

APPENDIX 07 – ELEVATOR & ESCALATOR DESIGN GUIDELINES

Intent

This document exists to standardize and over time reduce the number of variations in design of Rutgers, The State University of New Jersey (a.k.a. University) new elevator and escalator equipment. This standard shall serve as a guide for either new construction and or modernization related projects. The non-proprietary equipment approach, especially as it pertains to elevators, sets out to improve both service reliability and passenger experience.

This document captures code requirements as they exist upon publication date of this document. Where more stringent existing federal, state and local codes and standards apply, those will supersede and be used in the design, installation, or servicing of elevator or escalator equipment.

Scope and Exceptions

All newly designed elevators and escalators shall comply with the requirements outlined to the greatest extent possible.

Any condition or requirement within this document that cannot be met must be documented and approved prior to the conclusion of the design phase (e.g., Conceptual Design) by the University Architect as well as any other pertinent University department.

University recognizes that elevators or escalators may not be able to meet all requirements of this standard due to shaft or wellway size constraints, especially with existing conditions. If physical constraints exist, this standard shall be applied to the greatest extent possible without changing shaft or wellway dimensions unless shaft or wellway expansion is explicitly directed by the University Architect through the design process.

The design professional or responsible design entity shall document to the University Architect all areas where this Standard cannot be met. When the Standard cannot be met, design professional or responsible entity shall propose options, potential remedies, identify risks, and provide any potential rough order of magnitude costs incurred, for the University Architect review and acceptance.

For federally funded projects, review of Buy America and Buy American provisions is paramount. Full disclosure of federal funding resources shall be relayed to the design professional or responsible entity in the early design phases of a project (e.g., Conceptual Design). These provisions play an important role in the design and the procurement of elevator and escalator systems.

Reference Standards

1. As a minimum, comply with applicable requirements of the following:
 - A. ASME A17.1/ CSA B44 Safety Code for Elevator and Escalators hereinafter referred to as the “Code”.
 - B. ASME A17.2 Guide for Inspection of Elevators, Escalators, and Moving Walks
 - C. ASME A17.5/ CSA B44 Elevator and Escalator Electrical Equipment
 - D. ASME A17.7/ CSA B44.7 Performance-based Safety Code for Elevators and Escalators
2. All elevators and escalators shall meet the requirements of the following:
 - A. Accessible and Usable Buildings and Facilities (ICC A117.1)
 - B. ADA Standards for Accessible Design (ADA)
 - C. Americans with Disabilities Act Accessibility Guidelines (ADAAG)
 - D. American Society of Civil Engineers (ASCE) – ASCE 7 Seismic & ASCE 24 Flood Protection
 - E. American Welding Society (AWS) Structural Welding Code-Steel (D1.1)
 - F. New Jersey UCC Building Subcode (IBC, As Amended)
 - G. New Jersey Fire Alarm Code (NFPA 72)
 - H. New Jersey Fire Sprinkler Code (NFPA 13)
 - I. New Jersey Emergency and Standby Power Code (NFPA 110)
 - J. New Jersey Elevator and Escalator Code (ASME A17.1/B44)
 - K. New Jersey Elevator and Escalator Performance-Based Code (ASME A17.7/B44.7)
 - L. New Jersey Accessibility Code (ICC A117.1, As Amended)
 - M. New Jersey UCC Electrical Subcode (NFPA 70, As Amended)
 - N. New Jersey UCC Energy Code (IECC, As Amended)
 - O. New Jersey UCC Fire Subcode (IFC)
 - P. New Jersey Hospital Facilities Design Code (FGI Hospital, As Required)
 - Q. Occupational Safety and Health Administration (OSHA)
 - R. State of New Jersey Barrier Free Subcode (5:23-7)
 - S. State of New Jersey Elevator Subcode (5:23-12)
 - T. Underwriters Laboratories, Inc. (UL)

Quality Assurance

1. The installation Contractor of the elevator or escalator shall have been in business installing elevator or escalator equipment for a minimum of ten (10) years. Elevator or Escalator installation companies from the following list of acceptable installers:
 - A. KONE Inc.
 - B. Otis Elevator Company
 - C. TK Elevator
 - D. Or Approved Equal
2. The installation contractor is required to provide the University with a listing of at least five (5) comparable installations completed within the last eighteen (18) months.
3. The manufacturer of the elevator and escalator shall have been in business fabricating elevator and escalator equipment for a minimum of ten (10) years. Elevator or Escalator assembled by companies will include major components from the following list of acceptable manufacturers:

Elevators

1. Geared/Gearless Traction Machines:
 - A. Hollister Whitney
 - B. Imperial Electric
 - C. Torin Drive
2. Machine Room-Less Machines:
 - A. Hollister Whitney
 - B. Imperial Electric
 - C. Torin Drive
3. Hydraulic Tanks, Pumps and Motors:
 - A. Canton Elevator
 - B. Minnesota Elevator Inc.
 - C. Or Approved Equal
4. Traction / Hydraulic Controllers:
 - A. Elevator Controls, A Vantage Company
 - B. Motion Control Engineering (MCE)
 - C. Or Approved Equal
5. Machine Room-Less Controllers:
 - A. Elevator Controls, A Vantage Company
 - B. Motion Control Engineering (MCE)
 - C. Or Approved Equal

6. Elevator Cabs:
 - A. Canton Architectural Products
 - B. Columbia Elevator
 - C. EDI/ECI
 - D. Gunderlin Limited
 - E. Hauenstein & Burneister
 - F. MAD Elevator Inc.
 - G. National Cab & Door
 - H. Regency Elevator Products Corporation
 - I. Velis Associates
 - J. Or Approved Equal
7. Elevator Cab Flooring: (Coordinate w/ Division 9 Finishes)
 - A. The Mat King
 - B. Classic Tile Inc.
 - C. Aronson's Floor Covering, Inc.
 - D. Or Approved Equal
8. Elevator Entrances:
 - A. Canton Architectural Products
 - B. Columbia Elevator
 - C. EDI/ECI
 - D. Gunderlin Limited
 - E. Hauenstein & Burneister
 - F. National Cab & Door
 - G. The Peelle Company Ltd.
 - H. Velis Associates
 - I. Or Approved Equal
9. Elevator Signaling Fixtures:
 - A. Innovation Industries
 - B. Elevator Products Company
 - C. MAD Elevator Inc.
 - D. Or Approved Equal

