

SECTION 14245
HYDRAULIC ELEVATORS – PASSENGER

PART 1 GENERAL

These specifications shall be used for all new elevator installations and shall act as design guidelines for existing elevator modernizations.

1.1 SECTION INCLUDES

- A. All equipment and products shall be of the non-proprietary type as defined by the Florida Institute of Technology or their Elevator Consultant. Any proprietary type of equipment, substitute or experimental equipment shall NOT be accepted and could result in bid disqualification.
- B. Hydraulic passenger elevator system.
- C. Elevator car enclosure, signal equipment, hoist way entrances including doors and frames.
- D. Operation and control systems.
- E. Jacks
- F. Accessibility provisions for physically disabled persons.
- G. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
- H. Materials and accessories as required for a complete working elevator installation to meet this specification and all applicable Codes.

1.2 RELATED SECTIONS

- A. 01045 Cutting and Patching: Walls floors, etc as necessary for proper installations of elevator, equipment, materials, signals, anchors, sleeves, and anything related to the elevator installation.
- B. 01500 Construction Facilities and Temporary Controls: Temporary enclosures or other protection from open hoist ways during the elevator(s) installation.
- C. 02200 Earthwork: Proper trenching and backfilling for any underground piping or conduit.
- D. 03300 Cast-in-Place Concrete: Elevator pit, motor, pump, equipment supports and foundations.
- E. 04300 Unit Masonry System: Hoist way enclosure, building-in and grouting hoist way doorframes, and grouting thresholds.
- F. 05500 Metal Fabrications: Hoist beams, pit ladders, steel framing, auxiliary support steel, divider beams for supporting guide-rail brackets, steel angle sill supports, and miscellaneous steel required for proper installation of elevator.
- G. 07120 Water Proofing: Waterproof pit and hoist way as required.
- H. 09650 Resilient Flooring: Finishing floor covering for elevator cab.
- I. 09900 Painting:
- J. Division 15: Sump pit, sump pump, and oil separator.
- K. Division 15: Heating and ventilation of hoist way and machine room, maintain machine room temperature between 50°F and 100°F.
- L. Division 16:
 - 1. Provide electrical service for elevator, hoist way, machine room, and equipment.
 - a. Provide dry and isolated contact set and wiring between elevator controller and disconnect, Auxiliary contact closed when disconnect switch is in ON position and open when in OFF position.
 - b. Provide wiring and power to controller for cab lighting and ventilation.

2. Provide equipment to automatically discount main power supply to elevator prior to sprinkler activation in machine room with self re-setting ability.
3. Provide emergency power supply with automatic time delay transfer switch and auxiliary contacts with wiring to elevator controller.
4. Provide wiring for interconnection of elevator control system to fire alarm and security system, emergency communication to elevator controller, emergency communication to monitoring company/Florida Tech Security and heat and smoke sensing devices per ASME A17.1.

1.3 REFERENCES

- A. ADDAG - Accessibility Guidelines for Buildings and Facilities.
- B. ASME/ANSI A17.1 - Safety Code for Elevators and Escalators
- C. AWI – American Welding Society D1.1
- D. FBC - Florida Building Code
- E. FFPC - Florida Fire Protection Code
- F. NEC - National Electrical Code (NFPA 70)
- G. NFPA 80 – Standard for Fire Doors and Fire Windows
- H. UL Underwriters Laboratories 10B Fire Test of Door Assemblies
- I. City of Melbourne, Florida Jurisdictional Requirements
- J. Elevator Contractor shall be responsible for verifying and complying with all current and updated codes.

