APPENDIX C - ELEVATORS

The following outline specifications supplement BSRV 6.2 ELEVATORS are to be incorporated into specifications for new and replacement elevator work contracted by the University of Virginia.

C.1 GENERAL REQUIREMENTS FOR ALL ELEVATOR INSTALLATIONS

Under no circumstances will manufacturers or suppliers of proprietary equipment, systems, or software, other than those specifically noted in this Appendix, be accepted. The requirements of this appendix shall apply to both new construction projects and to the modernization of existing elevators. The A/E is encouraged to consult with the Elevator Department Manager by arrangement with the Project Manager. Elevator equipment submittals shall be provided for review/approval prior to purchasing materials. Compliance with requirements for non-proprietary components is mandatory and essential for the safe and expedient operation and maintenance of elevators throughout the University. Recommendations may include proven manufacturers to be included in specifications.

The following types of elevators shall not be installed without written approval from the Elevator Department Manager:

- Machine room less (MRL) type elevator machinery, controls, related equipment.
- (Underslung elevators) Elevators that have sheaves mounted under the elevator for hoisting purposes.
- Traction elevators that utilize a basement machine installation.
- Roped Hydraulic elevators.
- Two-stage and three-stage hole-less elevators, including the inverted type.

C.1.1 GOVERNING CODES

All work shall comply with VUSBC and ASME A17.1. Electrical work shall conform to NFPA – 70. Smoke and heat detector installation shall comply with NFPA – 72. In the performance of the work all personnel shall comply with all VOSHA safety regulations as well as with all specific safety regulations required by the University. Installations must adhere to all requirements noted in this Appendix, in addition to complying with the governing codes.

C.1.2 ELEVATOR MACHINE ROOM REQUIREMENTS

1. An elevator machine room must be provided for each individual elevator or elevator group. The elevator machine and controller must be located in the elevator machine room.
2. For facilities not located in a flood zone, locate hydraulic elevator machine rooms on the lowest landing served by the elevator. Electric traction elevator machine rooms shall be located above the elevator hoistway.
3. When possible, locate machine room and hoistway on the same side of any building expansion joint and adjacent to the elevator hoistway.
4. Design all machine beam support with hoistway wall beam-pocket construction.

5. In traction elevator machine rooms, install a beam above the elevator machine and motor that is sufficient in size and capacity to support the removal of elevator equipment.
6. Size and configure the elevator machine room so that there is a minimum clearance of 18" between any building component and a traction elevator drive machine.
7. Size and configure the elevator machine room so that there is a minimum clearance of 12" between any building component and an over-speed governor.
8. Size and configure the elevator machine room so that there is a minimum clearance of 6" between any building component and a hydraulic elevator pump unit.
9. A stairway with a maximum inclination of 45° must be provided for vertical access to an elevator machine room. Vertical ladders, ship ladders, and alternating step-tread designs must not be used for access. Steps must be designed with a maximum riser height of 8" and a minimum step-tread depth of 8" as measured from each adjoining step, nose to nose. The height of the access stairs may not exceed a rise of 10' without an intermediate landing.
10. Elevator machine rooms shall not be used for access to roofs or other parts of the building unless elevator equipment is fenced or walled.
11. Provide a proper means for elevator machine equipment to be removed or replaced when the elevator machine room is located above public access floors, such as a penthouse or attic area. An access floor hatch or other similar means shall be installed for equipment removal. The floor hatch shall be at least 4' X 3' and have a beam mounted directly above it that is capable of supporting all elevator equipment.
12. Machine room walls shall be painted bright white, and floor to be painted with high gloss epoxy, light gray paint.
13. Proper heating/cooling shall be provided to meet operational requirements of equipment and maintain elevator machine rooms at a maximum of 76°F.
14. HVAC equipment shall not be located above elevator equipment.
15. Air conditioning condensate lines must drain to a location outside of the elevator machine room and hoistway.
16. Locate the elevator disconnecting means on the wall inside the machine room, on the strike jamb side of the door, within sight of the elevator equipment that it controls. Provide a Lockable shunt trip, breaker type over-current disconnect. The shunt trip breaker should include a 120v coil. The disconnect must be properly labeled to the identifying number of the driving machine that it controls and have proper signage that identifies the location of the supply side over-current protective device.
17. When a hydraulic elevator is installed and equipped with auxiliary power lowering operation, the main line disconnect must be designed with an auxiliary contact to prevent automatic lowering operation when the mainline disconnect is in the open position.
18. Provide a Lockable disconnect switch with breaker type over-current protection for car lighting, located on the wall inside the machine room, on the strike jamb side of the door. The disconnect must be properly labeled to the identifying elevator that it controls and have proper signage that identifies the location of the supply side over-current protective device.
19. The machine room lighting shall not be equipped with automatic controls.
20. A minimum of two 4' LED lighting fixtures shall be installed for the elevator machine room lighting. Provide proper protection against bulb breakage/damage.
21. Install a data jack near the elevator controller for future elevator internet access.

