



Motion Control Engineering®

A Kinetek Company®

Specification Guide: Architects and Consultants

MCE: iControl Elevator Controls

Prepared in accordance with Construction Specifications Institute (CSI) 14210

1 iControl General Specifications



1.1 Code Compliance

The elevator controller shall use a microprocessor based logic system and shall comply with all applicable elevator and electrical safety codes including: (Contact MCE if a necessary code is not listed below.)

1.1.1 Elevator Safety Code Compliance

- ASME A17.1/CSA B44
- NYC Appendix K
- Massachusetts 524 CMR
- Australia AS 1735
- New Zealand NZS 4332
- EN 81-72 for Firefighters Lifts

1.1.2 Other Applicable Standards

- NFPA 70/CSA C22.1 Electrical Codes (U.S. & Canada)
- CSA B44.1/ASME A17.5 Elevator and Escalator Electrical Equipment Standards
- EN 12015 Emission Standards
- EN 12016 EMC Immunity Standards
- ADA & ICC/ANSI A117.1 Accessibility Standards

1.1.3 ADA Requirements

- The elevator controller shall comply with Title III of the Americans with Disabilities Act (ADA).
- Leveling Accuracy The controller shall have a self-leveling feature that shall automatically bring the car to floor landings within a tolerance of 0.5" (12.7 mm) or better under all loading conditions up to the rated load.
- Hall Lanterns The controller shall have outputs to drive the visible and audible signals that are required at each hoistway entrance to indicate which elevator car is answering a call. Audible signals shall sound once for up, twice for down.
- Car Position Indicators The controller shall have a position indicator output to drive the required position indicator which shall indicate the corresponding floor numbers as the car passes or stops at a floor. An audible signal shall sound as the position indicator changes floors.
- Optional — A voice annunciator output shall be available to facilitate audible announcement of car direction and floor number.

1.2 Non-Proprietary Equipment

Only universally "Serviceable and Maintainable," Non-proprietary elevator control equipment shall be accepted. Non-proprietary standards recognize specific owner's rights:

- The right to all information needed for diagnosis, service, and repair.
- The right to access on-board computers, including the information they store and the ability to diagnose, repair, and/or reprogram these systems.
- The right to select from among multiple sources for maintenance and repair in a competitive marketplace.

1.2.1 OEM Products

MCE products carrying MCE identification labels do not have proprietary diagnostics.

MCE may manufacture products for the OEM (Original Equipment Manufacturer) market that do not carry MCE identification labels. These products may have proprietary diagnostics owned by the manufacturer.

Any of the statements below can be used to ensure that non-proprietary diagnostics are furnished regardless of the elevator manufacturer:

- Provide MCE non-proprietary diagnostics.
- Provide non-proprietary diagnostics by MCE.
- Provide non-proprietary diagnostics.

1.3 Environmental Considerations

The elevator controller shall operate within the following environmental conditions:

- Ambient temperature: 32F degrees to 104F degrees (0C degrees to 40C degrees). Higher temperature ranges are available.
- Humidity: non-condensing up to 95%
- Altitude: Up to 7500 feet (2286 m)

MCE specializes in the manufacture of control products for adverse environmental conditions. For example, dust-proof, water-proof, corrosion-resistant, explosion-proof, or air-conditioned controller cabinets can be engineered to meet specific applications. Please contact MCE Sales Engineering for details.

1.4 Controller

The elevator controller shall be microprocessor based and designed specifically for elevator applications. Elevator and drive logic shall be implemented independently of safety functions.

Elevator logic shall be implemented on a single processor to facilitate tight coordination between subsystems and enhance reliability. The implementation shall utilize a real-time, multi-tasking operating system to allow the processor to simultaneously execute elevator control logic, drive control logic, operator interface logic, and communication support.

The elevator controller shall provide the ability to access significant memory capacity for configuration parameter storage, event recording, real-time diagnostics, and program execution.

The elevator controller shall have an independent safety system in order to implement safety features required by code. The safety system implementation shall utilize solid state devices. No relays shall be used for safety logic. The safety subsystem shall incorporate a check redundant, dual-processor, dual-path, solid-state, ASME A17.1-2000 compliant implementation that meets CSA and CE standards.

The elevator controller shall be configured and packaged in such a way that external “jumpers” cannot be used (intentionally or unintentionally) while the elevator is running in any passenger mode of operation. Non-passenger modes of operation shall be provided, along with means to bypass safety functionality, to allow inspection testing and other setup and/or troubleshooting operations.

The elevator control logic configuration shall be fully field programmable. Changes in number of floors, I/O configuration, drive setup, eligibility etc. shall not require the replacement/reprogramming of EEPROMs or other storage devices. Further, changes in the controller configuration shall be user adjustable in the field.

The elevator controller shall have extensive diagnostic capability. A built-in LCD display or equivalent shall allow access to major user functions and diagnostic features. The display shall be a multi-character, multi-line type with associated keypad to allow users to enter information. The display shall show data and menus in readily understood character format. No numeric, hexadecimal, or binary codes are acceptable.

Dedicated indicators shall be provided in a conspicuous location on the elevator controller to indicate important system statuses, such as when the safety string is closed, when the door locks are closed, when the elevator is on Inspection/Access, etc. In addition, other special or error conditions detected by the main processor or safety subsystem shall be displayed.

The elevator controller shall support an interface for communication and interaction via a separate application program running on a Windows PC. This application shall communicate with the controller and allow the user to access controller configuration parameters, view real-time elevator status information, initiate and facilitate setup and adjustment procedures, and provide advanced troubleshooting capabilities. The PC application shall be designed specifically for elevator applications and shall graphically and dynamically display information from the controller.

