**SECTION 14 24 20**

#### HYDRAULIC ELEVATORS

**BASED ON DFD MASTER SPECIFICATION DATED 09/04/2014**

*This specification has been written* to *cover most (but not all) situations that the spec writer may encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is written here. The Division of Facilities Development expects the spec writer to make changes and edits to this specification to make this master document specific to the specified project. As the intent of this document is that it be used as general guide in preparation of elevator specifications for state projects, User Agency specific requirements are NOT included herein. It remains the duty of the designer and spec writer to include User Agency specific requirements in the specification.*

*This specification is based upon a standard hydraulic elevator installation with the piston assembly in ground and the machine room located at the lowest level served adjacent to the elevator hoistway. Should the designer elect to specify a holeless or roped hydraulic assembly, this specification must be edited accordingly.*

*The Division will appreciate your comments, constructive criticism and suggestions for improving this document.*

# The A/E, in consultation with the User/Agency; shall select the appropriate design, type, capacity, speed and number of elevators to serve the programmatic & operational needs of the building and satisfy the requirements of applicable codes.

*General notes or comments to the spec writer will appear in red italic text. These notes will serve to alert the spec writer to design, specification, and/or drawing coordination issues that should be addressed by the writer. Generally speaking, these notes will apply to both new installations in new construction, and repairs and modernizations made to existing installations.*

*Notes or comments to the spec writer that pertain to elevator modernization or repair projects will appear in blue italic text.*

##### P A R T 1 - G E N E R A L

**SCOPE:**

Work of this section includes providing equipment, incidental material, transportation, all permits, all taxes and all labor required for a complete and operable elevator installation and all related maintenance of the newly installed equipment. Where singular reference is made to elevators or elevator components, such reference shall apply to the number of elevators or components required to complete the installation. This specification provides a broad outline of required equipment and does not describe the details of design and construction. Details shall be included in shop drawings required to be submitted in this section. Elevators shall be erected, installed, adjusted, tested and placed in operation by qualified elevator installers.

Project work consists of . . .

*(Include here a summary of the work to be furnished and installed by this section. Coordinate the text included here with the description listed in the Invitation to Bid, page A-1 of the BIDDING REQUIREMENTS).*

PART 1 – GENERAL

Scope

Related Work

Definitions

Quality Assurance

Job Conditions

Submittals

Permits, Inspections & Certifications

Warranty & Maintenance Service

[PART 2](#part2) – PRODUCTS

Description

Basic Materials

Hydraulic Equipment

Operational Systems

Hoistway Equipment

Hoistway Entrances

Car Enclosure

Signal Equipment

Standby Battery Lowering / Emergency Power Operation *(edit as required for one, not both)*

Fabrication of Finished Metal Components

[PART 3](#part3) – EXECUTION

Coordination

Installation

Protection

Tests of Elevator Work

Construction Verification

Demonstration & Training

Close Out Submittals

Miscellaneous

**RELATED WORK:**

Applicable provisions of Division 01 shall govern all work under this section.

The following outline of related work is to be used as guide to the spec writer in coordinating the work of the elevator contractor (this Section) with the work of the other affected trade contractors.

Commissioning Process - Section 01 91 01 or 01 91 02

# General Construction – Divisions 02 thru 13

Machine room construction

Hoistway construction

Pit

Hoistway

Overhead

Accessories

Pit ladder

Machine beams

Hoist beams

Access doors

Sill angles

Hoistway door headers

Guide rail inserts & accessory hardware

Cutting & patching related to the installation of elevator fixtures

Miscellaneous

Grouting & patching

Elevator finished flooring

Painting

Commissioning of Conveying Systems – Section 14 08 00

# Fire Protection – Divisions 21

Machine room fire protection

Hoistway fire protection

Electrical Power Interface

# Plumbing Work – Division 22

Pit drainage

Sump pump & controls

The designer should note that most all modern elevator control equipment is microprocessor based and thus requires a temperature-controlled environment to insure stable day-to-day operation and long service life. NEII (National Elevator Industries Inc.) recommends that the machine room/machinery space environment be maintained between 13 C/55 F and 32 C/90 F and not exceed 80% RH. If this controlled environment cannot be maintained, consult with the elevator equipment supplier.

# HVAC Work – Division 23

Machine room ventilation, room temperature control & air conditioning

Hoistway ventilation

# Electrical Work – Division 26 - 28

Main line disconnect for elevator control equipment

Shunt trip protection if fire protection is provided.

Machine room electrical work

Lighting

Service receptacles – GFIC protected

Service power for HVAC equipment

Service outlets for hydraulic oil tank heater

Elevator Car

Lighting circuitry & control

Ventilation circuitry & control

Hoistway lighting, circuitry & control

Elevator Pit

Lighting circuitry & control

Service receptacles – GFIC protected

Sump pump outlet & circuitry

Oil return pump outlet & circuitry

Leak detector outlet & circuitry

Emergency communications outlet & wiring

Fire alarm

Machine room detection

Hoistway detection

Elevator lobby detection

Elevator pit detection

Interface wiring to building FACP

Emergency power operation

Transfer switch & circuitry

Control circuitry

Miscellaneous

Service power for user/agency specified equipment

Building/User Agency Specific Requirements

Security

Access/Control/EMCS (Elevator Management & Control System)

**DEFINITIONS:**

Definitions contained in Division 01 apply to all of this section.

Main Floor: For purposes specified herein, the first floor shall be considered as the Main Floor. The second floor shall be considered as the alternate floor for fire service/elevator re-call. *(These floors shall be determined based upon consultation between the designer and the User Agency.)*

Elevator Emergency: The elevator is not operational or there is an entrapment.

Defective Elevator Work: Operation or control system failures; performance below specified ratings, excessive wear; unusual deterioration or premature aging of materials, equipment, devices or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration, and similar unusual, unexpected and/or unsatisfactory conditions.

*Recondition: To restore by repairing, renovating or rebuilding to be equivalent to original manufacturer’s specifications. Note that all items that are retained & reconditioned shall be repainted as noted. This definition must be edited to suit projects that include remodeling and/or re-use of existing equipment.*

*The spec writer should include here specific definitions necessary and applicable to the project that may not be included within the referenced documents.*

**QUALITY ASSURANCE:**

Elevator contractor shall provide maintenance service, including adequate local parts inventory within\*\* 75 \*\* miles radius of the installation.

Elevator contractor shall be capable of providing 24-hour-a-day emergency service.

Elevator contractor shall be capable of responding to an elevator emergency within one hour of the time the call is placed.

Elevator contractor shall employ competent personnel, experienced in elevator installation and maintenance.

Elevator contractor shall perform all maintenance during specified maintenance period. Service shall not be assigned or transferred.

The elevator contractor shall be regularly engaged in the servicing of similar elevator equipment and shall be an authorized distributor of the equipment to be installed.

Use only UL labeled products that comply with NEMA Standards. Electrical components and installation to meet all requirements of the electrical sections (Division 26) of project specifications.

Applicable standards:

American Society of Mechanical Engineers (ASME),/National Standards of Canada, Safety Code for Elevators and Escalators ASME A17.1-2007/CSA B44-07 except as superseded by Wisconsin Administrative Code Chapter SPS 318 Elevators.

State of Wisconsin Enrolled Commercial Building Code.

American Society of Mechanical Engineers (ASME), /National Standards of Canada, Elevator and Escalator Electrical Equipment, ASME A17.5/CSA-B44.1

American Society for Testing and Materials (ASTM), standards as referenced herein.

Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.

American National Standards Institute (ANSI), Specifications for Making Buildings and Facilities Accessible and Usable by Physically Handicapped People, A117.1-2003

National Electrical Manufacturers Association (NEMA), LD 3

National Fire Protection Association (NFPA), standards as referenced herein.

