**SECTION 14 21 20**

#### TRACTION 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 electric traction elevator installation with the machine located overhead. Should the designer elect to specify a basement traction assembly, this specification must be edited accordingly.*

# 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.

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

*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).*

All work shall be preformed in accordance with the latest adopted edition (as of the date bids are taken) of the American Society of Mechanical Engineers (ASME), /National Standards of Canada, Safety Code for Elevators and Escalators ASME A17.1, ANSI A117.1, Barrier Free Code as pertaining to Passenger Elevators, The National Electric Code, and/or such State and Local codes as applicable.

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

Traction Equipment

Operational Systems

Hoistway Equipment

Hoistway Entrances

Car Enclosure

Signal Equipment

Emergency Power Operation

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. The method of bidding, “lump sum” verses “separate primes” may affect the text used herein.

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

Sheave 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

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

Emergency communications outlet & wiring

Fire alarm

Machine room detection

Hoistway detection

Elevator lobby detection

Elevator pit detection *(as required by the installation)*

Interface wiring to building FACP

Firefighter communication

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:**

Contractor Qualifications:

Elevator contractor shall provide maintenance service, including adequate local parts inventory within\*\* 75 \*\* mile 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 assembly, installation and maintenance in the type of equipment to installed by this contract.

Elevator contractor shall perform all regular maintenance during specified maintenance period.

Elevator contractor shall perform all emergency service during specified warranty period. . Neither requirement (maintenance and emergency service) shall be assigned or transferred to another party.

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-BB44-07 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/CAN/CSA-B44.1

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

Americans with Disabilities Act (ADA), 2010 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 existing installations.)*

*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. It is not unusual to require that at least one elevator be in service at all times when the work it phased and the building is occupied.*

*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 write 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 approvals, 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

SBD 2E-E – Conveyance Safety and Governor Tests

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.

**TRACTION EQUIPMENT:** *(If the project is a remodel or a modernization of an existing installation, this entire section will have to be re-written to be specific to the project scope. Machine type, motor current, machine condition all must be evaluated. In general, it is recommended that DC MG equipment be replaced.)*

Machine: Furnish and install a traction machine complete with motor, brake, gearing and driving sheave, mounted in alignment on steel bedplate, one for each assembly. Support sheave and gear spider by heavy duty ball or roller bearings. Provide roller and anti-friction metal bearings with means of lubrication. The machine all components shall be factory assembled, factory aligned and

factory load tested. *(This spec is based upon a single worm gear driven machine. This paragraph shall be edited by the spec writer to further define the elevator machine as “geared, gearless, or machine-room-less (MRL) or other justifiable system drive equipment. IF a machine other than a geared machine is specified, the rest of this section will need to be edited accordingly.)*

Brake: Furnish an electrically-released, spring-supplied, double shoe brake mounted on machine. The brake assembly shall be factory assembled, aligned and tested.

Power drive: Provide a VVVF control drive system for the AC hoist motor and comply with ASME A17.1, Safety Code for Elevators, latest adopted edition. *(This spec is based upon AC drive equipment. Other equipment and systems are acceptable.)* The system shall provide comprehen­sive means to access the computer memory for elevators diagnostic purposes. Controller shall have permanent indicators to indicate important eleva­tor statuses as an integral part of the control­ler. Systems that require hook up of external devices for troubleshooting are acceptable. Should an external device (service tool) be necessary to trouble shoot and adjust the equipment to be installed, this tool and all software shall be provided to the User/Agency free of charge.

An electromechanical switch shall open all power feed lines to the brake. A single ground, short circuit, or solid-state control failure shall not prevent the application of the brake. Systems that do not apply the brake when the car stops at a landing are not acceptable.

The automatic leveling zone shall not extend more than 12" (304.8 mm) above or below the landing level, nor shall the doors begin to open until the car is within 12" (304.8 mm) of the landing. In addition, the inner leveling zone shall not extend more than 3" (76.2 mm) above or below the landing. The car shall not move if it stops outside the inner leveling zone unless the doors are fully closed and locked.

The system shall use an automatic two-way leveling device to control the leveling of the car to within 0.25" (6.35 mm) or better above or below the landing sill. Overtravel, undertravel, or rope stretch must be compensated for and the car brought level to the landing sill, irrespective of load.

The closed loop feedback power control shall be arranged to continuously monitor the actual elevator speed signal from the velocity transducer and to compare it with the intended speed signal to verify proper and safe operation of the elevator.

During operation of the elevator with an overhauling load (empty car up or loaded car down), precision speed control shall be obtained by the regulation system used in the power control. The power control shall have the capability to maintain regulation under varying loads.

The controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds. The system shall provide the required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest upon power failure.

A system for pre-torquing of the hoist motor shall be provided in order to ensure consistently smooth starts. An electronic load cell is required to implement the pre-torquing feature.