A PC application shall provide facilities to manage elevator controller configuration parameters. The user shall be able to manage and manipulate parameters including:

- Retrieve from the elevator controller and view/edit
- Retrieve from the elevator controller and save to a file on the PC
- Retrieve from the PC, view/edit, and download to the elevator controller
- Manage separate configurations for multiple elevator controllers

The user shall be able to select specific groups or subsets of parameters to send or retrieve from the elevator controller.

A PC application display shall provide motor field (where applicable), armature and brake voltages, armature current, intended and actual car speeds and hoist machine RPM. The PC diagnostics and adjustment display shall include online context-sensitive parameter descriptions and help information for fault troubleshooting.

The controller shall maintain an event log that records noteworthy events or faults. They shall be displayed in chronological order and time stamped for analysis or review. Data displayed shall include the type of event or fault, the date and time it occurred, and the position of the car and status of various flags at the time of the occurrence. The event log shall be able to be saved and reviewed offline via the PC application.

Communication between the elevator controller and the PC application shall be via a standard 100 base T TCP/IP network connection. The elevator controller shall be compatible with standard networking equipment (cables, hubs, switches and routers etc.).

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A PC application and elevator controller shall support remote connection via the internet. The elevator controller shall support up to four simultaneous PC connections (remote and/or local). A mechanism shall be provided to prevent the unauthorized alteration of elevator configuration parameters.

A controller test switch shall be provided. In the test position, this switch shall enable independent operation of the elevator, with the door open function deactivated, for purposes of adjustment and testing. The elevator shall not respond to hall calls and shall not interfere with any other car in a duplex or group installation.

Switches for controller inspection, enable, and up and down shall be provided to place the elevator on Inspection operation and allow the user to move the car from the machine room. The cartop inspection switch shall render the controller inspection switch inoperative.

The elevator control and safety functions shall be part of an integrated system designed for ease of use, with diagnostics and parameter adjustments accessible through a common user interface.

The brake supply shall be capable of providing at least four independently adjustable values of output voltage in order to provide smooth lifting, holding and releveling. These values shall be adjusted via computer parameters. Manual adjustment of resistor values shall not be required.

The elevator controller shall provide auto-tuning of the brake control values.

The controller shall provide logic to detect a failure of brake voltage to properly decay and relax a picked brake to hold/cooling position.

The brake control system shall include circuitry to detect insufficient brake current. This failure shall cause the elevator to be removed from service at the next stop and remain out of service until the condition is corrected.

For gearless applications, the drive control system shall use an optimized speed profile in a dual-nested-loop feedback system based on car position and speed. A speed feedback device (tachometer or encoder) shall permit continuous comparison of motor speed with the calculated speed profile to provide accurate control of acceleration and deceleration—right up to and including the final stop, regardless of direction of travel or load in the car. Drive subsystem control parameters shall be digitally adjustable through software and shall be stored in non-volatile FLASH memory.

For DC applications, the system shall include precise closed-loop motor field control. The system shall regulate motor field current throughout the range of operation via current feedback from the motor field. The system shall provide motor field current sensing which shall shut down the elevator if insufficient motor field current is detected.

The system shall provide adaptive gain parameters for optimum control of elevator speed throughout its travel.

The system shall use a device to establish car position to an accuracy of 0.1875" (4.76 mm) or better, using a quadrature signal operating over the entire length of the hoistway.

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 shall be compensated for and the car brought level to the landing.

A system for pre-torquing the hoist motor shall be made available to ensure consistently smooth starts. An electronic load sensor shall be required to implement the pre-torquing feature.

Pre-start sequencing shall be provided to safely energize the machine prior to the doors closing on a departing elevator, thus consistently improving floor-to-floor travel times.

Door pre-opening as the car approaches a landing shall be field adjustable to begin a maximum of six inches from level-at-floor position.

1.4.1 AC Flux Vector Drive

The control system shall utilize a flux vector AC drive.

The flux vector drive shall be capable of producing full torque at zero speed and shall not require DC injection braking in order to control car deceleration.

The drive shall be capable of controlling geared and gearless machines, induction and permanent magnet motors. The drive shall also work with different types of encoders such as EnDat, incremental, sine/cosine, and Hiperface.

The drive shall have built-in motor overload protection. External overload is not required.

The drive shall have the capability of being adjusted or programmed to achieve the required motor voltage, current, and frequency to properly match the characteristics of the AC elevator hoist motor.

The drive shall not create excessive audible noise from the elevator motor.

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The drive shall be heavy-duty, capable of delivering sufficient current required to accelerate the elevator to contract speed with rated load. The drive shall provide speed regulation appropriate to the motor type.

For non-regenerative drives, means shall be provided to remove regenerated power from the drive DC power supply during dynamic braking. This power shall be dissipated in a resistor bank that is an integral part of the controller. Failure of the system to remove regenerated power shall cause the drive output to be removed from the hoist motor.

A regenerative drive option (PowerBack) is available to return power to the AC line during dynamic braking. This system is very effective for higher horsepower (above 30HP) and gearless applications.

A contactor shall be used to disconnect the hoist motor from the output of the drive unit each time the elevator stops. This contactor shall be monitored and the elevator shall not start again if the contactor has not returned to the de-energized position when the elevator stops.

The controller shall provide stepless acceleration and deceleration and provide smooth operation at all speeds.

