

## SECTION 14215

## ELECTRIC TRACTION ELEVATORS

## PART 1 GENERAL

## 1.01 WORK INCLUDED

- A. Traction elevator(s) as follows: Machine Room Less (MRL).
- B. All engineering, equipment, labor, and permits required to satisfactorily complete elevator installation required by Contract Documents.
- C. Applicable conditions of General, Special, and Supplemental Conditions, and Division 1.
- D. Warranty / Preventive maintenance as described herein.
- E. Additional equipment or finishes furnished under other sections, installed under this section:
  - 1. Building announcement speaker(s) in Elevator cabs
  - 2. In car Firefighters' telephone jack(s)
  - 3. CCTV System – If required
  - 4. Provisions for and mounting of Card reader security system- if required
  - 5. Car interior finishes
  - 6. Car finish flooring

## 1.02 RELATED WORK PROVIDED UNDER OTHER SECTIONS - PROVIDED BY OTHERS

- A. Hoistway and Pit:
  - 1. Clear, plumb, substantially flush hoistway with variations not to exceed 1" at any point.
  - 2. Divider beams between adjacent elevators at each floor, pit, and overhead. Supports at each floor for car and counterweight guide rail fastening, including supports for car guide rail fastening above top landing. Intermediate car guide rail support when floor heights exceed 14'-0" or as designated on contract drawings. Intermediate counterweight guide rail supports where floor heights exceed 16'-0". Building supports not to deflect in excess of 1/8" under normal conditions
  - 3. Hoist machine supports including two (2) additional horizontal supports above the top terminal landing on the machine side of the hoistway. Locate as required for selected Contractors' equipment.
  - 4. Wall blockouts and fire rated closure for control and signal fixture boxes which penetrate walls.
  - 5. Cutting and patching walls and floors.
  - 6. Concrete wall pockets and/or structural steel beams for support of hoist machine, rope sheaves, and dead-end hitch beams. Support deflection shall not exceed

1/1666 of span under static load.

7. Erect front hoistway wall after elevator entrances are installed.
8. Grout floor up to hoistway sills and around hoistway entrances.
9. Lockable, self-closing, fire-rated pit door (walk in pits only)
10. Pit access stationary ladder for each elevator. Retractable ladder if provided shall include an electrical contact conforming to ASME A17.1, Rule 2.2.2.4.2.7.
11. Structural support at pit floor for buffer impact loads, guide rail loads.
12. Waterproof pit. Indirect waste drain or sump with flush grate and pump. Sump pump/drain capacity minimum 3000 gallons per hour, per elevator.
13. Groundwater sumps residing in elevator shafts must be protected from any water generated in the elevator shaft. Groundwater sumps are not to be used or considered as elevator emergency drain pump unless written approval is given by the Colorado Division of Oil and Public Safety Conveyance Program.
14. Protect open hoistways and entrances during construction per OSHA Regulations.
15. Protect car enclosure, hoistway entrance assemblies, and special metal finishes from damage.
16. Hoistway smoke relief venting.
17. Hoistway pressurization for smoke control. If required.
18. Hoist machine ventilation, heating, and/or cooling. Maintain minimum temperature of 55°F, maximum 90°F at the location of the hoist machine.
19. Seal fireproofing to prevent flaking.
20. Single Blind hoistway Rules - Provide emergency access door every third floor and maximum 36'-0" sill to sill. Minimum 28" wide x 80" high single slide or swing, self-closing and self-locking with key removable in locked position only. Mark room side of door with 2" high letters, "Danger: Elevator Hoistway." Door operable from hoistway side without key.
21. Finished Floor Covering: Unless otherwise specified, Provide Rubber tile 1/8" thick with 1" diameter by 0.025" raised circular pattern. Color to be determined.

B. Control Room and Machinery Spaces:

1. Enclosure with access.
2. Self-closing and locking access door.
3. Ventilation and heating. Maintain minimum temperature of 55° F, maximum 90° F. Maintain maximum 80% relative humidity, non-condensing.
4. Paint walls and ceiling.
5. Class "ABC" fire extinguisher in each elevator controller space.
6. Seal fireproofing to prevent flaking.
7. Fire sprinklers where required.

C. Electrical Service, Conductors, and Devices:

1. Lighting and GFCI convenience outlets in pit, controller space, and overhead machinery spaces. Provide one additional non-GFCI convenience outlet in pit for sump pump.
2. Provide compact fluorescent protected lighting fixtures, mounted vertically throughout the hoistway. Attain no less than 10 ft. candles illumination in pit and hoistway, 19 ft. candles in MRL machine space.
3. Three-phase mainline copper power feeder with true earthen grounding to terminals of each elevator controller in the controller space with protected lockable "open" disconnecting means.

4. Single-phase copper power feeder to each elevator controller for car lighting and exhaust blower with individual protected lockable "open" disconnecting means located in the controller space.
5. Emergency telephone line to each individual elevator control panel in elevator controller space.
6. Fire alarm initiating devices in each elevator lobby for each group of elevators or single elevator and each controller space to initiate firefighters' return feature. Device at top of hoistway if sprinklered. Provide alarm initiating signal wiring from hoistway or controller space connection point to elevator controller terminals. Device in machine room and at top of hoistway to provide signal for general alarm and discrete signal for Phase II firefighters' Operation.
7. Temporary power and illumination to install, test, and adjust elevator equipment.
8. Firefighters' telephone jack and announcement speaker in car with connection to individual elevator control panels in the controller space and elevator control panel in firefighters' control room. If required.
9. Conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room and/or main control console. If required. Coordinate size, number, and location of conduits with Elevator Contractor.
10. Means to automatically disconnect power to affected elevator drive unit and controller prior to activation of the controller space fire sprinkler System, and/or hoistway fire sprinkler system. Manual shut-off means shall be located outside bounds of the controller space. If sprinklers are required
11. When sprinklers are provided in the hoistway all electrical equipment, located less than 4'-0" above the pit floor shall be identified for use in wet locations. Exception: seismic protection devices.
12. Single-phase power feeders to main control console and firefighters' control panel.
13. Single-phase power feeder to elevator intercom amplifier in the elevator controller space. If present.
14. Single-phase power feeder to each elevator controller in the controller space with protected, lockable "open" disconnecting means for car heating and air conditioning unit. If present.
15. Single-phase power feeders to controller(s) for CCTV with lockable "open" disconnecting means. If present.