National Electrical Code

National Elevator Industries Incorporated (NEII)

Iron and Steel Institute (AISI), standards as referenced herein.

**JOB CONDITIONS:**

Contractor acceptance of elevator as designed: By submitting pricing for elevator, Contractor accepts that the equipment as shown and specified for this project is properly designed and engi­neered. Should additional design or engineering be required, additional costs shall be borne by the Contractor.

Temporary use: Temporary elevator use during construction shall be in accordance with the General Requirements section.

Storage: A dry and protected area, conveniently located to the elevator hoistway, will be assigned to the Elevator Contractor without cost, for storage of his materials, equipment and tools. *(This statement should be modified to suite actual site conditions when the project is a repair and/or remodeling of an existing installation.)*

*For repair and modernization projects that affect multiple installations, the writer should include here, text that defines the scheduling and sequencing requirements of the User Agency.*

*All existing elevator related equipment that is to be retained, re-used and/or restored shall be protected against damage, dust and debris during construction.*

**SUBMITTALS:**

Contractor submittals shall include, but not be limited to the following;

Equipment: Equipment locations, weights, reaction loads, electrical and mechanical requirements, construction details of fabricated components and catalog cuts of standard items. Include manufacturer’s product specification listing and description of control system features, performance and operating characteristics.

Car enclosures: Elevations of interior walls, car doors and reflected ceiling plan, materials, finishes, colors, fabrication and construction details and location of items visible in finished work. Include details or catalog cuts of all signal equipment, lanterns, position indicators, car operating panels and similar items.

Hoistway entrances: Indicate operation, construction and method of attachment to adjacent construction. Indicate sill type and method of attachment.

Samples:

The spec writer should include a complete description of the sample materials required to be submitted for review and selection by User Agency.

Control systems of proprietary design are not acceptable. Complete information shall be submitted to demonstrate the universal servicing capability of the proposed system. At the time of the pre-construction meeting, the contractor shall provide sufficient information to satisfy the User Agency’s representative that the controller design is non-proprietary. If this issue is not adequately resolved by the information submitted, the contractor shall demonstrate to the User Agency’s representative on an existing installation that the proposed controller meets the requirements of the specifications.

The contractor shall also refer to the Submittal Requirements Outline included herein.

**PERMITS, INSPECTIONS & CERTIFICATIONS:**

The contractor shall be fully responsible for obtaining all required permits, inspections and certificates for the work. The Contractor, shall pay all taxes, and shall pay permit fees, inspection fees and certificate fees. If required, the contractor shall also pay re-inspection fees.

The contractor shall submit equipment submittals and lay out drawings to the Wisconsin Department of Safety and Professional Services (DSPS) Division of Industry Services (formerly Safety & Building Division SBD) for approval. Equipment fabrication and/or installation shall not begin until approval by the Wisconsin Department of Safety and Professional Services (DSPS) is obtained, and the “Conditional Approval Letter” is issued.

Evidence of approval by the Wisconsin Department of Safety and Professional Services (DSPS) and a copy of the permit to perform the required (the Conditional Approval letter) work shall be submitted to the DFD Project Representative prior to the start of any work.

Submit operation certificate (permit to operate) after final inspection is completed by Wisconsin Department of Safety and Professional Services (DSPS), Elevator Safety Section.

Upon completion of project work, and after all adjustments, tests and inspections are performed, forward a signed certificate by the elevator installer stating that all equipment, controls and operation is as specified. Include in this certification that elevator hoistway doors, frames, transom panels, hardware and accessories comply with the specified fire rating requirements.

Copies of all approvals, submittals, tests, and permits shall be included in the Operation & Maintenance manuals.

The following Department of Safety and Professional Services (DSPS), forms may be obtained by contacting the Division of Industry Services (formerly Safety and Building Division) at <https://dsps.wi.gov/Pages/Programs/Elevators/Default.aspx>

SBD-22 – Elevator Application for Review

Initial Elevator Inspection Checklist

**WARRANTY & MAINTENANCE SERVICE:**

Maintenance: Elevator installer shall provide maintenance service on complete elevator equipment, including labor transportation, and materials, for a period of one year, beginning at Date of Substantial Completion. Maintenance service shall include all materials, labor and equipment required to maintain elevator equipment in proper operating condition.

Maintenance service shall include systematic (every other week) examination and service of equipment. Overtime callbacks shall be included in maintenance service. *(What is included here is a suggestion and may be more than is needed given the usage patterns of your facility. The frequency also affects the cost and the bid amount. It is recommended that this Article be specifically written for each project in consultation with the User/Agency.)*

Warranty and new installation maintenance: Elevator installer shall provide product and workmanship warranty for a period of one year, beginning at the Date of Substantial Completion. Warranty and new installation maintenance shall run concurrently.

All parts required to service or maintain this equipment shall be available for purchase by the owner or the owner’s designated representative/a qualified elevator maintenance contractor hired by the owner to perform service without restrictions.

Maintenance during warranty: All work shall be performed by qualified elevator mechanics adequately trained to service the equipment on which they will be working. Maintenance services by a helper or apprentice will be allowed only if under the direct supervision of a qualified mechanic.

The contractor shall keep a record of periodic maintenance activities (maintenance check chart) in a clearly visible location within the elevator machine room.

**P A R T 2 - P R O D U C T S**

**DESCRIPTION:**

*SBD Registration #:*

Include this number if project is a repair or remodel of an existing installation.

Capacity:

List rated design capacity in pounds.

Speed*:*

List the design speed in FPM, feet per minute.

Travel:

List total travel distance from bottom to top landing

Number of landings:

List total number of landings and state if; the landings are “in line”, there are front & rear landings.

Number of openings:

List total number of hoistway openings and state if; the openings are “in line”, or there are front & rear openings.

Car platform dimensions:

A. *insert the car platform width – side to side.*

B. *insert the car platform depth – front to rear.*

Car ceiling height:

Insert the clear distance from finished floor to underside of finished ceiling surface.

Car doors:

Width: *insert the door clear opening width.*

Height: *insert the door clear opening height.*

Type: *insert door type, center opening, single speed, or two speed.*

Hoistway doors:

Width: *insert the door clear opening width.*

Height: *insert the door clear opening height.*

Type: *insert door type, center opening, single speed, or two speed.*

Power supply:

Insert summary data on main line power to be supplied to the elevator(s) Include voltage, phase & cycle information.

Motor HP:

*Insert estimated motor HP based upon preliminary equipment selection.*

**BASIC MATERIALS:**

Steel:

Structural shapes: Meeting ASTM A36-93a.

Sheet: Meeting ASTM A366-91(1993), cold-rolled carbon steel, commercial quality.

Stainless steel:

AISI Type 302/304, #4 satin finish, vertical grain except as otherwise specified.

Aluminum:

Extrusions: Meeting ASTM B221-93, 6063 alloy.

Plate and sheet: Meeting ASTM B209-93.

Particleboard:

Meeting ANSI A208.1-1989, Type I, mat formed, manufactured of long fibered cuttings, bonded with water-resistant adhesives; weighing minimum of 42.5 lbs./cu. ft.; fire-retardant treated, meeting NFPA 101‑88, Class A.

Plastic laminate:

Acceptable products:

Formica Corp., Formica.

Nevamar Corp., Nevamar.

Ralph Wilson Plastics Co., WilsonArt.

Conforming to NEMA Standard LD 3-1991, Grade GP-50 for exposed surfaces; Grade BK-20 for backing sheet.

Colors and patterns: Manufacturer, color and texture selected by Architect from full product lines of acceptable manufacturers.

