PART 1: GENERAL

1.01 The Design Professional shall review, evaluate and comply with the following criteria in the planning, design and installation phases of vertical passenger elevator transportation systems:

A. Codes and Standards:

1. Building Code of New York State
2. Fire Code of New York State
3. Mechanical Code of New York State
4. New York State Department of Labor Division of Safety and Health, Industrial code Rule #8
5. Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities
7. NFPA Standards 13 and 70
8. Energy Conservation Construction Code of New York State
9. State University Construction Fund Elevator Standard (Contract College Facilities only)

B. Verify which Code versions are currently in force by the State of New York and local authority having jurisdiction.

C. Verify any particular requirements for the installation of passenger elevators currently in force by the local Fire Marshall and local authority having jurisdiction.

D. This standard does not apply to freight elevators as classified by ASME. Where the term “freight” is used in this standard, it applies only to passenger elevators which may be at the request of the customer to occasionally accommodate vertical movement of materials.

E. The Design Professional shall evaluate the following elevator selection criteria during the design “Program” Submission (Submission must be submitted to the elevator maintenance program manager for review):

1. While elevator car speed or car interior capacity is important, an overlooked critical element of passenger handling capacity is entrance door design. Elevator cars typically spend most of their real clock time parked at floors discharging passengers and embarking others. It is important to evaluate car door entrance sizes, car panel types and sizes, car door open periods and nudge times in relationship to the passenger type and loads expected. Industry standard elevator car entrances are normally 40 to 42 inch width openings X 80 inches high. In many cases this size may be too small to accept the desired simultaneous loading and unloading of car passengers in high traffic situations. Hoistway dimensions must be carefully reviewed to insure proper car door entrance sizes and car panel or landing door recesses needed inside the hoistway.
2. Proprietary elevator system manufacturer’s offer “architectural/engineering” hard copy bulletins, CD Rom file versions or internet web site based selection criteria. The Design Professional is urged to apply caution and diligence in employing these selection guides provided by such manufacturer’s as their use may not meet with the required performance and expectations of these Elevator Standards.

3. The Design Professional’s evaluation and analysis of elevator system shall include:

   a. Building population and peak usage times.
   b. Car speeds and time wait intervals between landing calls.
   c. Service or material handling needs.
   d. Location of elevators with respect to exits and egress passageways.
   e. Car platform size and car capacity.
   f. Mitigation of elevator noise and elevator car voice annunciation.
   g. Means of hoistway or machine room construction to contain noise and vibration from elevator systems.
   h. Means of maintaining elevator machine room ambient temperature.
   i. Elevator car construction, finish, appearance.
   j. Standardization of independent key and/or card “swipe” control with elevator.
   k. Fireman’s Phase I and Phase II requirements, coordinated with local Fire Marshall.
   l. Available electrical voltages.
   m. Seismic protection considerations.
   n. Standby electrical power and/or emergency lowering systems.
   o. Fire protection.
   p. Elevator pit water proofing, impact from ground water or artisan conditions, soil conditions.
   q. Buried utilities or man made obstructions beneath the hoistway construction “foot print”.
   r. Elevator system vertical forces on guide rails and impact loading on pit located cylinder heads and buffer assemblies which shall be resisted by hoistway pit design and construction.
   s. Soil boring to determine pit and/or in ground cylinder compatibility.
   t. Pit and overhead run by and safety clearances per Code.
   u. Machine room location, interior size to meet all clearances.
   v. Simplex selective for single cars, duplex selective car operation for two or more cars served by the same hoistway.
   w. Potential effects to elevator car and landing doors, or generated noises from wind or building stack effect at lower building entrances or lobbies.
4. ADA requirements for elevators shall be developed by evaluating the elevator sub-systems proposed. In evaluation, make specific reference to the ADA Code section number:
   a. Automatic elevator car operation and self-leveling.
   b. Lobby hall call button criteria.
   c. Hall lantern criteria.
   d. Hoistway entrance signage.
   e. Door protective and reopening criteria.
   f. Door and signal timing for hall calls.
   g. Door delays for car calls.
   h. Elevator car floor plan, minimum car interior dimensions.
   i. Elevator car floor surfaces.
   j. Car illumination levels.
   k. Car controls, control indicators, control buttons, mounting heights.
   l. Car control locations and car position indicators.
   m. Emergency communications.

5. Type of elevator drive system proposed.

F. Estimate of Construction Cost: Prepare an estimate of construction costs reflecting all general construction, elevator system components, related mechanical and electrical, and special elevator system components including, but not limited to: security reader card system, and emergency electrical power, if required.