1.4 QUALITY ASSURANCE

- A. An approved manufacturer regularly engaged in manufacturing, assembling, installing and servicing elevators of the type required by these specifications, shall furnish the elevator.
- B. Equipment and component systems shall not employ any proprietary designs that could hamper and/or otherwise prohibit subsequent maintenance, repairs or adjustments by all qualified contractors.
 1. All parts used in the manufacture, installation and maintenance of this elevator must be available for purchase at a fair market value by the owner/agent including their elevator maintenance contractor.
 2. The elevator manufacturer/installer shall have an ongoing quality assurance program implemented and documented.
- C. The installer shall have minimum of five years experience in the installation and service of this type system, and either work for the elevator company or be a manufacturer approved installer.
- D. Prior to start of work under this section, this contractor shall have a coordination meeting with the Architect, Owner, and other Contractors related to the installation of the elevator system.
- E. Temporary Elevator Use:
 1. Enclose cab with protective plywood on floor, walls, and ceiling.
 2. Provide temporary lighting.
 3. Provide control panel with manual and emergency operation with key operation for attendant operator.
- F. Inspection and testing: Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 1. Arrange for inspections and make required tests.
 2. Deliver to the Owner upon completion and acceptance of elevator work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver elevator materials, components, and equipment in manufacturer's original packaging.
- B. Protect and store materials and equipments in accordance with the manufacturer's requirements.

1.6 SUBMITTALS

- A. Product data: When requested, submit product data for the following:
 - 1. Elevator car enclosures and hoist way entrances.
 - 2. Operation, control, and signal systems.
- B. Shop drawings:
 - 1. Show equipment arrangement in the machine room, pit and hoist way. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 - 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 - 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 - 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Color selection: Submit color charts of exposed finishes and materials for color selection.
 - 1. When requested, submit samples of exposed finishes and materials selected for the elevator system materials and components.
- D. Certificates: Inspection and acceptance certificates of elevator system installation.
- E. Operation and maintenance data. Include the following:
 - 1. Operation and maintenance instructions.
 - 2. Parts list, with recommended parts inventory.
- F. Provide three copies of "as-built" plans, to have same detail as the shop drawings. One placed in secure location in the elevator equipment room, one for file at Facilities Operations and the other to Melbourne Florida Building Department.

1.7 MAINTENANCE

- A. The elevator contractor shall furnish maintenance and call back service for a period of 12 months on each elevator after final acceptance.
 - 1. This service consists of periodic examinations of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevator in proper operations, as required by the manufacturer's specifications.
 - 2. Trained employees of the elevator contractor shall do all work during regular working hours of the trade.
 - 3. As a part of the General Contractor's expressed warranty of construction for the one year period, the cost for first year service agreement shall be included in Contractor's bid price.
- B. Include parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Provide Owner with programing software.
- C. Show evidence of bidder's insurance coverage, certificate of insurance outlining limits of liability.
- D. 24-hour minor emergency repair call back service shall be included.

1.8 WARRANTY

- A. The elevator manufacturer warrant shall cover the equipment installed under these specifications against defects in materials and workmanship and any defects not due to ordinary

wear or tear or improper use or care for five (5) years from the date of Substantial Completion. Substantial Completion includes the elevator (s) passing an inspection by the State of Florida, and placed in operation.

1.9 JACK HOLE (IF "HOLED" UNIT PROVIDED)

- A. Provide the hole for the jack unit as required, based upon excavation through normal soil or clay that is removable by manual digging or with a standard truck-mounted drilling unit. If it is determined that a casing is required to retain the walls of the hole, it shall be furnished. Removal of excavation spoils deposited at the elevator pit will be by the Contractor.
- B. If any physical obstruction or hindrance is encountered below the surface of the ground, including but not limited to boulders, rock, gravel, wood, metal, pilings, sand, water, quick sand, caves, public utilities or any other foreign material, provide the elevator contractor with a written authorization to proceed with excavation utilizing any required special excavation equipment.
 - 1. The elevator contractor shall maintain a daily log of time and material cost to be compensated at their current billing rates on a time and material basis for the additional cost incurred subsequent to encountering the physical obstruction or hindrance including cost of the special excavation equipment.
- C. Provide unobstructed access and egress for excavation equipment with adequate workspace at the elevator pit.