**HYDRAULIC EQUIPMENT:**

*This section is based upon a submersible assembly. Should the designer elect to specify a dry v-belt driven assemble, this section will have to be edited/re-written accordingly. Submersible equipment is not recommended if the design capacity and speed requires a 40 HP motor or larger.*

Oil pumping and control mechanism shall be compact submerged type designed with components in a self-contained unit, factory finished and painted with a baked enamel finish.

Pump assembly shall be direct coupling type designed and manufactured for submerged oil-hydraulic elevator service; positive displacement, non-pulsating type. Output of pump shall not vary more than 10% between no- load and full-load on the elevator car.

Motor assembly shall be designed for oil-hydraulic elevator service, of standard manufacture, and of duty rating to comply with specified speeds and loads. Submersible motor/pump installations shall be equipped with a solid-state “soft-start” starter to control the motor.

*(In multi car installations, provide sequential starting, allowing only one motor in the elevator group to start at a time.)*

Furnish and install sound isolating couplings, two minimum, installed in oil line between pump and plunger/cylinder assembly.

Furnish and install an oil hydraulic silencer in the oil line near power unit, containing pulsation absorbing material inserted in a blowout proof housing arranged for inspecting interior components without removing unit from oil line.

Furnish and install power unit vibration isolators locate under each corner to isolate power unit from concrete slab.

Oil Control Unit:

Oil control unit/valve shall consist of the following components, all built into a single housing. Adjustments shall be accessible and shall be made without removing assembly from oil lines.

Relief valve shall be externally adjustable, capable of bypassing total oil flow without increasing back pressure more than 50% above working pressure.

Up start and stop valve shall be externally adjustable, designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from plunger/cylinder assembly.

Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

Lowering valve and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed. Leveling valve shall be designed to level car to floor in travel direction.

Include oil viscosity control on power unit to allow the hydraulic oil to be maintained with a predetermined temperature range. Provide and install viscosity control by means of running the motor and pump while the valve is in bypass mode

*The following shall be included where the elevator machine is located in a cold area, adjacent to an outside wall, or in an installation where it is deemed necessary during consultation with the User Agency.*

*Furnish and install a thermostatically controlled, low density, electric heating element in the oil reservoir tank to maintain proper viscosity.*

Hydraulic Cylinder Assembly:

*This section is based upon an in-ground device. Should design conditions dictate an alternative device, (holeless or roped hydraulic system), this section must be revised accordingly.*

Furnish and install a hydraulic cylinder assembly, direct lift type, single cylinder assembly of size required by elevator manufacturer to lift gross device weight plus design capacity over travel distance indicated on the drawings. The assembly shall consist of the following components:

Plunger assembly shall be turned and polished seamless steel tubing.

Cylinder assembly shall be steel tubing with minimum 3.0 mil thickness, rust-inhibitive, factory-applied, prime paint followed by double layer of electrolytic and corrosion resisting, bituminous wrap. Include support brackets welded to the cylinder housing.

Stop ring shall be furnished and installed, weld to plunger to prevent plunger leaving cylinder.

Furnish and install bronze plunger guide bearings and oil seal assembly with drip ring and wiper.

Furnish and install auxiliary casing consisting of heavy-wall open-end steel pipe casing to receive PVC sleeve and cylinder assembly. Provide casing with sub flange for embedding in pit slab. Diameter of casing shall be sufficient to accommodate PVC sleeve. *(This component is needed if sub surface soil conditions are unstable.)*

Furnish and install piping of size, type and weight, including victalic fittings, recommended by elevator manufacturer and meeting ASME A17.1 requirements.

Furnish and install safety valve, located in pit oil line as close to cylinder as possible, to stop and hold the car with rated load at any point, when maintained pressure drops below the minimum operating pressure.

Furnish full supply of hydraulic oil of type and grade recommended by elevator manufacturer.

Furnish a PVC sleeve (cylinder protection) consisting of PVC inner casing complete with couplings and end cap to be positioned between cylinder and any auxiliary casing. This is in addition to required cylinder wrap. Refer to the Elevator Equipment Installation section for specific cylinder requirements. The diameter shall be sufficient to accommodate the hydraulic cylinder assembly.

In consultation with the User Agency, consider adding the following Article; Furnish a permanent jack leak detector system equivalent to the EECO LD-1100. This device shall be installed to monitor leaks between the PVC liner and the cylinder.

Furnish an oil return system consisting of a self contained reservoir, pump, controls and return piping.

**OPERATIONAL SYSTEMS:**

The elevator controller shall utilize a microprocessor based logic system and shall comply with ASME A17.1, “Safety Code for Elevators and Escalators”, latest edition and CAN/CSA B44.1/ASME Al7.5, “Elevator and Escalator Electrical Equipment” latest edition. The system shall provide comprehensive means to access the computer memory for elevator diagnostic purposes with or without external devices and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller.

Provide a motor limit timer function which, in the case of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing and park, open the doors automatically and then close them. Car calls shall be canceled and the car taken out of service automatically. Operation may be restored by cycling the main line disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.

Provide a valve limit timer, which shall automatically cut off current to the down valve solenoids if they have been energized longer than a predetermined time. The car calls shall then be canceled and the car taken out of service automatically. Operation may be restored by cycling the main line disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.

Valve design shall allow use of viscosity control. Viscosity control shall cause the car to accomplish the following operation:

If a temperature sensor determines the oil is too cold, and if there are no calls registered, the car shall go to the bottom landing and, as long as the doors are closed, the pump motor shall run without the valve coils energized, to circulate and heat the oil to the desired temperature.

The spec writer shall coordinate this article with the Hydraulic Equipment section’s reference to thermostatically controlled electric heating.

In the event that the temperature sensor fails, a timer shall prevent continuous running of the pump motor.

Door protection timers shall be provided for both the opened and closed directions which will help protect the door motor and which will help prevent the car from getting stuck at the landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event the doors are prevented from reaching the open position. The door close protection timer shall reopen the doors for a short time in the event that the door closing attempt fails to make up the door locks after a predetermined time.

A minimum of four (4) different door standing open times shall be provided. A car call time value shall predominate when a car call only is canceled. A hall call time value shall predominate whenever a hall call is canceled. In the event of a door reopen from the detector, a separate short door time value shall predominate.

Should the doors be prevented from closing for a longer than predetermined time, door nudging operation shall cause the doors to move at slow speed in the closed direction. The door detector unit shall stop the door but not reverse. A buzzer shall sound while nudging operation is occurring.

Furnish and install Independent service operation such that actuation of a key switch in the car-operating panel will cancel any existing car calls and hold the doors open at the landing. The car will then respond only to car calls and will ignore hall calls. Car and hoistway doors will only close by constant pressure on car call buttons or a door close button until the car starts to move. While on independent service hall arrival lanterns and gongs shall be inoperative.

The car shall be equipped with two-way leveling to automatically bring the car within plus or minus quarter of an inch of floor level at any landing regardless of load.

A test switch shall be provided. In the "test" position, this switch will allow independent operation of the elevator without door open functioning for purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls and shall not interfere with the other cars in the group installation.

A timer shall be provided to limit the amount of time a car is held at a floor due to a defective hall call or car call including stuck push buttons. Call demand at another floor shall cause the car to eventually ignore the defected call and continue to provide service in the building.

All available parameters shall be field programmable without training or knowledge of any programming languages. Programmable options and parameters shall be stored in nonvolatile memory. As a minimum, there shall be a 32-character alphanumeric display used for programming and diagnostics. Programmable parameters shall include, but are not limited to, the following:

Number of stops/openings served (each car).

Fire floors (Main, Alternate).