C.1.3 ELEVATOR HOISTWAY REQUIREMENTS

1. For multiple elevators in the same hoistway, provide divider beams for guide rail support brackets.
2. Provide a hoist beam in the top of the elevator shaft to be located horizontally on the centerline of the car so that each end of the beam spans above the car guide rails. The beam shall be capable of supporting the total weight of the hoistway elevator equipment.
3. When elevator equipment is located at the top of the hoistway, a metal grated floor shall be installed, including proper access to safely install, maintain, and repair equipment.
4. Hollow concrete block, if used, must be filled solid with concrete or grout.
5. Install proper lighting with a 3-way switch located at the pit ladder and adjacent to the opening jamb of the top hoistway door inside the hoistway. Vertically install 4' Led lighting fixtures and mount them on the side hoistway wall, centered on the door headers at each landing. In the case of multiple hoistways, there shall be a 3-way/4-way switch mounted beside each bottom or top hoistway door opening, inside the hoistway.
6. All conductors and optical fibers in the hoistway, except traveling cable, must be in conduit or liquid-tight flexible metal conduit.
7. Provide a conventional hoistway that is constructed so that all types of elevators can be installed during future modernizations.

C.1.4 ELEVATOR PIT REQUIREMENTS

1. If a walk-in elevator pit is required, there shall be a metal grated, working platform installed 4' below the lowest elevator landing or further depending on elevator code requirements.
2. Provide continuous, non-slip, horizontal rungs every 12" for the full height of the pit ladder.
3. All elevator hoistways must be equipped with a sump pit located at the rear of the elevator pit. Metal grating shall be installed over the hole that sits flush with the pit floor. If required, drainage from the elevator pit shall be connected to the sanitary drain.
4. For the modernization of existing facilities that are not equipped with a sump pit, the sump pit is not required to be installed.
5. Provide a water sensor in sump pit to detect any fluid that may accumulate and send an alarm signal back to Facilities Management Systems Control.
6. Provide a 4' Led lighting fixture of the same type that is installed in the elevator hoistway.
7. Provide a single non-GFCI receptacle located at the pit ladder, above elevator sill height, for evacuating fluid from the elevator pit.
8. When a sump pump is necessary on hydraulic elevator installations, it must be designed with a sump pump oil sensing control system to allow water to be pumped out without pumping oil/hydraulic fluid from the elevator hoistway pit. The sump pump control system must include an audible alarm and visual indicators for water and oil. The alarm indicators and controls must be installed in the elevator machine room.

C.1.5 ELEVATOR FIRE PROTECTION REQUIREMENTS

1. Smoke detector at pit level for Hydraulic elevators.
2. Smoke detectors in machine room.
3. If sprinklers are provided, locate heat detectors within 24" of sprinkler head.

4. To prevent people from being trapped in an elevator when power is automatically disconnected, a pre-action system shall be installed with the controls necessary to accomplish the following: Heat detectors shall provide a signal to initiate Phase 1 Fireman's Service Emergency Recall Operation. Provide an elevator travel time delay, equivalent to the elapsed time for an elevator to travel from its farthest stop to the designated recall level plus ten seconds before power to the elevator equipment is disconnected and pre-action sprinkler is activated. (Elevator Travel Time Delay = the time for an elevator to close its doors, under Phase I conditions, return to the designated recall level and open its doors. If there are multiple elevators, the elevator having the greatest travel time shall be used in determining the time delay.)
5. Pre-action system with timer shall be furnished and shall be located outside of the elevator machine room.
6. If a "Wet Sprinkler System" is used, there shall be a dedicated flow switch for the elevator piping and elevator power shall shunt upon water flow with no time delay.
7. Provide a type ABC-10lb fire extinguisher mounted on the elevator machine room wall, adjacent to the entrance.

C.1.6 ELEVATOR EQUIPMENT AND COMPONENTS

1. **Guide Rails:** T-section type guide rails must be used for all car and counterweight guide rails.
2. **Roller Guide Assemblies:** Install and adjust guide assemblies to provide a smooth, quiet ride, and to limit lateral movement of the car or counterweight within the rails. Furnished by Elsco, Inc.
3. **Car Door Operator:** The type shall be MOVFR and shall be furnished with adjusting tool. Door operator shall be furnished by GAL Mfg. Corporation.
4. **Car Door Restrictor:** Shall be furnished by GAL Mfg. Corporation.
5. **Hoistway & Car Sills:** For every landing and sill, a one-piece aluminum entrance sill must be installed. The top of the landing sill must be flush, within 1/16" with the top of the finished floor. The same material and design must be used for all hoistway landings and elevator cab entrance sills.
6. **Hoistway Door Equipment**: Escutcheon tubes shall be installed on all hoistway doors for emergency access and top and bottom retaining devices shall be provided on all doors. All door equipment shall be manufactured by GAL Mfg. Corporation.
7. **Hoistway Access Switches:** Provide hoistway access switches at the top and bottom landings. Switches shall be the key-operated type, continuous pressure, and spring return with key removable only in the "off" position. Switch shall be located in the door jamb unless otherwise specified.
8. **Traveling Cables:** Provide a minimum of seven shielded pair wires to accommodate future security options. Provide a minimum of 10 spare field wires for future wiring, including a separate cable used specifically for video monitoring.
9. **Landing Control System:** The landing control system shall be provided by Motion Control Engineering (MCE), G.A.L. Mfg. Corporation, or SmartRise Engineering, Inc.
10. **Elevator Controller:** All control equipment shall be provided by Motion Control Engineering (MCE), G.A.L. Mfg. Corporation, or SmartRise Engineering, Inc.

11. **Electronic Door Detector:** A PanaChrome Smart 3D electronic door detector with voice annunciator shall be installed. Manufactured by Janus.

C.1.7 ELEVATOR CAB

1. All illuminating fixture components must utilize LED lighting for energy efficiency.
2. Pads and hooks conforming to the following shall be provided: Pads shall be fire resistant, quilted vinyl, provided for all interior cab walls, and the protective pads hooks shall be #4 brushed stainless steel and permanently mounted at the sides, rear and fronts of the car enclosure.
3. Provide handrails on top of car where necessary to protect workers from the excessive distance from top of car to shaft walls.
4. Provide car top inspection station complete with light and GFCI protected outlet.
5. Interior elevator cab panels that utilize adhesives for mounting/installation shall not be permitted.
6. Install a 2-speed exhaust fan with protective guard.

C.1.8 ELEVATOR FIXTURES

All fixtures and devices must be engraved to identify function and operation instructions and backfilled with a contrasting color. All fixture voltage is to be 24vdc and fixtures shall be provided by PTL Elevator Equipment or Innovation Industries, Inc. The use of digital/touch-screen type fixtures will be considered with the approval of the Elevator Department Manager. All fixtures and access Key switch cover plates shall be fastened/secured using security screws and all push buttons shall utilize LED bulbs.

C.1.8.1 CAR OPERATING PANEL

The car-operating panel shall be vandal-resistant and comply with all ADA requirements and have LED car position indicators as an integral part of the panel assemblies. The car-operating panel shall be mounted so that no button shall be higher than 48" above the finished floor. Emergency controls, including the emergency alarm and emergency stop, shall be grouped at the bottom of the panel and shall have their centerlines no less than 35" above the finished floor.

As part of the car operating panel also provide the following wording etched into the main panel:

1. Elevator Inspection Certificate Can Be Obtained From UVA Facilities Management
2. Elevator capacity pounds
3. Phase II operating instructions
4. No smoking

Behind a locked service panel shall be the following:

1. Toggle type cab lighting on/off switch
2. Toggle type two-speed cab fan on/off switch
3. Key operated "Hoistway Enable" switch for Hoistway Access Operation

4. Key operated “Independent Operation” switch
5. Push button to test Emergency Car Lighting operation
6. 120vac GFCI duplex receptacle
7. The fixtures shall be provided by PTL Elevator Equipment or Innovation Industries, Inc. If the fixtures are provided by PTL, the C.O.P should be fastened using cam locks that use PT14 Northeast key.
8. Install a key override switch for card reader in case of card reader failure. If the fixtures are provided by PTL, the key shall be a PT01 Northeast key.

C.1.8.2 CAR POSITION INDICATOR

The indicator shall be installed as an integral part of the car operating panel assembly and utilize LED lighting.

C.1.8.3 HALL LANDING FIXTURES

1. All elevator hall call fixtures must be flush mounted and engraved with the ASME A17.1 “Elevator Corridor Call Station” pictograph. Pictograph must be engraved and backfilled with a contrasting color.
2. Elevator call buttons must be vandal resistant.
3. Phase I instructions shall be engraved on the station at the designated landing, and a fireman’s service Phase I key switch provided.
4. Hall push button fixtures shall be located adjacent to the door strike jamb on all simplex elevators.

C.1.8.4 HALL POSITION INDICATORS

Direction position indicator and directional arrows shall be integrated into the hall button fixtures at each floor.

C.1.8.5 FIREFIGHTERS EMERGENCY OPERATION

Firefighter’s Emergency Operation shall be provided in compliance with the latest revision of the ASME/ANSI A17.1 and Phase 1 and Phase 2 operating instructions must be engraved and backfilled with a contrasting color.

C.1.8.6 CAR TRAVELING LANTERN

The car-traveling lantern shall be installed to comply with ADA requirements.

C.1.8.7 EMERGENCY CAR LIGHTING

An emergency power unit employing a six-volt sealed rechargeable battery shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of power failure. This lighting shall be provided as an integral part of the car operating assembly.

C.1.8.8 BRAILLE JAMB PLATES

Provide and install zinc diecast raised Braille jamb plates on both sides of the hoistway entrance frame at each landing. Securely fasten the plates using tamper-proof fasteners (adhesive shall not be the primary attachment means for the jamb plates).

C.1.8.9 ELEVATOR EMERGENCY PHONE

A hands-free ADA compliant telephone shall be provided as an integral part of the operating panel assembly. The telephone shall be built into the car-operating panel, with a clearly identified button provided for telephone activation. This button shall be located so that there shall be no confusion with door open, door close, or emergency alarm buttons. The phone shall be furnished by Talk-A-Phone Co.

C.1.8.10 EMERGENCY HOSPITAL SERVICE

Any medical facilities that have an operating room or has a need to transfer patients emergently, should include the following:

- Elevator controllers shall be provided with emergency hospital service and USE #4 key switches shall be installed. Key switches for hospital emergency service shall be provided at all floors and be the spring-return type. The key switch inside the elevator shall be the on-off type and all key switches shall be removable in the off position only.

C.1.8.11 ELEVATOR KEYS

All elevator keys shall be provided by PTL Elevator Equipment or Innovation Industries, Inc. Fire service switches shall be operated by a FEOK1 key.

C.1.9 FINAL ACCEPTANCE

Include the following statement in elevator specifications:

“As a part of final acceptance of the project and in accordance with the contract general conditions, the contractor shall have a qualified elevator inspector (QEI) conduct a full acceptance inspection and test in accordance with ASME/ANSI A17.1 before final acceptance by the owner and the inspector shall verify that the elevator is properly counter-balanced. The contractor shall obtain from the elevator contractor and/or manufacturer and furnish to the owner all data affecting the elevator installation or modification, including ‘as-installed’ circuit and control wiring diagrams and maintenance manuals.”

Any equipment that receives technical bulletins, software updates, and manufacturer directed engineering modifications, etc. must be included and/or shared with the University as this information becomes available for the lifetime of the equipment.

C.1.10 TECHNICIAN TRAINING

Provide instructions and training for the owner’s “Operations and Maintenance” personnel in the proper operation and maintenance of the equipment and related controls provided or altered in the work.

C.1.11 PROJECT CLOSE-OUT

Upon completion of the installation, the Contractor shall provide the following:

1. Two complete hard copy sets and one electronic copy of all Adjuster manuals, user's manuals, maintenance manuals, logic diagrams, computer software, access codes, password, wiring diagrams, electrical drawings, drive manuals, and all other materials required for on-going maintenance and use of the system.
2. The contractor shall deliver to the owner, 2 keys for each key-operated device that is provided.
3. If required, interface tools may be handheld or built into the control systems and shall function for the lifetime of the equipment without recharging or reprogramming. Contractor shall provide any special tools, prints and technical operation of equipment that cannot be obtained from multiple suppliers to the University upon completion of the project. Specifications shall be explicit that all tools, adjusters, manuals and schematic wiring diagrams become the property of the University to be used at their discretion related to installed elevators.

C.1.12 WARRANTY AND MAINTENANCE

All equipment shall carry a warranty period of one full year from the date of the University's acceptance. Defects or equipment failures occurring during that one-year period shall be promptly corrected at no cost to the University. The contractor shall provide one full year of complete maintenance service as part of this warranty. This service shall include monthly maintenance inspections and emergency call-back service 24 hours a day, seven days a week, including holidays, between regular examinations at no extra cost to the owner. A fire service check chart will be kept in the machine room and fire recall will be tested once a month and recorded on this chart.

The service technician will be required to check in with the elevator maintenance supervisor and to check out leaving a copy of the time sheet showing all work performed.

Prior to the end of the warranty period, the elevator contractor shall readjust and clean the elevator as required to meet all performance parameters specified. A written report shall be submitted by the elevator contractor to the University Elevator Manager.

C.2 REQUIREMENTS FOR TRACTION GEARED/GEARLESS ELEVATORS

Traction-type elevators shall have machinery located overhead.

C.2.1 HOIST MACHINE

1. The elevator hoist machine, including hoist motor and assembly, must be located within the elevator machine room.
2. Provide an AC hoist motor that is properly sized to meet the speed and capacity requirements of the elevator service.
3. Machine, sheaves, and motor to be furnished by Hollister Whitney Elevator Corporation.

C.2.2 HOIST ROPES

Only stranded steel wire rope may be used for elevator suspension and counterbalance. Aramid fiber ropes, coated steel ropes, and non-circular coated steel belts shall not be used for elevator suspension and counterbalance without written approval from the Elevator Department Manager.

1. All elevator ropes/cables shall be elevator traction grade, pre-stretched and pre-formed, fiber core, right hand/regular lay, and fastened with shackles using wedge sockets. Springs and bushings shall be installed on the car shackles.
2. The elevator contractor shall include any necessary shortening of ropes during the warranty period. It will not be permitted to run up the nuts on the shackles for this shortening.
3. All hoist ropes shall be tensioned at least once before the warranty period is over.
4. The minimum diameter of hoisting and counterweight ropes shall be 3/8").
5. Ropes shall be Bethlehem Wire Rope, manufactured by Wirerope Works, Inc.

C.2.3 OVERSPEED GOVERNOR/SHEAVES/SAFETIES

1. Only stranded steel wire rope may be used for over-speed governor applications.
2. All equipment to be furnished by Hollister Whitney Elevator Corporation.

C.2.4 EMERGENCY BRAKE

1. The emergency brake shall be designed to decelerate the car by acting directly on the elevator hoist ropes.
2. Furnish the "Linear Rope Gripper" by Hollister Whitney Elevator Corporation.

C.2.5 CONTROLLER REQUIREMENTS AND PROGRAMMABLE OPTIONS

All control equipment shall be provided by Motion Control Engineering (MCE), G.A.L. Mfg. Corporation, or SmartRise Engineering, Inc.

C.2.5.1 CONTROLLER REQUIREMENTS

1. Elevator controls shall be solid-state "selective collective automatic operation," as defined in ASME/ANSI A17.1. Controller shall be non-proprietary and shall not require a battery to maintain programming. Control system shall be microprocessor based for dispatch and motor control, capable of computer-based monitoring with terminals for connection.
2. For microprocessor-controlled systems, specifications shall require that diagnostic tools be functional for the lifetime of the equipment without requiring recharging or reprogramming. The use of proprietary equipment shall be prohibited by the specifications.
3. Dedicated permanent status indicators shall be provided on the controller to indicate the following:
   - When the safety circuit is open
   - When door locks are open
   - When the elevator is running at high speed
   - When the elevator is on independent service
   - When the elevator is on firefighters' service
   - When the elevator out of service timer has elapsed

- When the elevator has failed to successfully complete its intended movement.

4. Provide a capture/pretest switch so that the elevator is allowed to take the remaining passengers to their designated floors and then remain empty so that it may be captured for non-passenger use.
5. Provide a test switch. In the test position, this switch shall allow independent operation of the elevator without door open functioning for the purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls in this mode of operation.
6. The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling the car shall shut down immediately, requiring a reset operation.
7. A means shall be provided in the controller to register calls without the use of jumpers.
8. The elevator installer shall add additional car call buttons in the controller, furnished by the controller manufacturer.
9. Elevator control voltage shall be 24vdc.
10. Provide an arc flash guard in the controller.
11. Provide hinged access doors on controller.
12. The elevator controller shall provide building security options and features that will allow all or individual floor landings to be locked out and secured via car switch or card reader.
13. Provide car call security access by using car call push button security code.

C.2.5.2 OPERATION REQUIREMENTS

1. **Independent Service:** The car shall be provided with a switch to remove it from operation and shall operate in response to car calls only in an in car independent mode of operation.
2. **Door Nudging Operation:** Should the doors be held open due to a stuck call button or the failure of an electronic door reopening device for a predetermined adjustable time, a buzzer shall sound and the doors shall close at a reduced torque of 2-1/2’ per pound or less, permitting the car to run.
3. **Emergency Power Operation:** When emergency power is detected, cars shall return to the main lobby one elevator at a time and remain there with doors open. As each car returns, the other cars shall be shut down so as not to overload the emergency power generator. Once all cars have returned to the lobby, one or more cars may be selected to run under emergency power, depending on the capability of the emergency power generator. Selection of the cars that run under emergency power shall be done automatically by the group system and may be overridden through manual selection. The actual number of cars allowed to run under emergency power shall be a preprogrammed value and the number of cars allowed to run shall not exceed this value. The panel for the manual selection switches for each group of elevators will be installed at a location determined by the University.

C.2.5.3 MICROPROCESSOR

The microprocessor board shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of a minimum of eight specific control variables. Field changes should be stored permanently using non-volatile memory. The microprocessor board shall provide the following features:

- On board diagnostic switches and alphanumeric display that provide user-friendly interaction between the service person and the controller.

- On-board Real-Time Clock displaying date and time, able to be reset using on board switches.
- Display of calls on a per floor basis with all types of calls entered and displayed using on board switches and buttons.
- Field programmability of specific timer values which may be viewed and altered through use of the on-board switches and buttons.
- Display of the status of all of the inputs, outputs, internal control variables and flags, listed in order of their mnemonics.

C.2.5.4 EXTERNAL DEVICES

Provide comprehensive means to access the computer memory for elevator diagnostic purposes without the need for any external devices and provide permanent indicators to show important elevator status as an integral part of the controller. Systems that require attachment of external devices for troubleshooting must be submitted for approval before bids are submitted for review. Should a system requiring an external device be accepted, a minimum of one external device, including any/all software, passwords, parameters, etc. needed for the operation of the device, shall be provided to the Owner. External devices that require recharging and/or periodic reprogramming are prohibited.

C.2.5.5 TIMERS

1. Provide an out of service timer which automatically takes the car out of service if the car is delayed 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, and the detector screen input shall be unresponsive in the event that a faulty screen unit was delaying the car.
2. Provide door protection timers for both open and close directions that protect the door operator motor and prevent the car from being "stuck" at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that 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.
3. A minimum of four different door standing open times shall be provided:
   - A car call time value shall predominate when a car call only is canceled.
   - A hall call time value shall predominate whenever a hall call is canceled.
   - In the event of a door reopen from the detector screen, a separate short door time value shall predominate.
   - If the doors are prevented from closing for longer than a predetermined time, door-nudging operation shall cause the doors to move at slow speed and reduced torque in the close direction. The detector screen shall stop the door but not reverse it. A buzzer shall sound while nudging operation is activated.
4. Provide separate adjustable timing to establish independent minimum passenger transfer times for car stops, hall stops, main lobby stops and door reversal protection. 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 pushbuttons. Call demand at another floor shall cause the car to ignore the defective call and continue to provide service in the building.

C.2.5.6 CAR CONFIGURATION

For both duplex (two car) operation, and for group (multiple car) configurations, with a computer for each controller, operation shall assign cars on a real time basis using estimated time of arrival (ETA). Should one computer lose power or become inoperative in any way, all other computers shall be capable of accepting and answering all hall calls. When all computers are in operation only one of them shall assume the role of dispatching the hall calls to both elevators.

C.2.5.7 PROGRAMMABLE OPTIONS

All available options or 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 used for programming and diagnostics. Programmable parameters and options shall include, but not limited to, the following:

1. Number of stops/openings served (each car)
2. Simplex/duplex
3. Single automatic push-button
4. Selective collective/single button collective
5. Programmable fire code options/fire floors (main, alternates)
6. Floor encoding (absolute PI)
7. Digital PIs/single wire PIs
8. Programmable door times
9. Programmable motor limit timer
10. Nudging
11. External car shutdown input (e.g. rescuvator)
12. External Low Oil Sensor Input
13. External viscosity control input
14. Parking floors
15. Hall or car gong selection

C.3 REQUIREMENTS FOR HYDRAULIC ELEVATORS

Hydraulic elevators that utilize the direct bore type assembly (holed elevator) is the preferred installation type and shall be installed with a sealed PVC liner and monitoring system. Single stage hole-less hydraulic assemblies are also acceptable.

C.3.1 HYDRAULIC PUMPING UNIT

1. The pump shall be manufactured by IMO Industries, Inc. or Allweiler.
2. The pump motor shall be manufactured by Imperial Motor Co.
3. The hydraulic valve shall be manufactured by Maxton Manufacturing Co.
4. The motor starter shall be a Siemens A/C Semiconductor Motor Starter.
5. The pumping unit shall have the valve, pump, and motor located within the reservoir and the unit must be mounted on sound isolation pads.
6. Provide a hydraulic muffler in the machine room.

C.3.2 OVERSPEED VALVE

Provide an overspeed valve located in the pressure piping within twelve inches of the hydraulic jack.

C.3.3 HYDRAULIC OIL SUPPLY, PIPING, AND FITTINGS

1. All piping for the hydraulic system shall be schedule 80 and have at least one isolation coupling installed in the oil line.
2. Grooved fittings shall be installed for the hydraulic oil supply line piping that is located in the elevator hoistway and machine room. Welded piping and fittings shall be used outside of the elevator hoistway or machine room.
3. Piping buried in the ground shall have a protective casing.
4. Manual shut-off valves shall be provided in the elevator machine room and in the elevator hoistway pit. Shut-off valves must be full flow, ¼ turn ball valves.

C.3.4 CONTROLLER REQUIREMENTS AND PROGRAMMABLE OPTIONS

All control equipment shall be provided by Motion Control Engineering (MCE), G.A.L. Mfg. Corporation, or SmartRise Engineering, Inc.

C.3.4.1 CONTROLLER REQUIREMENTS

1. Elevator controls shall be solid-state "selective collective automatic operation," as defined in ASME/ANSI A17.1. Controller shall be non-proprietary and shall not require a battery to maintain programming. Control system shall be microprocessor based for dispatch and motor control, capable of computer-based monitoring with terminals for connection.
2. For microprocessor-controlled systems, specifications shall require that diagnostic tools be functional for the lifetime of the equipment without requiring recharging or reprogramming. The use of proprietary equipment shall be prohibited by the specifications.
3. Dedicated permanent status indicators shall be provided on the controller to indicate the following:

    - When the safety circuit is open
    - When door locks are open
    - When the elevator is running at high speed
    - When the elevator is on independent service
    - When the elevator is on firefighters' service
    - When the elevator out of service timer has elapsed
    - When the elevator has failed to successfully complete its intended movement.

4. A motor limit timer function shall be provided which, in case of the pump motor being energized longer than a predetermined time, shall cause the car to descend to the lowest landing and park, open the doors automatically and then close them. Car calls shall be canceled, and the car taken out of service automatically. Operation may be restored by cycling the main line disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.
5. A valve limit timer shall be provided which shall automatically cut off current to the down valve solenoids if they have been energized longer than a predetermined time. The car calls shall then be canceled, and the car taken out of service automatically. Operation may be restored by cycling the main line

disconnect switch or putting the car on access or inspection operation. Door reopening devices shall remain operative.

6. Provide a capture/pretest switch so that the elevator is allowed to take the remaining passengers to their designated floors and then remain empty so that it may be captured for non-passenger use.
7. Provide a test switch. In the test position, this switch shall allow independent operation of the elevator without door open functioning for the purposes of adjustment or testing the elevator. The elevator shall not respond to hall calls in this mode of operation.
8. The power control shall be arranged to continuously monitor the performance of the elevator such that if the car speed exceeds 150 fpm during access, inspection, or leveling the car shall shut down immediately, requiring a reset operation.
9. A means shall be provided in the controller to register calls without the use of jumpers.
10. The elevator installer shall add additional car call buttons in the controller, furnished by the controller manufacturer.
11. Elevator control voltage shall be 24vdc.
12. Provide an arc flash guard in the controller.
13. Provide hinged access doors on controller.
14. The elevator controller shall provide building security options and features that will allow all or individual floor landings to be locked out and secured via car switch or card reader.
15. Provide car call security access by using car call push button security code.

C.3.4.2 OPERATION REQUIREMENTS

4. **Independent Service:** The car shall be provided with a switch to remove it from operation and shall operate in response to car calls only in an in car independent mode of operation.
5. **Door Nudging Operation:** Should the doors be held open due to a stuck call button or the failure of an electronic door reopening device for a predetermined adjustable time, a buzzer shall sound and the doors shall close at a reduced torque of 2-1/2’ per pound or less, permitting the car to run.
6. **Emergency Power Operation:** When emergency power is detected, cars shall return to the main lobby one elevator at a time and remain there with doors open. As each car returns, the other cars shall be shut down so as not to overload the emergency power generator. Once all cars have returned to the lobby, one or more cars may be selected to run under emergency power, depending on the capability of the emergency power generator. Selection of the cars that run under emergency power shall be done automatically by the group system and may be overridden through manual selection. The actual number of cars allowed to run under emergency power shall be a preprogrammed value and the number of cars allowed to run shall not exceed this value. The panel for the manual selection switches for each group of elevators will be installed at a location determined by the University.

C.3.4.3 MICROPROCESSOR

The microprocessor board shall be equipped with on-board diagnostics for ease of troubleshooting and field programmability of a minimum of eight specific control variables. Field changes should be stored permanently using non-volatile memory. The microprocessor board shall provide the following features:

- On board diagnostic switches and alphanumeric display that provide user-friendly interaction between the service person and the controller.
- On-board Real-Time Clock displaying date and time, able to be reset using on board switches.
- Display of calls on a per floor basis with all types of calls entered and displayed using on board switches and buttons.
- Field programmability of specific timer values which may be viewed and altered through use of the on-board switches and buttons.
- Display of the status of all of the inputs, outputs, internal control variables and flags, listed in order of their mnemonics.

C.3.4.4 EXTERNAL DEVICES

Provide comprehensive means to access the computer memory for elevator diagnostic purposes without the need for any external devices and provide permanent indicators to show important elevator status as an integral part of the controller. Systems that require attachment of external devices for troubleshooting must be submitted for approval before bids are submitted for review. Should a system requiring an external device be accepted, a minimum of one external device, including any/all software, passwords, parameters, etc. needed for the operation of the device, shall be provided to the Owner. External devices that require recharging and/or periodic reprogramming are prohibited.

C.3.4.5 TIMERS

1. Provide an out of service timer which automatically takes the car out of service if the car is delayed 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, and the detector screen input shall be unresponsive in the event that a faulty screen unit was delaying the car.
2. Provide door protection timers for both open and close directions that protect the door operator motor and prevent the car from being "stuck" at a landing. The door open protection timer shall cease attempting to open the door after a predetermined time in the event that 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.
3. A minimum of four different door standing open times shall be provided:
   - A car call time value shall predominate when a car call only is canceled.
   - A hall call time value shall predominate whenever a hall call is canceled.
   - In the event of a door reopen from the detector screen, a separate short door time value shall predominate.
   - If the doors are prevented from closing for longer than a predetermined time, door-nudging operation shall cause the doors to move at slow speed and reduced torque in the close direction. The detector screen shall stop the door but not reverse it. A buzzer shall sound while nudging operation is activated.
4. Provide separate adjustable timing to establish independent minimum passenger transfer times for car stops, hall stops, main lobby stops and door reversal protection. 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 pushbuttons. Call demand at another floor

shall cause the car to ignore the defective call and continue to provide service in the building.

C.3.4.6 CAR CONFIGURATION

For both duplex (two car) operation, and for group (multiple car) configurations, with a computer for each controller, operation shall assign cars on a real time basis using estimated time of arrival (ETA). Should one computer lose power or become inoperative in any way, all other computers shall be capable of accepting and answering all hall calls. When all computers are in operation only one of them shall assume the role of dispatching the hall calls to both elevators.

C.3.4.7 PROGRAMMABLE OPTIONS

All available options or 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 used for programming and diagnostics. Programmable parameters and options shall include, but not limited to, the following:

16. Number of stops/openings served (each car)
17. Simplex/duplex
18. Single automatic push-button
19. Selective collective/single button collective
20. Programmable fire code options/fire floors (main, alternates)
21. Floor encoding (absolute PI)
22. Digital PIs/single wire PIs
23. Programmable door times
24. Programmable motor limit timer
25. Nudging
26. External car shutdown input (e.g., rescuvator)
27. External Low Oil Sensor Input
28. External viscosity control input
29. Parking floors
30. Hall or car gong selection

C.4 REQUIREMENTS FOR FREIGHT ELEVATOR DOOR EQUIPMENT

1. Lock boxes for hoistway access shall be installed at each hoistway landing and shall be keyed with a “CH751” type key manufactured by Bauer Products.
2. Freight door package, including door controller, shall be provided by EMS GROUP Incorporated.

C.5 REQUIREMENTS FOR DESIGNATED SERVICE ELEVATORS

1. **Hoistway & Car Sills:** For every landing and sill, a one-piece nickel-silver, stainless-steel, or nickel-bronze entrance sill must be installed. The top of the landing sill must be flush,

within 1/16” with the top of the finished floor. The same material and design must be used for all hoistway landings and elevator cab entrance sills.

2. Install a durable elevator cab floor consisting of diamond-plate aluminum or similar material.