D. Standby Power Provision: If present or required

1. Standby power of normal voltage characteristics via normal electrical feeders to run one elevator at a time in each elevator group and/or single elevator unit at full-contract car speed and capacity.
2. Conductor from auxiliary form "C" dry contacts, located in the standby power transfer switch to a designated elevator control panel in each elevator group and/or single elevator unit. Provide a time delay of 30 -45 seconds for pretransfer signal in either direction.
3. Standby single-phase power to group controller, and each elevator controller for car lighting, exhaust blower, emergency signaling device, intercom amplifier, hoist machine cooling fan, car heating and air conditioning unit.
4. Means for absorbing regenerated power during an overhauling bad condition per NEC 620.91. Elevator(s) will employ IGBT drive, presenting a nonlinear active load.
5. Standby power to machine room, pit, and overhead machinery space lighting.
6. Standby power to hoist machine and control room ventilation or air conditioning.

7. Standby power to emergency communications device(s).

### 1.03 DEFINITIONS

- A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.
- B. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
- C. Provisions of this specification are applicable to all elevators unless identified otherwise.

### 1.04 QUALITY ASSURANCE

- A. Approved Contractors: Alternate Contractors must receive approval of the owner at least 14 calendar days prior to bid date.
  1. Machine Room-Less Gearless Elevator(s): ThyssenKrupp, KONE, Otis, Schindler, Global Tardiff, Imperial, Hollister Whitney, GAL, MCE
  2. Car Enclosure: Eklund's Inc., Gunderlin, Ltd., Hauenstein & Burmeister, ThyssenKrupp, KONE, Otis, Schindler, Tyler, Schumacher
  3. Hoistway Entrance: Gunderlin, Hauenstein & Burmeister, ThyssenKrupp, KONE, Otis, Schindler, Tyler, Columbia.
- B. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
  1. Safety Code for Elevators and Escalators, ASME A17.1
  2. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
  3. Elevator and Escalator Electrical Equipment, ASME A17.5
  4. National Electrical Code, NFPA 70
  5. Americans with Disabilities Act, ADA
  6. Local Fire Authority
  7. Requirements of IBC, DSA, and all other Codes, Ordinances and Laws applicable within the governing jurisdiction
  8. Life Safety Code, NFPA 101
  9. Uniform Federal Accessibility Standard, UFAS
  10. Colorado School of Mines Construction Standards.
- C. Warranty:
  1. Material and workmanship of installation shall comply in every respect with Contract Documents. Correct defective material or workmanship which develops within one year from date of substantial completion of all work to satisfaction of Architect, Purchaser and Consultant at no additional cost, unless due to ordinary wear and tear, or improper use or care by Purchaser. Perform maintenance in accordance with terms and conditions indicated in the Preventive Maintenance

Agreement.

2. Defective is defined to include, but not limited to: Operation or control System failures, car performance below required minimum, excessive wear, unusual deterioration, or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise, or vibration, and similar unsatisfactory conditions.
3. Make modifications, requirements, adjustments, and improvements to meet performance requirements in Parts 2 and 3.

#### 1.05 DOCUMENT VERIFICATION

- A. In order to discover and resolve conflicts or lack of definition which might create problems, Contractor must review Contract Documents for compatibility with its product prior to submittal of quotation. Purchaser will not pay for change to structural, mechanical, electrical, or other systems required to accommodate Contractor's equipment.

#### 1.06 SUBMITTALS

- A. Within 60 calendar days after award of contract and before beginning equipment fabrication submit shop drawings and required materials for review as outlined in Division 1. Allow 30 calendar days for response to initial submittal.
  1. Scaled or Fully Dimensioned Layout: Plan of pit, hoistway, and control room indicating equipment arrangement, elevation section of hoistway, details of car enclosures, hoistway entrances, and car/hall signal fixtures.
  2. Design Information: Indicate equipment lists, reactions, and design information on layouts.
  3. Power Confirmation Information: Include motor horsepower, code letter, starting current, full-load running current, and demand factor.
  4. Fixtures: Cuts, samples, or shop drawings.
  5. Finish Material: Submit 3" x 12" samples of actual finished material for Architect review of color, pattern, and texture. Compliance with other requirements is the exclusive responsibility of the Contractor. Include, if requested, signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.
  6. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
- B. Acknowledge and/or respond to review comments within 14 calendar days of return. Promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Contractor's revision response time is not justification for equipment delivery or installation delay.

#### 1.07 PERMIT, TEST AND INSPECTION

- A. Obtain and pay for all permit, license, and inspection fee necessary to complete installation.
- B. Perform test required by Governing Authority in accordance with procedure described in ASME A17.2 Guide for Inspection of Elevators, Escalators, and Moving Walks in the presence of Authorized Representative.
- C. Supply personnel and equipment for test and final review by AHJ inspector, Consultant and owner as required in Part 3.

#### 1.08 MAINTENANCE

- A. Interim:
  1. When one or more elevators are near completion and ready for service, the General Contractor may accept elevators for interim use and place in service prior to substantial completion of project, entirely at their own risk.
  2. During this period General Contractor may pay a mutually agreed upon monthly amount per elevator for preventive maintenance to the elevator contractor. Provide a unit cost with bid documents to perform this work per elevator per month.
  3. Temporary acceptance form must be acceptable to General Contractor and signed prior to use.
  4. General Contractor must provide or pay for temporary hoistway and car enclosures; protect installed equipment and finishes; pay for and return elevators to elevator sub-contractor for all cleaning, repairs, and replacement of materials necessary to restore elevator to "as-new" condition as determined solely by representatives of the Colorado School of Mines prior to final acceptance.
- B. Warranty Maintenance:
  1. Provide preventive maintenance and 24-hour emergency callback service for one year commencing on date of final acceptance by Purchaser. Systematically examine, adjust, clean, and lubricate all equipment. Repair or replace defective parts using parts produced by the Contractor of installed equipment. Maintain elevator control room, hoistway, and pit in clean condition.
  2. Use competent personnel, acceptable to the Purchaser, supervised and employed by Contractor.
  3. The warranty maintenance period specified in Item 1 above shall be extended one (1) month for each three (3) month period in which equipment related failures average more than .25 per unit per month.
  4. Purchaser retains the Option to delete cost of warranty maintenance from new equipment contract and remit twelve (12) equal installments directly to Contractor during period in which maintenance is being performed.
  5. Use competent personnel, acceptable to the Purchaser, employed and supervised by Contractor.