Floor encoding (absolute PI).

Digital Pis/single wire Pis.

Programmable door times.

Programmable motor limit timer.

Nudging.

External car shutdown input (e.g., rescuvator).

External low oil sensor input.

External viscosity control input.

Parking floors.

Hall or car gong selections.

Number of cars that the group controller will allow to operate on emergency power.

Provide the capability of in-the-field changes for certain variables such as door times and time out of service. These changes should be stored permanently using non-volatile memory. Thus, if power to the unit is disconnected, the system shall maintain the programmable variables.

Firemen's Phase I emergency recall operation, alternate level Phase I emergency recall operation, and II emergency in car operation shall be provided in accordance with ASME Al7.1, “Safety Code for Elevators and Escalators”, latest edition and applicable local codes.

For single car installation, use the following:

Simplex selective collective automatic operation shall be provided for all single car installations. Operation of one or more car or hall pushbuttons shall cause the car to start and run automatically, provided the hoistway door interlocks and car door contacts are closed. The car shall stop at the first car or hall call set for the direction of travel. Stops shall be made in the order in which car or hall calls set for the direction of travel are reached, regardless of the order in which they were registered. If only hall calls set for the opposite direction of travel of the elevator exist ahead of the car, the car shall proceed to the most distant hall call, reverse direction, and start collecting the calls.

All available parameters shall be field programmable without need or knowledge of any programming languages. Programmable options and parameters shall be stored in nonvolatile memory.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator.

For two car (duplex) installations, use the following:

Duplex selective collective operation: Integrated selective collective service, in which first elevator car not in use shall be parked automatically at Main Floor; shall revert to single selective collective when one car is taken out of service. Parked car shall respond to hall calls when it can provide service substantially sooner than "free" car.

For duplex configurations, each elevator shall have its own computer and dispatching algorithm. Should one computer lose power or become inoperative in any way, the other computer shall be capable of accepting and answering all hall calls. When both computers are in operation, only one of them shall assume the role of dispatching the hall calls to both elevators.

The dispatching algorithm for assigning hall calls shall be real time, based on estimated time of arrival (ETA). In calculating the estimated time of arrival for each elevator, the dispatcher shall consider, but is not limited to, the location of each elevator, the direction of travel, the existing hall call and car call demands, door time, flight time, lobby removal time penalty, and coincidence calls.

The controller shall have field programmable inputs and outputs to activate different functions. All available parameters shall be field programmable without need for any external device or knowledge of any programming languages. Programmable options and parameters shall be stored in nonvolatile memory.

The controller shall include absolute floor encoding which, upon power up, shall move the car to the closest floor to identify the position of the elevator.

For three or more cars used in a group installation, use the following:

Group supervisory system: The Group Supervisory Control System shall be based upon a state-of-the-art network of microcomputers linked together with the Group Supervisory computer through a high speed data communication link.

The supervisory system shall automatically coordinate the building traffic demand from the common hall call buttons to make proper assignment of calls to cars. This assignment shall provide for efficient handling of varying traffic demands in terms of passenger waiting time and passenger transit time.

As conditions change in the building, the system shall continuously update, assign, and reassign the hall calls to the cars to keep up with the most current conditions. The Group Supervisory computer shall read in and evaluate system and car parameters at a rate of approximately ten times per second.

The Group Supervisory Controller shall be based on a multi-tasking/multi­processing network of microcomputers. As a minimum, the Group Supervisory Computer shall utilize a 32-bit Embedded RISC Controller. Separate processors shall be used for communications and diagnostics. The Group Supervisory Computer shall have the capacity of 4 megabytes of EPROM plus RAM and the capability to interface with the system hard disk drive. The group dispatcher enclosure shall include the CRT terminal and pull out tray for convenience use of the keyboard. The Group Supervisory Computer shall include a network connection terminal. *(This network connection terminal device shall be determined after consultation with the User Agency).*

The dynamic selection algorithm system shall be based on a real-time dynamic selection algorithm, which uses microprocessor technology combined with a sophisticated software program to ensure optimum performance for multi-car hydraulic elevator systems. The system shall be capable of responding to changing traffic demands in the building.

The algorithm system shall consider specific car and system information as follows: Car information, direction, position, number of stops ahead of the car (hall and car calls), car status (inspection, independent, etc.), activation of heavy load weigher in the car, system information, hall call demand, fire service, emergency power and program mode (balanced, up peak, down peak).

Once all of the above information has been compiled, algorithm assigns the hall calls to the car in the most efficient manner. To make the most efficient assignment, the following considerations shall be made: Shortest waiting time for the passengers and least amount of elevator movement in the building, thus minimizing the wear and tear of the elevator equipment.

The algorithm shall use a process of elimination and make preliminary decisions on the best car to respond to a call. After the preliminary selection, the algorithm shall reevaluate each selection and make final assignments. The algorithm process shall occur ten (10) times every second; any change in the building traffic or elevator status shall be constantly monitored and necessary adjustments made on a real-time basis.

Parking operation: As the traffic in the building decreases, cars with no demand shall be dispatched to the appropriate parking floors. The first car to become free shall park at the lobby, and other cars that become free shall park at predetermined parking floors. A parked car shall not respond to any hall calls unless the group dispatcher determines that the hall call demand has increased to a level that requires the service of a shut down car. The movement of an available parked car to the lobby can be bypassed as long as another car is predicted to arrive at the lobby within a predetermined programmable time period.

Special modes of dispatching: Depending upon the traffic pattern of the building the group supervisory system shall modify the dispatching mode of operation. Selection of the modes of operation shall be automatically invoked by demand or time of day or manually selected by the user. If modes of operation are automatically selected, the group supervisor shall continuously monitor the demand and select the proper mode of operation. Time clock invocation of mode of operation shall be field programmable.

Lobby up peak traffic: The operation selected to handle Lobby Up Peak demand shall return all cars to the lobby where they shall reverse and leave on a first car in, first car out basis. The cars shall close their doors and leave the lobby when they are either loaded to a predetermined adjustable level or when the lobby door time expires, whichever happens first. The cars shall travel to their highest call where they reverse and travel non-stop back to the lobby. Lobby Up Peak traffic shall have priority over down calls. A down service timer shall provide service to down calls during Lobby Up Peak operation. The selected car shall park with its doors open and the other cars at the lobby shall park with doors closed and shall not accept car calls until they are selected.

Down peak traffic: The operation selected to handle Down Peak demand shall reverse the cars at their lowest call and travel non-stop to the highest call in the building. From there they shall collect down calls as they are encountered until the cars are loaded to a predetermined adjustable level. They shall then by-pass hall calls until they make a low call reversal. The next up traveling car shall stop and reverse at the floor below the floor at which the prior car's load switch operated causing that car to by-pass hall calls. It shall then collect down calls in the same manner as the previous car until loaded then by-pass hall calls to its low reversal floor. All cars shall continue to operate in this manner until the load reversal floor is one floor above the lobby or the car makes low reversal without by-passing hall calls. The cars then travel to the highest call registered, starting the sweeping operation over again. Down Peak traffic shall have priority over up calls during Down Peak operation. An up service timer shall cause the system to provide service to up calls during down peak operation.

Up peak traffic: The operation selected to handle Up Peak demand shall reverse the cars at their highest call and travel non-stop to the lowest call in the building, From there they shall collect up calls as they are encountered until the cars are loaded to a predetermined adjustable level. They shall then by-pass hall calls until they make a high call reversal. The next down traveling car shall stop and reverse at the floor above the floor at which the prior car's load switch operated causing that car to by­pass hall calls. It shall collect up calls in the same manner as the previous car before it until loaded, then by-pass hall calls to its high reversal floor. All cars shall continue to operate in this manner until the load reversal floor is one floor below the top floor or a car makes a high reversal without by-passing hall calls. The cars then travel to the lowest call registered, starting the sweeping operation over again. Up Peak traffic has priority over down calls during Up Peak operation. A down service timer shall cause the system to provide service to down calls during Up Peak operation.