For applications where the building power supply has a "Grounded Leg Delta" configuration, an isolation transformer should be used to minimize noise and prevent any damage to the drive during voltage fluctuations.

1.4.2 12-Pulse SCR Drive

The control system shall utilize a 12-pulse SCR drive. The 12-pulse SCR drive shall be designed as an integral part of the control system providing access and adjustment of all diagnostic and configuration parameters.

The controller shall provide precise speed control using advanced processing and operating system technology. A high speed FPGA device shall be dedicated to encoder speed processing.

The control system shall provide auto-tuning of Motor Field and Brake control values.

The control system shall include dynamic braking to assist in bringing the car to a smooth, controlled emergency stop and to help limit car speed in the event of brake failure.

The control system motor field supply shall be current regulated and functionally integrated with the 12-pulse SCR drive in order to accomplish motor field forcing and armature voltage limiting.

A drive isolation transformer shall be provided as part of the control system to further reduce power line distortion and line notching. The transformer shall be matched to the characteristics of the 12-pulse SCR drive and elevator hoist motor.

1.4.3 Quattro Drives

The control system shall fully support Magnetek Quattro Drives including:

- Magnetek Quattro AC
- Magnetek Quattro DC

1.5 ETA Dispatching

Individual elevators shall be dispatched in a manner which minimizes the average time it takes for hall calls to be answered. Elevator position, speed, door status and direction of the hall call shall be taken into account. Each iControl elevator controller shall be capable of dispatching groups of up to six cars. If the current controller dispatcher is taken off line, the next designated controller shall immediately assume dispatching control. Refer to the iCentral specification in Section 2 of this document for information regarding the stand alone group dispatcher.

There shall be four distinct dispatching modes: balanced, lobby-peak, demand-up-peak and demand-down-peak.

Balanced mode shall optimize elevator dispatching for periods when the up and down hall call demands are randomly distributed throughout the building and approximately equal. This mode shall minimize the average wait time of all hall calls, giving no preference to up versus down calls.

The lobby-peak mode shall optimize elevator dispatching for periods when the hall calls at the lobby(s), in a specific direction, are significantly higher than all other hall call demands in the building. Certain cars shall be designated to service up or down hall calls at the lobby(s). The remaining cars shall be dispatched in balanced mode, to answer all other hall calls in the building. This mode shall give priority service to up or down hall calls at the lobby floor(s) in order to accommodate disproportionately high traffic at the lobby. The cars that are selected for lobby-peak mode shall bypass all other hall calls.

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Demand-up-peak (and down-peak) modes shall also be supported, for periods when the up (down) hall-call demand at all floors is significantly higher than the down (up) hall-call demand at all floors and give priority to all up (down) hall calls.

There shall be four ways in which the dispatching mode can be selected:

- Hardware switch
- Software switch
- Timer - software time schedule
- Automatic - software selected

In automatic mode, the dispatching software shall decide which mode to use. It shall evaluate the number of hall calls, car calls, their distribution and frequency as well as additional system inputs, to select the optimal dispatching mode to address the current building demand.

1.5.1 Parking

Eight user-defined parking schemes, to allow programming of multiple lobby and non-lobby parking configurations, shall be supported. It shall be possible to enable or disable these parking configurations manually or based on a time schedule. Time table choices shall include time of day, day of week, day of month, or day of year, allowing specification by name of day, occurrence of named day in the month, or by date.

The user shall select which cars may be parked at each programmed parking floor. If no cars are selected the system shall assume that all cars are eligible.

Zone/Sector parking shall be supported, allowing the user to divide the hoistway into multiple, contiguous floor zones in which idle cars shall be parked according to user-assigned priority.

Parking of cars with front and/or rear doors always closed, always opened, or opened for a programmed number of seconds shall be supported.

Parking logic shall be provided with shuffle delay timers (configurable parameter) to determine the wait time before parking idle cars, and re-parking non-lobby parked cars.

Dynamic-parking, to determine the optimal parking configuration for a building at any given time, shall be supported. Using artificial intelligence and learned historical data, predictions shall be made as to where the next building hall-call demands will most likely occur, and idle elevators shall be parked accordingly. The controller shall review data and refresh dynamic parking factors every fifteen minutes.

All time related configuration parameters used to park cars, including Lobby Parking Delay, Non-Lobby Parking Delay, Shuffle Delay, etc., shall be user programmable.

The user shall be able to specify whether lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time. The user shall also be able to specify whether non-lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time.

Combined dynamic and user-defined parking shall be supported. In this mode, the user shall be able to configure the essential parking floors and leave the rest of the parking floors undefined. Once all the user-defined parking floors are served, the dynamic parking scheme shall park the remaining idle elevators automatically.

1.5.2 Hall Call Eligibility

Eight, user programmable, Hall Call Eligibility configurations shall be supported. Each configuration shall specify that some cars are eligible to answer some types of hall calls while others are not. It shall be possible to activate any Hall Call Eligibility configuration manually or automatically by time table. Time table choices shall include time of day, day of week, day of month, or day of year, allowing specification by name of day, occurrence of named day in the month, or by date.

1.5.3 Artificial Intelligence

Artificial Intelligence shall be used to implement balanced mode, lobby-peak mode, automatic mode selection, and dynamic parking. In balanced mode, AI shall be used to determine the optimal hall-call assignment for each building configuration. In lobby-peak mode, AI shall be used to automatically determine the number of cars that shall be assigned for lobby-peak only service. In automatic mode, these methods shall be used to determine the optimum mode of operation at any given time. Finally, both methods shall be used to determine the optimum parking at any given time.