## PART 2 PRODUCTS

## 2.01 MATERIALS

## A. Steel:

1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568 and A569.
3. Structural Steel Shapes and Plates: ASTM A36.

## B. Stainless Steel: Type 302 or 304, complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.

1. No. 4: Directional polish (satin finish). Graining directions as shown or, if not shown, in longest dimension.
2. No. 8: Reflective polish (mirror Finish).
3. Textured: 5WL as manufactured by Rigidized Metals or Windsor pattern 5-SM as manufactured by Rimex Metals or approved equal with .050 inches mean pattern depth with bright directional polish (satin finish).
4. Burnished: Non-directional, random abrasion pattern.

## C. Bronze: Stretcher-leveled, re-squared sheets composed of 60% copper and 40% zinc similar to Muntz Metal, Alloy Group 2, with standard temper and hardness required for fabrication, strength, and durability. Clean and treat bronze surfaces before mechanical finish. After completion of the final mechanical finish on the fabricated work, use a chemical cleaner to produce finish (Federal Standard and NAAMIM nomenclature) matching Architect's sample:

1. No 4 Satin: Directional polish finish. Fine-satin clear-coated with clear organic coating recommended by Fabricator. Provide graining direction as shown or, if not shown, in longest dimension.
2. No. 8 Mirror: Reflective polish finish with no visible graining. Bright polished clear-coated finish with clear-organic lacquer coating recommended by Fabricator.
3. Acid-Etched Pattern: Provide a No. 8 mirror reflective-polished background with selectively acid-etched, matte-textured, custom pattern as shown. Acid selection and dilution (if required) recommended by Fabricator. After final finishing, coat bronze with clear-organic lacquer coating recommended by Fabricator.

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

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

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

- F. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted.
- G. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.
- H. Baked Enamel Finish: Prime finish per above. Unless specified "prime finish" only, apply and bake three (3) additional coats of enamel in the selected solid color.
- I. Glass: Laminated safety glass, minimum 9/16" thick, conforming to ANSI Z97.1 and CPSC 16CFR Part 1201.

## 2.02 CAR AND GROUP PERFORMANCE

- A. Car Speed: J: 3% of contract speed under any loading condition.
- B. Car Capacity: Safely lower, stop and hold 125% of rated load.
- C. Car Stopping Zone:  $\pm 1/4$ " under any loading condition.

## 2.03 OPERATION

- A. Approved non-proprietary microprocessor-based elevator controls and landing systems are as follows;
  - 1. Computerized Elevator Controls Corporation
  - 2. Elevator Controls Corporation
  - 3. Motion Control Engineering
  - 4. SmartRise
  - 5. Galaxy
  - 6. Original Equipment Manufacturers
    - a. Major Manufacturers equipment may be substituted with documentation confirming strict adherence to Section 14215, 3.08, A, 1-9.
      - i. KONE, Otis, ThyssenKrupp, Schindler
- B. Selective Collective Microprocessor Based (Car(s)):
  - 1. Operate car without attendant from pushbuttons in car and located at each floor. When car is available, automatically start car, and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
  - 2. Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of car and corresponding to the direction of car travel have been

answered.

3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

C. Duplex Selective Collective Microprocessor-Based, Car(s):

1. Operate cars without attendants from pushbuttons in cars and located at each floor. When cars are available, park one car at main floor ("home" car). Park other car where last used ("free" car).
2. Respond to car calls and hall calls above main floor using the free car. Once a car has started, respond to registered calls in the direction of travel and in the order the floors are reached.
3. Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of the car and corresponding to the direction of car travel have been answered.
4. Slow cars and stop automatically at floors corresponding to registered calls in the order in which they are approached in either direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
5. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is the highest (or lowest) call registered.
6. When the free car is clearing calls, start home car to respond to:
  - a. A call registered on home car pushbuttons.
  - b. An up hall call registered below free car.
  - c. An up or a down call registered above free car while free car is traveling down.
  - d. A hall call when free car is delayed in its normal Operation for a predetermined period.
7. When both cars are clearing calls, stop only one car in response to any registered hall call. Return the first car to clear its calls to main floor. Should last service required bring both cars to main floor, the first arriving car becomes the free car.
8. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

D. Group Automatic, Car(s)

1. Include, as a minimum, the following features:
  - a. Operate cars as a group capable of balancing service and providing continuity of group operation with one or more cars removed from the system.
  - b. Register service calls from pushbuttons located at each floor and in each car. Slow cars and stop automatically at floors corresponding to registered calls. Make stops at successive floors for each direction of travel irrespective of order in which calls are registered except when bypassing hall calls to

balance and improve overall service; stop only one car in response to a particular hall call. Assign hall calls to specific cars and continually review and modify those assignments to improve service. Simultaneous to initiation of slow down of a car for a hall call, cancel that call. Render hall pushbutton ineffective until car doors begin to close after passenger transfer. Cancel car calls in the same manner. Give priority to coincidental car and hall calls in car assignment.

- c. Operate system to meet changing traffic conditions on a service demand basis. Include provisions for handling traffic which may be heavier in either direction, intermittent or very light. As traffic demands change, automatically and continually modify group and individual car assignment to provide the most-effective means to handle current traffic conditions. Provide means to sense long-wait hall calls and preferentially serve them. Give priority to coincidental car and hall calls in hall call assignment. Accomplish car direction reversal without closing and reopening doors.
- d. Use easily reprogrammable system software. Design basic algorithm to optimize service based on equalizing system response to registered hall calls and equalizing passenger trip time to shortest possible time.
- e. Serve floors below main floor in a manner which logically minimizes delay in passing or stopping at main floor in both directions of travel. Provide manual means to force a stop at the main floor when passing to or from lower levels.
- f. Required Features:
  - i. Dispatch Protection: Backup dispatching shall function in the same manner as the primary dispatching.
  - ii. Delayed Car Removal: Automatically remove delayed car from group Operation.
  - iii. Position Sensing: Update car position when passing or stopping at each landing.
  - iv. Hall Pushbutton Failure: Provide multiple power sources and separate fusing for pushbutton risers.
  - v. Communication link: Provide serial or duplicate communication link for all group and individual car computers.

E. Other Items:

1. Load Weighing: Provide means for weighing car passenger load. Control system to provide dispatching at main floor in advance of normal intervals when car fills to capacity. Provide hall call by-pass when the car is filled to preset percentage of rated capacity and traveling in down direction. Field adjustment range: 10% to 100%.
2. Anti-Nuisance Feature: If car loading relative to weight in car is not commensurate with number of registered car calls, cancel car calls. Systems employing either bad weighing or door protective device for activation of this feature are acceptable.
3. Independent Service: Provide controls for operation of each car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.
4. Key requirements for all key operated devices must conform to the University master key plan, Medco brand.

- F. Firefighters' Service: Provide equipment and Operation in accordance with code requirements.
- G. Automatic Car Stopping Zone: Stop car within 1/4" above or below the landing sill. Maintain stopping zone regardless of bad in car, direction of travel, distance between landings, hoist rope slippage, or stretch.
- H. Remote Monitoring and Diagnostics: Equip each controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic, and monitoring Computers, keyboards, modems, and programming tools. The System shall be capable of driving remote color LCD monitor(s) that continually scan and display the status of each car and call.
- I. Motion Control: Microprocessor based AC, variable-voltage, variable frequency with digitally encoded closed-loop velocity feedback suitable for Operation specified and capable of providing smooth, comfortable car acceleration, retardation, and dynamic braking. Limit the difference in car speed between full bad and no bad to not more than  $\pm 3\%$  of the contract speed.
- J. Selective Leveling: Provide means to limit elevator car speed when traveling between adjacent floors.
- K. Passenger Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, dose doors. Provide "heavy door/variable air pressure" or closed loop feature for consistent specified door operation within appropriate speed and inertia limits.
- L. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum 5-year life expectancy. Include required transformer. Provide constant pressure test button in service compartment of car operating panel. Provide lighting integral with portion of normal car lighting system.
- M. Standby Power Operation: If provided or required
  1. Upon loss of normal power, adequate standby power will be supplied via building electrical feeders to simultaneously start and run one car in each group and single cars at contract car speed and capacity.
  2. Automatically return one car at a time, in each group and single car(s), nonstop to designated floor, open doors for approximately 3.0 seconds, dose doors, and park car. During return operation, car and hall call pushbuttons shall be rendered inoperative. As each car parks, system shall immediately select the next car until all cars in a group have returned to the designated floor. If a car fails to start or return within 30 seconds, system shall automatically select the next car in the group to automatically return.
  3. When all cars in a group have returned to the designated floor, one car in each

group shall be designated for automatic operation. When a service demand exists for 30 seconds and designated car fails to start, next available car in the group shall be automatically selected for Operation.

4. Provide separate group selection switch(es) in firefighters' control panel and security control panel if required.
  - a. Switch(es) shall be labeled "STANDBY POWER OVERRIDE" with positions marked "AUTO" and appropriate car numbers controlled by each respective switch. Key shall be keyed same as key utilized for firefighters' Phase 1 and II key switch. Key shall be removable in "AUTO" position only.
  - b. Switch shall override automatic return and automatic selection functions, and cause the manually selected car to operate. Manual selection shall cause car to start and proceed to designated floor and open and close its doors before standby power is manually transferred to next selected car.
  - c. Provide "STANDBY POWER" indicator lights, one per car, in firefighters' control panel and security control panel. Indicator light illuminates when corresponding car is selected, automatically or manually, to operate on standby power.
5. Successive Starting: When normal power is restored or there has been a power interruption, individual cars in each bank shall restart at five second intervals.

## 2.04 CONTROL ROOM EQUIPMENT

- A. Arrange equipment in spaces shown on drawings.
- B. Solid State Power Conversion and Regulation Unit: Provide solid-state, alternating current, variable voltage, variable frequency (ACV3F), I.G.B.T converter/inverter drives.
  1. Design unit to limit current, suppress noise, and prevent transient voltage feedback into building power supply. Provide internal heat sink cooling fans for the power drive portion of the converter panels. Conform to IEEE standards 519-1992 for line harmonics and switching noise.
  2. Isolate unit to minimize noise and vibration transmission. Provide isolation transformers, filter networks, and choke inductors.
  3. Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative transients induced into the mainline feeders or the building standby power generator.
  4. Supplemental direct-current power for the Operation of hoist machine brake, door operator, dispatch processor, signal fixtures, etc., from separate static power supply.
  5. ACV3F Drives for gearless elevators shall be regenerative and utilize IGBT converter/inverter and dynamic braking during overhauling condition.
- C. Encoder: Direct drive, solid-state, digital type. Update car position at each floor and automatically restore after power loss.
- D. Controller: TJLICSA labeled.
  1. Compartment: Securely mount all assemblies, power supplies, chassis switches, relays, etc., on a substantial, self-supporting steel frame. Completely enclose

- equipment with covers. Provide means to prevent overheating.
2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
  3. Microprocessor-Related Hardware
    - a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
    - b. Provide power supplies with noise suppression devices.
    - c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
    - d. Design control circuits with one leg of power supply grounded.
    - e. Safety circuits shall not be affected by accidental grounding of any part of the system.
    - f. System shall automatically restart when power is restored.
    - g. System memory shall be retained in the event of power failure or disturbance.
    - h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
  4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
  5. Permanently mark components (relays, fuses, PC boards, etc.) with symbols shown on wiring diagrams.
  6. Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary for monitoring function. Elevator contractor responsible to connect monitoring System interface to machine room monitoring compartment and LAN. Wiring from the LAN to the machine room monitoring compartment by others.
  7. Provide controller or machine mounted auxiliary, lockable "open" disconnect if mainline disconnect is not in sight of controller and/or machine.
- E. Sleeves and Guards: Provide 2" steel angle guards around cable or duct slots through floor slabs and/or walls. Provide rope and smoke guards for sheaves, cables, and cable slots in control room and secondary machinery levels.
- F. Noise/Vibration Isolation: All elevator equipment including their supports and fastenings to building, shall be mechanically and electrically isolated from the building structure and main line power feeders to minimize objectionable noise and vibration transmission to car, building structure, or adjacent occupied areas of building.

## 2.05 HOISTWAY EQUIPMENT

- A. Gearless Traction Hoist Machine:
1. AC induction or P.M.S.M. ACV3F gearless traction type motor with brake, drive sheave, and deflector sheave mounted in proper alignment on a common, isolated machine support frame at the top of the hoistway or mounted on the back of the guide rail at the top landing.

2. Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.
  3. Provide ladders and platforms with handrails and toeboards for overhead machine and/or sheave access within the bounds of the control room as required.
- B. Machine and Equipment Support Beams:
1. Provide structural steel frame required for direct support of and attachment to building structure of hoist machine, deflector sheaves, overhead sheaves, governor, and hoist rope dead-end hitch assemblies.
  2. Provide bearing plates, anchors, shelf angles, blocking, embedment, etc., for support and fastening of machine support frame or equipment to the building structure.
  3. Isolate machine and/or machine support frame to prevent noise and vibration transmission to building structure.
- C. Governor: Centrifugal-type, car driven with pull-through jaws and bi-directional shutdown switches. Provide required bracketing and supports for attachment to guide rail or machine support frame.
- D. Emergency Brake: Provide means to prevent ascending car over-speed and unintended car movement per code.
- E. Guide Rails: Planed steel T-sections for car and counterweight of suitable size and weight for the application, including brackets for attachment to building structure. Provide rail backing and intermediate counterweight tie brackets to meet code requirements. No additional structural points of rail attachment, other than those shown on the Contract Documents, will be provided.
- F. Buffers, Car and Counterweight: Oil (>200fpm) or spring type with blocking and support channels. Provide buffer access ladder(s) and platform(s).if distance form pit floor to underside of car, when at the lowest landing is > 83".
- G. Sheaves: Machined grooves and sealed bearings. Provide mounting means to machine support frame and car and counterweight structural members.
- H. Counterweight: Steel frame with metal filler weights. Provide Type "B" safety device.
- I. Counterweight Guide Shoes: Spring dampened roller guide shoes.
- J. Counterweight Guard: Metal guard in pit. Where counterweight is provided between adjacent elevators, provide runway guard next to the adjacent elevator.
- K. Governor Rope and Encoder Tape Tensioning Sheaves: Mount sheaves and support frame cm pit floor or guide rail. Provide frame with guides or pivot point to enable free

vertical movement and proper tension of rope and tape.

L. Hoist and Governor Ropes:

1. 8 x 19 or 8 x 25 Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated wedge type shackles.
2. Flat, polyurethane coated reinforced steel belts.
3. Governor rope to suit Contractor's specification.

M. Compensation: Contractor's standard application. Pit mounted guide assembly shall provide quiet, effective restraint without excessive wear of components. Inhibit rubbing or chafing against hoistway or equipment within hoistway or pit. Application must meet performance/noise level requirement of specification.

N. Terminal Stopping: Provide normal and final devices.

O. Electrical Wiring and Wiring Connections:

1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the control room. Provide four pair of spare shielded communication wires in addition to those required to connect specified items. Tag spares in control room.
2. Conduit: Painted or galvanized steel conduit, EMT, or duct. Conduit size, 1/2" minimum. Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices.
3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
4. Auxiliary Wiring: Connect fire alarm initiating devices, emergency two-way communication system, firefighters' phone jack, paging speaker, CCTV, card reader, intercom, and announcement speaker and/or background music in each car controller in control room. If required.

P. Passenger Entrance Equipment:

1. Door Hangers: Two-point hanger roller with neoprene roller surface and Suspension with eccentric up thrust roller adjustment.
2. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.
3. Door Interlocks: Operable without retiring cam. Paint interlock box flat black.
4. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to insure smooth, quiet mechanical close of doors.
5. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.
6. Hoistway Access Switches: Mount in wall at top and bottom floor(s). Provide switch with faceplate.

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

## 2.06 HOISTWAY ENTRANCES

- A. Complete entrances bearing fire labels from a nationally recognized testing laboratory approved within the governing jurisdiction.
- B. Frames: 14 gauge hollow metal at all floors. Bolted and lapped head to jamb assembly at all floors. Provide Arabic floor designation/Braille plates, centered at 60" above finished floor, on both side jambs of all entrances. Provide plates at main egress landing with "Star" designation. For designated emergency car, provide "Star of Life" designation plates at height of 78" - 84" above finished floor on both side jambs at all floors. Braille indications shall be below Arabic floor designation. Provide cast floor designation/Braille plates as manufactured by SCS, Vision Mark, or Entrada.
- C. Door Panels: Minimum 18 gauge steel, sandwich construction without binder angles. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two (2) gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs.
- D. Sight Guards: Minimum 16 gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges.
- E. Sills: Extruded nickel silver.
- F. Sill Supports: Structural or formed steel designed to support door sill based upon car loading classification. Mount to eliminate need for grout under the sill.
- G. Service Elevators: Provide 5" x 5" x 1/2" cold-rolled structural steel angle, extending full width of hoistway. Fasten to building structure at maximum 18" O.C.
- H. Fascia, Toe Guards and Hanger Covers: Minimum 16 gauge furniture steel with black enamel. Provide full height fascia, toe guards, and hanger covers where rear entrances are not provided. Provide front and/or rear fascia for express hoistway travel.
- I. Struts and Headers: Provide for vertical support of entrances and related material. Provide door open bumpers on entrances equipped with vertical struts.

## 2.07 CAR EQUIPMENT

- A. Frame: Welded or bolted, rolled or formed steel channel construction to meet bad classification specified.
- B. Safety Device: Type "B," flexible guide clamp.
- C. Platform: Isolated type, constructed of steel, or steel and wood which is fireproofed on underside. Design and construct to accommodate bad classification requirements. Provide Class "A" construction for passenger elevators, Class "A" construction for service elevator, Class "C" construction for freight elevator.
- D. Platform Apron: Minimum 16 gauge steel, reinforced and braced to car platform with black enamel.
- E. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe. Maximum roller rotation speed, 350 r.p.m.
- F. Sills: One piece extrusion with extruded extension between car entrance columns to face of car front return. Extruded extension to match finish of sill.
- G. Doors: Provide as specified for hoistway entrance doors.
- H. Door Hangers: Two-point hanger roller with neoprene roller surface and Suspension with eccentric up thrust roller adjustment.
- I. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.
- J. Door Header: Construct of minimum 12 gauge steel, shape to provide stiffening flanges.
- K. Door Electrical Contact: Prohibit car Operation unless car door is closed.
- L. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation.
- M. Restricted Opening Device: Restrict opening of car door(s) outside unlocking zone.
- N. Passenger / Service Door Operator: High speed, heavy-duty closed loop door operator capable of opening doors at no less than 2-1/2 f.p.s. Accomplish reversal in no more than 2-1/2" of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door Operation based upon velocity,

position, and motor current. Maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure. Acceptable closed-loop door operators:

1. G.A.L.MOVFR
2. Elevator Components Industries ECI 2000
3. Motion Control Engineer SmarTraq
4. Original Equipment Manufacturers
  - a. Major Manufacturers equipment may be substituted with documentation confirming strict adherence to Section 14215, 3.08, A, 1-9.
    - i. KONE, Otis, ThyssenKrupp, Schindler

O. Passenger / Service Door Control Device:

1. Infrared Reopening Device: Black, fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open.
  - a. Acceptable Infrared Reopening Device:
    - i. Cegard/MAX-154 by CEDES
    - ii. Gatekeeper by Adams
    - iii. Lambda II by Otis
    - iv. Magic Edge by Tri-Tronics
    - v. Microlite by ThyssenKrupp
    - vi. Microscan E by T.L. Jones
    - vii. Pana40 Plus by Janus
  - b. Acceptable Infrared 3D Reopening Device:
    - i. CegardtMAX-154 by CEDES
    - ii. Gatekeeper by Adams
    - iii. Lambda 3D by Otis
    - iv. Microlite 3D by ThyssenKrupp
    - v. Pana40 Plus 3D by Janus
2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0 - 25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0- 1.5 seconds after beams are reestablished.
4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
  - a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
  - b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use

hall call time when car responds to coincidental calls.

P. Car Operating Panel:

1. Car operating panel(s) without faceplate(s), consisting of a metal box containing vandal resistant operating fixtures, mounted behind the car swing front return panel(s).
2. Suitably identify floor buttons, alarm button, door open button, door dose button and emergency push-to-call button with SCS, Visionmark, or Entrada cast tactile symbols recessed flush rear mounted. Configure plates per local building code accessibility standards including Braille. Locate operating controls no higher than 48" above the car floor; no lower than 35" for emergency push-to-call button and alarm button.
3. Provide minimum 3/4" diameter raised floor pushbuttons which illuminate to indicate call registration.
4. Provide alarm button to ring bell located on car. Illuminate button when actuated.
5. Provide keyed stop switch at bottom of car operating panel in locked car service compartment. Mark device to indicate "ran" and "stop" positions.
6. Provide "door open" button to stop and reopen doors or hold doors in open position.
7. Provide "door dose" button to activate door dose cycle. Cycle shall not begin until normal door dwell time for a car or hall call has expired, except firefighters' Operation.
8. Provide "door hold" Button
9. Provide firefighters' Phase II key switch with engraved instructions filled red. Include light jewel, audible signal, and call cancel button.
10. Install firefighters' telephone jack with bezel matching adjacent controls if required.
11. Provide lockable service compartment with recessed flush door. Door material and finish shall match car return panel or car operating panel faceplate
12. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
  - a. Inspection switch.
  - b. Light switch.
  - c. Three-position exhaust blower switch.
  - d. Independent service switch.
  - e. Constant pressure test button for battery pack emergency lighting.
  - f. 120-volt, AC, GFCI protected electrical convenience outlet.
  - g. Card reader override switch.
  - h. Stop switch.
13. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
  - a. Phase II firefighters' operating instructions on main operating panel above corresponding keyswitch filled red.
  - b. Car number on main and auxiliary car operating panel.
  - c. "Certificate of Inspection on File in Building Office" on main car operating panel.
  - d. "No Smoking" on main car operating panel.
  - e. Car capacity in pounds on service compartment door.

- Q. Car Top Control Station: Mount to provide safe access and utilization while standing in an upright position on car top.
- R. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top of car. Include on/off switch and lamp guard.
- S. Communication System:
  - 1. "Push to Call," two-way communication instrument in car with automatic dialing, tracking, and recall features with shielded wiring to car controller in control room. Provide dialer with automatic rollover capability with, minimum two numbers.
    - a. "Push to Call" button or adjacent light jewel shall illuminate and flash when call is acknowledged. Button shall match car operating panel pushbutton design. Provide uppercase "PUSH TO CALL," "HELP ON THE WAY" engraved signage adjacent to button.
    - b. Provide "Push to Call" button tactile symbol, engraved signage, and
  - 2. Braille adjacent to button mounted integral with car front return panel. Firefighters' telephone jack in car and firefighters' panel, with four shielded wires to control room junction box. Jack bezel shall match adjacent controls if required.
  - 3. Install remote speaker(s) in car behind front return panel with drilled speaker pattern, with shielded wiring to control room junction box if required.
  - 4. Provide two-way communication between car and control room if required.

## 2.08 CAR ENCLOSURE

- A. Car Enclosure Passenger Elevator: Provide complete as specified herein and/or detailed on architectural drawings. Provide the following features.
  - 1. Shell: Reinforced minimum 16 gauge furniture steel formed panels with baked enamel interior finish as selected. Apply sound-deadening mastic to exterior.
  - 2. Canopy: Reinforced 12 gauge furniture steel formed panels with lockable, hinged emergency exit. Interior finish white reflective baked enamel.
  - 3. Front Return Panels and Integral Entrance Columns: Reinforced minimum 16 gauge stainless steel satin finish. Swing entire unit on substantial pivot points (minimum 3) for service access to car operating panel(s). Locate pivot points to provide full swing of front return panel without interference with side wall finish or handrail. Secure in closed position with concealed three-point latch. Provide service compartment with recessed flush cover and cutouts for operating switches, etc.
  - 4. Entrance Columns: Reinforced minimum 16 gauge stainless steel satin finish.
  - 5. Transom: Reinforced minimum 16 gauge stainless steel satin finish full width of enclosure.
  - 6. Car Door Panels: Reinforced minimum 18 gauge stainless steel satin finish. Same construction as hoistway door panels.
  - 7. Base: Stainless steel with concealed ventilation cutouts.
  - 8. Interior Wall Finish: Removable panels, faced and edged, with color core plastic laminate. Color and finish as selected.
  - 9. Ventilation: Two-speed type mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet requirements of Item 2.04, F.
  - 10. Lighting: Unless otherwise specified, Provide fluorescent fixtures with wiring and

hookup. Coordinate with emergency lighting requirements. Provide emergency lighting integral with portion of normal car lighting system. Include required transformer.