The controller shall use a solid-state drive unit. The solid-state power control shall be a closed loop feed design. The controller shall be a compact, self-contained unit that shall provide stepless acceleration, deceleration, and regulation at all speeds.

Isolation transformers or line inductors, plus proper filtering to eliminate both electrical and audible drive noise shall be provided and installed.

Fuses shall be included in the power feed to the drive.

**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 adopted 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 and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller.

Dedicated permanent status indicators shall be provided on the controller to indicate when the safety string is open, when the door locks are opened, when the elevator is operating at high speed, when the elevator is on independent service, when the elevator is on firemen’s service, when the elevator out of service timer has elapsed, and when the elevator has failed to successfully complete its intended movement. In addition, provide means of displaying other special or error conditions that are detected by the microprocessor.

An out of service timer (T.O.S.) shall be provided which will automatically take the car out of service if the car is delayed in leaving the landing while there are calls existing in the building. The car shall not respond to hall calls while in this mode of operation.

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 when ever 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.

Firemen's Phase I emergency recall operation, alternate level Phase I emergency recall operation, and Phase 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.

Independent service operation shall be provided 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.

The control equipment shall have all controlled parameters stored permanently on erasable programmable read-only memories (EPROM).

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).

Parking floors.

Hall or car gong selections.

The number of cars that the group controller will allow to run 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.

*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 for any external device 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 to be used for programming and diagnostics. The programmable parameters and options shall include, but not be limited to, the following: number of stops/openings served; programmable fire code options; fire floors (main, alternates); floor encoding (absolute PI); digital Pis/single wire Pis; programmable door times; nudging; emergency power; parking floors; door pre-opening; and hall or car gong selection.

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 duplex car 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.

There shall be a 32-character alphanumeric display to be used for programming and diagnostics. The programmable parameters and options shall include, but not be limited to, the following: Number of stops/openings served (each car); duplex; programmable fire code options; fire floors (main, alternate); floor encoding (absolute PI); digital PIs/Single Wire PIs; programmable door times; programmable motor limit timer; nudging; emergency power; and parking floors.

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 group installations (three or more cars), 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 micro computers. 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 convenient use of the keyboard.

Dispatching algorithm: The dispatching algorithm shall minimize the following system criterions: Minimize mean waiting time, minimize maximum waiting time and minimize the number of late calls. This algorithm shall cover all two-way traffics demands (i.e. light, medium and heavy traffic situations).

The algorithm shall compile the required physical and statistical data and parameters which are necessary to perform the above minimization tasks.

As a minimum, the system shall consider the following parameters: Car position, car direction, car status (automatic, inspection, independent, fire service), car motion status (acceleration, high speed, deceleration), anticipated direction of motion, door opening time, door closing time, door status (open, opening, close, closing), number of car calls, number of stops ahead of the car, assigned hall calls, coincidence calls and load weigher status.

The algorithm shall consider the following system information parameters: hall call demand, fire service, emergency power, program mode (balanced, up peak and down peak), long wait hall call threshold time (per hall call, per direction), and number of calls under supervisory control.

Having the above information, the first minimization algorithm shall assign hall calls to cars based upon minimizing the average waiting time by calculating the estimated time of arrival (ETA). As the traffic becomes busier, the minimization of mean waiting time can cause a few hall call waiting times to go beyond their "long wait hall call threshold time". At this time the second minimization algorithm shall minimize the "maximum waiting time". As the traffic becomes even heavier, there will be a tendency to cause too many hall calls to become late calls thus increasing the total average time. The third algorithm shall minimize the "number of late hall calls". The "long wait hall call threshold time" shall be field programmable by the user.

Parking operation: The Group Supervisory software shall provide a flexible parking operation that permits the user to select the most efficient parking configuration for the building. The parking floors shall be divided into two groups: Lobby Parking Floors (LPFs) and Non-lobby Parking Floors (NPFs). The LFPs are the floors at which the car would perform a lobby function when parked, the NPFs are floors at which the car would perform a regular parking function.

Lobby operation:

A lobby floor is a floor that has been designated to be a LPF. A user programmable option shall allow the first car that parks at a lobby to park and do one of the following: keep its doors closed, keep its door open for a programmable period of time or keep its doors open indefinitely.

The first car that parks at a lobby with its doors opened shall illuminate the up lantern. If the car with the up lantern illuminated starts to close its doors in preparation to leave the landing, the up lantern shall be transferred to the next car parked at that lobby and allow that car to open its doors.

Time activated dispatching configuration: The Group Supervisory software shall allow for eight different configurations of dispatching parameters to be programmed by the user. The programmable parameters for each configuration shall include: dispatcher mode of operations (balanced, peaks, etc.), lobby parking floors and their priorities, non-lobby parking and their priorities, lobby operation, lobby and non-lobby parking delay timers and long wait hall call threshold times. The user shall be able to invoke any of these configurations at any time of the day. There shall be up to sixteen time selections for each configuration.

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.