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Artificial intelligence shall be an integral part of the system and shall therefore always be active.

1.6 Monitoring

A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, door operation indication, dispatching ETAs, and security status.

The monitoring system shall be capable of remotely registering car and hall calls and of configuring hall call and car call restrictions in support of building security. The system shall be capable of implementing security overrides if required.

The monitoring system shall be capable of enabling Swing, Sabbath, and Auto-stop modes of operation on the group control and of acknowledging emergency alarm activity on any car in the group.

The monitoring system shall be capable of selecting group mode of operation including, Balanced, Lobby Peak, Demand Down, Demand Up, and Auto-mode (dynamic mode selection by group controller) when Operating Mode Configuration 1 is active on the group.

The monitoring system shall be capable of setting the group to Flood Operation mode when such mode is supported by the group control.

The monitoring system shall be capable of initiating recall of any car in the group to a selected floor and of controlling door operation of that car at the selected floor.

1.7 Reporting

A client/server based report collection and generation application shall be available. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call performance, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports.

2 iCentral Independent Dispatcher

2.1 Overview

iCentral is the central dispatching option for iControl, providing a central point to coordinate dispatching, parking, special operating modes, emergency power response, security, and interaction with existing (legacy) controls. This option is used for the most demanding systems.

With iCentral, the iCue dispatching software runs on a dedicated Windows PC or an embedded micro controller. You configure and interact with iCue using a Windows XP personal computer running the iView graphical user interface. iView is also used to connect to individual elevator controllers in the iControl group. iView automatically provides the correct user interface depending on the type of control (dispatcher or elevator) you are accessing.

The standard iCentral enclosure is a single-door cabinet. The cabinet provides two fixed shelves (for a monitor and a KVM switch and iCue and iView computers respectively), a sliding keyboard/mouse tray, and a peripherals/equipment interconnect area configured to meet the requirements of the individual job. A typical equipment complement includes LAN and System Ethernet switches, SC-ION addressable input/output boards, serial communication bus drivers, a second computer, and modular terminals to accommodate machine room and hoistway field connections.

Using a predictive knowledge base along with current and historical traffic information and artificial intelligence, iCue anticipates and adapts to changing building traffic demand. The iCue dispatching engine continuously runs multiple scenarios to ensure that every decision maximizes efficiency. A dedicated 100 mega-baud network ensures that iCue always has real-time car status information to work with. Self-optimizing technology adapts without intervention – the longer it runs, the better it gets.

The iCue intelligent parking system allows selection of user defined, automatic, or hybrid operation parking. Cars may be parked manually or dynamically, by floor, or by building sector. iCue supports the SmartLINK hall call system, MCE-Ready fixtures, and predictive hall gong service.

2.2 Backup Dispatching Overview

In addition to performing car control functions, iControl elevator controllers can assume dispatching responsibilities for a group of elevators. One or more Local cars can be designated as an Alternate Dispatcher, meaning that they can act as a backup for a central dispatcher or as one of several potential dispatchers for a group that has no central dispatcher.

2.3 Group Features

2.3.1 High Level

- Non-Proprietary (open architecture, universally serviceable, manuals/drawings provided)
- System Configuration: MCE iView application running on standard PC
- Diagnostics: MCE iView application running on standard PC
- Diagnostic hall call placement: MCE iView application running on standard PC
- Ethernet TCP/IP communications between group and cars
- Software updates through download or CD
- Status Indicators (on-screen messages and individual status LEDs)
- External communications: TCP/IP Ethernet
- Backup dispatching automatically assumed by designated car in group (no additional cabinet required)
- Legacy group control accommodation: Cross Registration / Cross Cancellation
- Inputs and Outputs reconfigurable in the field via iView

2.3.2 Operating Features

Dispatching: Individual elevators shall be dispatched in a manner which minimizes the average time it takes for hall calls to be answered. Elevator position, speed, door status and direction of the hall call shall be taken into account.

There shall be four distinct dispatching modes: balanced, lobby-peak, demand-up-peak and demand down-peak.

- Balanced mode shall optimize elevator dispatching for periods when the up and down hall call demands are randomly distributed throughout the building and approximately equal. This mode shall minimize the average wait time of all hall calls, giving no preference to up versus down calls.
- The lobby-peak mode shall optimize elevator dispatching for periods when the hall calls at the lobby(s), in a specific direction, are significantly higher than all other hall call demands in the building. Certain cars shall be designated to service up or down hall calls at the lobby(s). The remaining cars shall be dispatched in balanced mode, to answer all other hall calls in the building. This mode shall give priority service to up or down hall calls at the lobby floor(s) in order to accommodate disproportionately high traffic at the lobby. The cars that are selected for lobby-peak mode shall bypass all other hall calls.
- Demand-up-peak (and down-peak) modes shall also be supported, for periods when the up (down) hall call demand at all floors is significantly higher than the down (up) hall-call demand at all floors and give priority to all up (down) hall calls.

There shall be four ways in which the dispatching mode can be selected:

- Hardware switch
- Software switch
- Timer - software time schedule
- Automatic - software selected

In automatic mode, the dispatching software shall decide which mode to use. It shall evaluate the number of hall calls, car calls, their distribution and frequency as well as additional system inputs, to select the optimal dispatching mode to address the current building demand.

Security Management: Physical hall lock support per floor/riser, independent front/rear opening control per car/floor/riser/direction of travel, car operating panel floor registration control per riser.