10. Elevator Telephone Comms:
 - A. Avire (RATH, JANUS)
 - B. Wurtec
 - C. Kings III
 - D. Or Approved Equal
11. Elevator Two Way Video Comms:
 - A. Avire (RATH, JANUS)
 - B. Wurtec
 - C. Kings III
 - D. Or Approved Equal
12. Elevator Door Tracks, Hangers, Interlocks and Non-Linear Door Operators:
 - A. GAL, A Vantage Company
 - B. Or Approved Equal
13. Elevator Door Protective Device:
 - A. GAL, A Vantage Company
 - B. Adams
 - C. Avire
 - D. TriTronics
 - E. Or Approved Equal
14. Elevator Traction and Hydraulic Pump Motors:
 - A. Baldor
 - B. General Electric
 - C. Imperial Electric
 - D. Reuland
 - E. Or Approved Equal
15. Elevator Traveling Cables:
 - A. Draka
 - B. Or approved equal

Escalators

1. Escalator Manufacturers and Controllers:

- A. KONE Inc.
- B. Otis Elevator Company
- C. TK Elevator
- D. Or Approved Equal

2. Escalator Signaling Devices:

- A. KONE Inc.
- B. Otis Elevator Company
- C. TK Elevator
- D. PTL Equipment
- E. Or Approved Equal

Submittals

1. Operation and Maintenance Manuals

- A. Provide a separate and site-specific set of Operation and Maintenance Manuals for the elevators and escalators in an electronic format approved by the University Architect.
- B. Contractor shall provide, at completion of installation, As-built installation information in the University Architect approved electronic format for the control wiring, motor data, and all pertinent elevator information necessary for maintenance purposes.
- C. Contractor shall also provide four (4) sets of “AS INSTALLED” straight-line wiring diagrams in accordance with the following requirement:
 - 1) In addition to displaying name and symbol of each relay, switch or other electrical component utilized, the diagrams shall identify each wiring terminal.
 - 2) Electrical circuits depicted shall include all those which are hard-wired in both the machine room and hoistway.
 - 3) Supplemental wiring changes performed in the field shall be incorporated into the diagrams in order to accurately replicate the completed installation.
- D. Contractor shall provide a manual describing all adjustment procedures, maintenance requirements and a list of components including manufacturers and catalogue numbers. The manual shall be provided in four (4) identical bound and organized volumes of printed information, and shall comprise of the following:
 - 1) Step-by-step adjusting, programming and troubleshooting procedures that pertain to the solid-state microprocessor- control equipment.
 - 2) Passwords or identification codes required to gain access to each software program in order to perform diagnostics or program changes.

- 3) A composite listing of the individual settings chosen for variable software parameters stored in the software programs of both the motion and dispatch controllers.
2. Diagnostic Tools
 - A. Before seeking final acceptance of the project, Contractor shall deliver to the University Architect any specialized tools required to perform diagnostic evaluations, adjustments, and/or programming changes on any microprocessor-based control equipment installed by the Contractor.

Warranty

1. Elevator manufacturers shall provide for the benefit of the University a written warranty that all equipment manufactured and installed shall, for a period of one (1) year from the issuance of the Certificate of Final Completion, be free of defects in design, materials, and workmanship, under normal use and service.
2. Elevator Contractor shall provide for the benefit of the University a written warranty that the materials and workmanship of the apparatus furnished and installed under this specification shall, for a period of one (1) year from the issuance of the Certificate of Final Completion, be free of defects in design, materials, and workmanship, under normal use and service.
3. Warranties shall cover materials, shipping, special equipment, protection, travel costs and labor necessary to correct any defects
4. Defective is defined but not limited to; operation or control system failures, elevator or escalator performance below required minimum, excessive wear, leaks, unusual deterioration or aging of materials or finishes, unsafe conditions, need for excessive maintenance, abnormal noise or vibration, and similar unsatisfactory conditions

Maintenance Service

1. Elevators and Escalators shall be maintained by the Contractor upon receipt of the Notice to Proceed (NTP) through the expiration of the warranty period of the elevator or escalator. Maintenance shall include periodic (semi-monthly) inspection, cleaning, lubrication and adjustment, in compliance with the Contractors' published Maintenance Control Program (MCP). Any testing, including monthly fire service test and ASME A17.2 periodic requirements that become due during the interim and warranty maintenance period are to be included at no additional cost to the University. Provide 24hr callback service at no additional cost to the University with a response time not to exceed one (1) hour during normal working hours. Normal working hours of the elevator industry are from 8:00AM to 4:30PM Monday through Friday. Two (2) hour response before or after normal hours. Response time for emergencies shall be one (1) hour.

Elevator and Escalator Design Requirements

Elevator Load Ratings:

All elevator systems shall be sized using ASME A17.1/CSA B44. Elevator load and corresponding cab interior floor sizes tabulated as follows:

ASME A17.1/CSA B44			
Shape	Rated Load (lbs.)	Maximum Inside Net Area (ft ²)	Typical Classification
Passenger	2500	29.1	A
	3000	33.7	A
	3500 (See Note 2)	38	A
	4000 (See Note 3)	42.2	A
Service	4500	46.2	A or C3
	5000	50	A or C3
1.)	To allow for variations in cab designs, an increase in the maximum inside net platform area not exceeding 5% shall be permitted for the various rated loads.		
2.)	24" W x 84" Lg. w/ 5" Radial Corners Stretcher Compliant with 42" Wide Side Slide Doors (minimally)		
3.)	24" W x 84" Lg. w/ 5" Radial Corners Stretcher Compliant with 42" Wide Side Slide Doors (minimally) or 48" Wide Center Parting Doors (minimally)		

The rated load (i.e., capacity) for any elevator installed will be a minimum of 2,500 lbs., up to maximum of 4,000 lbs. with a passenger shape. 4500 lbs. and 5000 lbs. in a service shape.

When sizing elevators, consideration shall be accounted for the movement of mobility scooters, wheelchairs and stretcher compliance, as required by the building code.

A maximum (i.e., >5000 lbs. capacity) in a service shape may be exceeded based on requirements for special applications (e.g., hospital) and requires the prior written approval of the University Architect.

Campus Applications:

Design professionals or responsible design entities shall take into consideration the necessity for elevators to meet the various pedestrian foot traffic demands and certain duality-related functions (e.g., student housing move in/out periods, lab/classroom equipment movement, vivarium requirements, etc.). Traffic related studies are warranted to ensure students, staff and material movement are accounted for in the elevator design and equipment selection.

Hospital Applications:

Design professionals or responsible design entities shall take into consideration various pedestrian foot traffic demands and hospital functionalities to ensure ample elevator service for the movement of visitors, visitors in wheelchairs, small children, children in strollers, patients, staff and materials. Traffic related studies are warranted to ensure visitors, patients, staff and material movement are accounted for in the elevator design and equipment selection.

Inpatient Visitor and Outpatient Visitor elevators typically have a passenger shape with entrance doors on one side of the elevator platform. These types of elevators are allowed to be equipped with opposing side entrance doors (i.e., front and rear) of the elevator platform when building design warrants. These passenger shape elevators typically have a Class A classification.

Material/Staff Service, Inpatient Transport, Inpatient Trauma Transport, Automated Guided Vehicle/ Autonomous Mobile Robot (AGV/AMR), Sterile Process (SPD), Kitchen/Cafeteria, etc... typically require the elevators to have a service shape with opposing side entrance doors (i.e., front and rear) of the elevator platform to allow for free flow movement (i.e., pass through) in and out of the elevator. These service shape elevators typically have a Class C3 classification which is driven by the size, shape and weight of the load to be transported.

When required, Automated Guided Vehicle/ Autonomous Mobile Robot (AGV/AMR) requires design professionals or responsible design entities to coordinate the design of hallways, elevator lobbies and how the automatic operation of these autonomous devices will interact with the elevator controls and elevator signaling requirements. These types of elevators typically are not allowed for public or staff use. Elevator lobbies (i.e., detent and charging spaces) for these autonomous devices tend to be oversized. These oversized spaces allow for on and off movement of these devices from elevators. Elevator traffic and loading shall be restricted to the carrying of one (1) autonomous vehicle per elevator in a given trip to avoid overloading of elevator platform and potential elevator traffic signaling issues.

Freight Elevator Applications:

Design professionals or responsible design entity shall examine these types of elevators on a case-by-case basis as these are customizable. These elevators typically have a service shape which is driven by the size, shape and weight of the load to be transported. The type of door for these elevators are Vertical Bi-Parting type unlike the horizontally sliding type which are synonymous with most passenger and service shape elevators. Vertically Bi-Parting doors are typically the full width of the elevator platform to allow for an industrial truck load or vehicle to be transported. Freight applications are best served by either Hydraulic or Traction Drive technologies. Machine Room-Less (MRL) are not typically offered for freight applications due to the higher capacity ratings (i.e., >5000 lbs.) required and machine brake limitations.

Elevator and Escalator System Technologies:

Elevator systems shall primarily utilize Traction or Hydraulic type systems as the preferred drive systems by the University. Machine Room-Less (MRL) systems are considered a design alternate to Traction and Hydraulic systems. Where Traction and Hydraulic applications are not recommended by the design professional or responsible design entity, the design professional or responsible design entity shall thoroughly document why Traction and Hydraulic systems are not recommended for a given location. University Architect will review and provide written consent if MRL systems are approved.

Traction Drive Technology

Traction elevator drive technology (Geared or Gearless, VVVF with Regenerative Drive) shall be used for all elevators where overhead, pit conditions, capacity and travel permit. Traction systems can only be applied for those applications that will have the machine room located directly over the top of the shaft in a separate room or penthouse, adjacent to hoistway at lowest landing or intermediate landing.

1. The following criteria for the installation of new traction elevators should be followed:
 - A. For all structures containing seven (7) or more floors with a rise exceeding 60'-0", use of a geared or gearless traction type elevator is preferred.
 - B. Where geared traction elevators are installed, car speed shall not exceed 350 feet per minute.
 - C. Where gearless traction elevators are installed, car speed shall not exceed 500-700 feet per minute. Hospital elevators may require higher speed variation >700 feet per minute for specific hospital functions (e.g., Trauma Transport)
 - D. Traction steel rope suspension means shall be supplied and in accordance with manufacturers' requirements.
 - E. Heating and Cooling equipment and devices for machine room shall be reviewed and evaluated by the design professional or responsible design entity based on the applicable building code and manufacturers requirements.
 - F. Elevators shall be integrated with the fire detection system (required) and flood detection system (as required)
 - 1) Contain an ADA compliant visual alarm device during fire event
 - 2) Automatic return to lobby and shutdown feature in the event of fire detection.
 - 3) Automatic return to alternate lobby level, not main lobby level, in the event of flood event.

Hydraulic Drive Technology

Hydraulic elevator drive technology (Soft Start) shall be used for all elevators where overhead, pit conditions, capacity and travel permit. Hydraulic systems can only be applied for those applications that will have the machine/pump room located directly adjacent to hoistway at lowest landing or remote location less than 100 linear feet from the elevator hoistway at lowest landing.

1. The following criteria for the installation of new elevators should be followed:
 - A. For two (2) floor structures with a maximum rise of 18'-0", use of a Twin Jack Holeless (Single Stage Jack) hydraulic is preferred.
 - B. For three (3) to six (6) floor structures with a maximum rise of 60' - 0", use of a Twin Jack Roped or Direct Acting hydraulic is preferred
 - C. Where hydraulic elevators are installed, car speed shall not exceed 125 feet per minute. 100 feet per minute is a nominal rating for most applications.
 - D. The motor starters shall be one size larger than recommended due to their frequent starting and stopping.
 - E. Non-Submersible motors are preferred.
 - F. Direct Acting hydraulic, require double wall hydraulic piston casings on hydraulic elevators with waterproof seals at pit floor, and with waterproof, high pressure PVC Jack Casing at bottom of casings.
 - G. Heating and Cooling equipment and devices for machine/pump space shall be reviewed and evaluated by the design professional or responsible design entity based on the applicable building code and manufacturers requirements.
 - H. Elevators shall be integrated with the fire detection system (required) and flood detection system (as required)
 - 1) Contain an ADA compliant visual alarm device during fire event
 - 2) Automatic return to lobby and shutdown feature in the event of fire detection
 - 3) Automatic return to alternate lobby level, not main lobby level, in the event of flood event.

Machine Room-Less (MRL) Technology

Machine Room-Less (MRL) elevator drive technology (Gearless, VVVF with Regenerative Drive) shall be considered an alternate design to Traction and Hydraulic elevator technology when overhead, pit conditions, capacity and travel permit. MRL systems can only be applied for those applications that will have the controller room located at the top landing and adjacent to the hoistway. Closet and entrance jamb-mounted controllers shall not be provided due to service and maintenance constraints.

1. The following criteria for the installation of new elevators should be followed:
 - A. For all structures containing seven (7) or more floors with a rise exceeding 60'-0", use of a MRL, is to be considered an alternate design to Traction applications.
 - B. Where MRL elevators are installed, the car speed shall not exceed 500 feet per minute.
 - C. Traction steel rope suspension means shall be supplied and in accordance with manufacturers' requirements. Use of alternate suspension means (e.g., noncircular elastomeric-coated steel suspension members) shall be reviewed with University Architect for approval.
 - D. Heating and Cooling equipment and devices for MRL elevator machinery and control spaces shall be reviewed and evaluated by the design professional or responsible design entity based on the applicable building code and manufacturers requirements.
 - E. Elevators shall be integrated with the fire detection system (required) and flood detection system (as required)
 - 1) Contain an ADA compliant visual alarm device during fire event
 - 2) Automatic return to lobby and shutdown feature in the event of fire detection
 - 3) Automatic return to alternate lobby level, not main lobby level, in the event of flood event.

Escalator Technology

Escalator drive technology (VVVF) shall be considered for those installations that require the constant movement of pedestrians from various levels within a facility and where space will permit. Escalators shall be an all-inclusive design with controller, drive and all operating equipment self-contained within the confines of the escalator truss, as noted.

The escalators shall be designed to meet a Commercial to Medium Heavy-Duty environment. Commercial Duty escalators are primarily found in retail segments such as department stores, supermarkets, and shopping centers. Medium-heavy duty type escalators can also be found in some airport applications, schools, hospitals, hotels and office buildings. These types of escalators are designed to be cost competitive, visually appealing, and offer a variety of options in terms of architectural finishes and features.

The following criteria for the installation of new escalators should be followed:

1. Incline: 30 degrees (with respect to the horizontal)
2. Maximum Height Rise: 30'-0"
3. Horizontal Flat Steps: 2 or 3 Flat Steps at both top and bottom entry points
4. Transitional Radii (Top/Bottom): 1.5 m/1.0m
5. Operating Environments: Indoor or Semi Indoor
6. Nominal Step Width: 32 in. or 40 in.
7. Balustrade: Laminated tempered glass with Low Profile Handrail or Stainless Steel High Deck
8. Controller Location:
 - A. For Indoor Applications shall be Internal to Truss.
 - B. For Outdoor applications shall be in separate room preferably under escalator truss incline.
9. Speed: 100 feet per minute
10. Step Chains: Inside Roller Chains
11. Duty Cycle: 18-20 hours/ day
12. Dynamic Braking
13. Per New Jersey UCC Building Subcode, A sign stating "DO NOT USE A STANDING ESCALATOR AS A BUILDING STAIR" shall be permanently placed where it is readily visible to the general public at the top and bottom landings of an escalator. This requirement applies to new and existing escalator installations.

Controllers

All Elevator and Escalator technologies shall have the following requirements and apply as a minimum

1. The manufacturer / vendor shall provide a new VVVF control system, as noted, with all required functions including, but not necessarily limited to call allocation, logic functions, door control, speed sensing / position, all with non- proprietary microprocessor operation. The control system shall not require the use of any proprietary or specialized manufacturer diagnostic tools for purposes of trouble shooting and / or repair. No hand-held tools (data entry devices) will be acceptable for diagnostic or adjusting use. The manufacturer will turn over to the University Architect all tools / devices required for the maintenance of the elevator and escalator including equipment to reprogram software source codes at no extra cost to the University at the completion of the project.
2. Provide a malfunction signal to the controller which will indicate when the elevator or escalator is out of order. Rutgers will take the responsibility of transmitting this signal from the controller to its emergency maintenance system. Auxiliary contacts shall be provided by the Contractor to achieve this function.
3. All software, diagnostic, adjustment / tune-up manuals and documentation and any other documentation required for the maintenance of the elevator including tools or devices necessary to reprogram the software source codes shall be provided to the University Architect for approval prior to commencement of the installation of the elevator or escalator equipment. Once provided, no substitution of the equipment described in the manuals and documentation will be acceptable.
4. All printed circuit boards shall be available to the University for purchase as spare parts in any quantity deemed reasonable by the University. These spare printed circuit boards shall be exact duplicates of those in use and shall be provided with “as-installed” software programs. Overnight delivery of printed circuit boards must be available for emergency repairs. Printed circuit boards will be accompanied by all pertinent documentation for installation and use. All components of the elevator must be commercially available from standard parts suppliers.

Elevator Machine, Machinery Space and Control Rooms

All Elevator technologies within this standard shall have dedicated spaces for machine, hydraulic tank, and controller placement. Design professionals, design entity and contractors shall be responsible for ensuring these rooms and spaces meet all applicable codes. The following requirements apply as a minimum.

1. Spaces shall have direct accessibility without having to go through secondary rooms.
2. Shall be key controlled by the University.
3. The machine room , machine/pump room, machinery space and control room shall have heating and cooling equipment and or devices in accordance with the building code.
4. For Machine rooms and Control Rooms, these areas shall be supplied with a means of an outwardly swinging fire rated door measuring at least 3’-0” X 7’-0”.
5. Non-elevator-related equipment or piping may not be located or run through the machine room, machine/pump room, machinery space and control room.
6. For Machine Rooms and Control Rooms, these areas shall have at a minimum elevator mainline electrical disconnect, elevator cab light disconnect, machine room light switch and Ground Fault Circuit Interrupter (GFCI) located adjacent to the machine room door in accordance with NFPA 70. These devices shall be within 3’-0” line sight of controller

per University Architect requirements, as best as feasible.

7. For Machine Rooms and Control Rooms, clearance shall be provided for all control panels and equipment cabinet doors to open at least 90 degrees, and at least three (3) feet free of obstructions on all serviceable sides of machinery. Existing conditions may prohibit this requirement and shall be evaluated based on site-specific conditions.
8. For Machine Rooms and Control Rooms, the room must be equipped with a minimum of one (1) wall mounted fire extinguisher.
9. For Machine Rooms and Control Rooms, the room shall be provided with 7'-0" of minimum height clearance measured from finished floor to lowest obstruction in the space per ASME A17.1/CSA B44. 8'-0" is recommended.
10. For MRL machinery spaces, secondary motor disconnecting means location shall be identified by the design professional or responsible design entity and shall be provided in the overhead machinery area. Coordinate secondary motor disconnecting means in accordance with manufacturer's requirements.
11. For MRL machinery spaces, these areas shall have provisions for light switch, light(s) and Ground Fault Circuit Interrupter (GFCI) within the machinery space.
12. For Machine Rooms, Control Rooms and MRL machinery spaces, heating and cooling equipment or devices shall be coordinated by the design professional or responsible design entity to avoid interference with rotating elevator machinery within the space and overhead (MRL Applications) overhead.
13. For MRL machinery spaces, design professional or responsible design entity shall coordinate location and access to the governor based on manufacturers requirements and any applicable code requirements.
14. For Hydraulic Applications, the design of hydraulic elevator machine rooms should be such as to provide for proper environmental conditions to prevent overheating or congealing of the oil.

Elevator Pits

All Elevator technologies have the following requirements. ■

1. Install a ladder, emergency stop switch, light(s) and a sump pit in the elevator pit. Sump pump shall be provided when Firefighters Operation is provided for elevators per ASME A17.1 /CSA B44.
2. For Hydraulic Applications, review of fire suppression equipment (i.e., sprinklers) and signaling devices shall be coordinated by the design professional to ensure compliance with applicable building code. Scavenger pump provisions shall be provided to remove excess oil from jack heads.
3. For Direct Acting Hydraulic Applications, design professionals or responsible design entity shall review and coordinate requirements for placement of jack and casing within the ground along with proper sealing requirements to prevent water infiltration in and around the hydraulic jack within the pit slab cutout.

Elevator Cabs

The following cab interior features are intended to establish a baseline to promote vandal resistance without diminishing architectural design freedoms. The following requirements apply as a minimum. Deviation from below shall be reviewed with University Architect for approval.

1. Car Shell: No. 14-gauge unpainted/painted furniture steel or 304 Stainless Steel with No. 4 finish reinforced and designed for permanent installation of hung wall panels. Apply sound deadening material to the sides exposed to hatch side. Cab Shell wall panel sections shall not exceed 24" in width.
2. Hung Wall Panels: Individual hung wall panels shall not exceed 24" in width and shall be comprised of vandal resistant finishes (e.g., Rigidized Stainless Steel, etc.). The panels shall be affixed to cab shell to utilizing Z style clips to prevent dislodgement.
3. OBSERVATION/GLASS APPLICATIONS ONLY: Car Shell: Steel Mullions/Glass Wall Panels: 9/16" clear laminated glass panels in 12-gauge formed solid metal 304 Stainless Steel frames with No. 4 finish. Laminated glass panels must conform to ANSI Z97.1 and CPSC 16 CFR Part 1201. Markings as specified in ANSI Z97.1 shall be on each separate piece of glass and shall remain visible after installation.. Coordinate glazing requirements with glazing specifications. Incorporate stainless steel angles and anchors. All glass is to be provided with a scratch protection system. For MRL applications, coordination required with manufacturers on cab design, as weight of glass and mullions play a critical role in overall weight limitations associated with MRL systems.
4. Base, Reveals-Frieze: No. 14 gauge unpainted/painted furniture steel or 304 Stainless Steel with No. 4 finish at the sides and rear of the car enclosure. Base to be provided with ventilation slots and shall be approx. 4" to 6" in height.
5. Stationary Front Returns Panels, Entrance Post and Transoms: No. 14-gauge 304 Stainless Steel with No. 4 finish . Cut-outs for fixtures shall be provided.
6. Cab Doors: The doors shall be 1" minimally. Doors shall be 16-gauge, with 14-gauge

internal stiffeners. Doors shall be 304 Stainless Steel with No. 4 finish. Apply sound deadening to the interior of the door panels exposed to the hatch side.

- A. Cab Door Equipment: Furnish and install GAL's MOVFR HH closed loop door operator designed to operate car and hoistway doors simultaneously at a specified speed.
 - B. Door Hangers: Door hangers for cars and hoistway doors shall be of the two-point suspension sheave type equipped with grease packed heavy duty precision ball bearings, eccentric up-thrust rollers and oiler/cleaners.
 - C. Non-Contact Door Reopening Device: Provide car door non-contact reopening device of the proximity type.
 - D. Door Lock Monitoring: Comply with ASME A17.1/CSA B44
7. Elevator Cab Sill: Provide extruded stainless-steel sills.
 8. OBSERVATION/GLASS APPLICATIONS ONLY: Cab Doors: The doors shall be 1" minimally, 12-gauge solid metal 304 Stainless Steel frames with No. 4 finish. Full 9/16" clear laminated panels and or vision panels shall be substantially flush with stainless steel door finish. Panel sizes shall be in accordance with ASME A17.1/CSA B44. Laminated glass panels must conform to ANSI Z97.1 and CPSC 16 CFR Part 1201. Markings as specified in ANSI Z97.1 shall be on each separate piece of glass and shall remain visible after installation.
 9. Cab Flooring and Subflooring: Finished flooring material type and thickness to be coordinated with University Architect. Subflooring at a minimum shall consist of two (2) 3/4" thick marine grade plywood substrate. Special consideration shall be taken into account when choosing flooring materials. Flooring materials shall be chosen based on direct environmental conditions (e.g., rain, snow, etc....) Coordinate minimum thickness as required to meet slip resistance requirements per ADA.
 - A. Finished Flooring:
 - i. 1/8" thick, 12"x12" rubber tiles with 1" spaced studs.
 - ii. Tile color: Black
 - iii. Stud material: Stainless steel
 10. Canopy: 12-gauge furniture steel, bolted or welded at all corners to represent one-piece construction. Reinforced canopy in accordance with ASME A17.1/CSA B44. Rigidly fasten canopy to elevator car frame. Canopy interior to cab shall be painted reflective white.
 11. Canopy Emergency Exits: 12-gauge furniture steel. Ensure to operate per ASME A17.1/ CSA B44 and have proper electrical contacts and mechanical locks on the exterior of the cab enclosure. No other key to the building shall unlock the emergency exit lock except access switch keys, which may be keyed alike. Canopy Emergency Exit interior to cab shall be painted reflective white.
 12. Ventilation: Ventilation of the exhaust type shall be provided in the elevator in accordance with ASME A17.1/CSA B44 and Energy Conservation Code.

13. OBSERVATION/GLASS APPLICATIONS ONLY: Solar gain is prevalent within all

glass elevator hoistway, the elevator cab shall be supplied with air conditioning unit. This unit shall be installed on top of the car and have the capability to provide ventilation air to the car in accordance with the ASME A17.1/CSA B44 requirements. The unit shall have an electric heater to maintain a cab temperature of 50°F in winter. Thermostatic controls shall be in accordance with manufacturers' requirements. A condensate evaporator shall be provided to dispose of condensate during cooling mode operation

14. Lighting: Provide LED type and or Approved Equal fixtures in accordance with ASME A17.1/CSA B44 and Energy Conservation Code that will provide thirty (30) foot candles illumination in the cab. The light output of the fixtures shall be adjustable. If a fixture is in an area occupied by the ceiling emergency exit, arrange it so it can be opened without fixture removal. Protect lamps from breakage with guards as required. Provide a CSA approved emergency power supply and the battery pack shall be sized to provide a minimum of four hours of continuous operation for two car light fixtures.
15. Handrails: Provide 2" minimum flat bar or 1 1/2" diameter 304 Stainless Steel with No. 4 finish with tapered end sections and reinforced backer plates. All welds shall be ground smooth and invisible. All fasteners shall be concealed.
16. HOSPITAL AND MATERIAL TRANSPORT APPLICATIONS: Bumper Rails: Provide 6" minimum flat bar 304 Stainless Steel with No. 4 finish with tapered end sections and reinforced backer plates. All welds shall be ground smooth and invisible. All fasteners shall be concealed.
17. Pad Hooks and Protective Pads: Provide 304 Stainless Steel with No. 4 finish pad buttons. Each elevator shall be provided with one set of quilted protective pads, which cover sides, rear, and front panels. Identify pads by car number and panel location.
18. Security Mirrors: Provide security mirrors in all passenger elevator cabs.
19. Car Top Safety Handrails: Stainless steel handrails shall be provided and in compliance with ASME A17.1/ CSA B44.
20. Car Top Inspection Station: Provide in compliance with ASME A17.1/ CSA B44.
21. Bell Alarm System: Bell alarm system for each elevator shall be properly located on the bottom of the platform and audible outside hoistway when activated by the ALARM call button on each car control station.
22. Work Lights and Receptacles: Provide guarded LED work lights with GFCI 120-volt receptacles at top and bottom of elevator car.

Elevator Entrances

The following elevator entrance features are intended to establish a baseline to promote vandal resistance without diminishing architectural design freedoms. The following requirements apply as a minimum. Deviation from below shall be reviewed with University Architect for approval.

1. Frames: The frames shall be constructed of 14 gauge 304 Stainless Steel with No. 4 finish.
2. Entrance Sill: Provide extruded stainless-steel sills
3. Hoistway Doors: The doors shall be 1" minimally. Doors shall be 16-gauge, with 14-gauge internal stiffeners. Doors shall be 304 Stainless Steel with No. 4 finish, reinforced and provided with keyways and escutcheons.
4. OBSERVATION/GLASS APPLICATIONS ONLY: Hoistway Elevator Doors: The doors shall be 1" minimally, 12-gauge solid metal 304 Stainless Steel frames with No. 4 finish. Full 9/16" clear laminated panels and or vision panels shall be flush with stainless steel door finish. Panels sizes shall be in accordance with ASME A17.1/CSA B44. Laminated glass panels must conform to ANSI Z97.1 and CPSC 16 CFR Part 1201. Markings as specified in ANSI Z97.1 shall be on each separate piece of glass and shall remain visible after installation.
5. Jamb Braille Plate: Die-cast jamb markings (two per entrance) mounted in compliance with ADAAG.
6. Star of Life Identification Plate: Die-cast jamb markings for Star of Life stretcher compliancy (two per entrance) for elevators(s) in accordance with local building code requirements. Star of Life shall be a white symbol on a contrasting blue background.
7. Entrances shall bear a 1½-hour label of Underwriter's Laboratories, Inc, minimally.

Hall/ Lobby Signaling Devices:

The following hall/lobby signaling device features are intended to establish a baseline to promote vandal resistance without diminishing architectural design freedoms. The following requirements apply as a minimum. Deviation from below shall be reviewed with University Architect for approval.

Hall Call Station:

1. Stations shall be provided with 10-gauge 304 Stainless Steel with No. 4 finish faceplates for Indoor applications and 10-gauge 316 Stainless Steel with No. 4 finish for outdoor applications at all elevator landings served.
2. Stations shall be flush with mounting surface including matching flush type tamper-proof fasteners. Surface mount applications shall be avoided (e.g., inch line style)
3. Provide vandal resistant LED-illuminated (center jewel or halo ring), call-acknowledging single button at each terminal floor and up and down pushbutton at typical floor.
4. Provide firefighter key switch and engraving in the main lobby level hall station as required by ASME A17.1/CSA B44 and New Jersey UCC Building Subcode.
 - A. All key switches used in the hallway should be on the University master key system.

Emergency fire key which shall be Yale 3502. Twelve copies of the key shall be provided to the University Architect for the Emergency Services Department's use.

5. Provide IN CASE OF FIRE signs integral with faceplate and in compliance with ASME A17.1/ CSA B44 and New Jersey UCC Building Subcode at all floors served.
6. Provide Illuminating fire hat integral within the faceplate at all floors served.
7. Provide Emergency Power jewel and engraving, as required by ASME A17.1/ CSA B44.
8. Provide Elevator Communications Failure jewel, buzzer, reset switch, and engraving as required by ASME A17.1/CSA B44.
9. FLOOD CONTROL OPERATION: Provide Out of Service Jewel at all floors served, when applicable.
10. Card Reader and or Key Switch Access: Coordinate hall station design and wiring requirements based on Rutgers Access management department requirements. Card Reader and or Key Switch access functionality shall be approved prior to the conclusion of the design phase (e.g., Design Development)

Combination Hall Position Indicator (PREFERRED):

1. Combination Position Indicators shall be provided with 10-gauge 304 Stainless Steel with No. 4 finish faceplates for Indoor applications and 10-gauge 316 Stainless Steel with No. 4 finish for outdoor applications at all elevator landings served.
2. Combination Position Indicators shall be flush with mounting surface including matching flush type concealed tamper-proof fasteners. Surface mount applications shall be avoided (e.g., inch line style)
3. Provide vandal resistant LED-illuminated triangle, round, or dot type projecting lens with audible and adjustable chime. For terminal floors, projecting lens shall indicate either up or down direction. Typical floors projecting lens shall indicate up and down. Lens style and color selection by University Architect.
4. Provide LED illuminated 2" minimum display
5. Position Indicator shall be horizontally mounted above each entrance. at all elevator landings served.

Hall Position Indicator (OPTIONAL):

1. Position Indicators shall be provided with 10-gauge 304 Stainless Steel with No. 4 finish faceplates for Indoor applications and 10-gauge 316 No. 4 Stainless Steel for outdoor applications at all elevator landings served.
2. Position Indicators shall be flush with mounting surface including matching flush type concealed tamper-proof fasteners. Surface mount applications shall be avoided (e.g., inch line style)
3. Provide vandal resistant LED-illuminated triangle, round, or dot type projecting lens with audible and adjustable chime. For terminal floors, projecting lens shall indicate either up or down direction. Typical floors projecting lens shall indicate up and down. Lens style and color selection by University Architect.

4. Position Indicator shall be horizontally above or vertically mounted adjacent to each entrance at all elevator landings served shall be reviewed with University Architect for approval.

Fire Command/Lobby Control Panel/Emergency Power Control Panel

(When Required by Building Code):

1. Fire Command/Lobby Control Panel/Emergency Power Control Panel shall be provided with 10-gauge 304 Stainless Steel with No. 4 finish faceplates for Indoor applications and 10-gauge 316 Stainless Steel with No. 4 finish for outdoor applications at designated level for emergency personnel use. Fire Command/Lobby Control/Emergency Power Control Panels are custom designs and per the building requirements. Design professionals or design entities shall coordinate the requirements and placement of such devices so accessible for emergency personnel use.
2. Fire Command/Lobby Control Panel/Emergency Power Control Panel shall be flush with mounting surface including matching flush type concealed tamper-proof fasteners.
3. Provide the following operational and signaling controls at a minimum. Design professionals or responsible design entities shall coordinate any additional requirements as required by the authority having jurisdiction and Rutgers operations for incorporation into custom panel.
 - A. 2"-high LED position and direction indicators
 - B. Car On/Car to Lobby/Car Off three-position keyed switch with pilot light.
 - C. Phase 1 Firefighters Key Switches
 - D. Security On/Off keyed switch (OPTIONAL)
 - E. Emergency selector switches and emergency power-on indicator
 - F. "Car at the designated floor with its doors open" indicators
 - G. Master intercom system/Telephone
 - H. Remote wiring from outside elevator shaft to fire command room, lobby panel area or security room/area by others. Final connections at panel by "Installer"

Hoistway Access Station:

1. Stations shall be provided with 10-gauge 304 Stainless Steel with No. 4 finish faceplates for Indoor applications and 10-gauge 316 Stainless Steel with No. 4 finish for outdoor applications at terminal landings only.
2. Stations shall be flush with mounting surface including matching flush type tamper-proof fasteners. Stations can be directly mounted to lobby walls or inconspicuously mounted to inset entrance jamb frame (e.g., return side).
3. Provide access key switch which shall be keyed differently than other typical keys used to operate the elevator. Keying shall be in accordance with Security Group Classifications as required by ASME A17.1/CSA B44 and New Jersey UCC Building Subcode.

Car Signaling Devices and Operation:

The following car signaling device features are intended to establish a baseline to promote vandal resistance without diminishing architectural design freedoms. The following requirements apply as a minimum. Deviation from below shall be reviewed with University Architect for approval.

Main Car Operating Panel:

1. Car Operating Panel shall be provided with 10-gauge 304 Stainless Steel with No. 4 faceplates for Indoor applications and 10-gauge 316 Stainless Steel with No. 4 finish for outdoor applications.
2. Stations shall be flush with mounting surface including matching flush type tamper-proof fasteners and inconspicuous hinge for service.
3. Main Car Operating Panel face plates shall have a factory-provided knock- outs to receive a cylinder and core. All key switches shall match the building lock cylinders. All key switches must be on the University's master key system
4. Provide vandal resistant LED-illuminated (center jewel or halo ring) , call-acknowledging single button for each floor served.
5. Provide LED 3" or greater car position indicator display.
6. Provide the following vandal resistant operational buttons, switches and jewels with appropriate engraving as required by ASME A17.1/CSA B44, New Jersey UCC Building Subcode and ADA Standards for Accessible Design (ADA):
 - A. Door Open/Door Close Buttons
 - B. Rear Door Open / Rear Door Close Buttons (AS REQUIRED)
 - C. Alarm
 - D. Auto-dial Telephone
 - E. Emergency Stop Switch
 - F. Yes/No Buttons for Two Way Video Communication
 - G. Door Hold (COORDINATE WITH HOSPITAL APPLICATIONS)
 - H. "Help is on the Way" Illuminating Jewel
 - I. Speaker Holes for Hands Free Phone Communication
 - J. Card Reader and or Key Switch Access: Coordinate main car operating panel design, wiring and traveling cable requirements based on Rutgers Access management department requirements. Card Reader and or Key Switch access Card Reader and or Key Switch access functionality shall be approved prior to the conclusion of the design phase (e.g., Design Development).
7. Provide the following vandal resistant operational buttons and switches within locked Firefighters Operation Cabinet with appropriate engraving as required by ASME A17.1/CSA B44 and New Jersey UCC Building Subcode.

- A. Call Cancel
- B. Illuminating Fire Hat
- C. Emergency Stop
- D. Phase II Firefighters Operation Switch
- E. Door Open/Door Close (REQUIRED)
- F. Rear Door Open/Rear Door Close (AS REQUIRED)
- G. Provide the following vandal resistant operational buttons and switches within locked Service Cabinet with appropriate engraving as required by ASME A17.1/CSA B44 and New Jersey UCC Building Subcode
- H. Inspection
- I. Independent Service
- J. Car Light
- K. Fan
- L. Emergency Light
- M. Access
- N. Card Reader Shutoff/Override (AS REQUIRED)
- O. Emergency Light Test
- P. Two spares
- Q. Duplex Ground Fault Circuit Interrupter (GFCI)
- R. Provide flush with faceplate die-cast raised markings / lettering for the car buttons and car controls in compliance with the "Handicapped Requirements" of ASME A17.1/CSA B44, New Jersey UCC Building Subcode and ADA Standards for Accessible Design (ADA).
- S. Engraving shall be in compliance with ASME A17.1/CSA B44, New Jersey UCC Building Subcode and ADA Standards for Accessible Design (ADA).
- T. All key switches used in the car should be on the University master key system. Emergency fire key which shall be Yale 3502. Twelve copies of the key shall be provided to the University for the Emergency Services Department's use
- U. Emergency Communication Device: Emergency communication devices shall be vandal-resistant hands-free phone and in compliance with ASME A17.1/CSA B44, New Jersey UCC Building Subcode and ADA Standards for Accessible Design (ADA). Model selected shall be electronics only, one-button product that shall be mounted behind the elevator's car operating panel.
- V. Two-Way Elevator Visual Emergency Communication System (AS REQUIRED)
 - i. Two Way Elevator Visual Emergency Communication system shall be in accordance with applicable codes in effect at time of design and permitting.

- ii. Provide non-proprietary controller panelboard mounted behind the elevator's car operating panel.
- iii. Provide adjustable camera shall be located within car operating panel. Camera shall be flush mounted to car operating panel. Camera shall be located to provide full view of the elevator cab and elevator floor. Camera shall be viewed remotely by rescue personnel.
- iv. Provide LCD display screen on car operating panel shall be installed.
- v. Provide vandal-resistant buttons labeled "Yes" and "No."
- vi. Coordinate monitoring with Rutgers Emergency Operations, where system can be monitored locally within the building or at a remote location offsite.

Auxiliary Car Operating Panel (OPTIONAL):

Auxiliary Car operating Panel are typically installed when there are opposing side doors on the elevator platform (i.e., front/rear). Auxiliary panels can be considered optional and have similar outline and functionality as the Main Car Operating Panel with the following exclusions:

- 1. No Firefighters Operation Cabinet required
- 2. No Service Cabinet required
- 3. No Hands-Free Phone required
- 4. No Two -Way Elevator Visual Emergency Communication