   1. Estimates of construction cost shall be prepared for each program phase submission. The estimate of construction cost may provide lump sum breakdowns, but shall be delineated in break downs according to each C.S.I. specification number. A contingency of no more than ten percent may be applied.

G. Outline Technical Specifications: Prepare an outline technical specification at the program phase submission.

H. Drawings: Provide at each submission phase, a set of coordinated elevator drawings indicating hoistway, pit, and machine room and lobby landings including:

   1. Architectural, including door and frame construction.
   2. Structural.
   3. Electrical.
   4. Elevator system.
   5. HVAC including exhaust and/or ceiling.
   6. Fire sprinkler system protection and fire alarm system protection.
I. The Design Professional, as part of their services and at their own cost, shall retain the services of a New York State licensed Professional Engineer who specializes in the design, specification, and installation of vertical passenger elevator systems to provide engineering services as may be necessary to meet or comply with these Elevator Standards.

J. These Elevator Standards are only a limited guide toward directing the design professional to materializing in the planning, selection, and design of elevator systems. The Elevator Standards do not relieve the design professional of carrying out all professional services, standards and responsibilities required of him/her by Law or by Agreement with Cornell University. The Elevator Standards do not constitute a technical specification on to themselves, nor shall they be reproduced in print and incorporated into the project contract documents by the design professional.

1.02 ELEVATOR SYSTEM SERVICE CRITERIA

A. The design professional shall incorporate the following elevator system performance criteria:

1. Cars will serve all building levels including basement and penthouse unless directed otherwise by the Cornell University Project Manager.
2. Front and rear door car operation shall not be contemplated except where their use renders economical advantage to the project.
3. Corner post elevator car construction shall not be provided.
4. Hoistways, shafts, and machine rooms shall be enclosed within code required fire rated construction.
5. Elevators grouped into a common hoistway shall be operated from a master duplex collective dispatching system.
6. Elevator drive system applications shall be:

<table>
<thead>
<tr>
<th>BUILDING TYPE</th>
<th>ELEVATOR TYPE</th>
<th>CONTRACT SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low rise buildings (up to four landings)</td>
<td>Hole-less hydraulic</td>
<td>150 FPM</td>
</tr>
<tr>
<td>Medium rise buildings (five to nine landings)</td>
<td>Traction</td>
<td>350 FPM**</td>
</tr>
<tr>
<td>Highrise buildings (ten landings or higher)</td>
<td>Traction</td>
<td>550 FPM**</td>
</tr>
</tbody>
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** Elevator speeds indicated are nominal and may be higher in contract speed if program design phase analysis determines economical best use of fewer elevators, or if elevator is to be gearless traction type.

7. Buildings with laboratories shall have at least one elevator car:
   a. Rated for 6,000 pounds capacity.
   b. Car control panel shall have key override special use for authorized personnel.
   c. Car doors shall provide a 60-inch clear opening into car.
   d. Interior finished car ceiling height shall be a minimum of 96 inches.
8. Elevators serving administration spaces shall have at least one elevator car home automatically to the most important floor landing and car door shall open when idle.

9. Medium and high rise building elevators shall be designed for and equipped:
   a. Elevators programmed by a closed loop solid state microprocessor group supervisory system based upon and analyzed by artificial intelligence telemetry data recorded by the elevator dispatcher controller. Dispatch system shall continuously monitor changing operations in various traffic situations and enable each elevator car to be assigned elevator traffic responsibilities that most efficiently accommodate the varying passenger traffic demands.
   b. Automatic load weighing set for an upset of approximately 80% full car load rating, that when realized by the weighing system, shall cause the elevator to bypass corridor calls and initiate dispatch of the car at the main terminal prior to the elapse of the normal dispatching interval.
   c. False car call checking and canceling controls to minimize nuisance stoppages to empty landings.
   d. Hoistway rope compensating chains.

B. Elevator Traction Drive Applications:
   1. Gearless traction machines shall be provided whenever of economical advantage to do so as compared with roped traction driven machines.
   2. Roped traction machines shall be provided for all medium and high rise applications at the rated car speed.
   3. Under no case shall hydraulic driven elevators be provided for medium rise buildings unless the elevator is to be used exclusively for equipment service and vertical transportation of people is secondary. In any case the elevator shall be made ADA compliant.
   4. Roped hydraulic applications shall not be used, particularly where it appears such application may fit medium rise building applications.

