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**TIPS:**

To view non-printing **Editor's Notes** that provide guidance for editing, click on Masterworks/Single‑File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on Masterworks/Supporting Information.

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
   * + 1. **RELATED DOCUMENTS**

Retain or delete this article in all Sections of Project Manual.

* + - * 1. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. **SUMMARY**

This section includes Machine Room (MR)/ Room less (MRL) machine room less type (motors shall be located within elevator shafts at high level) for passengers as shown on the schedule

B. All equipment, labor and permits required to satisfactorily complete elevator installation as required by contract documents.

C. Ongoing preventive maintenance as described herein

Service elevators are elevators that are used both for passenger service and for moving freight. They are passenger elevators, even though car finishes may be similar to freight elevators. The term "freight elevator" is defined in ASME A17.1/CSA B44 to mean elevators used primarily for carrying freight and inaccessible to the general public. ASME A17.1/CSA B44 does not have the same requirements for freight elevators as for passenger elevators, so using the proper terminology is important.

* + - 1. **REFERENCES**
         1. Safety Rules for the construction and installation of Lifts and Service Lifts, European Standard EN 81 (All Parts).
         2. Transportation System in Buildings, CIBSE Guide D
         3. Elevators and Service Elevators, BS 5655
         4. Elevators and Service Elevators, BS ISO 4190-1
         5. Code of Practice for safe working on elevators, BS 7255
         6. Specifications for insulated flexible cables for elevators and other flexible connections, BS6977
         7. Environmental testing – Part 2: Tests-test Fc: Vibration, EN 60068-2-6
         8. Electromagnetic compatibility – Product family standard for Lifts, Escalators and passenger conveyors- Emission, pr EN 12016: 1995
         9. Electromagnetic compatibility – Product family standard for Lifts, Escalators and passenger conveyors- Immunity, pr EN 12015: 1995
         10. Fire resistance testing of Lifts landing doors. BS 476
         11. Fire Fighting Lifts EN 81-72
         12. Optoelectronic devices. IEC 747.5
         13. Insulation co-ordination for equipment within low-voltage systems. IEC 664-1
         14. Latest Prevailing Local Codes and Regulations.
         15. NFPA
      2. **RELATED WORK SPECIFIED ELSEWHERE**
         1. The following works to be completed by the Contractor:

Legal Hoistway and Pit:

Clear, plumb, substantially flush hoistway with variations not to exceed 26 mm at any point.

Bevel cants not less than 75° with the horizontal on any rear or side wall ledges and beams that project or recess 50 mm or more into the hoistway. Not required on hoistway divider beams.

Installation of guide rail bracket supports in concrete. Inserts or embeds, if used, will be furnished under this Section.

Wall blackouts and fire rated backing for control and signal fixture boxes which penetrate walls.

Cutting and patching walls and floors.

Wall pockets and/or structural beams for support of machine, sheave, and dead ‑ end hitch beams. Support beam deflection shall not exceed 1/1666 of span under static load.

Erect front hoistway wall after elevator entrances installed.

Grout around hoistway entrances and sills.

Pit access ladder for each elevator, third party certified hooks for each elevator hoistway.

Structural support for car and counterweight buffer impact loads, and guide rail loads.

Waterproof pit. Indirect waste drain and sump with flush grate and pump.

Protect open hoistways and entrances during construction per OSHA Regulations.

Protect car enclosure, hoistway entrance assemblies and special metal finishes from damage after installation.

Hoistway venting or pressurization to prevent accumulation of smoke and gas.

Crane facilities to facilitate vertical movement of subcontractor’s equipment.

Cab flooring.

Third party certified steel scaffolding in each elevator shaft to subcontractors’ requirements.

* + - * 1. Electrical Service, Conductors and Devices

Lighting and water proof outlets in pit and overhead machinery space.

Conduit from the closest hoistway of each elevator group to the fire control room and elevator control panel. Coordinate size, number and location of conduits and elevator control panel.

Three‑phase mainline copper power feeder to terminals of each elevator controller in the elevator shaft at high level with protected, lockable "off", disconnect.

Single phase copper power feeder to each elevator controller for lighting and exhaust blower with individual protected, lockable "off", disconnect switch located in elevator shaft at high level.

Single phase power feeders to elevator group control panel with single phase, protected, lockable "off", disconnect switch.

Emergency intercom telephone service with dedicated line to individual elevator control panel.

from outside the hoistway. Provide sensor signal wiring from hoistway connection point to controller terminals.

* + - 1. **DEFINITIONS**
         1. Retain terms that remain after this Section has been edited for a project.
         2. Terms used are defined in the latest edition of machinery EN294.
         3. Terms used are defined in the latest edition of standards as referenced herein.
         4. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
      2. **QUALITY ASSURANCE**
         1. Employ suppliers who have been manufacturing similar lifts for at least ten (10 years.
         2. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of international and local codes and/or authorities, including revisions and changes in effect on date of these specifications.
         3. Warranty:

The following shall be provided:

Material and workmanship of the installation shall comply in every respect with contract documents. Correct defective material or workmanship which develops within two years from date of final acceptance of work to the satisfaction of the Engineer 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 attached Preventive Maintenance Contract.

Defective is defined to include, but not limited to; operation or control system failures, 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.

Make modifications, adjustments and improvements to meet performance requirements in Parts 2 and 3.

* + - 1. **DOCUMENT VERIFICATION**

In order to discover and resolve conflicts during construction. The Contractor must review contract documents for compatibility with the lift proposals. Review structural, architectural, electrical and mechanical Drawings and Specifications. The Contractor will be solely liable for any changes to structural, mechanical, electrical or other systems required to accommodate Installer's equipment if not identified sufficiently early.

* + - 1. **SUBMITTALS**
         1. Within eighteen (18) days after award of contract and before beginning equipment fabrication, submit shop drawings and required material for review as outlined in Division 1. Allow thirty (30) days for response to submittal.

Scaled or Fully Dimensioned Layout: Plan of pit, hoistway and elevator shaft indicating equipment arrangement, elevation section of hoistway, details of car enclosures, hoistway entrances, and car/hall signal fixtures.

Design Information: Indicate equipment lists, reactions and design information on layouts.

Power Confirmation Sheets: Include motor horsepower, code letter, starting current, full‑load running current, and demand factor for applicable motors.

Fixtures: Cuts, samples or shop drawings.

Finish Material: Submit 75 mm samples of actual finished material for review of color, pattern and texture by Engineer. Compliance with other requirements is the exclusive responsibility of the Provider.

B. Acknowledge and/or respond to Drawing comments within ten (10) days of return; promptly incorporate required changes due to inaccurate data or incomplete definition so that delivery and installation schedules are not affected. Revision response time is not justification for equipment delivery or installation delay.

* + - 1. **PERMIT, TEST AND INSPECTION**
         1. Perform test in accordance with applicable international and Latest Prevailing Local Authorities Standards requirements in the presence of Authorized Representative. Alternatively, a separate contract can be provided for this interim period at mutually agreed cost.
         2. Supply personnel and equipment for test and final review required by consultant, as indicated herein.
         3. Allow for witness tests to be carried out in factory and give at least fourteen (14) days notice before the tests are to be carried out. For details refer to sections 26 01 20 and 26 05 00.
      2. **MAINTENANCE**

A. Interim

1. When one or more elevators are near completion and ready for service, the Owner may accept elevators for interim use and place in service before entire installation of all elevators has been completed and accepted.

2. Temporary acceptance form must be acceptable to the Owner and signed prior to use.

B. Warranty Maintenance

1. Provide preventive maintenance and 24‑hour emergency call‑back service for (1) year commencing on date of final acceptance by the Owner. Systematically examine, adjust, clean and lubricate all equipment. Repair or replace defective parts using parts produced by the Manufacturer of installed equipment. Maintain elevator shaft, hoist way, and pit in clean condition.

2. Use competent personnel, acceptable to the Owner, supervised and employed by the Provider.

C. Preventive Maintenance Contract

Contract (Ongoing Preventive Maintenance Program): Quote monthly cost for two (2)‑year maintenance agreement commencing on completion of the defects liability period. Submit quote based upon terms and conditions of the Owner's standard preventive maintenance agreement.

1. PRODUCTS
   * + 1. ELEVATORS DATA SHEET SUMMARY MINMUM REQUIREMENT REFER TO Lift’s ARCHITECTURAL DRAWINGS .

Motor Control: DC Variable Voltage Variable Frequency (VVVF) Microprocessor Based with Digital Closed‑Loop Feedback and Automatic Stopping.

Power Characteristics: 400 Volts, 3 Phase, 50 Hertz

Door Operation: High‑Speed, Heavy‑Duty, VVVF Door Operator.

Door Protection: Infrared, Full Screen Device, with Differential Timing and Nudging and Interrupted Beam Time.

Machine: Gearless.

Starts Per Hour: 180

Machine Location: Machine room above

Safety: Flexible Guide Clamp, Over Speed governor control.

Car safety device.

Guide Rails: Planed Steel Tees

Car Enclosure: For car Finishes, Refer to Elevator Arch/ID drawings.

Signals: Manufacturers range as selected by the Engineer.

Registration Lights: Single Hall Pushbutton Riser

Car Operating Panel

Anti-Vandal Car and Corridor Pushbuttons

Position Indicator: Car Digital with Direction Arrows in Car Entrance Transom

Hall Lanterns: Predictive Function at All Floors with Adjustable Electronic Tone.

Hall Car Position

Indicator: Digital with Direction Arrows at Primary Floor.

Communication System: Intercom with Distress Signal

Anti-Vandal, Push –to‑Talk, Two‑Way Communication System with Reception desk.

Fixture Submittal: Submit Brochure Depicting Manufacturer's Proposed Designs

Additional Features: Additional Features: There must be a facility inside the car to isolate the landing push buttons. This should take the form of key - operated switch. Visual indication must be provided on each landing to show when the elevator is being used for beds is not available.

Priority Button Switch (inside car operating panel)

By pushing the Priority Button Switch and the desired floor button, the car can be driven directly to requested destination, by - passing other calls. No special key to be needed.

Door Hold Open (Inside car operating panel)

By pushing the Door Hold Open, it holds the doors open or performing such time-consuming tasks of loading or unloading.

Elevators shall be suitable for handicapped use (e.g. control panels on a height of max. 0.85 m above floor level).

* + - 1. **MATERIALS**
         1. Steel

Sheet Steel (Furniture Steel for Exposed Work): Stretcher ‑leveled, cold ‑rolled, commercial ‑quality carbon steel, complying with ASTM A366, matte finish.

Sheet Steel (for Unexposed Work): Hot ‑rolled, commercial ‑quality carbon steel, pickled and oiled, complying with ASTM A568 and A569.

Structural Steel Shapes and Plates: ASTM A7, ASTM and A36.

* + - * 1. Stainless Steel: Type 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, with texture and reflectivity required to match Engineer's sample. Protect with adhesive ‑paper covering.

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

D. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire ‑Rated Grade (GP‑50), Type 7, 1.27 mm +/‑ 0.127 mm thick; color and texture as follows:

Exposed Surfaces: Color and texture selected by Engineer.

Concealed Surfaces: Manufacturer's standard color and finish.

E. Fire ‑Retardant Treated Particle Board Panels: Minimum 20 mm thick backup for natural finished wood and plastic laminate veneered panels, edged and faced as shown, provided with suitable anti‑warp backing; meet ASTM E84 Class "I" rating with a flame ‑spread rating of 25 or less, registered with Local Authorities for elevator finish materials.

F. Paint: Clean exposed metal of oil, grease, scale and other foreign matter and factory paint one shop coat of Manufacturer's standard rust ‑resistant primer. After erection, provide one finish coat of Industrial enamel paint. Galvanized metal need not be painted. Painting shall be in compliance with section 09 90 00 (Paints and Coatings)

G. Prime Finish: Clean all surfaces receiving a baked enamel finish of oil, grease and scale. Apply one coat of rust ‑resistant mineral paint followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of mineral paint.

* + - 1. **CAR PERFORMANCE**

A. Speed: ± 3% of contract speed under any loading condition.

B. Capacity: Safely lower, stop and hold up to 125% of rated load.

C. Stopping Accuracy: +/‑ 7 mm under any loading condition.

D. Door Opening Time: 1.6 Seconds from start of opening to fully open

E. Door Closing Time: 2.3 Seconds from start of closing to fully closed

F. Floor –to ‑Floor Performance Time: 10.5 Seconds from start of doors closing until doors are 3/4 open (½ open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction.

G. Ride Quality

Horizontal acceleration within car during all riding and door operating conditions: Not more than 20 mg peak to peak in the 1‑10 Hz range.

Acceleration and Deceleration: Smooth constant and not more than 1524 mm/second/second with an initial ramp between 0.5 and 0.75 seconds.

Sustained Jerk: Not more than 2438.4 mm/second/second squared.

H. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 50 dBa in elevator lobbies and 60 dBa inside elevator car under any condition including door operation and car ventilation exhaust blower on its highest speed.

* + - 1. **OPERATION**

A. Single Automatic Pushbutton ‑ Microprocessor Based selective collective up/down: Operate elevator without attendant from buttons in car and at each landing. When elevator is idle, automatically start car and dispatch it to appropriate floor when call is registered by pressing car or hall pushbutton. Illuminate, "in use" lights in each hall station when car is responding to registered call. Prevent registration of another call until trip is complete including time for passenger transfer and registration of car call if car is responding to a hall call. Extinguish "in use" light to indicate system is available to respond to next hall call.

B. Other Items

Load Weighing: Provide means for weighing car passenger load. Design 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%.) Set at 65%.

Independent Service: Provide controls for operation of each elevator from car pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.

Elevator‑to‑Lobby Feature: Provide the means for each elevator to return to the main floor and park during fire mode.

* + - 1. **MACHINE EQUIPMENT**
         1. Gearless Traction Hoist Machine

Gearless Machines

The motor shall be VVVF drive, A.C. type, with a minimum rating of 180 starts per hour or as per lift schedule.

Gearless machines shall be used. These shall be of the compact type with high efficiency, having the driving sheave directly coupled to the shaft of the machine rotor. Diverting pulleys, if any shall be fitted on the same bed plate with the machine for precision alignment.

Winding insulation shall be Class (H) and protection degree (IP41)

The motor must be provided with overload, reversal phase and phase failure cut-out devices.

The machine to be provided with manually operation turning device in order to bring the car to the nearest landing in case of power failure.  The system must prevent engaging of the turning device, until the power supply for the motor is switched off.  When not in operation, the motor shall start automatically upon registration of a call.   The machinery & controller to be placed on vibration dampers inside the shaft. All steel structures for machinery shall be included in this contract. The contractor must produce necessary & sufficient drawings for special concrete foundations for the Machinery, if needed.

The contractor must provide information to the CLIENT/ENGINEER on the highest permissible ambient temperature in the shaft and the produced heat by the entire Installation.

Controller

Controllers shall be of the vertical, totally enclosed dust proof cubicle type constructed of sheet steel with hinged doors on the front & screwed panels on the back, giving easy access to all components inside the controller. The cubicle enclosure shall be such as not to pose any danger of shock to persons. The cubicle shall be well ventilated by means of louvers or other approved method, such that the temperature inside never exceeds the safe temperature limit of the equipment.

The controller shall house selectors, timing devices, transformers, motor protection, isolation equipment and all components associated with the control of the lift.  All control circuits shall have silver contacts.  Control of elevators shall be by electronic microprocessor Based automatic control circuitry.

All insulated components of the controller shall be “Class B”.  Protection degree of the controller to be IP41. The controller shall provide protection and automatically disconnect motor against the following:

No - volt and sustained under voltage.

Over-current in any component.

Phase reversed of the power supply.

Overload.

Earth leakage protection.

Serious unbalance of phase winding currents.

Phase failure.

All sheaves and pulleys shall comply with the relevant British Standard and Code of Practice. The sheave casting shall be of the correct hardness to suit the ropes they carry.

The motor, electro-mechanical brake, bearing driving sheaves shall be mounted in proper alignment on one continuous bed plate of cast iron or fabricated mild steel of substantial of design to form a completely self-contained unit. The bearings shall be sleeve type on the motor and sleeve, roller or ball type on the gear.

The brake shall be spring applied, electrically released and designed to be instantly and automatically applied in the event of interruption of power supply from any cause. Provision shall be made for releasing the brake by hand in the event of emergency and this release gear must be of a type, which leave the brake operative the moment that manual pressure is released.

* + - * 1. 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 with noise‑suppression devices.

Isolate inputs from external devices (such as pushbuttons) with opto‑isolation modules.

Design control circuits so that one side of power supply is 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.

Equipment shall operate properly with a 500 KHZ to 1300 MHZ radio frequency signal, transmitted at a power level of not less than 100 watts effective radiated power (ERP) at a distance of 91.5 mm.

* + - * 1. Wiring: Copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
        2. Permanently mark components (relays, fuses, PC board, etc.) with symbols shown on wiring diagrams.
        3. Provide controller or machine mounted auxiliary, lockable "off" disconnect if mainline disconnect not in sight of controller or machine.
        4. Sleeves and Guards: 50 mm steel angle guards around cable or duct slots through floor slabs or grating. Provide rope and smoke guards for sheaves, cables.
        5. Machine and Equipment Support Beams: Provide structural steel beams required for direct support of elevator hoist machine, deflector sheaves, overhead sheaves, governor, and dead‑end hitch assemblies.

Provide bearing plates, anchors, shelf angles, blocking, embedments, etc., for support and fastening of machine beams or equipment to the building structure.

Isolate machine and overhead sheave beams to eliminate noise and vibration transmission to building structure.

* + - * 1. Governor: Centrifugal‑type, car driven, with pull‑through jaws and bi‑directional electrical shutdown switches. Provide required auxiliary supports for attachment to building structure.
        2. Vibration Isolation: All elevator equipment provided under this contract, including power conversion unit, controller and their support, shall be mechanically isolated from the building structure and from electrically induced vibration to minimize the possibility of objectionable noise and vibrations being transmitted to the car or occupied areas of the building.
        3. Sound Isolation:

Noise level relating to elevator equipment and its operation shall not exceed 80 dBa outside the hoistway.

All dBa readings to be taken 915 mm off the floor and 915 mm from the equipment using "A" weighted scale.

* + - 1. **HOISTWAY EQUIPMENT**
         1. Guide Rails: Planed steel T‑sections suitable for the application, car weight, counterweight, with brackets for attachment to building structure. Provide car rail backing and intermediate counterweight tie brackets to meet Code requirements.
         2. Buffers, Car and Counterweight: hydraulic or polyurethane with blocking and support as recommended by elevator’s manufacturer types and shall comply with the requirements of EN 81 and BS ISO 4190-1. Test certificate should be provided. Provide switch on oil buffers to limit elevator speed if buffer is compressed.
         3. Sheaves: Machined grooves with sealed bearings. Provide mounting means to machine beams, machine bedplate, car and counterweight structural members, etc.
         4. Governor and Encoder Pit‑tensioning Sheave: Mount sheave and frame on pit support member or guide rail. Provide with guides or pivot point to enable free vertical movement and proper tension of cable/tape.
         5. Counterweight: Steel frame with metal filler weights, guided by roller guide shoes.
         6. Counterweight Guard: Metal guard in pit.
         7. Hoist and Governor Ropes

8 x 19 or 8 x 25 Seale construction, traction steel type. Fasten with staggered length, adjustable, spring isolated shackles.

Governor rope to suit Manufacturer's specification.

* + - * 1. Terminal Stopping: Provide normal, final devices.
        2. Electrical Wiring and Wiring Connections:

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, junction boxes, or conduits. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the elevator shaft at high level. Provide four pairs of spare shielded communication wires in addition to those required to connect specified items.

Conduit: Painted or galvanized steel conduit and duct. Conduit size, 20 mm minimum. Flexible conduit not to exceed 915 mm in length. Flexible heavy‑duty service cord may be used between fixed car wiring and car door switches for door protective devices.

Traveling Cables: Flame and moisture‑resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.

* + - * 1. Entrance Equipment

Door Hangers: Two‑point hanger roller with neoprene 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: Operable without retiring cam. Paint interlocks flat black.

Door Closers: Spring, spirator or jamb/strut mounted counterweight type. Design to insure the mechanical close of the doors and quiet operation.

* + - * 1. Safety Gear

1. The safety gear shall be of the progressive type operated by an over speed governor and shall be arranged to bring the car to a gradual stop. The safety gear and governor shall comply with the test requirements of EN 81 and BS ISO 4190-1.
2. The over speed governor shall be fitted with a switch, which shall cause the motor control and brake control circuits to be opened in the event of over speeding in the upward and downward directions. The motor control and brake circuits shall be opened by a switch on the safety gear before or at the time the safety gear is applied. The breaking or slackening of the governor rope shall cause the lift to stop.
   * + 1. **CAR EQUIPMENT**
          1. Frame: Welded or bolted, rolled or formed steel channel construction to accommodate load classification requirements.
          2. Safety Device: Type "B", flexible guide clamp.
          3. Platform: Isolated type, constructed of steel, fireproofed on the underside. Construct to accommodate load classification requirements.
          4. Guide Shoes: Roller type with three or more spring dampened, sound‑deadening rollers per shoe. Minimum roller diameter 125 mm.
          5. Finish Floor Covering: Refer to Elevator Arch/ID Drawings.
          6. Sills: For car Finishes, Refer to Elevator Arch/ID drawings
          7. Toe Guard: Minimum 14‑gauge steel, reinforced and braced to car platform, with flat black finish.
          8. Doors: Provide DC power operated, VVVF controlled, as specified for hoistway and car entrance doors.
          9. Door Hangers: Two‑point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.
          10. Door Track: Bar or formed, cold drawn removable steel track with smooth roller contact surface.
          11. Door Header: Construct of minimum 12-gauge steel, shape to provide stiffening flanges.
          12. Door Electrical Contact: Prohibit car operation unless car door is closed within tolerance allowed by Code.
          13. Door Clutches: Heavy‑duty clutches, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, while hoistway doors remain open.
          14. Restricted Opening Device: Restrict opening of car doors outside the unlocking zone.
          15. Door Operator: High‑speed, heavy‑duty, master door operator capable of opening doors at no less than 0.76 mps. Accomplish reversal in no more than 760 mm of door movement. Open doors automatically when car arrives at a floor.
          16. Doors shall have a fire rating of 2 hours for firefighting lifts and 1.5 for others.
          17. Door Control Devices

1. Infrared Reopening Device: Black, fully enclosed device extending full height of car door panels. Full screen infrared matrix or multiple beams extending vertically along edge of each leading door panel to minimum height of 2130 mm above finished floor. Device shall prevent open doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. Include discreet beams at 125 mm and 738 mm above floor for ADA compliance. If device fails, provide for automatic shutdown of car at floor level with doors open.

2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20 ‑ 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 the nudging operation and re‑open the doors.

3. Interrupted Beam Time: When beams are interrupted during initial door opening, 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) seconds after beams are reestablished.

* + - * 1. 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.

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

* + - * 1. Car Operating Panels:

Two (2) car operating panels with faceplates, consisting of a metal box containing the operating fixtures, mounted on the car enclosure stationary front return panels. Faceplates shall be hinged and constructed of stainless steel.

Suitably identify floor buttons, alarm button, door open button, door close button tactile symbols rear mounted. Provide plates per A.D.A. Standards. Locate operating controls no higher than 1220 mm (front approach) 1370 mm (side approach) above the car floor; no lower than 890 mm for stop switch and alarm button.

Provide minimum 2 mm diameter raised floor pushbuttons which illuminate to indicate call registration. Include 1.6 mm high designation of the floors served on face of button.

Provide alarm button at bottom of car operating panel to ring bell located on elevator, and sound distress signal at control panel. Illuminate button when actuated.

Provide keyed stop switch with markings to show "run" and "stop". Locate in locked car service compartment.

Provide lockable service compartment with recessed flush door. Door material and finish to match car return panel or car operating panel faceplate.

Include the following controls with function and operating positions identified by engraved signage painted black:

Inspection switch.

Light switch (On/Off).

Exhaust blower switch (On/Off).

Independent service switch.

Constant pressure test button for battery pack emergency lighting.

Keyed stop switch.

Extended Door Hold Open Button: Provide button to extend normal door hold open period up to 30 seconds.

* + - * 1. Car Top Control Station: As required by application code.
      1. **CAR ENCLOSURE**
         1. Provide complete car enclosure as specified herein.

Shell: Reinforced 14‑gauge. For car Finishes, Refer to Elevator Arch/ID drawings.

Canopy: Reinforced 14‑gauge. For car Finishes, Refer to Elevator Arch/ID drawings

Front and Rear Return Panels and Integral Entrance Columns Front and Rear Sides and Back: Reinforced 14‑gauge. For car Finishes, Refer to Elevator Arch/ID drawings

Entrance Columns and Transom: Reinforced 14‑gauge. For car Finishes, Refer to Elevator Arch/ID drawings

Car Door Panels: Minimum reinforced 16‑gauge clad. For car Finishes, Refer to Elevator Arch/ID drawings. Same construction as specified for Hostway door. Metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 26 mm on rear side of panels.

Floor: For car Finishes, Refer to Elevator Arch/ID drawings

Interior Finish: Reinforced 14‑gauge. For car Finishes, Refer to Elevator Arch/ID drawings

Ventilation: Three‑speed exhaust blower mounted to car canopy on isolated rubber grommets.

Lighting: Lighting and emergency lighting with wiring and hookup per manufacturer recommendations, but to match finishes car Finishes, refer to Elevator Arch/ID drawings. Coordinate with emergency lighting requirements. Provide lighting integral with portion of normal car lighting system. Include required transformer. Provide temporary lighting as required.

Suspended Ceiling: For car Finishes, Refer to Elevator Arch/ID drawings

Handrail: For car Finishes, Refer to Elevator Arch/ID drawings.

Bumper rails: For car Finishes, Refer to Elevator Arch/ID drawings

* + - 1. **HALL CONTROL STATIONS**
         1. Pushbuttons: Provide single riser with flush mounted faceplates, 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.
      2. **SIGNALS**
         1. Hall Lantern: Provide at each entrance to indicate travel direction of arriving elevator. Locate as detailed on Drawings. Illuminate indicators with shielded lights. Illuminate up or down lights and sound tone, twice for down direction travel, prior to car arrival at floor. Sound level to be adjustable from 20 ‑ 80 dBa measured at 1525 mm in front of corridor pushbutton and 915 mm off floor. Illuminate light until the elevator doors start to close. Provide advanced hall lantern notification to comply with ADA corridor call notification time. Minimum 64 mm in the smallest dimension, arrow lenses with faceplates.
         2. Car Position Indicator: Alpha‑Numeric Digital indicator type containing floor designations and direction arrows a minimum of 13 mm high to indicate floor served and direction of car travel. Locate fixture in transom above car entrance. 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. Use 50 mm segmented LED or vacuum‑fluorescent type units.
         3. Faceplate Material and Finish

Hall Lantern: Stainless steel

Car Position Indicator: Stainless steel

Lobby Position Indicator: Stainless steel

* + - * 1. Arrival Chime: Provide an audible chime 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.
      1. **INTERCOM AND DISTRESS SIGNAL SYSTEM**
         1. General: Provide intercommunication system for elevators and reception desk.
         2. Basic Equipment

Amplifier providing static‑free voice transmission with adequate volume and minimum distortion at all stations, with preamplifier capable of receiving emergency building communication system.

Activation of emergency building communication system overrides all other conversations and permits 1‑way conversation to all master stations in system.

Master Station:

Speaker‑microphone combination, and/or handset for 2‑way communication.

Selection buttons to enable communication with all master stations. Maintain continual reception of hands‑free reply from station when a selected button is depressed.

Button to establish communications with all stations.

Stations:

Station in car shall be activated automatically when a call is generated from any of the handsets in main lobby/security room.

Locate car microphone and speaker, or transceiver/speaker combination in car front return car operating panel.

* + - * 1. Station Housings to be enclosed inside the car operating panel.

1. PART 3 ‑ EXECUTION
   * + 1. **SITE CONDITION INSPECTION**
          1. Prior to beginning installation of equipment examine hoistway areas. Verify that no irregularities exist which affect execution of work specified.
          2. Do not proceed with installation until work in place conforms to project requirements.
       2. **PRODUCT DELIVERY, STORAGE, AND HANDLING**
          1. Deliver material in Manufacturer's original, unopened protective packaging.
          2. Store material in original protective packaging. Prevent soiling, physical damage or moisture damage.
          3. Protect equipment and exposed finishes from damage and stains during transportation, erection, and construction.
       3. **INSTALLATION**
          1. Install all equipment in accordance with Manufacturer's instructions, referenced codes, specification and approved submittal.
          2. Install machine roomless equipment with clearances in accordance with referenced codes and specification.
          3. Install all equipment so it may be easily removed for maintenance and repair.
          4. Install all equipment for ease of maintenance.
          5. Install all equipment to afford maximum accessibility, safety and continuity of operation.
          6. Remove oil, grease, scale, and other foreign matter from the following equipment, and apply one coat of field‑applied machinery enamel.

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

Machine roomless equipment, hoistway equipment including guide rails, guide rail brackets and pit equipment.

Neatly touch up damaged factory‑painted surfaces with original paint and color. Protect machine‑finish surfaces against corrosion.

* + - 1. **FIELD QUALITY CONTROL**
         1. 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.
         2. Have Code Authority acceptance inspection performed and complete corrective work?
      2. **ADJUSTMENTS**
         1. Install rails plumb and align vertically with tolerance of 1.6 mm in 30.5 m. Secure joints without gaps and file any 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, power conversion unit, brake, controllers, and leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.
      3. **CLEANUP**
         1. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.
         2. Remove all loose materials and filings resulting from work.
         3. Clean hoistways, car, car enclosure, entrances, operating and signal fixtures.
      4. **ACCEPTANCE INSPECTION AND TESTS**
         1. General: Furnish labor, materials, and equipment necessary for tests. Notify Consultant 5 days in advance when ready for final review of elevator unit or group. Final acceptance of installation will be made only after all field‑quality control reviews have been completed, identified deficiencies have been corrected, all Owner's information and certificates have been received, and the following items have been completed to satisfaction of Purchaser and Consultant.

Workmanship and equipment comply with specification.

Contract speed, capacity, floor‑to‑floor, and door performance comply with specification.

Performance of following are satisfactory:

Starting, accelerating, running

Decelerating, stopping accuracy

Door operation and closing force

Equipment noise levels

Signal fixture utility

Overall ride quality

Performance of door control devices

Operations of Standby Power transfer Operations

Operations of special security operation and floor lock‑off provisions

Test Results:

In all test conditions, obtain specified speed, performance times, stopping accuracy without re‑leveling, and ride quality to satisfaction of the Owner and Consultant.

Temperature rises in motor windings limited to 50° Celsius above ambient. A full‑capacity, 1‑hour running test, stopping at each floor for 10 seconds in up and down directions, may be required.

* + - * 1. Performance Guarantee: Should tests reveal defects, poor workmanship, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of specification, complete corrective work to satisfaction of the Owner and Consultant at no cost.

Replace equipment that does not meet Code or specification requirements.

Perform work and furnish labor, materials and equipment necessary to meet specified operation and performance.

Perform and assume cost for retesting required by Governing Code Authority, the Owner and the Engineer to verify specified operation and/or performance.

* + - * 1. The Contractor shall be responsible to provide before Final Lifts Commissioning, Testing Acceptance/Approval Certificate to all Lifts from the Local Authorities Having Jurisdiction. Contractor is to pay all associated costs at no extra fees (contractor is not liable for remunerations/compensation).
      1. **OWNER'S INFORMATION**
         1. Provide three sets of neatly bound written information necessary for proper maintenance and adjustment of equipment at least 30 days before final acceptance tests. Include the following as minimums:

Straight‑line wiring diagram 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 machine roomless. Provide remaining set rolled and in a protective drawing tube. These diagrams are Owner's property.

Lubricating instructions, including recommended grade of lubricants.

Parts catalogs for all replaceable parts including ordering forms and instructions.

Four sets of neatly tagged keys for all switches and control features properly tagged and marked.

Diagnostic test device completes with access codes, adjusters manuals and set‑up manuals for adjustment, diagnosis and troubleshooting of elevator system and performance of routine safety tests.

* + - * 1. Non‑Proprietary Equipment Design

The Contractor shall submit the following information, at least 30 days before final acceptance tests of the installation, for the Owner's file.

Wiring Diagrams: Three sets of "as installed" straight‑line wiring diagrams showing the electrical connections of all equipment and all modifications to control circuits. One set of straight‑line wiring diagrams shall be reproducible original. A legend sheet shall be furnished with each set of drawings to provide the following information:

Name and symbol of each relay, switch or other apparatus.

Location on drawings, drawing sheet number and area, and location of all contacts.

Location of apparatus ‑ whether on controller, or on car.

Lubricating instructions, including recommended grade of lubricants.

Parts Catalog: Three sets of complete parts catalogs listing all replaceable parts including Manufacturer's identifying numbers and ordering instructions.

Printed Instructions: Three sets of neatly bound instructions explaining all operating features.

Complete software documentation for all installed equipment.

Diagnostic Test Equipment and Instructions: Provide all diagnostic test devices together with one set of all supporting information necessary for interpretation of test data and troubleshooting of system.

The elevator installation shall be a design that can be maintainable by any licensed elevator maintenance company employing qualified mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.

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

If the equipment for fault diagnosis is not completely self‑contained within the controllers but requires a separate, detachable device, that device shall be furnished to the Owner as part of this installation. Such device shall be in possession of and become property of the Owner.

Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to the Owner.

The Contractor is responsible for upgrades and/or revisions of software during the progress of the work, warranty period and the term of the ongoing maintenance agreement, between the Owner and the Contractor.

**END OF SECTION**