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, sling and safety assembly, guide devices, guide rails, pit ladder, buffers, limit switches, terminal stopping devices, traveling cables, governor, landing systems and related equipment and hardware.

Platform and Sling:

Design and fabricate frame of formed structural steel shapes, gusseted, bolted or welded with steel plate or wood sub-floor. Reinforce platform where car safety assembly attaches to the platform frame. Furnish and install car safety device.

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.

Furnish and install 6” diameter spring tensioned roller guides at top and bottom of elevator car.

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 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 counterweight assembly fabricated with a structural steel frame, and steel plate or cast iron weights to balance the car and approximately 40% of the contract load. Pass two tie rods through the frame and weights. Counterweight installation shall include guide rails, minimum 3” diameter roller guides, and all related components and mounting hardware. *(Provide counterweight safety as required by ASME A17.1, if there is an occupied space under the elevator hoistway/counterweight system.)*

Furnish and install oil buffers under car and counterweight in elevator pit in accordance with ASME A17.1. Include all related components and mounting hardware.

Furnish and install sheaves required of the system to be installed, with machined grooves and ball or roller bearings. Provide mounting to machine beams, machine bedplate, car and counterweight structural members. Provide drip pans under deflector sheaves and guards on compensation and secondary sheaves. *(Drip pans may be deleted if all bearings are SEALED.)*

Furnish compensation system if needed of the traction system design. Compensation shall be chain type with plastic sheathing and pit guide rollers. Pad areas where chain may strike car or hoistway equipment.

Furnish, install and properly tension suspension, counterweight and governor ropes. Wire ropes shall be traction steel type meeting ASME A17.1; complete with fastenings, rope tags and all mounting hardware.

Furnish and install structural steel machine required for support of the elevator machine, sheaves, governor and deadened hitches. Provide bearing plates, anchors, shelf angles and blocking to support beams and equipment. Include all mounting hardware and related components.

Furnish and install one centrifugal type governor per car, car driven designed to provide electrical shutdown of the car. Include overhead supports, mounting hardware, tensioning and adjustment hardware.

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.

**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, ASME A17.1 approved, with 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 16 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 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" thickness 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 and 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 similar in design and from the same manufacturer. All device buttons shall be similar, all round or all square, at the contractors option.

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 may be 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.

Emergency stop.

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

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 position of the elevator car.

Group Indicator/Control Panes: *(some times called a “Life Safety Panel”.)*

*The location, content and function of this device must be determined in consultation with the User Agency and the local Fire Marshall. Hise rise building code requirements too must be reviewed and addressed. This device may be surface mounted, recessed mounted or mounted in a security control station.*

*This device is typically furnished and installed in multi-story office or lodging facilities.*

The Group Indicator Panel may contain the following:

Position indicator for each elevator.

Direction indicator for each elevator.

Emergency alarm indicator light, with bell.

Firefighter's Phase I emergency key switch.

Firefighter’s phone connection.

Independent service key switch.

Emergency service switches for elevator operation under emergency power.

Machine jewel.

Lobby park switch.

Perforated panel for speaker/microphone installation with cutouts for intercommunication controls.

Time clock override key switch for designated elevators

Finish on combination group indicator/control panels shall be *(as specified and can be stainless steel, brass, or bronze.*

***Emergency Power Operation:*** *The spec writer in conjunction with the building designer will have to determine if emergency power operation is warranted. This feature may be required by the building code, based upon usage and building height/number of floors served.*

**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. Note that frames must be grouted solidly in place.*

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.

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 metal conduit, metallic tubing, wire ducts, or raceways.

Deliver keys for all key-operated switches to Owner, in triplicate. Fireman's service switches shall be keyed separately from other key operated devices.

Key fireman's service switches to code requirements.

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.

**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.

*(note protection of equipment to be retained and re-used.)*

**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 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 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: 2500 lbs.

Speed: 200 or 350 fpm. (Note: 350 fpm speed recommended for buildings over ten floors)

Travel: Maximum 200 feet.

Number of landings: Up to fifteen.

Number of openings: Up to fifteen 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 24 by 76 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.

*Should the A/E utilize a LULA (limited use, limited access) device, there are specific code limitations that must be considered. (Travel is limited to 25’-0”)*

# **Example #2**

Capacity: 3500 lbs.

Speed: 200 or 350 fpm. (Note: 350 fpm speed recommended for buildings over ten floors)

Travel: Maximum 200 feet.

Number of landings: Up to fifteen.

Number of openings: Up to fifteen front openings.

Car platform dimensions: 7'-0" wide by 5'-6" 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:** This type of 3500 lb. capacity elevator with single slide or center opening 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. The 3500 lb. capacity elevator is the desired application for mid-rise buildings of eight to fifteen floors.

# **Example #3**

Capacity: 4000 lbs.

Speed: 200 or 350 fpm. (Note: 350 fpm speed recommended for buildings over ten floors)

Travel: Maximum 200 feet.

Number of landings: Up to fifteen.

Number of openings: Up to fifteen 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.