PART 2 PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Pre-approved required.

2.2 ELEVATOR DESCRIPTION

- A. Elevator Minimum Requirements:
 - 1. Quantity: As shown on the plans.
 - 2. Capacity: 2500 pounds
 - 3. Clear Inside: 5'8" wide by 4'3" deep by 8'0" high (Verify with local Jurisdiction).
 - 4. Entrance Size:
 - a. Height: 7'-0"
 - b. Width: 3'-0"
 - 5. Speed: 100 fpm.
 - 6. Net Elevator Travel: As per plans.
 - 7. Openings:
 - a. Front: As per plans.
 - b. Rear: As per plans.
 - 8. Door Type: As per plans.
 - 9. Power Characteristics: V277/480 VAC, 3 PHASE, 60 HZ.
- B. Special Features:
 - 1. Baked Enamel: Electrostatically applied, oven baked to match selected color.
 - 2. Paint: Except as otherwise specified, all metal work fabricated by the elevator contractor shall be properly painted with the manufacturer's standard paint.
 - 3. Floor finish as scheduled.

2.3 MATERIALS, GENERAL

- A. Colors, patterns, and finishes, as selected by the Architect from manufacturer's range of standard colors, patterns, and finishes.
- B. Steel
 - 1. Steel shapes, bars, and plates complying ASTM A36.
 - 2. Sheet Steel Exposed Work: Stretcher leveled, cold rolled, commercial-quality carbon steel complying with ASTM A366.
 - 3. Sheet Steel Un-Exposed Work: Hot rolled, commercial-quality carbon steel complying with ASTM A 569.
- C. Stainless Steel
 - 1. Type 304 with #4 (satin) or #8 (polished) finishes to comply with ASTM A167 and NAAMM.
 - 2. Shapes and bars shall comply with ASTM A 276, Type 300.
 - 3. Tubing shall comply with ASTM A 269, Type 300.
- D. Bronze:
 - 1. Drawn pipe shall comply with ASTM B 43; alloy UNS C23000, red brass.
 - 2. Sheet shall comply with ASTM B 36; alloy UNS C28000, muntz metal.
 - 3. Extrusions shall comply with ASTM B 455; alloy UNS C38500, architectural bronze.
- E. Aluminum
 - 1. Sheet and plate shall comply with ASTM B 209, alloy 6063-T52.
 - 2. Extrusions shall comply with ASTM B 221, alloy 6063-T52.
- F. Plastic Laminate, Decorative high-pressure type complying with NEMA LD3 and ASTM E 84.

2.4 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub floor.
 - 1. Fireproof platform underside.
 - 2. The platform shall have a Class A rating.
- B. Sling: Steel stiles properly affixed to a steel crosshead and bolster channels with bracing members, to remove all strain from the car enclosure.
- C. Guide Rails: Formed steel properly fastened to the building structure with steel brackets.
- D. Guide Shoes: Top and bottom rigid type with metal body and removable non-metallic liners.
- E. Guide Rail Lubricators: Provide a leak proof reservoir mounted on top of upper guide shoes. Wood felt wiper shall apply and even, uniform flow of lubricant which shall thoroughly cover face of guide rail.
- F. Buffers: Provide substantial buffers in the elevator pit.
 - 1. Mount on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor with substantial extensions if required by job conditions.
- G. Jack: Provide a jack unit of sufficient size to lift the gross loads the height specified and factory test to insure adequate strength and freedom from leakage. Do not use brittle material, such as grey cast iron, in the jack construction.
 - 1. The jack unit shall consist of the following parts:
 - a. A heavy seamless steel tubing plunger accurately turned and polished.
 - b. A stop ring electrically welded to the plunger to prevent plunger from leaving the cylinder.
 - c. An internal guide bearing.
 - d. Packing or seal of suitable design and quality.
 - e. A drip ring around cylinder top.
 - f. A cylinder made of steel pipe and provided with a pipe connection and air bleeder.