Dispatching Penalty and Advantage Assignment: Allows you to set conditions that will favor assignment of calls to cars depending upon real time traffic conditions including car operating modes, car readiness, and call coincidence (floor call at registered car call destination)

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Parking Management: Eight user-defined parking schemes, to allow programming of multiple lobby and non-lobby parking configurations, shall be supported. It shall be possible to enable or disable these parking configurations manually or based on a time schedule. Time table choices shall include time of day, day of week, day of month, or day of year, allowing specification by name of day, occurrence of named day in the month, or by date.

The user shall select which cars may be parked at each programmed parking floor. If no cars are selected the system shall assume that all cars are eligible. Zone/Sector parking shall be supported, allowing the user to divide the hoistway into multiple, contiguous floor zones in which idle cars shall be parked according to user-assigned priority.

Parking of cars with front and/or rear doors always closed, always opened, or opened for a programmed number of seconds shall be supported.

Parking logic shall be provided with shuffle delay timers (configurable parameter) to determine the wait time before parking idle cars, and re-parking non-lobby parked cars.

Dynamic-parking, to determine the optimal parking configuration for a building at any given time, shall be supported. Using artificial intelligence and learned historical data, predictions shall be made as to where the next building hall-call demands will most likely occur, and idle elevators shall be parked accordingly. The controller shall review data and refresh dynamic parking factors every fifteen minutes.

All time related configuration parameters used to park cars, including Lobby Parking Delay, Non-Lobby Parking Delay, Shuffle Delay, etc., shall be user programmable.

The user shall be able to specify whether lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time. The user shall also be able to specify whether non-lobby priority cars are to park with doors opened, closed, or opened for a specified amount of time.

Combined dynamic and user-defined parking shall be supported. In this mode, the user shall be able to configure the essential parking floors and leave the rest of the parking floors undefined. Once all the user defined parking floors are served, the dynamic parking scheme shall park the remaining idle elevators automatically.

Emergency Power Operation: Recall (Phase 1) and Service (Phase 2) management per cars in group

2.4 Destination Based Dispatching

Dispatching shall be destination based, allowing passengers with the same or efficiency-compatible destination floors to be grouped in specific elevator cars so fewer stops are required per car.

The destination based dispatching system shall be scalable, permitting destination based dispatching to be employed throughout a building, on specified floors, or as lobby boost installations that use destination based dispatching only on the busiest departure floors while allowing other floors to retain traditional dispatching hall call stations.

The destination based dispatching system shall be capable of being returned to a traditional dispatching system at the will of building management. Such return shall be capable of being assigned manually or through automated timers. Should a malfunction seriously impact the destination based dispatching system, dispatching shall be returned to traditional means automatically to avoid disrupting elevator service. Such return to traditional dispatching shall require no additional fixtures to be installed. Instead, destination entry touch screens shall display touch-enabled Up and Down call symbols.

The destination based dispatching system shall use touch screen fixtures at the primary destination entry stations and in place of traditional hall call stations. Should it be desirable or necessary to uninterrupted system operation, touch screens shall revert to traditional up/down hall call functionality.

Destination Based Dispatching shall fully support ADA requirements. Primary destination entry stations, in addition to touch screen controls, shall have a Braille labeled button that, when pressed, initiates a voice-directed means of destination selection using only the Braille labeled button. Such audible direction shall include announcement of a tone or set of tones that, when repeated by the assigned elevator car, allow that car to be readily identified and located.

Destination Based Dispatching primary entry stations shall support an optional feature allowing a user to enter a number of passengers associated with the call entry to support more efficient and accurate car assignment. Such designation shall be for two passengers, three passengers, or four or more passengers.

2.4.1 Elevators shall be dispatched as an automatic group.

- An independent PC running advanced software application to dispatch from 1 to 8 cars shall be supplied.
- Group dispatching algorithm shall minimize system journey time (time between latching a destination call and arriving at destination).
- Group dispatching algorithm shall not put priority on individual passenger wait times over the system journey time.
- Group dispatcher shall take into account separate walk times individually set for each destination input device. Walk times shall be field adjustable.
- Group dispatcher shall take into account field programmable car capacities as number of passengers per car.
- Group dispatcher shall have an option to operate in standard ETA mode based on software input, programmable timer, or hardware switch.
- During ETA mode, destination input devices shall show only up and down call buttons and register regular hall calls.

2.4.2 Call Input Devices

- Passengers shall enter destination calls by touch screen destination input devices (DID).
- Each floor shall have at least two destination input devices.
- Destination input device shall optionally request number of passengers to help prevent piggybacking of people going to same floor.
- Destination input device shall have option to show custom image of building or site.
- Destination input devices shall communicate serially via CAN protocol to the group dispatcher.
- Destination Input Device shall respond to call request with a graphical representation of a path from that particular DID to the assigned car.

2.4.3 Special Access ADA operation:

- Destination input device shall have a mechanical button with Braille 3 dot equilateral triangle symbol for accessibility.
- When button is pressed, the destination input device shall verbally inform the passenger to press again when the desired floor is spoken.
- Destination input device shall respond to a call request with a graphical representation of the path to the assigned car and a voice announcement of the car letter and unique audible tone for that car.
- Audible tone played at destination input device shall be repeated by hallway fixture above the car.
- Elevator adjuster shall have the ability to select which tone plays for each car as a field programmable option.
- Registration of a call with ADA button shall give preference to an empty car and extend door time set by a field adjustable parameter.

2.4.4 Special Operation Features

- Destination input device shall have ability to display special operations screen.
- Special operations screen shall be guarded by 3 to 10 digit password entered on touchscreen.
- Special operations password may be changed on the group dispatcher in the machine room.
- Special operation screen shall allow selected individuals to recall a car to DID floor with doors open so that it may be put in independent service or taken out of service for maintenance.

2.4.5 Hallway Fixtures

- Each hallway opening shall have a destination hallway fixture.
- Hallway fixture shall show the car letter when no destinations are displayed.
- When call is registered, the assigned car's hallway fixture at the source floor shall change to show the car label and the destination floor(s) being served.
- Destinations shown on hallway fixture shall be extinguished when car answers the source call.
- Hallway fixtures shall blink the car letter and repeat unique car tone when ADA special operation calls are assigned to the car.

2.4.6 In-Car Fixture

- Each car shall be equipped with at least one door jamb fixture.
- Door jamb fixture shall show destinations car is traveling to. Destination floor label shall be added to the list only after car arrives at source floor.
- Door jamb shall flash destination floor label when car arrives at that floor.
- COP call buttons shall be concealed behind a locked panel for use only when the elevator is operating on modes other than destination dispatch.

2.4.7 Exposed COP devices shall include:

- Door open/close buttons.
- Alarm button.
- Emergency stop switch.
- Self-dialing hands free phone or intercom with ADA provisions
- Three position fire key operated switch, call cancel button, and illuminated visual/audible signal system with mandated signage engraved per ASME A.17.1 standards.

2.4.8 Locked Panel

Provide a locked panel containing key switches required to operate and maintain the elevator, including, but not limited to:

- Independent/Attendant service switch and service indicators.
- Light switch.
- Fan switch.
- G.F.I. duplex receptacle.
- Emergency light test button.
- Inspection Service operation key switch.

2.5 Dispatching, General

2.5.1 Emergency Power Options

- Automatic selection of power feed from any car in the group
- Building Emergency Generator

2.5.2 Monitoring Options

- iMonitor: Local, LAN/WAN, Remote (high-speed Internet) Cars/Groups/Sites
- iReport: System logging, report generation, archiving, automated notification
- BMS-LINK: Monitoring and control through Building Management System software

2.5.3 Non-Proprietary Equipment

Only universally "Serviceable and Maintainable," Non-proprietary elevator control equipment shall be accepted. Non-proprietary standards recognize specific owner's rights:

- The right to all information needed for diagnosis, service, and repair.
- The right to access on-board computers, including the information they store and the ability to diagnose, repair, and/or reprogram these systems.
- The right to select from among multiple sources for maintenance and repair in a competitive marketplace.

2.5.4 Environmental Considerations

The elevator group control shall be capable of operating within the following environmental conditions:

- Ambient temperature: 32°F to 104°F (0°C degrees to 40°C degrees).
- Humidity: Non-condensing up to 95%
- Altitude: Up to 7500 feet (2286 m)

Motion Control Engineering specializes in control products for adverse environmental conditions. For example, dust-proof, water-proof, corrosion-resistant, or air conditioned controller cabinets can be engineered to meet specific applications. Higher temperature range compatibility is available. Please contact MCE Sales Engineering for details.

2.5.5 Status Display

The group shall have a status display screen (iCue default display) that provides group and car status. At a minimum, the display shall provide:

- Group identification
- Group mode of operation (Automatic (dynamic mode assignment by Group), Balanced, Lobby Peak, Demand Down Peak, Demand Up Peak)
- LAN and System network IP address, Subnet mask, and Gateway
- Connection status for each car in the group
- Bus status (connection, voltage, Driver VDC, Node Control, Bus Enabled, High Current) for each of up to four serial bus connections if present
- Emergency power status for each of up to two generators

2.5.6 User Displays Through iView

The status display described above appears when the system configuration PC is monitoring iCue real-time operating software. When the system configuration PC is connected to the group through iView, configuration-oriented displays including the following are displayed.

2.5.7 Building Configuration

The group shall support field configuration or reconfiguration of building-service parameters in the field through iView. Such configurable parameters shall include:

- Floors served per car
- Label assignment per floor up to three characters
- Setting or editing the number of cars in the elevator group
- Label assignment per car up to three characters
- Primary dispatcher designation
- Alternate dispatcher designation

2.5.8 Commandeer For Special Services

The group shall provide a screen allowing assignment or editing of special riser hall calls that may be used to recall a car to an enabled floor/opening for service outside group control. Such service may include security, VIP, or other independent control requirements. This screen shall provide:

- Maximum number of cars to operate on selected CFSS mode simultaneously
- Selection of 1 or multiple hall calls permitted per assigned car
- Per car designation of enabled (front or rear) riser per building floor

2.5.9 Dispatching Options

The group shall provide a screen allowing assignment or editing of conditions that will favor assignment of calls to cars depending upon real time traffic conditions including car operating modes, car readiness, current car assignment, and call coincidence (floor call at registered car call destination)

2.5.10 Hall Call Eligibility

The group shall provide a screen allowing assignment or editing of up to eight different Hall Call Eligibility sets. For each set, this screen shall provide:

- Selection of eligible hall call risers on a per car, per floor, per opening basis

The user shall be able to assign any of the eight sets to any of four Dispatching Configurations. Each Dispatching Configuration shall be capable of manual assignment by the user or of timer-based assignment by the elevator group control. Each Dispatching Configuration shall be additionally capable of controlling Parking sets, Parking Eligibility sets, and Mode of Operation sets. (See [Dispatching Configurations.](#))

2.5.11 Mode of Operation

The group shall provide a screen allowing assignment or editing of up to eight different Mode of Operation sets. For each set, this screen shall provide:

- Selection of the Mode of Operation to be used when this set is active (Automatic [dynamic selection by Group according to user-defined conditions], Balanced, Lobby Peak, Demand Up Peak, Demand Down Peak).