Emergency dispatch operation: In the event of a malfunction of the Group Supervisory Network, the computers operating the individual cars ("Local" computers) shall detect the malfunction and provide emergency dispatching of all in-service cars to assure continuing elevator operation evenly to all floors with each car stopping at the main lobby landing. All cars shall continue to operate in response to their car calls while under Emergency Dispatch Operation.

Out of service: The system shall automatically remove any car from the group operation should the car be delayed from responding to its demand for an adjustable period of time. This time shall be field adjustable. The system shall automatically restore any car back to the group operation when the reason for the delay has been corrected.

Load dispatch: All waiting time shall be removed from the main lobby landing should any car become loaded to a predetermined adjustable load level.

In consultation with the User Agency consider the inclusion of this requirement. It may prove beneficial in a classroom or student dormitory setting; Loaded car hall call by-pass: Cars shall by-pass hall calls if loaded to a predetermined adjustable load level.

Light load - anti-nuisance logic: The computer shall cancel all previously registered car calls if a predetermined adjustable number of car calls registered is exceeded while the Light Load input function is active.

Idle car shut down: As the demand on the individual car decreases, each car shall be shut down after an adjustable amount of time. This time shall be field adjustable.

**HOISTWAY EQUIPMENT:**

Hoistway equipment includes, but is not limited to; the platform and sling assembly, guide devices, guide rails, pit ladder, pit channels, buffers, limit switches, terminal stopping devices, traveling cables, landing systems and related equipment and hardware.

Platform and Sling:

Design and fabricate frame of formed and structural steel shapes, gusseted and bolted or welded with steel plate or wood sub-floor.

Isolate platform from car sling and bracing materials by vibration absorbing material.

Prepare platform for finished floor covering.

Design and fabricate sling from structural steel channel stiles affixed to steel crosshead and bolster, with bracing members to remove strain from car enclosure. Affix steel bumper plates to bottom of bolster channels and attach to plate with clamps and cap screws for fastening sling to plunger.

Furnish and install guide shoes at top and bottom of elevator car. Guide shoes shall be self-aligning, swivel type with steel body and replaceable non-metallic liners. Furnish automatic guide rail lubricators located on the top of the upper guide shoe assembly. The contractor has the option to furnish and install spring tensioned, 6” diameter, roller guides.

Guide rails shall be fabricated from structural steel "T" section rails, size required by ASME A17.1 for elevator travel and capacity; machined on surfaces on which guide shoes operate. Guide rail lengths shall have tongue and groove end joints; joined by fishplates.

Furnish and install spring buffers and pit channels under car in elevator pit in accord with ASME A17.1. *(For elevator speeds in excess of 200 FPM, furnish and install oil buffers.)*

Furnish and install normal and final terminal stopping devices in accord with ASME A17.1.

Furnish and install emergency terminal stopping devices for speeds exceeding 100 fpm. Devices shall operate independently of normal terminal stopping devices, should normal devices fail to slow the car at terminals intended.

Furnish and install one new traveling cable per elevator car, connected to car and to junction box provided in shaft. Cable shall carry electrical power and intercommunication wiring. Traveling cable shall have flame and moisture resistant outer covering. The following spare conductors shall be provided in each traveling cable – a minimum of 4 or 10% of the count, which ever is greater plus 2/14 AWG, 2/18 AWG, 2/shielded pair and one coax/RG6/U. These shall be spares and included in excess of those needed by the contractor. The spare conductors shall run between the controller and the push button station in the car. The conductors shall be tested for shorts, opens and grounds. They shall be clearly identified on both ends as spares.

Hoistway Landing System:

The hoistway landing system shall be designed to provide precise information to the controller as to the absolute position of the car in the hoistway. With the car at a landing, the landing system shall indicate to the controller the actual floor number, so that no movement to the terminal landings or specific floors shall be necessary to establish car location within the building.

A perforated steel tape with holes on 3/4-inch centers shall be utilized with dual sensors to provide a quadrature signal to give positional accuracy of 0.1875-inch resolution over the entire length of the hoistway. The sensors may be magnetic or optical.

Using magnetic strips on the tape shall provide leveling and floor proximity (door zone) signals. This leveling system shall allow control of the accuracy of the stops to within 1/4 inch.

Magnetic strips on the tape and sensors shall be provided to give a binary coded floor position with parity check each time the car stops at a floor.

Easy access shall be provided to the leveling sensors such that the leveling system enclosure cover need not be removed in order to adjust the leveling performance.

The contractor has the option to furnish and install a vane-actuated infrared landing system in lieu of a steel tape system.

Pit Ladder:

Furnish and install a pit ladder fabricated of all steel construction, shop prime coat and yellow enamel finish coat, with steel; ¾” rungs, 3/8”x2” vertical rung support and 3/8”x3” wall angle supports (space every 2’). Rungs shall be vertically spaced every 12” with an 18” width. Ladder shall extend from 6” above the pit floor to 42” above the hoistway door sill. Securely anchor to hoistway wall. Ladder installation shall not block or inhibit access to installed electrical devices, junction boxes, or other electrical or elevator components. *(This device may be existing on a project that is to be modernized.)*

**HOISTWAY ENTRANCES:**

Hoistway entrance systems include, but not limited to; door panels, entrance frames, operating devices, interlocks, restrictors, and related mounting hardware and components. Hoistway entrance systems shall be furnished and installed in accord with approved submittals and in accord with manufacturers printed installation instructions.

Entrances shall be horizontal sliding type, bearing ASME A17.1 approved, and factory installed fire labels.

Doors shall be minimum 16 ga. steel construction with a baked enamel finish in color selected by Architect.

*(Use the following if stainless steel is to be used.)*

Doors shall be minimum 16 ga. steel interior construction faced with minimum 20 ga. stainless steel face panels as specified herein.

Frames shall be flush, welded construction, welds ground smooth and indistinguishable in finished work.

Hoistway doorframes shall be minimum 16 ga. steel construction; baked enamel finish in color selected by Architect.

*(Use the following if stainless steel is to be used.)*

Hoistway doorframes shall be a minimum 14 ga. stainless steel construction.

Entrance components shall consist of aluminum sills, hangers and supports, dust and hanger covers, faceplates and installation hardware.

Tactile floor designations:

Acceptable product: Stencil Cutting and Supply Co., #C-V-FM, or approved equivalent.

Type: Surface mounted plate with raised designations.

Designations: 2" high Arabic with Braille raised characters.

Plate size: 2-1/2" wide by 3-1/2" high.

Letter style: Helvetica Medium.

Finish: *\*\* Satin Nickel \*\* Polished stainless steel \*\* Satin bronze \*\* Polished bronze \*\* with black background – to be selected in consultation with User Agency.*

Attachment: Stud mounting.

Door operator shall be heavy-duty, motor driven operator utilizing closed-loop control design, operating car and hoistway doors simultaneously, maximum closing speed of two ft./sec; one ft./sec. per door panel.

Door movements shall be electrically cushioned at both limits of travel.

Manual operation shall be possible in event of power failure.

Doors shall automatically open as car arrives at a landing and automatically close after adjustable length of time or when car is dispatched to another landing.

Furnish and install, on each entrance, an interlock to prevent movement of car away from landing until doors are locked in the closed position; and to prevent opening of doors at a landing from corridor side unless car is at rest at that landing, or is in the leveling zone and stopping at that landing.