11. Handrails: Minimum 1-1/4" diameter stainless steel tubular grab bar across rear wall.

B. Car Enclosure Service Elevator: Provide complete as specified herein. Provide the following features.

1. Shell: Reinforced minimum 16 gauge textured stainless steel formed panels as specified. Apply sound deadening mastic to exterior.
2. Canopy: Reinforced 12 gauge furniture steel formed panels with lockable hinged emergency exit. Interior finish white reflective baked enamel.
3. Front Return Panels: Reinforced minimum 16 gauge stainless steel, satin finish as specified.
4. Entrance Columns and Transom: Reinforced minimum 16 gauge, stainless steel, satin finish.
5. Car Door Panels: Reinforced minimum 18 gauge stainless steel textured finish as specified in Item 2.02. Same construction as hoistway door panels. Architectural metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 1/2" on rear side of leading edge of panels.
6. Ventilation: Two-speed exhaust blower mounted to car canopy on isolating rubber grommets. Provide with a diffuser and grille. Exhaust blower shall meet requirements of Item 2.03, H.
7. Lighting: Fluorescent fixture flush mounted in ceiling with protective diffuser and steel guard over fixtures on car top.
8. Handrails/Guardrails: Two lines. Top handrail line minimum 1-1/4" diameter stainless steel tubular grab bar. Lower guardrail line 4" x 3/8" solid stainless steel flatstock bars mounted on both sides and rear of the car. Locate bottom guardrail line at 8" above car floor and handrail line at 32" above the car floor. Bolt rails through car walls from back and mount on 1 1/2" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls.
9. Finished Floor Covering: Rubber tile 1/8" thick with 1" diameter by 0.025" raised circular pattern.

## 2.09 HALL CONTROL STATIONS

- A. Pushbuttons: Provide number of riser(s) with flush or surface mounted faceplates per architectural drawings. Include pushbuttons for each direction of travel which illuminate to indicate call registration. Include approved engraved message and pictorial representation prohibiting use of elevator during fire or other emergency situation as part of faceplate. Pushbutton design shall match car operating panel pushbuttons.
- B. Provide an illuminated signal marked "Elevator Emergency Power" to indicate emergency or standby power is in effect. If emergency power is present.
- C. Provide vandal resistant pushbutton and light assemblies.

## 2.10 SIGNALS

- A. Passenger Car(s): Provide at each entrance to indicate travel direction of arriving car. Illuminate up or down LED lights and sound tone once for up and twice for down direction prior to car arrival at floor. Sound level shall be adjustable from 20 - 80 dB measured at 5'-0" in front of hall control station and 3'-0" off floor. Illuminate light until the car doors start to close. Provide advanced hall lantern notification to comply with ADA hall call notification time. Car direction lenses shall be arrow shaped with faceplates. Lenses shall be minimum 2-1/2" in their smallest dimension. Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.
- B. Car Position Indicator: Alpha-numeric digital indicator containing floor designations and direction arrows a minimum of 1/2" high to indicate floor served and direction of car travel. Locate fixture in each car operating panel. When a car leaves or passes a floor, illuminate indication representing position of car in hoistway. Illuminate proper direction arrow to indicate direction of travel. Provide multi-numeral vandal resistant indicator and light assemblies.
- C. Faceplate Material and Finish: Stainless steel Satin finish all fixtures unless otherwise specified.
- D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.
- E. Voice Synthesizer: Provide electronic device with easily reprogrammable message and female voice to announce car direction, floor, emergency exiting instructions, etc.
- F. Firefighters' Control Panel: IF REQUIRED: Locate in building fire control room. Fixture faceplate, stainless steel satin finish, including the following features:
  - 1. Car position and direction indicator (digital-readout or color SVGA display type). Identify each position indicator with car number.
  - 2. Indicator showing operating status of car.
  - 3. Manual car standby power selection switch(es) and power status indicators.
  - 4. Two-position firefighters' emergency return switch(es) and indicators with engraved instructions filled red.
  - 5. Firefighters' telephone jack.

Fixtures and monitor shall be located as directed by Architect / Owner. Where applicable, identify all indicators and manual switches with appropriate engraving. Provide wiring to control panel.

- G. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave

instructions for use on cover per Local Fire Authority requirements.

## 2.11 INTERCOM AND DISTRESS SIGNAL SYSTEM

- A. Cars with a travel > 60'-0" require additional two way communication to master control panel for emergency personnel.
- B. General: Provide intercommunication system. Include all wiring between elevator hoistways and control panels.
- C. Basic Equipment:
  - 1. Amplifier providing static-free voice transmission with adequate volume and minimum distortion at all stations, with pre-amplifier capable of receiving voice and music inputs from building and emergency building communication system.
  - 2. Activation of emergency building communication system overrides all other conversations and permits one-way conversation to all master stations in system.
  - 3. Master Stations:
    - a. Speaker-microphone combination and/or handset for two-way communication.
    - b. Selection buttons to enable communication with all master stations. Maintain continual reception of hands-free reply from station when a selected button is depressed.
    - c. Two-Position "Talk/Listen" Button: Press to talk; release to listen.
    - d. Illuminate "in use" light when any master station is being used.
    - e. Reset button to make System available for use by any master station.
    - f. Volume control knob for adjustment of incoming volume.
    - g. Button to establish communications with all stations.
    - h. Distress light in lobby panel which illuminates when "push to call" button, or alarm button in car is actuated. Energize distress light and buzzer or chime until intercom selection button for that car has been depressed. Sound buzzer or chime in lobby panel simultaneously with illumination of distress light.
  - 4. Remote Stations:
    - a. Station in car shall be activated by "push to call," two-way communication button. "Push to call" button shall illuminate and flash when call is acknowledged. Button shall match car operating panel pushbutton design. Provide uppercase "PUSH TO CALL," "HELP ON THE WAY" engraved signage adjacent to button. Provide "push to call" button tactile symbol, engraved signage, and Braille adjacent to button.
    - b. Locate car microphone and speaker or transceiver/speaker combination in car canopy behind front return panel with drilled speaker pattern, with shielded wiring to control room junction box.
- D. Station Housings:
  - 1. House master station at direction or owner in a metal compartment with baked enamel finish. Attach to the group elevator supervisory control panel or wall mount. Provide communication handset with 25'-0" long cord.
  - 2. Provide control center master intercoms with stainless steel satin finish faceplates

and engraved operating instructions. Coordinate faceplate size and installation of units with building Console Supplier.

## 2.12 MONITORING CAPABILITES

1. Elevator controls must be capable of being monitored by monitoring systems as determined by the Colorado School of Mines Facilities Management.

## PART 3 EXECUTION

### 3.01 SITE CONDITION INSPECTION

- A. Prior to beginning installation of equipment examine hoistway and control room areas. Verify no irregularities exist which affect execution of work specified.
- B. Do not proceed with installation until work in place conforms to project requirements.

### 3.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver material in Contractor's original unopened protective packaging.
- B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.
- C. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.

### 3.03 INSTALLATION

- A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.
- B. Install control room equipment with clearances in accordance with referenced codes and specification.
- C. Install all equipment so it may be easily removed for maintenance and repair.

- D. Install all equipment for ease of maintenance.
- E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.
- F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
  - 1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
  - 2. Control room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
  - 3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

### 3.04 FIELD QUALITY CONTROL

- A. Work at jobsite will be checked during course of installation. Full cooperation with reviewing personnel is mandatory. Accomplish corrective work required prior to performing further installation.
- B. Have Code Authority acceptance inspection performed and complete corrective work.

### 3.05 ADJUSTMENTS

- A. Install rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure joints without gaps and file any irregularities to a smooth surface.
- B. Static balance car to equalize pressure of guide shoes on guide rails.
- C. Lubricate all equipment in accordance with Contractor's instructions.
- D. Adjust motors, power conversion units, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

### 3.06 CLEANUP

- A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.
- B. Remove all loose materials and filings resulting from work.

- C. Clean control room equipment and floor.
- D. Clean hoistways, car, car enclosure, entrances, operating, and signal fixtures.

### 3.07 ACCEPTANCE REVIEW AND TESTS

- A. Review procedure shall apply for individual elevators, portions of groups of elevators, and completed groups of elevators accepted on an interim basis or elevators and groups of elevators completed, accepted, and placed into operation.
- B. Contractor shall perform review and evaluation of all aspects of its work prior to requesting Consultant's final review. Work shall be considered ready for Consultant's final contract compliance review when all Contractors' tests are complete and all elements of work or a designated portion thereof are in place and elevator or groups of elevators are deemed ready for service as intended.
- C. Furnish labor, materials, and equipment necessary for Consultant's review. Notify Consultant a minimum of five (5) working days in advance when ready for final review of elevator or group.
- D. Consultants' written list of observed deficiencies of materials, equipment, and operating systems will be submitted to Contractor for corrective action. Consultant's review shall include as a minimum:
  - 1. Workmanship and equipment compliance with Contract Documents.
  - 2. Contract speed, capacity, floor-to-floor, and door performance comply with Contract Documents.
  - 3. Performance of following is satisfactory:
    - a. Starting, accelerating, running
    - b. Decelerating, stopping accuracy
    - c. Door operation and closing force
    - d. Equipment noise levels
    - e. Signal fixture utility
    - f. Overall ride quality
    - g. Performance of door control devices
    - h. Operations of emergency two-way communication device
    - i. Operations of firefighters' service
  - 4. Test Results:
    - a. In all test conditions obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Purchaser and Consultant. Tests shall be conducted under both no load and full load condition.
    - b. Temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity one (1) hour running test, stopping at each floor for ten (10) seconds in up and down directions, may be required.

- E. Performance Guarantee: Should Consultant's review identify defects, poor workmanship, variance or noncompliance with requirements of specified codes and/or ordinances, or variance or noncompliance with the requirements of Contract Documents, Contractor shall complete corrective work in an expedient manner to satisfaction of Purchaser and Consultant at no cost as follows:
  - 1. Replace equipment that does not meet code or Contract Document requirements.
  - 2. Perform work and furnish labor, materials, and equipment necessary to meet specified Operation and performance.
  - 3. Perform retesting required by Governing Code Authority, Purchaser, and Consultant.
  
- F. A follow-up final contract compliance review shall be performed by Consultant after notification by Contractor that all deficiencies have been corrected. Provide Consultant with copies of the initial deficiency report marked to indicate items which Contractor considers complete.

### 3.08 PURCHASER'S INFORMATION

- A. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment within 30 days following final acceptance. Final retention will be withheld until data is received by Purchaser and reviewed by Consultant. Include the following as minimums:
  - 1. Straight-line wiring diagrams of "as-installed" elevator circuits with index of location and function of components. Provide one set reproducible master. Mount one set wiring diagrams on panels, racked, or similarly protected, in elevator control room. Provide remaining set rolled and in a protective drawing tube. Maintain all drawing sets with addition of all subsequent changes. These diagrams are Purchaser's property.
    - a. Provide one (1) electronic copy of all required documentation.
  - 2. Written Maintenance Control Program (MCP) specifically designed for the equipment included under this contract. Include any unique or product specific procedures or methods required to inspect or test the equipment. In addition, identify weekly, bi-weekly, monthly, quarterly, and annual maintenance procedures, including statutory and other required equipment tests.
  - 3. Lubrication instructions including recommended grade of lubricants.
  - 4. Parts catalogs for all replaceable parts including ordering forms, price lists and ordering instructions.
  - 5. Four sets of keys for all switches and control features properly tagged and marked.
  - 6. Diagnostic test devices together with all supporting information / documentation necessary for interpretation of test data, fault code interpretation, manufacturers acronym definitions, adjustment parameters, troubleshooting of elevator system, and performance of routine safety tests.
  - 7. The elevator installation shall be a design that can be maintained by any

licensed elevator maintenance company employing journeymen mechanics without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment Contractor.

- a. At the request of the University of Colorado, Provide 8 hrs. of onsite controller diagnostic training to University of Colorado qualified elevator maintenance personnel.
  - b. Provide onsite capability to diagnose faults to the level of individual circuit boards and individual discrete components for the solid state elevator controller.
  - c. Provide a separate, detachable device, as required to the Purchaser as part of this installation if the equipment for fault diagnosis is not completely self-contained within the controller. Such device shall be in possession of and become property of the Purchaser.
  - d. Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to the Purchaser.
8. Provide software upgrades and/or revisions during progress of the work, warranty period and a term of 10 years from the date of substantial completion.

END OF SECTION