The user shall be able to assign any of the eight sets to any of four Dispatching Configurations. Each Dispatching Configuration shall be capable of manual assignment by the user or of timer-based assignment by the elevator group control. Each Dispatching Configuration shall be additionally capable of controlling Parking sets, Parking Eligibility sets, and Hall Call Eligibility sets. (See [Dispatching Configurations.](#))

2.5.12 Parking

The group shall provide a screen allowing assignment or editing of up to eight different Parking sets. For each set, this screen shall provide:

- Selection of the Parking Method to be employed (Per Floor, Sector Parking).
- Parking delay options in seconds for Lobby parking, Lobby shuffle, Non-lobby parking, Non-lobby shuffle
- Door behavior per car when parked
- Parking floor priority if multiple parking floors are assigned to a car

The user shall be able to assign any of the eight sets to any of four Dispatching Configurations. Each Dispatching Configuration shall be capable of manual assignment by the user or of timer-based assignment by the elevator group control. Each Dispatching Configuration shall be additionally capable of controlling Hall Call Eligibility, Parking Eligibility sets, and Mode of Operation sets. (See [Dispatching Configurations](#).)

2.5.13 Parking Eligibility

The group shall provide a screen allowing assignment or editing of up to eight different Parking Eligibility sets. For each set, this screen shall provide:

- Parking behavior per car (at a specific floor(s), not at all)
- Door behavior if allowed to park

The user shall be able to assign any of the eight sets to any of four Dispatching Configurations. Each Dispatching Configuration shall be capable of manual assignment by the user or of timer-based assignment by the elevator group control. Each Dispatching Configuration shall be additionally capable of controlling Parking sets, Hall Call Eligibility sets, and Mode of Operation sets. (See [Dispatching Configurations](#).)

2.5.14 Dispatching Configurations

The group shall provide a screen allowing assignment or editing of up to eight pre-programmed dispatching configurations. Each configuration shall be capable of incorporating and controlling any one of eight pre-programmed Parking Eligibility, Parking, Hall Call Eligibility, or Mode of Operation sets. This screen shall provide:

- Ability to manually select and manually assign an ad-hoc Configuration incorporating any one of the eight sets previously configured for Parking Eligibility, Parking, Hall Call Eligibility, or Mode of Operation
- Ability to enable or disable timer-based assignment of any of up to eight Dispatching Configurations (Please refer to [Timer Tables](#))

2.5.15 Timer Tables

The group shall provide a screen(s) allowing assignment or editing of timer tables used by the Group to enable system features on a timed basis. This screen shall provide:

- The ability to add, edit, remove, or set the priority of system timers
- A display of the attributes of any selected timer
- The ability to enter a logical name for each timer
- The ability to set a recurrence pattern for each timer
- The ability to set starting and ending times for each timer
- The ability to assign Hall Call Eligibility, Parking, Parking Eligibility, Mode of Operating, and Security attributes per timer
- The ability to assign the status (on/off) of any or all of four shared remote outputs per timer

2.5.16 Split Bank Operation

The group shall provide a screen(s) allowing assignment or editing of split bank operation (splitting the elevator group into two, separate groups call “banks”). This screen shall provide:

- The ability to enable or disable split bank operation
- The ability to assign hall call risers to each bank

2.5.17 Management (Monitoring)

The group shall provide a screen(s) allowing authorization or de-authorization of access to third-party monitoring systems.

2.6 Emergency Power

The group shall provide a screen(s) allowing assignment or editing of emergency generator attributes in relation to cars in the elevator group. This screen shall provide:

- Ability to assign or edit assignment of selected cars to one of up to two emergency generators
- Set the active polarity (high/low) of the emergency generator alerting input
- Set a time in seconds which must elapse before cars may be run on emergency power (allowing the generator power to stabilize)
- Determine how or if emergency recall is activated per car and the sequence in which cars are recalled
- Set the number of cars that may be recalled simultaneously
- Set a recall timeout such that, if a car should fail to recall within this period, the group shall move on to the next eligible car
- Determine how or if recalled cars should be run on emergency power and the sequence in which they are to be run
- Set the number of cars that may run simultaneously on emergency power

2.7 Legacy Group Interface

*The group shall provide a screen(s) allowing accommodation for a legacy group control (cross-cancellation / cross-registration). This screen shall provide:

- Assignment of accommodation type (cross-cancellation / cross-registration)
- Cars to be cross-registered if that accommodation is selected
- Setting or editing of threshold time (if an iControl car cannot respond within this time, iCentral will assign the call to a legacy car) – cross-registration
- Setting or editing of cross-cancellation output timer – cross-cancellation (first group car to respond causes cancellation of call to other group; timer allows receiving controller time to process the cancellation input and cancel the car assignment)
- Legacy group accommodation requires additional hardware. Not all legacy controllers can be accommodated.

2.8 Security

If the elevator group is subject to building security requirements, interface must be provided for elements external to the elevator group. iCentral provides means to configure security requirements pertinent to the elevator group.

2.8.1 Security (Status)

The group shall provide a screen(s) allowing current security status to be displayed and to override software security if necessary. This screen shall provide:

- Master security status (Active, Hardware override active, Software override active)
- Software security override capability
- Active security configuration (if multiple configurations have been programmed) and means of activation (hardware, software, timer)
- The ability to assign activation of a security configuration manually or by a timer
- The ability to override or allow override by the Master Security switch
- Manage passwords allowing access to security settings
- The ability to assign security level (no security, basic security with per floor codes, basic security with per floor and passenger codes)

2.8.2 Security (Per Floor)

The group shall provide a screen allowing management of security per-floor. This screen shall provide:

- The ability to assign or edit hall call security (unrestricted, locked, or secured (security requirements active) on a per-floor, per riser, per opening, per car direction, per security set basis
- The ability to determine how long the call will accept input after the security requirement has been met
- The ability to allow/disallow a car to park at a secured floor

2.8.3 Security (Per Car Hall Call Response)

The group shall provide a screen allowing management of security per-car. This screen shall provide:

- Determination of which cars may respond to a hall call on a per-car, per-floor, per-direction basis.

2.8.4 Security (Car Floor Access)

The group shall provide a screen allowing management of car call registration per security configuration. This screen shall provide:

- The ability to edit any one of eight security configurations –
 - Floors/Openings that may be accessed per car when security is active and security requirement are satisfied
- The ability to edit the period of time within which a call must be registered after security requirements are met

2.8.5 Security (Car Restriction Override)

The group shall provide a screen allowing a car call security restriction to be overridden when the car is operating in a selected mode or when the call is placed from a selected source. This screen shall provide:

- Selection of the security configuration to be overridden
- Selection or editing of the sources or modes capable of overriding security (All, OBD calls, Remote calls, Attendant service, CFSS 1, CFSS 2, Independent service, Test mode, Shuttle service)

2.8.6 Security (Car Operating Panel Passcode Per Floor)

The group shall provide a screen allowing floor access to be restricted unless the correct COP passcode is entered. This screen shall provide:

- Selection of the security configuration to be affected
- The ability to set a required passcode for car access on a per-car, per-floor, per opening basis

2.8.7 Security (Car Operating Panel Passcode Per Passenger)

The group shall provide a screen allowing car access to specific floors and openings dependent upon entry of a code unique to a specified passenger. This screen shall provide:

- The ability to add, delete, or edit passenger settings
- The ability to set particular floors and openings available to the passenger
- The ability to assign or edit a COP entered passcode for the passenger
- The ability to determine what operating modes, in addition to normal Passenger mode, in which this passenger code is effective (Attendant, Independent, Sabbath, CFSS 1, CFSS 2)

2.9 Diagnostics and Service Related Screens

The group shall provide screens allowing diagnostic and service related parameters to be defined. These screens shall provide:

- Assignment or reassignment of inputs or outputs on the group serial bus (main/auxiliary riser calls, CFSS calls, emergency power, cross-registration, security, security override, remote outputs, user-defined events)
- Viewing of the status of any of the four system busses
- Inventory and functionality test of all bus devices
- System performance graphics per hall call type capable of being printed to a user-provided printer
 - Hourly average wait times for up and down hall calls
 - Number of up and down hall calls answered each hour
 - Average wait time for up and down hall calls for each hour
 - Average wait time for up, down, and all hall calls during last 24 hours

2.10 Status Indicators

Every field connection input or output shall have a dedicated LED such that no volt meter or other test equipment is required to see when an input or output is active.

2.11 Hoistway Display

The hoistway display shall provide a real-time view of all cars in the group, providing information and capabilities including:

- Traffic mode display (Balanced, Lobby Peak, Demand Up Peak, Demand Down Peak, Automatic)
- ETA in whole seconds in which the group estimates a registered hall call will be serviced per riser
- Ability to register hall and car calls
- Communication status per car
- ID per car
- Hoistway location per car
- Direction of travel per car

- Current floor per car
- Active calls per car
- Real time door operation per car

2.12 Monitoring Options

2.12.1 MCE iMonitor

A PC-based system monitoring application shall be available. At a minimum, monitoring shall be capable of providing system status, car location and travel direction, operating mode, and door operation indication via Ethernet connection.

The monitoring system shall be capable of remotely registering car and hall calls.

The monitoring system shall be capable of initiating recall of any car in the group to the lobby floor and of placing the car into Independent Service or placing it out of service upon arrival.

Optional: A site view, with three-dimensional representations of site buildings, visual indicators of elevator status in buildings so equipped, and the ability to show status details upon indicator selection shall be available. (This option requires additional graphics development as agreed upon by MCE and the customer.)

2.12.2 MCE iReport

An Ethernet client/server based report collection and generation application shall be available. Based on historical data collected by the server, the report application shall provide, at a minimum, hall call analysis, traffic analysis, hall call log, car call log, event log, emergency log, maintenance log, and percent in service reports. The report application shall also be capable of emergency notification and report distribution through email service.

2.12.3 Building Management System Interface

An interface to a Tridium technology client Building Management System shall be available. At a minimum, this interface shall allow the management system to view car location, call status, and door operation. The interface shall also allow the management system to set any of three levels of demand-response operation, each of which shall specify a set of cars to continue running in response to curtailed energy availability or if the building owner is voluntarily reducing energy demand. The interface shall also allow selected cars to be removed from and/or returned to service as desired through the building management system. (Depending on Building Management System software, modification of system code may be required.)

2.12.4 Third Party Monitoring

Optional: An interface to an IDS Liftnet monitoring system shall be available.