Door hangers and tracks:

Type: Sheave type, two-point suspension hangers and tracks.

Sheaves: Minimum 3" diameter with polyurethane tires and sealed ball bearings.

Hangers shall have adjustable slide to take the up thrust of doors.

Tracks: Drawn steel shaped to conform to hanger sheaves.

Gibbs: Minimum of two (2) per door panel.

Furnish and install hoistway entrance locking device in accordance with ASME A17.1 for each hoistway, to allow authorized persons to gain access to hoistway. Provide means for unlocking each hoistway entrance, at each landing.

Control system shall be designed with separately adjustable timers to control open time for car and hall calls, to suit traffic flow.

Furnish and install sight guards with finish matching entrances.

Furnish and install door restrictors in accordance with ASME A17.1 for all elevators.

**CAR ENCLOSURE:**

The elevator car enclosure typically consists of a car structure to which all car finished components are attached. Finished components typically include; surface applied hung wall panels, front returns and transom panels, a ceiling assembly, a finished floor surface, car door panels, and car sill. Additional components include, but are not limited to; the car operating panel, car illumination, ventilation, car door operators, door re-opening device, an emergency exit and necessary emergency lighting and communications devices. The car assembly specified here is a basic enclosure with hung wall panels and is suitable for most installations. The spec writer will have to consult with elevator sales staff when considering special finishes or architectural grade car designs.

For a repair and or remodeling projects, the scope of car work will have to be determined in consultation with the User Agency.

The elevator car enclosure shall include, but is not limited to; the car structure, wall panels, ceiling construction, front returns and transom panels, car door panels, operators and safety devices, finished flooring, door sill, illumination, ventilation, emergency exit, related components and hardware.

Car Structure shall consist of minimum 14 ga. phosphatized, stretcher leveled sheet steel construction with factory applied baked enamel finish.

Wall panels shall be minimum 3/4" fire-retardant particleboard construction, designed for removal and replacement without exposed fasteners. Sizes and arrangement of panels shall be as indicated on approved shop drawings. *(The designer shall specify the type of edge treatment/finish desired Panel edges: Exposed edges finished same as faces.)*

Base between panels and car floor, vertical reveals between panels and at corners, and wall areas above panels to top of car shall be baked enamel finish.

*The following is an alternate car wall configuration.*

Wall panels: Minimum 3/4" fire-retardant particleboard construction, designed for removal and replacement without exposed fasteners. Sizes and arrangement of panels shall be as indicated on drawings approved shop drawings.

Ceiling panels: Minimum 3/4" fire-retardant particleboard, laminated to minimum 22 ga. stainless steel; back side of panel covered with plastic laminate backing sheet Grade BK-20. Finish on stainless steel shall be as specified herein.

*The following is an alternate car-ceiling configuration.*

Ceiling panels: Minimum 3/4" fire-retardant particleboard, faced with minimum 14 ga., phosphatized, stretcher leveled steel, baked enamel finish.

Emergency exits: Coordinate design and fabrication of suspended ceiling assembly with location of car top emergency exit to meet ASME A17.1 requirements. Accessible portions of ceiling assembly shall be indistinguishable in the finished work. Exit door assembly shall be equipped with an safety switch to prevent car movement when the exit door is open.

Illumination: *(Designer shall specify number and type of fixtures in consultation with User Agency. Vandal resistant fixtures may be required in hard use environment (student housing).)*

Ventilation: Two-speed *(or single speed)* standard fan located in car ceiling, with concealed vents.

Front returns, entrance columns, transom panels shall be stainless steel as specified herein, minimum 14 ga.

Finish flooring: *(Shall be specified by the designer in consultation with the User Agency.*

Car doors shall be minimum 1-1/4" thick hollow metal construction filled with sound deadening material. Car sides of doors shall be faced with stainless steel as specified herein.

Leading edge of door shall have an infrared detector similar to ICU47, designed to automatically return car and hoistway doors to open position if doors are obstructed during closing cycle. Door shall then resume closing cycle.

Equivalent manufactures include Janus, Tri-Tronics or Innovation Industries.

Pads: Furnish and install a set of standard pad hooks at each car. Provide one set of pads for each car in manufacturer's standard color.

Emergency lighting: Furnish and install in each car, a two lamp, battery-operated, 12-volt, solid state emergency lighting fixture. Locate flush in front return panels. This device may be integral to the car-operating panel. *(The designer should consult with the User Agency in selecting this device.)*

Door sills shall be extruded aluminum with a non-slip finish.

Capacity plates: One, flush-mounted in front return panels.

**SIGNAL EQUIPMENT**: *(also known as Elevator Fixtures)*

Signal equipment typically includes, but is not limited to; car operating panels (car stations), landing pushbutton stations (hall calls), hall lanterns (also known as directional lanterns, traveling lanterns (typically located within the elevator car) and position indicators (PI’s). These devices are typically fabricated from stainless steel. Bronze is used in select applications. The spec writer in consultation with the designer and User Agency will need to select the fixture style and function consistent with the usage. High use areas (student dorms) typically require heavy duty and vandal resistant devices and mounting hardware. **All devices must be ADA compliant.**

Fixture locations and mounting heights should be shown on plan drawings and elevations to clearly identify the number required and mounting requirements.

All fixture types may not be used. Position indicators, for example, are not needed on two-stop installations. Position indicators may be used on one floor only, the main lobby. Hall lanterns maybe deleted if door frame mounted car traveling lanterns are used.

General:

Furnish and install signal equipment for each elevator car and installation as indicated on the drawings and specified herein. Devices include, but are not limited to; car operating panels, hall/landing pushbutton stations, position indicators, hall lanterns and traveling lanterns.

All devices shall be fully compliant with ANSI A117.1.

Spec writer shall include here, specific material requirements (stainless steel, bronze, other), material thickness and finish requirements, and mounting and installation requirements (vandal resistant hardware).

Approved Manufactures:

Adams

Innovation Industries

GAL

Provide tactile symbols for each device, button and telephone cabinet. Tactile symbols shall meet requirements of ASME A17.1 and ANSI A117.1.

Characteristics:

Front mount, round medallion type with Arabic and Braille characters.

Attachment: Mechanically fastened, vandal resistant.

Size: 1-3/8" diameter.

Letter style: Helvetica Medium.

Finish: *(to be specified by designer in consultation with the User Agency)*

Car Operating Panel:

Furnish and install one car-operating panel per car, integral with the front return panel. *(Under some circumstances, two are utilized)*

Each operating panel shall contain the following:

Position indicator with directional travel arrow.

Internally illuminated floor buttons with graphics indicating floor services, functions and amenities per floor.

Emergency alarm button.

Door open and door close buttons.

Buttons shall have manufacturer's standard adjacent tactile symbols.

Emergency lighting.

Capacity plates.

Phase I, firefighter's service indicator light.

Phase II, firefighter's call cancel switch.

Phase II, firefighter's key switch.

Independent service switch.

Fan/light control switches.

Landing passing chime/signal. *(Buzzer signals are not acceptable)*

Emergency stop.

Telephone cabinet integral with operating panel. Telephone cabinet shall not be lockable.

Emergency telephone/communications device.

Type: Push-to-operate, hands-free.

Provide telephone complete with communication wiring from telephone to elevator machine room.

Provide cabinet complete with communication wiring from cabinet to elevator machine room.

*Emergency Phone cabinet doors shall comply with ADAAG 4.27 Controls and operating mechanisms, 4.27.4 Operation. Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbf (22.2N).*

Landing Pushbutton stations:

Furnish and install one landing pushbutton station at each landing. Terminal stations shall have one pushbutton; intermediate stations shall have one pushbutton for "UP" and one for "DOWN" direction.

Pushbuttons shall be internally illuminated, with directional graphics and installed with concealed fasteners.

Provide Firefighter's Phase I instruction sign, etched in Helvetica Medium letters and symbols. Provide in landing button faceplate with firemen’s recall switch at Main Floor.

Hall Lanterns:

Furnish and install hall directional lanterns with directional graphics; "UP" and "DOWN" lights at intermediate floors; "UP" or "DOWN" lights at terminal floors.

Connect into control and signal system so that proper light will be illuminated as a car approaches to stop in answer to a hall call. Lanterns shall remain illuminated until car leaves that landing. When car stops for car call, proper light shall be illuminated as car approaches to indicate direction in which car is traveling. When illuminated, white lantern indicates "UP" and red lantern indicates "DOWN".

Incorporate gong into lantern fixture to sound as lantern is illuminated; one stroke indicates "UP"; two strokes indicate "DOWN".

Traveling Lantern:

Furnish and install traveling lanterns as indicated on the drawings with directional graphics; "UP" and "DOWN" lights.

Connect into control and signal system so that proper light will be illuminated when doors are fully opened in response to a hall call. Lanterns shall remain illuminated until car leaves that landing.

Audible signal: Incorporate gong into lantern fixture to sound as lantern is illuminated; one stroke indicates "UP"; two strokes indicate "DOWN".

Position Indicators:

Furnish and install position indicators as indicated on the drawings, complete with illuminated position graphics.

Connect into control and signal system so that proper light will be illuminated to indicate the location of the elevator car.

***Emergency Power Operation:*** *The spec writer in conjunction with the building designer will have to determine if emergency power operation is warranted. If it is needed, two options exist, one being “Standby Battery Lowering” and the other is “Emergency Power Operation” with backup power provided by an emergency generator. This second option is more costly and not normally used in conjunction with low-rise hydraulic elevator installations and /or single car installations. Both options are listed herein. One or both may be deleted. Use one or the other, NOT both.*

**STANDBY BATTERY LOWERING:**

Provide emergency power standby battery lowering device for the automatic lowering of each individual elevator to lowest landing upon loss of electrical service to the elevator. Provide one battery-lowering device (self-charging) for each elevator car. Each device shall be pre-wired and installed in the elevator controller enclosure.

When the elevator controller detects loss of electrical service, the elevator car shall automatically lower and stop at lowest landing. The elevator car doors shall open at the lowest landing and remain there until electrical service is restored, as detected by the controller. System shall automatically reset once electrical service is restored. Standby Battery Lowering shall not operate when the system is in fire service.

Elevator equipment supplier shall coordinate Standby Battery Lowering equipment with electrical disconnect equipment. Additional interlock contacts shall be provided by the Electrical Contractor (Division 26 work) to ensure unintended activation of the Standby Battery Lowering equipment when the electrical service disconnect is open. Also, the elevator equipment supplier shall provide required electrical disconnect for Standby Battery Lowering equipment.

In addition, provide a manual-lowering valve in the elevator machine room to permit the manual lowering of the elevator car in the event that the standby battery lowering function does not operate properly.

**EMERGENCY POWER OPERATION:**

The elevator shall be connected to run on emergency power as follows:

When a signal from the building electrical system indicates loss of normal electrical power, each elevator shall return to its Main Floor. Each elevator shall cycle its doors and be removed from normal service.

All emergency power transfer switches that supply power to elevator equipment shall be capable of sending an Emergency Power Signal to the elevator controller. This signal shall consist of a Form C contact that will change state and maintain its state as long as the emergency power transfer switch has transferred to the emergency power source/generator. The elevator Group Supervisor shall be capable of selecting the number of elevators that will be allowed to run during the Emergency Mode in an effort to limit the load on the emergency generator. If the Group Supervisor senses that the elevators which would normally run in Emergency Mode are not available, it shall be capable of selecting alternative elevators to run in Emergency Mode.

*The Electrical Contractor shall provide this signal to the elevator equipment. Coordinate these requirements with Division 26 Electrical work.*

All emergency power transfer switches that supply power to elevator equipment shall be capable of sending a Pre-Transfer Warning Signal that precedes the operation of the emergency transfer switch. This signal shall be available for a live-buss-to-live-buss transfer to emergency power and on transfer back to normal power. This signal shall precede transfer by a period of time as recommended by the elevator installer. The time period shall generally range from 10 to 20 seconds. The Pre-Transfer Warning Signal shall reset to normal when transfer takes place. The signal shall be available as a Form C contact. This signal shall put the elevator in a special service mode. The special service mode will bring the elevator to the nearest landing and open the doors. The special service mode will attempt to assure that the car is not in motion when the transfer of power takes place. The Electrical Contractor shall provide this signal to the elevator equipment. Coordinate these requirements with Division 26.

When a group of elevators are connected to standby/emergency power, all elevators should be connected to emergency power. A signal from the emergency transfer switch to the group controller shall be used by the controller to determine which elevators run on emergency power.

*Add to & coordinate with Division 26 Electrical work.*

If the standby/emergency power design intends to provide for elevator operation, the lights for all elevators that are intended to be run on standby/emergency power shall also be supplied by standby/emergency power.

*Add to & coordinate with Division 26 Electrical work.*

**FABRICATION OF FINISHED METAL COMPONENTS:**

Fabricate metal panels, returns, doors and similar components in accordance with approved shop drawings to sizes and profiles indicated. Use full size sheets with joints only as indicated on approved shop drawings.

Form components to shape by bending or forming. Make edges and corners crisp and square without fatigue in metal and sharp edges. All exposed edges shall be hemmed. Make joints with hairline, aligned joints.

Factory-laminated components: Provide complete bond between factory-laminated components as required.

Perform cutting and punching without deformation in exposed surfaces.

Following fabrication, provide protective masking over all finished surfaces subject to damage to protect during transit and installation.

**P A R T 3 – E X E C U T I O N**

**COORDINATION:**

The elevator contractor shall coordinate his work with the work of other trades.

The elevator equipment arrangement indicated on the drawings is “diagrammatic”. The elevator contractor shall be responsible for the final locations of installed elevator equipment to provide safe maintenance/service access, code clearances and trouble free operation of the equipment. Should the Elevator Contractor require modifications to the indicated locations of electrical and HVAC equipment, any extra costs associated with these modifications/relocation changes shall be the sole responsibility of the Elevator Contractor. Final/installed equipment locations shall be clearly shown on record drawings to be included in the Operation and Maintenance manuals.

Elevator fixture drawings indicate all square buttons. Contractor has the option to use all round buttons. A combination of the two is not acceptable.

Leave front wall of hoistway or rough opening 1'-0" greater in width and 6" greater in height than finished opening until hoistway entrances are installed.

*At cast-in-place concrete construction, provide hoistway frames of type, which may be installed after placing of concrete and setting of rails.*

Set entrance frames in alignment with guide rails.

Advise DFD Project Representative and A/E three days in advance of dates and times of all tests, all training and state inspections that are to be performed on elevators.

**INSTALLATION:**

Install elevator equipment in accord with manufacturer's product data and ASME A17.1.

Drill and otherwise excavate as required for hydraulic plunger/cylinder assembly.

Set auxiliary casing, centered and plumb in excavation. Pack with sand. Immediately prior plunger/cylinder assembly, remove water and debris from casing.

Set plunger/cylinder assembly and PVC (Poly Vinyl Chloride) protection, centered and plumb.

PVC-1120 Class 83 pipe, unions and end cap shall be specifically designed for underground use and shall comply to ASTM D2241-93 and ASTM D1785-93 standards. The solvent cement shall be rated for pipe exceeding 8" diameter and expressly for schedule 40 or 80 pipe and shall comply with ASTM D2564-93 standards. Liberal application of cement is required for solvent cementing of PVC so as to achieve the integrity of a water tight "weld" seal.

With plunger/cylinder and PVC protection set plumb to the vertical, the area between the two and between the PVC and auxiliary casing shall be filled with clean neutral sand (PH factor of 7)

All water shall be removed from the space between the PVC liner and the cylinder. The space between the PVC liner and the cylinder shall be left as empty as possible. Backfilling with sand shall be limited to the minimum amount possible. The top of the liner shall be sealed, even with the floor of the pit.

Provide inserts for the proper mounting of car rails and confirm proper mounting locations and embedment criteria with installing contractor.

Install wiring to connect equipment and components specified in this section and wiring to make connection to the elevator control panel.

Electrical service through a circuit to the elevator control panel lugs is provided in Division 26.

Suspend traveling cable without straining conductors.

Run all other wire in UL rated metal conduit, metallic tubing, wire ducts, or raceways.

Deliver keys for all key-operated switches to DFD Project Representative in triplicate. All switches, except fireman's service switches, shall be keyed alike.

Key fireman's service switches to code requirements.

A complete set of keys must be turned over to the owner at the time of the DSPS Safety inspection.

Lubricate and adjust operating components.

Just prior to Date of Substantial Completion, remove protective masking from finished metal surfaces. Examine panels for damage, and replace panels, which exhibit damage, deformation, buckling or staining which cannot be corrected to Architect's satisfaction.

Clean all finished surfaces. Refinish or replace components which have become damaged or stained. Perform cleaning work to remove all soil, finger marks and discolorations that may have been caused before or during installation. Soiling that causes permanent discoloration will be cause for rejection of the materials on which it occurs.

Hoistway sills and doorframes shall be properly secured in position and grouted in place.

**PROTECTION:**

Provide protective coverings, barriers, devices, signs, and other procedures to protect elevators, hoistway openings, machine spaces and elevator pits.

Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

Should the elevators or elevator components become damaged, the elevator contractor shall replace damaged work.

**TESTS OF ELEVATOR WORK:**

Laboratory testing: Comply with ASME A17.1 required laboratory testing of elevator components, including buffers, interlocks, door contacts, wire rope, connectors, fasteners, materials and products used in elevator work. Label such products and materials to indicate testing and certification by laboratory.

Acceptance testing: Upon nominal completion of elevator installation, and before permitting use of elevator, perform code required acceptance tests. Submit copies of certified test reports to architect.

Owner reserves the right to engage a third party consultant to perform work progress evaluations and/or final approval evaluations.

Cost of testing shall be borne by Contractor.

At the time of substantial completion, each car shall be loaded with its full test weight and run continuously for 30 minutes in the presence of the owner’s representative. The test runs shall run from the top to the bottom and stop at every floor in between.

**CONSTRUCTION VERIFICATION**

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 14 08 00 in accordance with the procedures defined for construction verification in Section 01 91 0**1 or 01 91 02**.

**DEMONSTRATION & TRAINING:**

***This section must be written in consultation with the User Agency. Training may take the form of:***

***Basic familiarization with the equipment and emergency procedures.***

***Modest familiarization with the equipment, maintenance procedures & requirements, and emergency procedures.***

***Detailed familiarization with the equipment, equipment set up and adjustment, repair procedures, maintenance procedures, and emergency procedures.***

*The elevator contractor shall provide a minimum of 4 hours of training for User Agency maintenance staff. All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 0****x*** *(01 91 01 or 01 91 02).*

*The purpose of the training is to fully prepare the User Agency maintenance staff for complete operational responsibility of the elevator systems. The facility maintenance staff shall be fully trained, and provided the capabilities by the product vendor and installing contractor, to fully repair, service and maintain the system after (and if desired during) the warranty period.*

*Training shall be provided at the site and encompassing all aspects of the systems installed and shall orient responsible personnel to a level satisfacto­ry to the Owner and Engineer.*

*Training times shall be arranged with the Owner. The training shall include the facilities designated personnel. Training shall not take place until all systems are 100% operational as approved by the Engineer.*

*Two complete copies of all O&M materials shall be submitted one week prior to the scheduled User Agency training sessions.*

*Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of operational failure and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.*

**CLOSE OUT SUBMITTALS:**

*To be written by the individual consultants to be project specific*

**MISCELLANEOUS:**

Furnish and properly install finish elevator car flooring as specified.

Furnish and install elevator machine room signage.

Paint elevator machine room and elevator pit floor.

Identify and properly delineate top of car and elevator pit floor refuge spaces.

Maintain the fire rating of the hoistway and mechanical (machine) rooms. All penetrations shall be fire stopped with an approved material. Install approved product in accordance with the manufacturer's instructions. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

END OF SECTION

# The A/E, in consultation with the User/Agency; shall select the appropriate design, capacity, speed and number of elevators to serve the programmatic needs of the building and satisfy the requirements of applicable codes.

# The following examples are included here for information only. It is the responsibility of the A/E to coordinate the specifications with drawings.

**Example #1**

Capacity: 2000 lbs.

Speed: 100 or 125 fpm.

Travel: Maximum 60 feet.

Number of landings: Up to three.

Number of openings: Up to three front openings.

Car platform dimensions: 6'-0" wide by 5'-0" deep.

Car height: 7'-4" under finished ceiling.

Car doors: 3'-0" wide by 7'-0" high, single slide.

Hoistway doors: 3'-0" wide by 7'-0" high, single slide.

**NOTE:** This type of 2000 lb. capacity elevator meets the minimum requirements of the Americans with Disabilities Act.

**Example #2**

Capacity: 2500 lbs.

Speed: 100, 125 or 150 fpm.

Travel: Maximum 60 feet.

Number of landings: Up to seven.

Number of openings: Up to seven front openings.

Car platform dimensions: 7'-0" wide by 5'-0" deep.

Car height: 7'-4" under finished ceiling.

Car doors: 3'-6" wide by 7'-0" high, single slide.

Hoistway doors: 3'-6" wide by 7'-0" high, single slide.

**NOTE:** This type of 2500 lb. capacity elevator with single slide doors meets the minimum requirements of the American with Disabilities Act and the minimum ambulance stretcher requirements (minimum stretcher size of 22 by 78 inches) of most building codes for buildings with four or more floors.

**NOTE:** A 2500 lb. capacity elevator with center opening doors meets the minimum requirements of the American with Disabilities Act, but will not meet the minimum ambulance stretcher requirements of most building codes for buildings with four or more floors.

**Example #3**

Capacity: 3500 lbs.

Speed: 100, 125 or 150 fpm.

Travel: Maximum 60 feet.

Number of landings: Up to seven.

Number of openings: Up to seven front openings.

Car platform dimensions: 7'-0" wide by 6'-2" deep.

Car height: 7'-4" under finished ceiling.

Car doors: 3'-6" wide by 7'-0" high, center opening.

Hoistway doors: 3'-6" wide by 7'-0" high, center opening.

**Note:** None

**Example #4**

Capacity: 4000 lbs.

Speed: 100, 125 or 150 fpm.

Travel: Maximum 60 feet.

Number of landings: Up to seven.

Number of openings: Up to seven front openings.

Car platform dimensions: 6'-0" wide by 8'-4" deep.

Car height: 7'-4" under finished ceiling.

Car doors: 4'-0" wide by 7'-0" high, two speed.

Hoistway doors: 4'-0" wide by 7'-0" high, two speed.

**NOTE:** This type of 4000 lb. capacity elevator is the standard hospital size elevator; as such, it meets the American with Disabilities Act and building code requirements.