This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

NOTE: Additional items in related work of other disciplines are not included in this section. See additional design guidelines for these items at <https://popcdn.azureedge.net/pdfs/Elevator_Escalator_MovingWalk%20Guidelines.pdf>.

SECTION 142100 – TRACTION ELEVATORS

1. GENERAL
   * + 1. description
          1. This section describes manufacture, installation, and one-year preventive maintenance for geared traction elevators.
       2. Related WORK specified elsewhere
          1. Section 033000, Cast-In-Place Concrete
          2. Section 055000, Metal Fabrication
          3. Division 21, Fire Suppression
          4. Division 26, Electrical
       3. REFERENCES
          1. ADA: The Americans with Disability Act
          2. ASME: American Society of Mechanical Engineers

ASME A17.1: Safety Code for Elevators and Escalators

ASME A17.2: Elevators, Escalators, and Moving Walks

* + - * 1. ASTM: American Society of Testing and Materials

ASTM A36: Standard Specification for Carbon Structural Steel

ASTM A240: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

ASTM A1008: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM A1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

ASTM B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

* + - * 1. FCC: Federal Communications Commission
        2. IEEE: Institute of Electrical and Electronics Engineers:
        3. IEEE Standard 519
        4. NAAMM: National Association of Architectural Metal Manufacturers
        5. NEC: National Electrical Code:

NEC Article 250: Grounding and Bonding

* + - * 1. NFPA: National Fire Protection Agency:

ANSI/NFPA 70: National Electrical Code

NFPA 72: National Fire Alarm and Signaling Code

* + - * 1. OAR: Oregon Administrative Rules

Chapter 918: Building Codes Division

* + - * 1. OR-OSHA: Oregon Occupational Safety and Health Administration
        2. SEI/ASCE: Structural Engineering Institute/American Society of Civil Engineers:

SEI/ASCE 7: Minimum Design Loads for Buildings and Other Structures

* + - 1. DEFINITIONS
         1. Terms used are defined in the Safety Code for Elevators and Escalators, ASME A17.1.
         2. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
      2. COORDINATION
         1. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to the work site in time for installation.
         2. Coordinate locations and dimensions of other work specified in other sections that relates to elevators including, but not limited to: electrical service and electrical outlets, lights, and switches in hoistways, pits, and machine rooms. Schedule and be responsible for coordinating related work with specified in other sections to avoid omissions and schedule delays.
      3. SUBMITTALS
         1. Shop Drawings: Provide plans, elevations, sections, and large scale details for the following:

Pit, hoistway, and machine room indicating equipment arrangement, pit ladder, counterweight guide rails, location of in-car telephone line connection in machine room, elevation section of hoistway, details of car enclosure, hoistway entrances, hoistway doors, all fixtures, openings at each landing, machine room layout, coordination with building structure, relationships with other construction, locations of equipment, layout of car operating panel and standby power operation control panel, and maximum dynamic and static loads imposed on building structure at points of support.

Half size scale drawings of all fixtures.

* + - * 1. Product Data: Provide data for the following:

Capacities, sizes, performances, operations, safety features, finishes, and similar information.

Car enclosures, hoistway entrances, and operation, control, and signal systems.

Car and counterweight roller guides and door operators.

Signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.

Maximum and average power demand.

Interface required for connection to other systems.

Power confirmation information including motor horse power, code letter, starting current, full-load running current, and demand factor.

Seismic equipment lists, reactions, and design information.

Cable.

Control panels with fault interrupting ratings.

* + - * 1. Samples for Verification:

Exposed finishes: 3-inch x 12-inch samples or 12-inch lengths of actual finished materials for the Port's review of color, pattern, and texture. Also submit one of each type of signal units, pushbuttons, lights, graphics, Braille plates, and mounting provisions.

Cable: Two 2-foot long pieces.

* + - * 1. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
        2. Diagnostics and Troubleshooting: Prior to substantial completion, furnish any special tools, meters, diagnostic tools/devices, troubleshooting special hand-held tools/devices, printed information, and adjusting information to perform maintenance, troubleshooting, repairing, and adjusting.
        3. Operations and Maintenance Manuals: In addition to the information required in Section 013300, Submittal Procedures, operations and maintenance manuals shall be complete in all respects for the equipment provided and the controls, accessories and appurtenances stipulated. Include, at a minimum, the following:

Drawing or diagram showing equipment location.

The final control settings, such as feet per minute, door open, door close, and all other adjustable features and/or timers.

The original factory adjustor’s manual used to adjust the elevators including as-built, as-installed, and as-adjusted field notes.

Step-by-step procedures for elevator start-up, operation, and shutdown.

Maintenance, repair, and adjusting instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides for the equipment.

Lubrication information including type and grade.

Safety precautions, including diagrams and illustrations as needed for clarity.

All testing procedures including Seismic and Firefighters’ Service.

Parts lists, with manufacturers’ names, catalog numbers, and ordering instructions. Lists shall be complete for the equipment provided.

Serial numbers of equipment provided.

Complete software documentation.

Service organizations and sources of replacement parts with company names, addresses, and telephone numbers.

Provide service and field technical bulletins and manuals normally supplied to the factory/field adjustor including video or other media.

Include (add) the Port to the mailing list for receiving factory/field technical instruction publications for the equipment provided.

Straight-line wiring diagram of as-installed circuits, with index of location and function of components.

Written maintenance control program per ASME A17.1, specifically designed for the equipment provided. 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.

* + - * 1. As-Constructed Drawings:

Provide “As-Constructed” wiring diagrams and wireman’s original pull sheets showing raceway, junction box, traveling cable wire nomenclature, and origination and termination locations. Provide a legible copy of the elevator adjuster’s final control settings for adjustable features and/or timers.

Straight-line wiring diagrams of “as-installed” elevator circuits, with index of location and function of components.

Laminate as-constructed wiring diagrams and mount in a protected area in the elevator machine room.

* + - 1. QUALITY ASSURANCE
         1. Comply with the most-stringent applicable provisions of the following codes and authorities, including revisions and changes in effect on date of contract award:

Safety Code for Elevators and Escalators ASME 17.1, including all addenda and Elevator Safety Requirements for Seismic Risk 3 or greater.

Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2.

National Electrical Code, ANSI/NFPA 70, and National Fire Alarm and Signaling Code, NFPA 72.

Requirements of the International Building Code and any other codes, ordinances, and laws applicable within the governing jurisdiction.

The Americans with Disability Act (ADA).

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Deliver material in manufacturer’s original unopened protective packaging.
         2. Protect equipment and exposed finishes from damage and stains during transportation.
         3. Store material in original protective packaging. Prevent soiling, physical damage, and moisture damage.
      2. WARRANTY
         1. Manufacturer’s Warranty: Obtain from the manufacturer a warranty in which the manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship during the one-year warranty period.
         2. Provide upgrades and/or revisions of software during the warranty period.
         3. Maintain an inventory level of spare parts, in the machine room, which will permit prompt repair or replacement of standard components that fail or become worn.
         4. Requests for Service:

In the event of equipment failure to operate properly, the Port will notify the Contractor by telephone and request immediate repair. For this purpose, the Contractor shall maintain at all times office facilities, a twenty-four-hour, seven days a week telephone service and personnel to promptly dispatch mechanics to repair any reported elevator.

Mechanics shall arrive at the location of the failure within 2 hours of Port notification to the Contractor’s office.

* + - * 1. Do not keep elevators shut down for more than 24 continuous hours after notification of a failure except for pre-scheduled or major equipment repairs.
        2. After each warranty work call, complete a legible work ticket indicating the elevator serviced, building in which the elevator is located, work performed, parts replaced, date of service, time arrived and time left, total hours on the job and the service personnel performing the work. In the case of an elevator shut down or repair, the work ticket shall describe the cause of the elevator failure and the action taken to correct the failure. Send work tickets to the Port within 30 days of work completion.
      1. PERMITS, TESTS AND INSPECTIONS
         1. Obtain and pay for permits, licenses and inspection fees necessary to complete the elevator installation acceptable for operating.
         2. Perform tests required by the State of Oregon Elevator Inspector and ASME 17.1 with procedures described in ASME A17.2 in the presence of the State of Oregon Elevator Inspector.
      2. PREVENTIVE MAINTENANCE SERVICE
         1. Provide a full preventive maintenance service for the system during the one-year warranty period in accordance with the requirements of ASTM A17.1 and A17.2. Follow the maintenance control program specifically designed for the elevators. This service shall include all labor and material to perform routine preventive maintenance as well as any adjustments, lubrication, repairs, or parts replacements required to keep the equipment in good and safe working order.
         2. Submit the request for payment for the preventive maintenance service as part of the request for final payment.
         3. The Port will issue keys for the equipment and the machine rooms. Do not duplicate any key. Pay for any and all costs occurring due to the loss of keys.
         4. All labor furnished shall be trained journeyman level mechanics and helpers, thoroughly skilled in elevator maintenance.
         5. Maintain a complete set of wiring diagrams showing as-built conditions with any changes or modifications to circuits resulting from control modifications, parts replacement, or equipment up-grade.
         6. Pay State of Oregon elevator inspection fees for any changes made during preventive maintenance repairs or adjustments that require re-inspection.
         7. Materials: In performing the above indicated work, provide only genuine parts used by the manufacturers of the equipment for replacement or repair, and use only lubricants obtained from and/or recommended by the manufacturer of the equipment. Equivalent parts or lubricants may be used if approved in advance, in writing by the Port.
         8. Performance Requirements: During the one-year preventive maintenance period, the original elevator performance and operation requirements of this specification section shall continue to be met. In addition, the elevator shall continue to produce a comfortable ride with smooth acceleration, retardation and a soft stop, and door operation shall be quiet and positive with smooth checking at the extremes of travel.
         9. Group Program Adjustments:

If a group of elevators have been placed in service, the elevators shall be regularly observed under normal operating conditions and minor adjustments shall be made as found necessary to ensure that the elevators operate at maximum efficiency.

If zones are employed, arrangements shall be made in the control circuits of the elevators for the division between each zone to be raised or lowered if found necessary due to uneven distribution of traffic between the zones.

* + - 1. OUT-OF-SCOPE WORK
         1. For requirements of and payment for work during the one-year service warranty period that is outside the scope of the warranty or the preventive maintenance service, the Port will offer an agreement separate from this contract. Examples of out-of-scope work are additional scope desired by the Port and “passenger induced failure.” For the terms of such agreement, contact the Port’s Elevator Contracts Administrator.

1. PRODUCTS
   * + 1. MANUFACTURERS
          1. The manufacturer shall have a local distributor in the Portland, Oregon metropolitan area. Subject to compliance with requirements, provide products with a minimum of 5 years of proven design history, by one of the below manufacturers:

KONE Inc.

Otis Elevator Co.

Schindler Elevator Corp.

thyssenkrupp Elevator.

Or pre-bid approved equal.

* + - 1. ELEVATORS
         1. Unless otherwise indicated, manufacturer’s standard components shall be used, as included in standard elevator systems and as required for a complete system.

Edit the following three paragraphs as appropriate for the project and add information in the blank spaces provided.

* + - * 1. Passenger Elevator.

Capacity: 5,000 lbs.

Class of Loading: Class A.

Contract Speed: 500 fpm.

Machine Location: Overhead.

Operational Control: Selective collective microprocessor-based.

Power Characteristics: 480 Volts, 3 Phase, 60 Hertz.

Stops and Openings: \_\_\_, all front.

Floors Served: \_\_\_\_.

Travel: \_\_\_\_±.

Platform Size: \_\_\_\_ wide x \_\_\_\_deep

Minimum Clear Inside Car: \_\_\_\_ wide x \_\_\_\_ deep

Entrance Size: \_\_\_\_ wide x \_\_\_\_ high.

Entrance Type: Two-speed center-opening.

Door Operator: Linear medium-speed heavy-duty with 1.5 fps minimum opening speed.

Door Protection: Infrared full screen device with differential timing, nudging, and interrupted beam time.

Guide Rails: Planed steel tees.

Buffers: Oil.

Car Enclosure:

Steel shell as specified plus car interior finishes.

Clear Height Under Canopy: 9'-0".

* + - * 1. Service Elevator.

Capacity: 5,000 lbs.

Class of Loading: Class C3.

Contract Speed: 350 fpm.

Machine Location: Overhead.

Operational Control: Selective collective microprocessor-based.

Motor Control: Single speed AC with electronic soft start.

Power Characteristics: 480 Volts, 3 Phase, 60 Hertz.

Stops and Openings: \_\_\_\_,\_\_\_\_ rear.

Floors Served: \_\_\_\_.

Travel: \_\_\_\_±.

Platform Size: \_\_\_\_ wide x \_\_\_\_ deep

Minimum Clear Inside Car: \_\_\_\_ wide x \_\_\_\_ deep

Entrance Size: \_\_\_\_ wide x \_\_\_\_ high.

Entrance Type: Side slide-opening.

Door Operator: Medium-speed heavy-duty with 1.5 fps minimum opening speed.

Door Protection: Infrared full screen device with differential timing, nudging, and interrupted beam time.

Guide Rails: Planed steel tees.

Buffers: Oil.

Car Enclosure:

Steel shell as specified plus car interior finishes.

Clear Height Under Canopy: 9'-0".

* + - * 1. Other Features

Signal Fixtures: Manufacturer’s standard design with LED illumination.

Hall and Car Pushbutton Stations:

Single hall pushbutton riser.

Dual car operating panels.

Vandal resistant car and hall pushbuttons.

Car Position Indicators: Digital station with car direction arrows.

Hall Lanterns: At all floors with volume adjustable electronic chime or tone. Sound twice for down direction, vandal resistant assembly.

Door Hold Open Button: In all car operating panels.

Communication System: Self-dialing, vandal resistant, push to call, two-way communication system with recall, tracking, and voiceless communication.

Miscellaneous Items:

Hoistway access switches, top and bottom floors.

Hoistway door unlocking device at all floors.

System diagnostic means and instructions.

Lift-Net monitoring system provision.

Anti-Nuisance Service.

* + - * 1. The elevator components and design shall be such that they can be maintained by any licensed elevator maintenance company employed journeymen mechanic, with minimal need to use additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.

Provide on-site capability to diagnose faults to the level of individual circuit boards and individual discreet components for the solid-state controller.

Furnish a separate, detachable device if the equipment for fault diagnosis is not completely self-contained within the controller. The device shall have an LED or LCD screen with viewable area no smaller than 7 inches x 7 inches. Such device shall become property of the Port.

* + - 1. MATERIALS
         1. Steel:

Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A1008, matte finish.

Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A1011.

Structural Steel Shapes and Plates: ASTM A36.

* + - * 1. Stainless Steel:

Type 302 or 304, complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match the Port’s sample. Protect finish on exposed side by applying a strippable, temporary protective covering before shipping.

No. 4, Non-Directional Finish.

See Car Enclosure article for finish specified for interior wall panels.

* + - * 1. Aluminum: Extrusions shall be according to ASTM B221, sheet and plate shall be according to ASTM B209.
        2. Fire-Retardant Treated Plywood: Minimum 3/4-inch thick fire-retardant treated plywood backup for the finish material specified in the Car Enclosure article below.
        3. Plywood Sub-Floor: 3/4-inch thick fire-retardant treated marine-grade plywood.
        4. Primer: The manufacturer’s standard rust-resistant primer.
        5. Finish Paint: Industrial enamel paint. The Port will select the color from the manufacturer’s standard colors.
        6. Sound Deadener: Fire retardant; spray or roller applied; 3/16 inch thick.
      1. CAR PERFORMANCE
         1. Car Speed: ±3% of contract speed under any loading condition.
         2. Car Capacity: Safely lower, stop, and hold 125 percent of rated load.
         3. Car Landing Zone: ±1/4" under any loading condition or direction of travel.
         4. Releveling: Provide smooth and accurate releveling if required due to cable stretch.
         5. Door Open and Close Times: Seconds from start to fully open or fully closed.

Door Open: 2.6 seconds.

Door Close: 3.2 seconds.

* + - * 1. Door Dwell Times: Separate adjustable timers with initial settings as follows:

Main Lobby Hall Call: 10 seconds.

Upper Lobby Hall Call: 7 seconds.

Car Call: 5 seconds.

Interruption of Door Protective Device: Reduce dwell to 3 seconds.

* + - * 1. Car Ride Quality:

Starting and stopping shall be smooth and comfort­able, without obvious steps of accelera­tion. Slowdown, stopping and leveling shall be without jars or bumps. Stopping upon operation of emergency stop switch shall be rapid but not violent.

Vertical Acceleration: Maximum 4 ft. per second squared. Maximum jerk 8 ft. per second cubed.

Horizontal Acceleration: Maximum 10 mg peak-to-peak measured at full speed for full travel in both directions.

Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.

Full Speed Riding: Free from vibration and sway.

* + - 1. SEISMIC OPERATION
         1. The elevator system shall withstand the effects of earthquake motions determined according to Oregon Structural Specialty Code and shall comply with elevator safety requirements for seismic risk Zone 3 or greater in ASME A17.1/CSA B44.
         2. The term “withstand” means the system will remain in place without separation of any parts when subjected to the seismic forces specified.
         3. Provide earthquake equipment required by ASME A17.1/CSA B44.
         4. Provide seismic switch required by SEI/ASCE 7.
      2. OPERATION
         1. Collective Microprocessor-Based:

Operate car without an attendant from pushbuttons located in the car and at each floor. When a car is available, automatically start the car and dispatch it to the floor corresponding to registered car or hall call. Once the car starts, respond to registered calls in direction of travel and in the order the floors are reached.

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.

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 for an adjustable time interval to allow for passenger or material transfer.

Answer calls corresponding to direction in which car is traveling unless a call in the opposite direction is the highest or lowest call registered.

Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

Provide “anti-nuisance service” whereby all car calls will be cancelled if the load weighing device detects that an abnormal number of calls are registered given the number of passengers in the car. System using false call answering to accomplish this is not acceptable.

* + - * 1. Group Automatic Operation; For Two or More Cars:

Provide an “on-demand” hall call response system that will continuously scan the hall calls and assign the closest elevator in time to respond to that call. The system shall be capable of reassigning the elevator if demand changes the real-time calculation.

During heavy “up peak” periods, provide high call reversal and return cars to dispatching landing. Park one car with Up lantern illuminated (flashing) and doors open for passenger loading. Dispatch cars when loaded to predetermined load or upon expiration of approximately 15 seconds loading time.

During heavy “down peak” periods, cars shall immediately dispatch upward after unloading at the main floor. Cars shall dispatch to various floors, not always to the top terminal to provide equal service to all floors. Up hall calls during “down peak” periods shall be preset so that each call can be answered in an adjustable time period.

During heavy “two-way” traffic periods, the system shall assign hall calls to the car closest to real time response.

Provide zones for the elevators with the Lobby as one zone and the remaining stops divided equally with the remaining number of elevators or provide a system where the cars park with their doors closed at the last landing served. This system shall also provide for an adjustable number of cars to be assigned to a high zone during off peak conditions. In either case, the elevators must con­tinuously scan hall calls outside their zone so that they are capable of responding outside the zone if they are the closest elevator in response time.

A car with no car calls registered arriving at a floor where both up and down hall calls are registered shall respond to the hall call in the direction of travel and illuminate the appropriate lantern. If no car call is registered for that direction, the lantern shall be extinguished, the lantern for the other direction shall light and the car shall respond to the car in that direction. The doors shall close and reopen.

The system shall be capable of monitoring hall and car calls to monitor coincidental calls. The cars will continuously scan the whole system to determine the closest elevator in time taking into account the coincidental car and hall call.

Other Required Features:

In the event of a failure of the dispatching system due to computer malfunction or failure of power supply to such equipment or to the landing buttons, a backup dispatch system is to be provided so that each elevator on group control shall be allocated to a group of landings that includes the main dispatching level so that all levels are served and shall proceed to and stop at these landings, the car shall proceed to the landings for which car calls are registered and shall then return to the group of landings to which it has been allocated and stop at these landings in rotation.

Should a car be delayed from leaving a floor for any reason, other cars shall respond to the hall calls at that floor and shall be dispatched in a normal manner.

Provide each car with an adjustable platform load weighing device which will immediately dispatch other cars and bypass hall calls when car is loaded to predetermined load. Provide monitoring lights in car service cabinet to indicate operation of load weighing switches at 60 and 80 percent of full load.

* + - * 1. Independent Service: Provide controls for operation of each car from only its pushbuttons. Close doors by constant pressure on desired destination floor button or by the door close button. Open doors automatically upon arrival at the selected floor.
        2. Firefighters’ Service: Allow for operation and recalling of the elevator to the designated floor during a fire or other emergency condition. Provide sensor signal wiring from hoistway or machine room connection point, to controller terminals. Operate visual/audible signal until return is complete or automatic operation is restored. Provide a Phase I key switch with engraved instruction at the “Floor 1” hall pushbutton cover plate.
        3. Automatic Car Stopping or Accuracy Zone: Stop car within 1/4 inch above or below the landing sill. Maintain stopping zone regardless of the load in the car, direction of travel, distance between landings, or doors being opened or closed.
        4. Motion Control: Provide microprocessor-based AC type suitable for specified operation and capable of providing smooth, comfortable car acceleration and retardation. Limit the difference in car speed between full load and no load to not more than ±10 percent of the contract speed in either direction of travel.
        5. Door Operation, Passenger/Service Elevator: Automatically open doors when car arrives at a floor. Automatically close doors at expiration of normal dwell time. Reopen doors when door hold-open button is pushed. Provide heavy door/variable air pressure feature for consistent specified door operation within the appropriate speed and inertia limits.
        6. Standby Power for Lighting and Alarm:

Provide a car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery shall be rechargeable with minimum 5-year life expectancy and be capable of providing a minimum of 4 hours of cab lighting. Include required transformer. Provide constant pressure test button in the service compartment of the car operating panel. Provide lighting integral with the car station.

Approved Manufacturer: Nylube model EL-SS, ELB-6, or pre-bid approved equal.

* + - * 1. Standby Power Operation: Upon loss of normal power, simultaneously start and run one car in each group and single cars at contract car speed and capacity on standby power.
        2. Overload Protection: Provide overload protection to protect car from operating if it is overloaded.

Switch for 110 percent capacity switch shall open safety circuit and prevent car operation and activate indicator light on the car operating panel.

Switch for 90 percent capacity shall activate indicator light on car operating panel.

* + - 1. MACHINE ROOM EQUIPMENT
         1. Geared Traction:

Provide manufacturer's standard single wrap traction worm-gear machines as approved with 1:1 roping and undercut sheave grooves. Maximum motor speed 1200 RPM.

Provide bedplate blocking to elevate secondary or deflector sheave above machine room floor.

Provide hoist machine mounted direct drive, digital, closed-loop velocity encoder.

Provide hoist machine drip pans to collect lubricant seepage.

* + - * 1. Solid State Power Conversion and Regulation Unit: Provide solid-state, alternating current, variable voltage, variable frequency (ACV³F), IGBT converter/inverter Power Factor1 drive.

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. Design in accordance with IEEE standard 519.

Provide isolation transformers, filter networks, and choke inductors.

Suppress solid-state converter noises, radio frequency interference, and eliminate regenerative transients induced into the mainline feeders or the building standby power generator.

Obtain supplemental direct-current power for the operation of hoist machine brake, door operator, dispatch processor, signal fixtures, etc., from separate static power supply.

ACV³F Drives shall be regenerative and utilize IGBT converter/inverter and dynamic braking during overhauling condition.

* + - * 1. Landing System: Solid-state, magnetic, or optical type.
        2. Controller: UL/CSA labeled.

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.

Relay Design: Magnet operated with contacts of design and material to ensure 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.

Motor Control:

Equipment: Capable of operating at plus or minus ten percent of normal feeder voltage and plus or minus three percent of feeder frequency without damage or interruption of elevator service.

Control System: Closed loop feedback control incorporating positional and velocity selector system capable of operating continuously at contract speed and load for one hour without exceeding 50°C from ambient machine room temperature. Design the system so that it does not adversely affect stability of voltage and frequency controls of emergency generator set or loads connected to emergency power bus during standby power operation.

Microprocessor-Related Hardware:

Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.

Provide power supplies that have noise suppression devices.

Isolate inputs from external devices, such as pushbuttons, with opto-isolation modules.

Design control circuits with one leg of power supply grounded.

Safety circuits shall not be affected by accidental grounding of any part of the system.

System shall automatically restart when power is restored.

System memory shall be retained in the event of power failure or disturbance.

Provide equipment with electromagnetic interference shielding within FCC guidelines.

Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.

Permanently mark components (relays, fuses, PC boards, etc.) with designations shown on the wiring diagrams.

Remote Monitoring and Diagnostics: Equip each controller with standard ports, interface boards, and drivers to accept maintenance, data logging, fault finding diagnostic, and monitoring system computers, keyboards, modems, and programming tools. The system shall be capable of driving remote color LED and LCD monitors and continually scan and display the status of each elevator.

Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary to monitor items outlined elsewhere in this section. Provide components required to connect monitoring system interface to equipment monitoring compartment and for LAN to interface with Lift-Net. Integrate into the Lift-Net system and make operational.

If the mainline disconnect is not in sight of the controller or machine, provide a controller or machine mounted auxiliary lockable “open” disconnect.

* + - * 1. Provide a parts cabinet and a certified trash can in the machine room.
        2. Control Station: Locate in the fire con­trol room, if such a room is provided. Size panel to suit space available, design as approved. Include the follow­ing for each elevator or group of elevators as applicable.

Digital readouts with direction arrows indica­ting location and direction of travel of each elevator.

Two-position fire key switch with visual indication.

A pilot light with sign reading EMERGENCY POWER in 1/8 inch letters and illuminating manual selection switches for each car, indicating which car is operating on standby (emergency) power. The pilot light shall light as soon as main power fails and each jewel shall remain illuminated as long as its car is operating on emergency power. When normal power is resumed, all lights and the pilot shall be extinguished automatically.

* + - 1. HOISTWAY EQUIPMENT
         1. Guide Rails: Planed steel T-sections for car of suitable size and weight for the application, including seismic reactions and brackets for attachment to building structure. Provide drawings showing locations for concrete inserts, embeds, and rail backing as needed. Provide bracketing, at top and bottom of floor beams. No additional structural points of rail attachment other than those shown on the drawings will be provided. Guide rails and brackets shall be painted black.
         2. Buffers: Oil type with blocking and support channels. Provide marking plates. Paint black.
         3. Guide Rollers:

Roller Guides: Roller type with neoprene tires, minimum 3/4-inch wide and fully adjustable spring loaded to provide continuous contact with rail surfaces. Balance car to ensure equal guide roller pressure on all wheels and not exceed manufacturer's recommendations.

* + - * 1. Hoisting Method:

Hoist and Governor Ropes: Size and number to ensure proper wearing qualities. Traction steel type with 8x19 or 8x25 seale construction.

Fasten with staggered length, adjustable, spring isolated wedge type shackles.

* + - * 1. Counterweights: Sectional metallic weights securely fastened in structural frame.
        2. Governor: Centrifugal speed type to be located over hoistway with protective covering over sheave, jaws and exposed gears. Frame shall be ratchet or tension type held under 200 pounds tension.
        3. Terminal Stopping: Provide upper and lower normal terminal stopping devices. Provide a limit switch that will not cause high noise level when activated by the car cam.
        4. Entrance Equipment, Passenger/Service Elevator:

Door Hangers: Two-point hanger roller with polyurethane roller surface and suspension with eccentric upthrust roller adjustment.

Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.

Door Interlocks: Paint interlock box flat black.

Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to ensure smooth, quiet mechanical close of doors.

Hoistway Door Unlocking Device: Provide Tri-Lok keyed TL1415, or equal; unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.

Hoistway Access Switches: Mount in wall at top and bottom floors. Provide switch with faceplate.

* + - 1. HOISTWAY ENTRANCES
         1. Approved Manufacturers: Otis, KONE, tyssenkrupp, Schindler, Elevator Manufacturing, LLC, Custom Cabs Industries, Minnesota Elevator Inc., or pre-bid approved equal.
         2. Complete entrances bearing fire labels from a nationally recognized testing laboratory approved by the authority having jurisdiction.
         3. Frames: 14-gauge hollow metal at all floors. Provide Arabic floor designation/braille plates, centered at 60 inches 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 inches above finished floor on both side jambs at all floors. Braille indications shall be below Arabic floor designation. Provide cast floor designation and Braille plates as manufactured by SCS, Vision Mark, Entrada, or equal. Provide 14 gauge subframe for special architectural overlay finishes at all floors. Size clear opening of subframes at least 4 inches wider and 2 inches higher than clear finish opening.
         4. Passenger/Service Door Panels: 16-gauge steel, sandwich construction without binder angles. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs. Architectural metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 1/2 inch on rear side of leading edge of panel at all floors. Provide rubber astragals on leading edges of passenger elevator center-opening doors and on side-slide doors (if astragals are provided standard by the manufacturer on side-slide doors).
         5. Hangers and Tracks: Sheave type with two-point suspension. Steel sheaves with flanged groove and resilient sound-absorb­ing tires. Minimum 2-1/2" diameter for hoistway, 3 inch for car. Manu­facturer's heavy-duty tracks and ball or roller bearing with adjustable upthrusts.
         6. Dust and Hanger Covers: Provide as required of minimum 16-gauge sheet steel. Provide hanger cover plates extending full length of door track. Paint black.
         7. Fascia, Toe and Head Guards: Minimum 16-gauge sheet steel; reinforce fascia. Paint black. Provide blind fascia in express zones for reverse openings as required.
         8. Sight Guards: 14-gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges.
         9. Sills: Nickel silver.
         10. Fascia, Toe Guards, and Hanger Covers: 14-gauge furniture steel with Contractor’s standard finish. Provide car door interlock to prevent opening of car doors outside the unlocking zone.
         11. Struts and Headers: Provide for vertical support of entrances and related material. Provide door open bumpers on entrances equipped with vertical struts.
         12. Finish of Frames and Doors: stainless steel trim and panels.
      2. CAR EQUIPMENT
         1. Frame: Welded or bolted, rolled or formed steel channel construction to meet load classification specified.
         2. Platform:

Isolated type, constructed of steel, or steel and wood, which is fireproofed on underside.

Design and construct to accommodate load classification requirements.

* + - * 1. Platform Apron: Minimum 14-gauge steel, reinforced and braced to car platform with Contractor’s standard finish.
        2. Approved Manufacturer: Elsco or pre-bid approved equal roller guides.
        3. Door Hangers: Two-point hanger roller with polyurethane roller surface and suspension with eccentric upthrust roller adjustment.
        4. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.
        5. Door Header: Construct of minimum 12-gauge steel, shape to provide stiffening flanges.
        6. Door Electrical Contact: Prohibit car operation unless car door is closed. Provide car door interlock to prevent opening of car doors outside the unlocking zone.
        7. Door Clutch: Heavy-duty clutch and pickup rollers or cams shall provide positive, smooth, quiet door operation. Design clutch so car doors can be closed while hoistway doors remain open.
        8. Door Operator: GAL-MOVFE, or pre-bid approved equal, linear door operator. Medium-speed, heavy-duty door operator capable of opening doors at no less than 1 1/2 fps. Accomplish reversal in no more than 2 1/2 inches of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Provide a minimum of four controller-activated motion profiles per floor, per door, to maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure.
        9. Door Control Device:

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 feet above finished floor. Device shall prevent doors from closing and shall 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 that floor level with doors open:

Acceptable Reopening Device: Adams GateKeeper 3000, or pre-bid approved equal.

Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20-25 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.

Interrupted Beam Time: When beams are interrupted during initial door closing, hold door open a minimum of 3 seconds. When beams are interrupted after the initial 3‑second hold open time, reduce time doors remain open to an adjustable time of approximately 1‑1.5 seconds after beams are reestablished.

Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.

Car Call: Hold open time adjustable between 3 and 5 seconds.

Hall Call: Hold open time adjustable between 5 and 8 seconds. Use hall call time when car responds to coincidental calls.

* + - * 1. Car Operating Panel: Innovation Industries Incorporated “The Bruiser Vandal Resistant;” or pre-bid approved equal.

Two vandal resistant car operating panels with faceplate consisting of a metal box containing operating fixtures, mounted behind the car full swing return panel.

Provide “door open” button to stop and reopen doors or hold doors in open position.

Provide “door close” button to activate door close cycle. Door closing shall not begin until normal door dwell time for a car or hall call has expired, except during firefighters’ operation.

Provide locked panel containing Phase II fire access switch, floor buttons, call cancel button, door open button, door close button, stop button, and lighted fire hat indicator, for fire officer use and use of car on independent service only. Configure switch to sound the group control panel distress signal when actuated.

Provide “extended door hold open” button to extend normal door hold open period up to 30 seconds. Cancel extended time by registration of car call or actuation of door close button.

Provide minimum 3/4-inch diameter raised floor pushbuttons that illuminate to indicate call registration.

Provide alarm button to ring bell located on car. Button shall illuminate when actuated.

If a service elevator is the only elevator type within the scope of this section, delete “Use manufacturer’s standard tactical markings.”

Suitably identify floor buttons, alarm button, door open button, door close button, and emergency push-to-call button with cast tactile symbols flush mounted with permanent rear mounted fastenings. Use manufacturer’s standard tactile markings. Configure plates per local building code accessibility standards including Braille. Locate top floor button at maximum height allowed above the car floor, no lower than 35 inches for emergency push-to-call button and alarm button.

Adhere to the layouts for buttons and for text of adjacent floor descriptor signage shown on the drawings.

Provide an overload capacity indicator light on main car station.

Provide 2" x 2" stainless steel angle iron protection around main car station panel.

Provide lockable service compartment with recessed flush door. Door material and finish shall match surrounding panel material. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:

Inspection switch.

Light switch.

Exhaust blower switch.

Independent service switch.

Constant pressure test button for battery pack emergency lighting.

120-volt, AC, GFCI protected electrical convenience duplex outlet.

Card reader override switch.

Switch to select either floor voice annunciation only, floor passing tone/chime only, or voice plus tone/chime.

Keyed stop switch.

Provide 10 total sets of the following keys:

Stop: EX512

Light: EX513

Service Cabinet: EX513

Inspection/Hatch Access: EX514

Fire: EX515

Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:

Phase II firefighters’ operating instructions on inside face of firefighters’ compartment door. Engrave red filled “firefighters’ operation” on outside face of compartment door.

Building identification car number on main car operating panel.

“No Smoking” on main car operating panel.

“Certificate of Inspection on File in Building Office” on main car operating panel.

Car capacity in pounds and loading classification on main car operating panel service compartment door.

* + - * 1. Car Top:

Control Station:

Mount to provide safe access and utilization while standing in an upright position on car top. Mount to the crosshead, if inaccessible from the landing sill. Provide an additional stop switch on the car top safely accessible from the landing. Provide the car top control station with an on/off switch for controlling the car top station and continuous pressure operating buttons.

Work Lights:

A mounted LED work light with an on/off switch and a guard for containment in the event the light shatters.

A hard-wired LED work light with minimum 8-foot flexible cord and a metal bracket to store the cord and light, an on/off switch, and a guard for containment in the event the light shatters.

Car Top Handrail: Provide car top handrail.

* + - * 1. Duplex Power Receptacle: GFCI protected power receptacle at top of car.
        2. Communication System:

Provide hands free emergency communication fixture that complies with ADA. Provide all necessary wiring between the elevator car and elevator machine room. Operating fixture call button and other features, including engraved instructions, shall be part of and built into the car operating station cover plate. Program phone to comply with all code and ADA requirements. Provide an Electronic Micro Systems model PBX or pre-bid approved equal phone to be programmed by the Port. Mount in a box with flush mount door.

Provide remote speakers in car behind front return panel with drilled speaker pattern, with shielded wiring to machine room junction box.

* + - * 1. Medical Emergency Elevator: The identification symbol (Star of Life) shall be fabricated from material and finish matching hall button stations and mounted with concealed mechanical fasteners. Submit samples for the Port to select from. The medical emergency elevator shall be designated by Port.
      1. CAR ENCLOSURE

Fill in the blank as appropriate for the project.

* + - * 1. Approved Manufacturers: Otis, KONE, tyssenkrupp, Schindler, Elevator Manufacturing, LLC, Custom Cabs Industries, Minnesota Elevator Inc., or pre-bid approved equal. Allow \_\_\_\_\_\_ pounds combined total weight allowance for car interior finishes including weight of finished flooring, interior wall panels, and ceiling fixtures.
        2. Enclosure Features:

Shell: Reinforced 14-gauge furniture steel formed panels with baked enamel interior finish as selected. Apply sound-deadening mastic to exterior. Provide concealed ventilation cutouts.

Canopy: Reinforced 12-gauge furniture steel formed panels with lockable hinged emergency exit. Interior finish white color reflective baked enamel.

Front Return Panels: Reinforced 14-gauge furniture steel, clad with minimum 16-gauge stainless steel with cutouts for applied car operating panels and other equipment.

Transom: Reinforced 14-gauge furniture steel, clad with minimum 16-gauge stainless steel full width of enclosure.

Interior Wall Finishes:

Wall Panels: Removable panels with plywood backing, faced and edged with texturized stainless steel. Texturized stainless steel shall be Rigidized Metals No. 5 WL pattern or equal, minimum thickness 0.050".

Stainless Steel Trim and Panels: Minimum 16-gauge with No. 4 non-directional finish.

Stainless Steel Wall Base: Minimum 16-gauge with No. 4 non-directional finish.

Ventilation: Morrison Products, Inc. model AA 06-01048 or equal, three-speed exhaust blower mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet noise and vibration criteria. Provide timer with adjustable delay for turning off ventilation when there is no elevator demand.

Lighting: Provide two-bulb LED fixtures with wiring and hookup. Provide timer with adjustable delay for turning off lighting when there is no elevator demand. Coordinate with emergency lighting requirements. Provide emergency lighting integral with portion of normal car lighting. Provide required transformer.

Suspended Ceiling: Stainless steel trim and panels, minimum 16-gauge with No. 4 non-directional finish.

Subfloor: See Materials article above.

When an elevator is located where water will be tracked into it, use walk-off mat for floor covering and describe the walk-off mat in Section 096800. If Section 096800 is not used, edit the following paragraph to include: Abrasive Action II #02578 Tandus Flooring, no substitutions; color Winter Gray, 19103.

Finish Floor Covering: Accommodate for the following.

Homogeneous rubber sheet.

Color and Pattern: Nora Norament grano Myrrh 5308, or equal.

Design: Hammered.

Thickness: Minimum 0.125".

Handrails: Provide minimum 1 1/4-inch diameter stainless steel tubular grab bar with backing plates and captive nuts across rear and side walls. Bolt rails through car walls from back and mount on 1 1/2-inch deep solid round stainless steel standoff spacers no more than 18 inches on center. Return handrail/guardrail ends to car walls.

Work with the Port Elevator Contracts Administrator to determine which cars will have pads.

Pads and Buttons: Include three-piece removable pads. Two pads covering side walls and adjacent front returns, and one covering rear wall. Provide cutouts to access main car operating panel.

Sills: One piece nickel silver extrusion with nickel silver extension, if required, between car entrance columns to face of car front return.

* + - 1. HALL CONTROL STATIONS
         1. Innovation Industries Incorporated “The Bruiser Vandal Resistant;” or pre-bid approved equal.

Coordinate location of pushbuttons with the drawings.

* + - * 1. Pushbuttons: Provide one riser with flush mounted faceplates. Include pushbuttons for each direction of travel that illuminate to indicate call registration. Include approved engraved message and engraved pictorial representation prohibiting use of elevator during fire or other emergency as part of faceplate. Pushbutton design shall match car operating panel pushbuttons. Provide vandal resistant pushbutton and light assemblies. Provide blue LED illumination.
        2. Phase I Fire Service fixture, including keyswitch, engraved operating instructions and illuminating lighted fire hat indicator. Provide illuminating jewels indicating standby power status.
      1. SIGNALS
         1. Hall:

Provide a hall direction lantern at each entrance to indicate travel direction of the arriving car. Locate as detailed on the drawings.

Up or down LED lights shall illuminate and sound tone shall activate, once for up and twice for down direction, prior to car arrival at the floor. Light shall illuminate until the car doors start to close.

Sound level shall be adjustable from 20-80 decibels measured at 5 feet in front of hall control station and 3 feet off of the floor.

Provide hall lantern advance notification to comply with ADA hall call notification time. Set the adjustable car door dwell time to comply with ADA requirements relative to hall call notification time.

Car direction lenses shall be arrow shaped with faceplates. The “up” arrow shall be white. The “down” arrow shall be red.

Lenses shall be minimum 2 1/2 inches in their smallest dimension.

Provide vandal resistant lantern and light assemblies.

* + - * 1. Car:

Provide an audible floor passing tone of no less than 20 decibels and a frequency of no higher than 1500 Hz to sound as the car passes or stops at a floor served.

Provide car position indicators with indications corresponding to floor designations with matching direction arrows. Use “X” or “E” indications for elevators with express zones. Provide digital type direct readout indicator with minimum 2-inch high indications mounted integral with each car operating panel. Projection type readouts will not be permitted.

Provide a CE Electronics voice enunciator with an easily reprogrammable message (with male or female voice) to announce car direction and floor (upon arrival at the floor) and emergency exiting instructions, etc. Set voice to female. Direction and floor message shall state, “floor 1 going up, floor 2 going down”, etc.

* + - * 1. Faceplate Material and Finish: Stainless steel, No. 4 non-directional for all fixtures. Provide tamper resistant fasteners for fastenings exposed to the public.
      1. ELECTRICAL WIRING AND CONNECTIONS
         1. Provide electrical components of the elevator equipment and systems, including motors, motor starters, controllers, control instruments, switches, conduit, wire, and relays as specified herein and as necessary for complete and operable systems. Provide interconnecting wiring for components of equipment as an integral part of the equipment.
         2. Electrical equipment and wiring shall conform to NEC.
         3. For equipment with electrical components, provide UL label on each component for which published standards exist.
         4. The frames of all motors, controllers, transformers, and the metal enclosures for all electrical equipment in or on the car, hoistway, and machine room shall be grounded in accordance with NEC Article 250.
         5. Provide “daisy chain” electrical grounding for all machine room electrical cabinets.
         6. Provide electrical wiring gauge sizing and number of electrical conductors to eliminate any voltage/amperage drop or variation for all machine room, hoistway switches/interlocks, car position indicators, exhaust fan, car lighting, inspection station, leveling devices, hall position indicators, and all other elevator electrical equipment.
         7. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Do not use splices or similar connections in wiring except at terminal blocks, control cabinets, or junction boxes. Provide 10 percent spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room. Separate and mark all spare wires. All spare wire ends shall be turned back or protected against accidental exposure to any live electrical circuit or electrical ground.
         8. Conduit: Galvanized steel conduit, EMT, or duct. Flexible conduit length shall not exceed 3'-0". Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices. Do not use plastic wire ties for conduit fastening.
         9. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
         10. Provide five pair shielded 18-gauge cable for card reader from the elevator interface enclosure to card reader location in the cab that includes 3 feet of additional length.
         11. Provide three Cat 6A (DRAKA, or equal) network cables for internet protocol devices within traveling cable from elevator interface enclosure to car top junction box that includes 3 feet of additional length at each end.
         12. Provide eight pair shielded 18-gauge communication cables for spares between elevator interface enclosure and car top junction box with 3-foot excess loop at each end.
         13. Add tag that identifies each spare cable or pair at both ends.
         14. Tag spares in machine room. Provide cables from controller to top of car.

1. EXECUTION
   * + 1. SITE CONDITION INSPECTION
          1. Prior to beginning installation of equipment, examine hoistway and machine room areas. Verify no irregularities exist which affect execution of the work.
          2. Do not proceed with installation until work in place conforms to project requirements.
       2. INSTALLATION
          1. Install equipment items in accordance with the manufacturer’s direction and referenced codes and in such a manner that they are:

Easily maintained.

Easily removed for maintenance and repair.

Have maximum accessibility, safety, and continuity of operation.

* + - * 1. Painting:

Clean the following items of oil, grease, scale and other foreign matter, and field-apply primer and finish paint.

##### All exposed equipment and metal work installed as part of this work which does not have architectural or galvanized finish.

##### Machine room equipment.

Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply a final coat of primer.

Apply three coats of finish paint.

* + - * 1. When activities such as preparation for inserts, attachments, or penetrations require removal of fireproofing, remove the minimum amount possible.
        2. Floor Numbers: Stencil paint 4 inches high in contrasting color on inside face of hoistway doors or hoistway fascia and in location visible from within the car.
        3. Protect open hoistways and entrances during installation, per OR-OSHA regulations.
        4. Protect car enclosure, hoistway entrance assemblies, and special metal finishes from damage.
        5. Neatly touch up damaged factory painted surfaces with original paint and color. Protect machine finish surfaces against corrosion.
        6. Replace, repair, or repaint any material or building equipment damaged during the work.
        7. Provide upgrades and/or revisions of software during the progress of the work.
        8. Provide ten sets of keys for all switches and control features. Properly tag and mark the keys.
      1. NOISE AND VIBRATION CONTROL
         1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 56 decibels inside the car under any condition including door operation and car ventilation exhaust blowing on its highest speed. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 70 decibels. All decibel readings shall be taken 3 feet off of the floor and 3 feet from the equipment using the “A” weighted scale.
         2. Vibration Control: All elevator equipment including power unit, controller, oil supply lines, and their support shall be mechanically isolated from the building structure to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.
      2. FIELD QUALITY CONTROL
         1. The Port will check the work during the course of installation. Correct work as required prior to performing further installation.
         2. Operating Test:

Load each elevator to rated capacity and operate continuously for 60 minutes over full travel distance, stopping at each level for 10 seconds and proceeding immediately to the next. Doors/gates shall complete a full open and close cycle at each floor. Record temperature rise of elevator motor windings during the 60-minute test period. Temperature rise shall not exceed 50°C above ambient.

Under any load condition, obtain specified contract speed, performance times, stopping accuracy without re-leveling, ride quality, and equipment noise levels to satisfaction of the Port. Tests may be conducted under no load, unbalanced load, and full load conditions.

* + - 1. ADJUSTMENTS
         1. Install guide rails plumb and align vertically with tolerance of 1/16 inch in 100 feet. Secure guide rail joints without gaps, adjust to within 1/32 inch in 100 feet of vertical, and file all irregularities to a smooth surface.
         2. Static balance car to equalize pressure of guide shoes on guide rails.
         3. Lubricate all equipment in accordance with manufacturer’s instructions.
         4. Adjust motors, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices, etc., to achieve required performance levels.
      2. CLEANUP
         1. Keep work areas orderly and free from debris during progress of the work. Remove packaging materials daily.
         2. Remove loose materials and filings resulting from the work.
         3. Clean machine room equipment and floor of dirt, oil, and grease.
         4. Clean hoistway, car, car enclosure, entrances, operating and signal fixtures, and trim of dirt, oil, grease, and finger marks.
      3. ACCEPTANCE INSPECTION AND TESTS
         1. Coordinate inspections and tests with the Port and the State of Oregon Elevator Inspector.
         2. Verify that Lift-Net monitoring is operational.
      4. TEMPORARY USE BY CONTRACTOR
         1. Comply with the following requirements for each elevator used for construction purposes:

Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

Provide strippable protective film on entrance and car doors and frames.

Provide padded wood bumpers on entrance door frames, covering jambs and frame faces.

Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.

Do not load elevators beyond their rated weight capacity.

Provide full maintenance service. Include preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of the original equipment.

Prior to turning over to the Port for public use, check operation of each elevator in the presence of the Port. Determine that operating systems and devices are functioning properly.

Restore damaged work so no evidence remains of correction. Return items which cannot be refinished in the field to the shop, make required repairs, and refinish entire unit, or provide new units as required.

* + - 1. TRAINING
         1. Supply a factory authorized installer/adjuster to train the Port to service the elevators.

Training shall be focused on instruction to Port elevator mechanics and staff for troubleshooting, maintenance, repairs, and adjustments.

Training shall be a minimum of one 8-hour session.

END OF SECTION 142100