- g. Weld brackets to the jack cylinder for supporting the elevator on pit channels.
 - h. Provide an auxiliary safety bulkhead in the lower end of the cylinder.
 - 2. The jack cylinder and any underground piping shall be double wrapped with an approved coating designed to help protect it from electrolytic and chemical corrosion.
 - H. Automatic Terminal Limits: Place electric limit switches in the hoist way near the terminal landings they shall be designed to cut off the electric current and stop the car should it run beyond either terminal landing.
 - I. Automatic Self-Leveling: Provide the elevator with a self-leveling feature that will automatically bring the car to the floor landings and correct for over travel or under travel.
 - 1. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device.
 - 2. The car shall be maintained approximately level with the landing irrespective of the load.
 - J. Failure Protection: Design electrical control circuit so that if a malfunction occurs, due to motor starter failure, oil becoming low in the system, or the car failing to reach landing in the up direction with a pre-determined time, the elevator car will automatically descend to the lowest terminal landing.
 - 1. Power-operated doors, the doors shall automatically open when the car reaches that landing to allow passengers to depart.
 - 2. The doors will then automatically close and all control buttons, except the “door open” button in the car station, are made inoperative.
 - K. Wiring, Piping, and Oil:
 - 1. Provide and install all necessary wiring in the hoist way in accordance with the NEC.
 - 2. At least ten percent (10%) spare for other wires shall be provided in the traveling cable of each elevator with the additional spares being properly marked and tagged.
 - 3. All necessary pipe and fittings to connect the power unit to the jack unit.
 - 4. Provide oil of the proper grade.
 - L. Emergency Terminal Stopping Device: Provide an emergency terminal stopping device for speeds over 100 FPM which operates independently of the normal terminal stopping device should it fail to slow down the car at the terminal as intended.
 - 1. Stopping devices shall not be prevented from functioning by a single short circuit caused by a combination of grounds, or by other conditions.
 - 2. The normal and emergency terminal stopping devices shall not control the same controller switches unless two or more separate and independent switches are furnished, two of which shall be closed in either direction of travel to complete the circuit to the control valve solenoids in the down direction and to complete the circuit to the pump motor for the up direction of travel.

2.5 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism) shall be compactly and neatly designed with all of the components listed below combined in a self-contained unit.
 - 1. Oil reservoir with tank cover and controller compartment with cover.
 - 2. An oil-hydraulic pump.
 - 3. An electric motor, oil control unit with the following components built into a single housing.
 - 4. A high-pressure relief valve.
 - 5. A check valve.
 - 6. An automatic unloading up start valve.
 - 7. A lowering and leveling valve.
 - 8. A magnetic controller.

- B. Provide a pump specifically designed and manufactured for oil-hydraulic elevator service. It shall be of the positive displacement type, inherently designed for steady discharge with minimum pulsations to give smooth and quiet operation. Discharge of pump shall not vary more than 10% between no load and full load on the elevator car.
- C. Drive shall be by direct coupling with the pump and motor submerged in the oil reservoir or by multiple V-belts and sheaves of number and size to insure maximum factor of safety. Drive type shall be determined based primarily on the load on the car, travel and speed.
- D. Provide a motor specifically designed for oil-hydraulic elevator service, of standard manufacturer, and of duty rating to comply with herein specified speeds and loads.
- E. Oil Control unit shall consist of the following components, all built into a single housing.
 - 1. Welded manifolds with separate valves to accomplish each function will not be acceptable under this specification.
 - 2. All adjustments shall be readily accessible and made without removing the assembly from the oil line.
 - 3. Provide an externally adjustable relief valve capable of bypassing the total oil flow without increasing backpressure by more than 10% above that required to barely open the valve.
 - 4. Up start and stop valve shall be externally adjustable, and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, insuring smooth up starts and up stops.
 - 5. Provide check valve designed to close quietly without permitting any perceptible reverse flow.
 - 6. Provide externally adjustable lowering valve and leveling valve for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth DOWN starts and stops. Provide a leveling valve designed to level the car to the floor in the direction the car is traveling when slowdown is initiated.
- F. Power controller shall contain all necessary electrical contractors; electro-mechanical switches and thermal overload relays. All components shall be mounted in a NEMA I enclosure. Logic control system shall be microprocessor based and protected from environmental extremes and excessive vibrations.
- G. Each controller shall contain a Leviton TVSS surge suppressor, or approved equal, which shall be mounted integrally in the new controller.
- H. Reduced Voltage Starting: Provide a solid-state starter to limit current inrush during starting and to provide gradual acceleration of the motor. Motor starting shall not be initiated by mechanical contacts. The starter shall include a current limit adjustment range of 200% to 450% of the overload adjustment range. An integral fault detection and diagnostic system shall be provided. If the internal fault detection system detects a failure, power shall be removed from the motor.

2.1 OIL-HYDRAULIC SILENCER

- A. Provide and install an oil-hydraulic silencer (muffler device) at the power unit location.
 - 1. It shall contain pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior parts without removing unit from oil line.
 - 2. Rubber hose without blowout proof features will not be acceptable.

2.2 VIBRATION PADS

- A. Provide and mount vibration pads under the power unit assembly to isolate the unit from building structure.

2.3 SOUND INSULATING PANELS

- A. Where pump and motor are not submerged, provide panels manufactured of reinforced 14-ga steel with a 1"-thick 1½ lb. fiberglass core affixed to interior and mounted on all four open sides of the power unit frame.

2.4 SOUND ISOLATING COUPLINGS

- A. Where pump and motor are not submerged, provide and mount a minimum of two couplings in the oil line in the machine room between pump and jack.

2.5 CAR ENCLOSURE

- A. Walls: Cab type DLP, durable wood core finished on both sides with high-pressure plastic laminate.
 - 1. Reveals: Exposed surface of cab shell shall be finished in Baked Enamel.
- B. Canopy: Reinforced 14-ga cold roll steel with hinged exit openable from car top only. Finish shall be two coats factory applied reflective baked enamel.
- C. Ceiling: Suspended type, fluorescent lighting with translucent diffuser mounted in a metal baked enamel frame at 7'-4" above the finished floor.
- D. Cab Columns, Front and Transom: Stainless steel: ASTM A 167, Type 304 stainless steel panels, No. 4 satin finish.
- E. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity.
 - 1. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track, and guided at the bottom by non-metallic shoes sliding in a smooth threshold groove.
 - 2. Door Finish: Stainless steel: ASTM A 167, Type 304 stainless steel panels, No. 4 satin finish.
 - 3. Cab Sills: Extruded, with grooved surface, ¼" thickness, and ASTM B 221 aluminum mill finish.
- F. Ventilation: A two-speed exhaust fan shall be mounted on the car top.
- G. Pad Buttons: Provide pad buttons on cab front(s) and walls.
 - 1. Protection Pads: Provide one set of vinyl pads.
- H. Base: No base.
- I. Finished Floor: See Finish Schedule.
- J. Hand Rail: Stainless steel flat bar stock, spaced from wall 2"; placed at rear wall only.

2.6 CAR OPERATING STATION

- A. Provide a main car control in each car and shall contain the devices required for specific operation. The panel shall consist of a series of modules; inclined 20° from vertical for optimum viewing and accessibility.
 - 1. The lowest module shall contain the "door open", "door close", "alarm" buttons and an "emergency stop" switch.
 - 2. Intermediate modules shall contain floor buttons that illuminate when a call is registered and remain illuminated until the call is answered.
 - 3. The next module shall contain the required switches.
 - 4. The top module shall contain all fire service features as required per ASME A17.1, rule 211.3 including operating instructions.

5. All raised floor indications and accessibility symbols shall be located immediately adjacent to the floor buttons and fully integrated in the module design.
6. There shall be no applied floor indications or symbols on the buttons.
7. Provide a car operating station furnished in an integral swing return panel requiring no applied faceplate.
8. The integral swing return finish shall be stainless steel No. 4.
- B. Position Indicator: Provide an electronic dot matrix position indicator inclined 20° from vertical and mounted in a module matching the control panel for optimum viewing.
 1. As the car travels, indicate its position in the hoist way by the illumination of the alpha/numeric character corresponding to the landing that the elevator is stopped or passing.
- C. Emergency Light: Provide an emergency light and capacity plate integrated into a module inclined 20° from vertical. The emergency light shall illuminate automatically upon loss of the building's normal power supply.
- D. Column Mounted Car Riding Lantern: Install a car-riding lantern in the elevator cab and located in the entrance.
 1. The lantern, when illuminated, will indicate the intended direction of travel.
 2. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop.
 3. The lantern shall remain illuminated until the door(s) begin to close.
- E. An emergency communications device shall be provided and shall comply with requirements specified in the ADDAG, FBC and ASME A17.1. Line powered, no batteries, no external power required.
- F. Special Accessories:
 1. Two speed fan/light switch.
 2. Telephone jack.
 3. Certificate frame.

2.7 HALL STATIONS

- A. Provide one set of risers.
 1. Each terminal station shall contain an illuminating push-button.
 2. Each intermediate station shall consist of two illuminating push buttons, one for up direction and the other for the down direction.
 3. The buttons shall illuminate to indicate a call is registered at the floor and the direction.
 4. Phase I firefighters service key switch, with instructions, shall be incorporated into the hall station at the designated level.
 5. Faceplate shall be stainless steel No. 4.
- B. Floor Identification Pads: Provide doorjamb pads at each floor. Jamb pads shall comply with the requirements of ADDAG and FBC.

2.8 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide and install complete hollow metal sliding type at each hoist way opening.
 1. Provide manufacturer's standard design bearing the proper UL fire rated labels.
 - a. They shall consist of 14-ga frames with 2" profile, 16-ga doors, hangers, hanger supports, hanger covers, fascia plates, sigh guards and all necessary hardware.
 2. The interface of the elevator wall with the hoist way entrance assembly shall be in strict compliance with the elevator manufacturer's requirements.
 3. Doors: Flush construction.

- a. Stainless Steel: ASTM A 167, Type 304 stainless steel panels, No. 4 satin finish.
4. Frames: Formed construction.
 - a. Stainless Steel: ASTM A 167, Type 304 stainless steel panels, No. 4 satin finish.
- B. Interlocks: Provide each hoist way entrance with an approved type interlock tested as required by Code.
 1. The interlock shall prevent operation of the car away from the landing until the doors are locked in the closed position as defined by Code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at that landing or is in the leveling zone and stopping at that landing.
- C. Door Hanger and Tracks: For each hoist way sliding door, furnish and install sheave type two point suspension hangers and tracks complete.
 1. Sheaves shall have polyurethane tires with ball bearings properly sealed to retain grease.
 2. Hangers shall be provided with an adjustable slide to take the up-thrust of the doors.
 3. Tracks are to be drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- D. Hoist way Sills: Extruded, with grooved surface, ¼ inch thickness, ASTM B 221 aluminum-mill finish.

2.9 OPERATION

- A. Controller: The elevator control system shall be microprocessor based and software oriented and be linked together for purposes of communication by a serial communications link. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
 1. Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.
 2. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.
 3. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.
- B. Microprocessor: Locate the main microprocessor and car controller in the elevator machine room.
 1. Microprocessor door operator shall reside in the door operator and control all functions of the elevator door(s).
 2. Electronic selector shall reside on the car top and contain hall affect transducers that detect magnetic fields. Magnets, corresponding to floor positions and top/bottom of hoist way are mounted on a perforated metal tape that runs the length of the hoist way.
- C. Provide a key operated switch in the elevator for the purpose of removing the car from normal operation. When the switch is in the "independent service" position, the elevator will bypass all

landing calls and answer only car calls. The operator will have complete control over the operation of the car.

- D. Any design changes and/or software upgrades available to either the controller and/or drive assembly shall be provided by the Elevator Contractor and by the Controller and drive manufacturer at no additional cost to the Florida Institute of Technology for a period of five (5) years following the date of turnover of each elevator.
- E. Emergency Power: In the event of a normal power supply failure, the elevator system shall be arranged to lower from an emergency power supply. The emergency power supply shall consist of a battery furnished by the elevator contractor. The elevator contractor shall provide circuitry so after normal power failure and establishment of emergency power, each elevator shall lower to a field adjustable return landing and park with the doors closed. If the designated return landing is above the current position, the elevator shall run down to the next lower landing and park with the doors closed.
- F. When the hoist way doors are exposed to the weather, (no enclosure to protect the doors), program the system to have the car wait for a call at the upper most stop. (This is to help protect the car and its controls from damage from water entering the hoist way.)

2.1 DOOR OPERATION

- A. Provide and install a direct current motor driven heavy-duty operator designed to operate the car and hoist way doors simultaneously.
 - 1. The door operator shall be microprocessor based linked to the main microprocessor through a serial communication link and reside in the door operator controlling all functions of the door.
 - 2. Door movements shall electrically cushion at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure.
 - 3. Doors shall automatically open when the car arrives at the landing and shall automatically close after an adjustable time interval or when the car is dispatched to another landing.
 - 4. Direct drive geared operators, AC controlled units with oil checks, or other deviations from the above are not acceptable.
- B. No Unnecessary Door Operation: The care door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as the next car up.
- C. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
- D. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel.
 - 1. If an onward car call is not registered before the door closes to within 6" of fully closed, the preference will reverse and the door will reopen to answer the other call.
- E. Nudging Operation: The doors remain open as long as the electronic detector senses the presence of a passenger or object in the door opening.
 - 1. If door movement is obstructed for a field programmable time, a buzzer will sound and the doors will close at reduced speed.
 - 2. If the infrared door protection system detects a person or object while closing, the doors will stop and resume closing after the obstruction has been removed.
- F. Limited Door Reversal: If the doors are closing and an infrared beam is interrupted, the doors will reverse and re-open partially. After the obstruction is cleared the doors will begin to close.
- G. Door Open Sentinel: If the doors are opening but do not fully open after a field adjustable time, the doors will recycle closed then open four (4) times to try and correct the fault.

- H. Door Close Sentinel: If the doors are closing but do not fully close after a field adjustable time, the doors will recycle open then close four (4) times to try and correct the fault.
- I. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied in an effort to possibly overcome any mechanical resistance or differential air pressure and allow the door to close.

2.2 DOOR PROTECTION DEVICES

- A. Provide a solid-state electronic detector at the entrance of the elevator car.
 - 1. In addition, provide an electro-mechanical reversal edge on the leading edge of the car doors.
 - 2. The doors will remain open as long as the electronic detector sense the presence of a passenger or object in the door opening.
 - 3. If door movement is obstructed for a predetermined time, the doors will resume normal closing operation.
 - 4. If the electro-mechanical reversal edge contacts a person or object while closing, the doors will immediately stop and reopen.
 - 5. Closing will be initiated after the passenger or object has moved from the opening.

2.3 CAR TOP INSPECTION

- A. Provide a car top inspection station with an “emergency stop” switch and constant pressure “up-down” direction buttons to make the normal operating devices inoperative and give the inspector complete control of the elevator.
- B. The car top inspection station shall be mounted in the door operator assembly and not be a separate unit.

2.4 ELEVATORS WITH UNPROTECTED HOIST WAY DOORS

- A. In elevator installation with hoist ways exposed to the weather, without a roofed enclosure protecting the hoist way doors, provide NEMA 4 rated equipment.
 - 1. Hall stations and lanterns exposed to weather.
 - 2. Elevator car operating stations, lanterns, controls and electronics.
 - 3. Door protection devices.
 - 4. Other electrical and electronic devices which maybe damaged from water intrusion.

PART 3 EXECUTION

3.1 EQUIPMENT AND TOOL STORAGE

- A. Project Manager will assign a dry and protected area, conveniently located to the elevator hoist way, for the elevator contractor without cost, for storage of material and tools.
- B. If storage on site is not available at time of delivery, Purchaser will provide suitable storage, assume all costs incurred, and make the payments due for the equipment.

3.2 EXAMINATION

- A. Elevator Contractor shall inspect hoist way, hoist way openings, pits and machine rooms, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed, before starting the elevator installation.
- B. Installation of the elevator constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.3 INSTALLATION

- A. Competent elevator installation personnel in accordance with ASME A17.1, manufacturer's instructions, approved shop drawings, and all codes shall perform work.
- B. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- C. Jack unit excavation: Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
 - 1. Install casing for jack unit.
 - 2. Set casing for jack unit assembly plumb.
- D. Set jack unit-cylinder assembly plumb, centered accurately and shimmed to proper elevation.
- E. Install all the elevator systems components, coordinate installation of hoist way wall construction, and adjust equipment to comply with required performance levels.
- F. Before permitting either temporary or permanent use of elevators, perform tests required by ASME A17.2 and governing agencies or regulations.

3.4 PERMITS, TAXES AND LICENSES

- A. All applicable sales and use taxes, permits, fees and licenses, as of the date bids are taken, shall be paid for by the elevator contractor. The elevator contractor shall be paid, as an addition to the contract price, any additional taxes, fees or other charges exacted from the Purchaser or the elevator contractor on account thereof, by any law enacted after bids are taken.

3.5 TEMPORARY USE OF ELEVATOR

- A. Temporary use of the elevator (before final acceptance) allowed only after the elevator contractor has a signed temporary acceptance from the user.
 - 1. The purchaser shall pay for any work required to return the elevator in the condition as existed when temporary acceptance was agreed upon.
 - 2. The purchaser shall provide fees, temporary enclosures, guard, or other protection of the hoist way openings, elevator operators, and any other item necessary to permit safe temporary operation of the elevator.
- B. User shall provide protection for the cab walls, ceiling, and floor.

3.6 ACCEPTANCE OF INSTALLATION

- A. Upon notice from the elevator contractor that the installation of the elevators is complete, the purchaser will arrange for a person duly authorized to make the final inspection and provide a written acceptance.
- B. Prior to final acceptance of the completed elevator system, the Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments and/or programmable software changes on any unit of microprocessor-based elevator control equipment installed by the Contractor. Any such tools shall become the property of the Owner.
- C. If any diagnostic tools provided to the Owner require periodic re-calibration and/or re-initialization, the Contractor shall perform such tasks on a timely basis at no additional charge to the Owner for as long as the elevator control system is in operation, regardless of who is maintaining the system. If the tools cannot be re-calibrated on site, provide "loaner" tools at no charge to ensure that the system always remains serviceable.

- D. Contractor shall deliver to the Owner, printed or on-line "adjuster-level" help instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, adjustments and/or programmable software changes on any unit of microprocessor-based elevator control equipment installed by the Contractor. Accompanying these instructions shall be any and all access codes, passwords, nomenclature or other proprietary information that is necessary to interface the tool with the microprocessor control equipment.
- E. The mutually agreed date shall be not more than ten business days after the date the elevator contractor's notification of completion.

3.7 OWNER'S INFORMATION

- A. Once Owner accepts the elevators, elevator contractor shall supply the Owner with two Owner's Manual containing parts list, general maintenance instructions, lubrication instructions, and other data relating to the installation.

END OF SECTION