C. Traction Drive Machine Rooms:
   1. Traction machine drives generally fall into one of three categories:
      a. Overhead.
      b. Basement.
      c. Machine room less*

*The Design Professional is cautioned that new generation elevator systems, often referred to as “machine room less” will require additional hoistway clearances, additional upper hoistway run by clearances than normal and still require a space outside of the hoistway for house electrical equipment. Also, elevator equipment manufacturers may not offer a system based upon non-proprietary equipment.
2. The design professional shall include in the elevator system program phase evaluation:

   a. Overhead roped traction machines and gearless machines require a penthouse machine room enclosure. Visual encumbrances on building roof lines may be objectionable.

   b. Machine room less and even basement traction located drive machines may still require hoistway run by clearance heights, and structural overhead beams which can cause the hoistway to rise through and above the building roof line.

   c. If machine room, less over head traction machines, is considered, the Design Professional shall apprise the Project Manager of any Code variances or special conditions necessary for design and installation.

   d. Basement roped drive traction machines are uncommon, but equipment manufacturers still offer such equipment. Where roof line visual considerations must not be compromised, a basement traction machine system should be considered. Basement traction systems will require deflector drive sheaves to encroach into the hoistway, so hoistway clear dimensions must be factored.

D. Machine Room Environmental Control:

1. All elevator machine rooms (also included by reference are machine room less electrical spaces) require a mechanical cooling HVAC system to maintain a range of acceptable space temperatures conducive for control, leveler and dispatch systems operation.

   a. Design Professional shall consider all internal and external heat gains which may impact machine room temperature.

   b. Use of air source heat pumps or DX refrigerant systems which can not ordinarily operate at low ambient conditions shall be avoided unless special controls are provided by the HVAC equipment manufacturer as part of a factory installed, wired, and tested system prior to shipment.

   c. Fluid piping systems such as steam, condensate, chilled water and heating hot water piping are not permitted inside of elevator machine rooms.

   d. Use of exhaust for space cooling should be avoided as introduction of ambient dust and pollen can be detrimental to control equipment.

1.03 ELEVATOR CONSTRUCTION QUALITY CONTROL AND ELEVATOR ACCEPTANCE

A. Submit to Cornell complete shop drawings and submittals of all elevator system construction.

B. Submit manufacturer’s original samples of all materials proposed for exposed finished installation. Samples shall become the property of Cornell University.
C. In addition to any other quality assurance inspections, the design professional shall review and require by means of performance specifications and field review the following:

1. Ride Quality: The design professional needs to specify quality elevator car ride. Evidence of quality car ride, however, will not necessarily become evident until after substantial completion of the construction, so it is important that the design professional carefully review elevator construction progress. The design professional shall specify and review the quality of the elevator ride in both up or down direction, fully loaded and unloaded.

2. Acceptance of the elevator system by the design professional, local authority having jurisdiction or issuance of a certificate to operate does not imply acceptance of quality car ride. Cornell University shall test and commission for ride quality. Only after commissioning the elevator will Cornell accept the elevator.

3. Elevator car cab construction and performance:
   a. Elevator front left and right return, door transom shall be plumb, aligned and edges parallel with adjacent finished surfaces. Evenly secured from bottom to top door transom so that no gaps or exposed edges can be pried open or lifted outward.
   b. Design cab floor with sufficient rigidity to avoid deflection under maximum load conditions.
   c. Seams in flooring materials are not acceptable except for seams continuously heat fused as one beaded joint.
   d. The car control panel assembly shall be plumb and secured with security fasteners. All wiring shall be concealed. Control panel edges are to be recessed to resist being pried open.
   e. At each floor, the clearance between the cab and landing sills shall be a maximum of 1/8 inch. The sill clearance shall not vary between floor levels.
   f. The maximum acceptable tolerance for car leveling at each floor shall be 1/16 inch.
   g. Car running speed:

      1) Traction Elevators: car speed (for both fully loaded and empty cars) shall be maintained within 5% of the specified car speed in both the up and down directions.

         (a) Run time between consecutive floors shall not deviate more than 1.5 seconds. Run time shall be measured from the start of door closing until the car is stopped on the next level with its door at least 75% open.

      2) For hydraulic machines, car speed and run time between consecutive floors is maintained per traction machine elevator criteria in the up direction only.
h. Car door opening speed shall be no more than 1.0 feet per second with door reversal dimension travel no more than 2-1/2 inches. Door opening times shall be timed to be no more than 1.5 to 2.5 seconds, but will vary with door panel arrangement, door width, special or ADA requirements and Code. The design professional shall review all such requirements.

i. Car door closing times shall be based upon Code requirements, but generally no more than 2.4 to 3.5 seconds. Determine actual closing times with ASME Code equations.

j. Car door dwell time shall be initially set for 3.0 seconds, but field adjustable to greater times as Code or special requirements may require.

k. Car door “nudging” time shall be 4.0 seconds, with a 5.0 second advance signal per ADA criteria based upon distance, with a maximum field adjusted time up to 20 seconds.

l. Door closing pressing shall not exceed 30 PSI. An instrument approved to measure the door closure force shall be used to verify this requirement.

4. Check hydraulic elevator in ground cylinder alignment, performance, before proceeding with each phase of construction work scope:

a. Provide a report to certify the wellhole is plumb. If the wellhole is not plumb, provide at no cost to Cornell University an analysis of free wellhole annular space for maintaining aligned cylinder piston.

b. All wellholes shall be fitted with a full size, schedule 40 ASTM A-36 steel casing, extending entire rise of wellhole.

c. Upon installation of PVC leakage containment vessel and cylinder, employ spider, plumb line or laser to verify axial alignment of cylinder with respect to elevator car travel in hoistway.

d. Upon installation of piston into cylinder, perform alignment test by extending the plunger piston by force of pumped hydraulic oil to approximately one half of its extended distance into the hoistway up to the platen plate attached to the elevator sling bolster channel in alignment and rotation of the plunger is necessary to attain alignment inside the hoistway with out dog leg interference from the inside cylinder wall, this shall only be permitted if the plunger is fabricated with a truncated stop ring quadrant and upon test and inspection of the cylinder top ring packing by Cornell University.

e. Prior to elevator acceptance, replace the cylinder top ring packing.

f. Test and observe that with the plunger fully extended up into the hoist that a sufficient allowance of hydraulic oil is left in the storage reservoir and that the pump does not entrain air or cavitate.

g. Test and observe that with the plunger fully recessed, that the hydraulic oil level in the storage reservoir is at least 4 inches below the top edge of the oil storage vessel.

h. Test and observe that with the elevator car left at the top most landing for twenty four hours, no drop in height of elevator car sill below the adjacent landing sill is detected and that no oil has leaked on to the packing ring.
5. Finished elevator acceptance tests:

   a. All tests required by The Safety Code for Elevators and Escalators (ASME A17).
   b. All tests shall be performed in the presence of the National Elevator Inspection Service (NEIS), the Design Professional, and Cornell Commissioner. Test results shall be sent to the Elevator Maintenance Program Manager.
   c. For roped traction elevator machines, de-energize, inspect and test drive sheaves and spider for tightness, misalignment, and excess play. Check that sheave bearings are properly lubricated. Check that all traction ropes seat to the same depth. Examine machine brake linings for oil or scoring.
   d. Buffer test performed at rated load and rated speed.
   e. Normal operation test: Run elevator car in both up and down directions, by use of normal car and hall push button devices with full load, stopping at each floor served, cycle open and closed car door panels and landing doors, for a minimum of one hour.
   f. Test, determine and record actual timed speed of elevator car employing tachometer for in both up and down direction, stopping at each floor, fully cycling each door:
      1) Fully loaded car.
      2) Empty loaded car.
   g. Test limit switches and observe that elevator car does not move.
   h. Car and counterweight balance test, to be performed before any load safety test. Add or remove filler weights from counter weight sling to maintain original manufacturer’s recommended balance relationship.
   i. For hydraulic elevators, run the elevator car to its upper most stop and verify oil pump pressure reading and oil pressure reading when the safety bypass valve opens.

D. Cornell University close out and acceptance documents.

   1. Certificate to operate passenger elevator(s) issued by the local elevator inspector having jurisdiction.
   2. Certificate of inspection, issued by the local elevator inspector having jurisdiction.
   3. Inspection Report for Elevators and Escalators, issued by the local elevator inspector having jurisdiction.

E. Architectural finishes at the elevator main floor lobby and all hoistway entrances are at the discretion of the design professional. However, the contractor must insure the following inter-trades coordination during construction:
1. After the hoistway construction is established, the elevator contractor must be given priority to place his brackets and guide rail system, car frame and platform, cables or cylinder/piston system and controls, and finally the hoistway sill and platform inside the hoistway to provide for a plumb vertical elevator movement maintaining proper run by clearances at each floor landing.

2. Construction of lobby and all landing area walls must not commence until the elevator contractor has successfully installed the landing door sills and landing door frames (bucks).

3. At that time, the general contractor may evaluate the field conditions necessary to infilling the hoistway wall construction and apply any special work needed to account for out of plumb hoistway, or other irregular construction in order to maintain landing door reveal clearances with the walls.

F. Warranty and Maintenance Service

1. Special Manufacturer’s Warranty: Written warranty, signed by manufacturer/elevator installer agreeing to repair, restore or replace defective elevator within specified warranty period.
   
   a. