a weather resistant cover.
 2. Opening speed shall not be less than 3.0 FPS with reversal in no more than 2 1/2-inches.
 3. An auxiliary-closing device shall automatically close hoistway doors if car leaves the landing zone.
 4. In case of power interruption, it shall be possible to manually operate car and hoistway doors from inside the cab, if the car is within the landing zone.
- J. Car Door Contacts: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by Code.

- K. Door Restrictors: Provide door-restricting devices to prohibit the opening of car doors by more than 4-inches when outside of the unlocking zone.
- L. Top of Car:
 - 1. Provide two tops of car compact fluorescent light fixtures and locate on each side of car top sheave or hoist rope fastening. One light fixture shall be portable type.
 - 2. Provide at least one duplex GFCI receptacle on car top.
 - 3. Provide fixed top of car inspection unit including up and down buttons, enable button, stop button and guarded toggle switch.
 - 4.
- M. Car Sills:
 - 1. Provide properly dimensioned sill blocking to interface with finished flooring inside cab.
 - 2. All sills shall be extended such that the door panels shall remain in the sill when the doors are in the fully open position.
 - 3. Provide sill extensions to face of front return.
 - 4. Provide milled stainless-steel sills and matching sill extensions to align edge of sill with face of front returns.

2.9 CAR ENCLOSURE

- A. The equipment manufacturer or a vendor approved by the manufacturer shall fabricate the car enclosure. The enclosure shall be adequately reinforced and ventilated to meet Code requirements. Provide effective sound-deadening mastic to exterior of all enclosures.
- B. Shell: Shall be minimum 14-gauge sheet steel with powder coated or baked enamel interior finish. Arrange shell width and depth to accept removable panels as detailed by Architect. Ensure light-proof joints and gasket or secure to prevent transmission of noise generated by the movement or minor contortion of the cab.
- C. Canopy: Adequately reinforced to be Code-compliant. Underside of canopy to be powder coated or baked enamel to match custom color as selected by Architect. Arrange for hinged top emergency exit including lock as required by Code.
- D. Interior Panels:
 - 1. Provide mounting method that prevents rattling or vibration. Installation to facilitate authorized removal with a specialized tool to allow for repair or replacement of new cab panels without requiring access to the hoistway or outside the car enclosure.
 - 2. The enclosure shall be adequately reinforced and ventilated to meet Code requirements. Provide effective sound-deadening mastic to exterior of all enclosures.
 - 3. Provide applied panels with textured stainless-steel finish. Panels shall be configured to be removable from inside of the car.
 - 4. Vent slots at bottom of shell shall be located so that they are concealed behind custom panels.
- E. Suspended Ceiling and Lighting:
 - a. Suspended Ceiling: Satin stainless steel #4 finish with pin hole LED Lighting.
 - b. Lighting fixtures shall be designed to protect passengers from dislodged bulbs or broken glass while providing Code compliant illumination. Arrange for hinged top emergency exit including lock as required by Code.
 - c. If any of the are selected to be utilized for Construction Use, provide temporary

- lighting fixtures for use during the Construction Use period. Provide provisions for removal or relocation of fixture before custom cab interiors are installed.
- d. Provide timed feature to turn lights off after pre-determined period of inactivity.
- F. Floor Covering: Allow a 2-inch platform recess. Final sill height and total flooring weight to be confirmed before fabrication.
- G. Front Return Panels and Entrance Columns: Minimum 14-gauge satin stainless steel. Adequately brace to prevent bowing and flexing. All elevators shall have full width swing type to allow access to car operating panel wiring and fixtures. Mini or partial swing returns shall not be provided. Provide cabinets for special operating features and flush mounted speaker grills for the "Hands Free" telephone and communication systems required by these specifications.
- H. Transoms: Minimum 16-gauge stainless steel. Finish and edging to match front return panels and entrance columns for all elevators.
- I. Car Door Panels: Door panels shall be hollow metal flush door construction, manufacturer's, minimum 14-gauge stainless steel. Provide reinforcement by formed vertical sections running full height of door. Doors shall be provided with two (2) removable, non-metallic gibs with fire tabs, located at the leading and trailing edge of the door panel. Center opening doors shall be provided with full length rubber astragal at leading edge of each door. Finishes to extend completely around door panels and overlap a minimum of 1-inch on the hoistway side. There shall be no visible exposed or protruding fasteners.
- J. Handrails: Integrate handrail installation to facilitate authorized removal with a specialized tool to allow for repair or replacement of new cab panels without requiring access to the hoistway or outside the car enclosure. Provide adequate mounting to comply with strength as required by Code. Provide two (2) rows of 4-inch bar type handrails / bumper rails located at 8 inches above finished floor on all three (3) walls. Bar thickness shall be 3/8-inch. Finish shall be stainless steel. Handrails and bumper rails shall be fastened to wall a maximum of 12 inches on center and shall be removable from inside the car.
- K. Pads and Hooks: Provide pad hooks and protection pads for two elevators. Pad hooks shall be conspicuous type (buttons) where there are no stand-off panels and inconspicuous type ("S") hooks for walls with stand-off panels. Pads shall cover all walls and front return panels and include cutouts for access to the operating fixtures.
- L. Ventilation: Provide three-speed blower type fan with adequate vibration isolation material to prevent perceptible vibration inside of car when fan is operating at top speed.
- M. Emergency Car Lighting and Alarm System: Part of normal car lights.
1. Unit shall provide emergency light in car upon failure or interruption of normal car lighting. Device shall be placed on car top and power a portion of normal car lighting. Swing panel mounted units are not acceptable. Light fixture shall consist of 5 LEDs. Emergency lighting unit shall provide a minimum illumination of 0.2-foot-candle at 4 feet-0 inches above car floor approximately 1 foot-0 inches in front of car operating panel for not less than 4-hours. Battery charger shall be capable of restoring battery to full charge within 16-hours after resumption of normal power. Provide an external means for testing battery, lamps, and alarm bell.
 2. If any elevators are selected to be utilized for Construction Use, provide a temporary emergency lighting fixture for use during the Construction Use period. Provide provisions for removal and / or relocation of fixture before interiors are installed.

2.10 SIGNALS AND FIXTURES

- A. Provide signal fixtures as detailed by the Architect or provide manufacturer's premium model fixtures, selected from product brochures depicting typical devices and arrangements. Company logos shall not be visible in public spaces.
- B. Provide vandal resistant fasteners on all surfaces exposed to public view unless otherwise specified.
- C. All electrical devices, car operating panels, hall fixtures, etc. shall be in watertight enclosures.
- D. Car Operating Panels:
 - 1. Panel shall be integral with front return panel. Front return panels shall have continuous hinge or three piano hinges with concealed three-point latching. Panels shall have illuminating pushbuttons numbered to conform to floors served. Include service cabinet. Auxiliary shall be surface mounted on the side wall and shall have three piano hinges with concealed three-point latching.
 - 2. Buttons shall light to show registration and extinguish when car stops in response to a call. Buttons shall have a minimum dimension of 3/4-inch, be raised 1/8-inch plus or minus 1/32-inch above the surrounding surface, be of square shouldered design, and have a detectable mechanical motion. A minimum clear space of 3/8-inch or other suitable means of separation shall be provided. Buttons shall have stainless steel button face with white illuminating halo. Provide LED illumination.
 - 3. Braille / Arabic designations shall be identified by a minimum of 5/8-inch Arabic numeral, standard alphabet character, or standard symbol immediately to the left of the control button. Braille shall be located immediately below the numeral, character, or symbol. Controls and emergency equipment shall be identified by raised symbols, including but not limited to, door open, door close, alarm bell and telephone. The call button for the main entry floor shall be designated by a raised star at the left of the floor designations. Braille and Arabic designations shall be cast with flush mounting to match entrances. The plaques shall have raised white colored numerals on a black background. Provide Entrada type VS2 or equal plates.
 - 4. Panel shall include an Alarm Bell, Door Open, Extended Door Hold and Door Close buttons. All operating controls shall be located at 4 feet-0 inches above the car floor, the alarm button shall be located no lower than 2 feet-11 inches above finished floor height.
 - 5. In main panels, provide a fire emergency service cabinet containing: Phase II emergency fire service switch, fire jewel, fire operating instructions on the inside face of the cabinet door, Call Cancel button and Door Open and Door Close buttons. Cabinet door shall be flush with the faceplate with hairline joints. "FIREFIGHTERS OPERATION" shall be engraved on visible face of door in red text no less than 7/16-inch. For all visible to public spaces stick-on or inserted plaques are not acceptable.
 - 6. In main panels, provide an intercom grill and flush mounted speaker grill for the "Hands-free" telephone / communication system.
 - 7. Provide a lockable service cabinet with concealed hinges. Locate in auxiliary panel below all operating controls and devices. Cabinet door shall be flush with hairline joints. The Cabinet shall contain the following controls:
 - a. In-car light switch.
 - b. "Push / Pull" type emergency stop switch.
 - c. Fan / Blower switch.
 - d. Inspection (hoistway access enable) switch, conforming to the ANSI Code.
 - e. Independent service switch.
 - f. Emergency light test button.
 - g. Duplex 120-volt, A.C. G.F.C.I convenience outlet.
 - h. Light switch for under platform light.

- i. 2 USB Ports and keyboard plug in for programing the Digital Display. All programing for the Elite PI shall be possible thru the ports in the service cabinet.
- 8. Engrave all panels above the Position Indicator, with the following:
 - a. Elevator number. Minimum 1/2-inch lettering.
 - b. Elevator capacity. Minimum 1/4-inch lettering.
 - c. Fire Instruction signage; on inside face of door to Firefighters Operation cabinet
 - d. All Code Required Signage/Verbiage Shall be engraved on the car operating panel.
- E. Digital Display: Passenger Provide one per car minimum 12-inch display.
 - 1. Provide on main car operating panel. Use to display information and customize with USB port or from main control station. Provide a 12-inch minimum display. Display elevator position, direction of travel and priority messages. The system shall also be capable of displaying floor-based messages, time, date, temperature as well as scheduled messages.
 - 2. Configure display to provide messages such as security override, fire service, etc.
 - 3. Incorporate Position Indicator into Digital Display.
 - 4. An additional power supply and disconnect for the Elite PI Display in the control room for each elevator.
 - 5.
- F. Hall Call Stations: With engraved faceplates for In Case of Fire Signs and Fire Instructions
 - 1. Provide one riser for each elevator. Hall call station shall include 11-gauge stainless steel faceplate. The centerline of riser (call button or centerline of two-button pattern) to be located at 3 feet-6 inches above the finished floor. Buttons shall have a minimum dimension of 3/4-inch, be raised 1/8-inch plus or minus 1/32-inch above the surrounding surface, be of square shouldered design, and have a detectable mechanical motion. A minimum clear space of 3/8-inch separation shall be provided. Provide LED illumination.
 - 2. Provide a 3-position Code required Phase I Fire Service key switch, visual indicator, and operational instructions. Integrate devices and signage with hall call station. Fire instructions shall be engraved minimum 1/8-inch high on the faceplate.
 - 3. Provide emergency power indicator at the main lobby for each group of elevators; integrate with the Phase I Fire Service key switch into same faceplate. Refer to Fire Control Panel section for emergency power selector switches.
 - 4. Faceplate edges shall be relieved. Finish shall be stainless steel No. 4 brushed finish. Engraving shall be epoxy filled. Integral signs shall be as follows:
 - a. Fire Exiting Instructions: Minimum 1/2-inch lettering.
 - b. Phase I Fire Service Instructions: Minimum 1/8-inch lettering.
 - c. Provide spanner type security fasteners. Finish matching faceplate.
- G. Combination Position and Direction Indicators: Provide direction indicators at all floors. Provide vandal resistant at all floors. Provide UP and DOWN lanterns at intermediate landings, single lantern at terminal landings. Electronic chimes for each lantern shall sound once for up and twice for the down direction of rise. The lantern shall illuminate for corresponding direction of car rise and the chime shall sound when the elevator is at a predetermined distance from the scheduled floor stop. The location of the lanterns shall be as directed by Architect.
- H. Hoistway and Pit Access: Provide hoistway unlocking device in every hoistway door located no more than 6'-11" above finished floor. Provide stainless steel escutcheon tubes and secure with silicone in each door. Provide hoistway access key switches at top floor of each elevator and provide pit access key switches at bottom floor of each elevator. Mount access switches in door jamb without cover plate. Engrave key switch collar with function and UP and DOWN directions. Key switches shall be same type for each elevator.

2.11 Fire Control Panel

- A. Provide a common control panel for all units provided under this contract. Locate, as directed by Architect. All wiring and interconnection of devices is to be installed under this section. Panel to contain the following devices and indicators:
1. Digital position and direction indicator per elevator.
 2. Fireman's return switch per group or individual elevator as required.
 3. Visual indicator to indicate if doors are open at the fire egress floor per elevator.
 4. Fire service jewel per group or individual elevator as required.
 5. Visual indicator indicating if the car is occupied per elevator.
 6. Engraved instructions for fire service operation.
 7. Emergency power selector switches per group.
 8. Emergency power status indicators.

2.12 ENGINEERS CONTROL PANEL

- A. Provide all necessary integration and compatibility with the airport monitoring system.
- B. Provide one panel for all elevators and escalators.
- C. Provide a single LCD/CPU with a minimum 19 inches diagonal flat non-glare screen mounted as required in the security desk. Coordinate with Security Subcontractor on location and size of display. For escalators, display operational functions as required including but not limited to faults, operating status, etc. Provide a visual and audible alert if the unit malfunctions if safety circuits are tripped or if unit is shut down due to activation of a stop switch.
- D. The stations shall be connected to the monitoring system to display information such as car position, car status, emergency power, fire recall, all operational functions and traffic information (up and down calls, etc.)
- E. All wiring to each of the panel shall be included in this scope of work.
- F. Provide one 19-inch color flat screen liquid crystal display with active-matrix screen, keyboard and modem connections and mount in Security Center for monitoring all elevators. The system shall be equal to Lift Net as manufactured by Integrated Display System. The screen and keyboard shall provide the following monitoring and control functions for all elevators.
- G. Display position of each elevator.
- H. Display status of each elevator (i.e., normal, independent, inspection, fireman's service phase 1 or phase 2, parked, emergency power, out of service, etc.
- I. Provide flashing warning device and audible signal to indicate an elevator has shut itself down due to a fault in the system.
- J. Provide automatic means and manual means to permit security to park and shut down each elevator at the designated landing with its doors closed.
- K. Provide controls to manually or automatically lock off selected car call buttons in any elevator and to lock off selected hall buttons on any group of elevators. Provide capability in system so that Owner can choose to have independent service operation override or not override security lockout.

- L. Provide waiting time analysis to measure average waiting times, maximum waiting time, waiting time over 60 seconds for any floor and for any time of day for each elevator.

2.13 MONITORING STATION

- A. Provide a single LCD / CPU with a minimum 19-inch diagonal flat screen mounted as required in Security desk. The monitor shall be capable of monitoring all elevators and escalators. Separate panels for freight elevator or escalators shall not be provided.
- B. Coordinate with Contractor / Architect for location and size of display. Display operational functions and security features as required including but not limited to car and hall calls, car bypass functions, security operation, ability to turn car on and off as well as return the car to the lobby. Data collection, data storage, and real-time monitoring portion of the system shall be based on Microsoft Windows and be able to run on current Windows operating systems.
- C. Each unit shown on the plan view shall be individually displayed and shall be visible on the monitoring system display terminal without the need to scroll. Each individual unit, when operating "normally," shall be displayed in green. In the event of a malfunction of any individual unit, the unit shall be displayed by a red blinking light on the monitoring system display. Units which are intentionally placed out of service shall be shown as yellow in the display mode. When malfunctioning units, or units intentionally placed out of service are returned to normal operation the graphical representation for that unit(s) shall automatically return to green. All monitored units shall be visible from any monitoring terminal on the network. Entry into the network shall be multi-level password protected.
- D. System Capabilities:
 - 1. The system shall be capable of real time display of all monitored status points on all monitored equipment. Fault and event notification screens and audible alarms shall be immediately displayed on selected monitoring stations. Different fault and event tables shall be defined on a per-bank basis. The system shall collect and store all status, fault, and event information for later reporting and analysis. The system shall provide statistical analysis of hall call response times, traffic patterns, fault conditions, service logs, and security usage in graphical and tabular format.
 - 2. The system shall maintain a record of every status point change occurring on the monitored equipment and provide the ability to replay these events in a simulation later in real time, slow speed, single step, reverse, or fast forward. This information shall be retained for a period of at least twenty-four (24) weeks and a mechanism shall be provided whereby this information may be archived.
 - 3. The system shall store traffic fault and statistical data for a period of at least three (3) years.
 - 4. The system shall log error type, car number, floor position, and major system status points whenever a fault or logged event occurs.
 - 5. The system shall provide interactive control of certain features provided in the unit control system. These features may be revised as the requirements of the building change.
 - 6. Some of these interactive controls may include, but are not limited to: Security floor lockouts, entering car and hall calls, Firefighters" service, lobby recall, VIP service, etc.
 - 7. In the case of a power failure the system shall be capable of connecting to emergency power back-up unit. The loss of power shall not affect any stored data. The system shall have the capability to detect the loss (disconnect) of any individual unit from the monitoring system by periodically polling all units to ensure that normal communications between the unit(s) and the terminals / server are maintained.
 - 8. The system will automatically re-boot the program and continue to operate after a power loss or other system malfunction.

2.14 COMMUNICATION SYSTEM

- A. Provide automatic dial voice, video and text communication system located in the main swing panel. A video display shall suitably identify activation of auto dialer for the visually and hearing impaired. Speaker shall be mounted without faceplate or visible fasteners and located behind the main panel. A camera shall be mounted in the front return to establish a visual link between the car and remote communication center. Voice and video communication shall be capable of being heard and viewed from any location within the car enclosure.
- B. Provide minimum 4-inch diameter speaker and microphone and mount behind perforations in a circular pattern in main car station of each elevator.
- C. Provide "Push to Call Button" in car station such that when call button is pressed call is automatically placed to Security Center.
- D. Provide engraved signage for CALL PLACED and CALL RECEIVED lights into car station.
- E. Provide raised phone symbol and braille tag to left of push to call button.
- F. All wiring shall be the responsibility of this section including that between the control room and the hands-free telephones.
- G. Provide consolidator in each control room as necessary in the event there is only one telephone line in each control room.
- H. The phone shall have the ability to record and play two different voice messages for all elevators.
- I. Provide battery backup to operate telephones for at least 4 hours of use.
- J. The phones shall be programmable and shall have 4 autodial capabilities. The phone shall employ all progress monitoring to detect whether a call has been successfully placed.
- K. Telephone System: Provide automatic dial "Hands-Free" telephone station located in the main car operating panel. A button shall suitably identify activation of auto dialer for the sight impaired. Speaker shall be mounted without faceplate or visible fasteners and located either behind the main panel.
 - 1. A push button to actuate the two-way communication means shall be provided in car operating panel. The push button shall be visible and permanently identified as "HELP." The identification shall be on or adjacent to the "HELP" button. When the push button is actuated, the emergency two-way communication means shall initiate a call for help and establish two-way communications.
 - 2. A visual indication on the same panel as the "HELP" push button shall be provided, that is activated by authorized personnel, to acknowledge that two-way communications link has been established. The visual indication shall be extinguished when the two-way communication link is terminated. Engrave "BLINKING INDICATES CALL IS ANSWERED, HELP IS ON THE WAY" adjacent to visual indication in main panel.
 - 3. A video screen shall be provided within the cab, that is activated by authorized personnel, to acknowledge that a communications link has been established. The visual indication shall allow text messaging to be initiated from the communication center. A means shall be provided in the elevator cab to allow acknowledgement of receiving the text message. A video screen shall provide indication that chat, and video connection has been initiated.
- L. Provide wiring from car to telephone terminal box in elevator control room.

- M. Provide permanent means of communication between the first responder emergency personnel location and the elevator car. This communication shall be able to interrupt calls which may be underway between the passenger and the 24/7 answering service.
- N. Mount fire alarm speaker on each car top and run required wiring from speaker to life safety terminal box in control room. Speakers to be provided by fire alarm contractor.
- O. Mount security camera in each elevator cab and run required wiring from car top junction box to security camera terminal box in control room.
- P. Include the installation of Life Safety speaker within the elevator cab. Provide wiring from car to Life Safety junction box in control room.

PART 3 - EXECUTION

3.1 EXAMINATION OF BUILDING AND CONTRACT DOCUMENTS

- A. The Contractor/Installer shall examine the supporting structure and the conditions under which the work shall be installed and notify the Contractor of any conditions detrimental to the proper and timely completion of the work. Such examination and notification shall occur early enough to ensure unsatisfactory conditions have been corrected and are acceptable prior to start of installation without causing or contributing to schedule delay.
- B. Verify dimensions of supporting structure at the site by accurate field measurements. The work shall be accurately fabricated and fitted to the structure. Subcontractor shall be satisfied, by combined review and comparison of the working drawings and field observation, that the clearances and the alignments are as represented as the basis for bid and proper for the installation of this work.
- C. Coordinate works with the work of other trades and provide items to be placed during the installation at the proper time to avoid delays in the overall work. Use Contractor's benchmarks where necessary.
- D. The Subcontractor shall review the electrical drawings and verify all conditions for proper installation of this work. Verify that all elevator equipment electrical data serving as the basis for the work of others is correct. for proper operation.

3.2 FIELD QUALITY CONTROL

- A. When the installation is completed, notify the Owner, Architect and Consultant in writing that the work prescribed hereunder is:
 - 1. Completely installed and fully adjusted.
 - 2. Certified by the installer as compliant with all applicable Codes and the Contract Documents.
 - 3. Prepared with all test instruments, weights, gauges, meters, and other materials that may be required, and is, in every way, ready to conduct both Safety Testing (by Authorities Having Jurisdiction – AHJ) and Performance Review (by Consultant).
- B. Safety Testing and Code Compliance: Arrange testing and inspection date with the Authority Having Jurisdiction (AHJ). The proper and safe operation, as well as statutory tests of the elevator system and compliance with applicable Codes, shall be demonstrated to the satisfaction of the

AHJ.

1. Repair or replace and re-test incomplete or defective work as required.
2. Pay for restoring or replacing any work damaged by or due to tests.
3. Record, certify, and report test results as required by Code and the AHJ.
4. Construction Use Inspection: General Contractor will elect to use one (1) or more elevators for construction. Elevator Contractor shall provide General Contractor with one (1) additional inspection per Construction Use elevator.
5. Performance Review and Contract Compliance:

C. After acceptance of the installation and issuance of an operating permit by the AHJ, contractor shall notify Owner, Architect and Consultant of its readiness to attend and support Performance Review. The measuring tools shall be provided by the elevator contractor. Performance Reviews include:

1. Visual Examinations: Elevator spaces, including control or control room, hoistway (including car top examination of each elevator's entire hoistway and entrance equipment at each landing), MRL machine, secondary or overhead sheave space and pit.
2. Test Period: The elevator shall be subjected to a test period of one (1) hour of continuous operation, with full specified load in the car. During the test, the car shall be stopped at all floors in both directions of rise for a standing period of 10-seconds per floor.
3. Speed / Load Tests: The actual speed of the elevator car shall be determined in both directions of rise with full contract load and with no load in the elevator car. The actual measured speed of elevator car with full load shall be within 5-percent of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined between the "Up" and the "Down" directions shall be checked.
4. Floor-to-floor performance times, in both directions, shall be checked.
5. Door operation as follows shall be verified:
 - a. Opening time in seconds
 - b. In response to car calls
 - c. In response to hall calls
 - d. Re-opening for interruption of door protection
 - e. Closing time in seconds
 - f. Nudging delay in seconds
 - g. Closing Force (less than 30 psi)
6. Car Leveling Tests: Elevator car leveling devices shall be tested for accuracy (plus or minus 1/8-inch) of landing at all floors, under various load conditions as determined by consultant, in both directions of travel.
7. Noise Level Tests: Noise levels shall be tested for compliance with requirements of the Contract Documents in the following locations:
 - a. Machine / control room
 - b. Inside the elevator car
 - c. In the elevator lobby and / or rooms adjacent to hoistway.
8. Ride Quality Tests: Quality of elevator's ride, vibration, and comfort shall be evaluated under the following conditions:
 - a. Acceleration, in both directions of travel
 - b. Deceleration, in both directions of travel
 - c. Leveling, in both directions of travel
 - d. At full contract speed, in both directions of travel
 - e. During floor-to-floor runs, in both directions of travel
9. Fit and Finish: Materials, position, secure mounting, quality of finishes, joints, connections, transitions, and workmanship of all visible surfaces shall be inspected and verified as compliant with Contract Documents

10. Re-review: If any equipment is found to be damaged, incomplete, non-compliant or defective, or if the performance of the elevator does not conform to the performance requirements of the Contract Documents, initiation of equipment Warranty shall be delayed until all defects have been corrected. The elevator contractor shall be responsible for any costs associated with re-reviews.

3.3 ADJUSTING, CLEANING, LUBRICATION AND PAINTING

- A. Provide all instructions and training as required by DFW.
- B. Perform the following work prior to final testing and acceptance.
 1. Adjust all equipment for optimum performance, including controllers, motors, drives, landing systems, hoistway switches, door operating equipment and safety equipment to achieve the required performance levels.
 2. Thoroughly clean all equipment and equipment areas free of all dust, dirt, debris and excessive oil and grease.
 3. Lubricate all equipment in accordance with manufacturer's guidelines.
 4. Patch and paint exposed work soiled or damaged during installation. Repair to match adjoining work prior final acceptance.
 5. Clean and paint the following equipment and areas: pit floor and control room floor.

3.4 INSTRUCTIONS

- A. Upon completion of all work, the Elevator Contractor shall provide an instruction period. Instructions shall be given by technically competent personnel and shall apply to actual project conditions. The instructions shall cover, but shall not be limited to the following:
 1. Operation of elevators under routine and emergency conditions, proper maintenance of finish surfaces and protocol for placing emergency or trouble calls and authorizing overtime work.
 2. Operation of elevator fire recall system and tenant security system.
 3. Operation of elevator communication, door reversal device, etc.
 4. Routine operational items and frequent, common, external causes of elevator failure that the Owner or designated occupant should inspect and verify before calling for service, to avoid unnecessary additional charges.
 5. Maintenance Tools: Provide a complete list of specialty tools required for general maintenance including programmable and diagnostic tools.

END OF SECTION

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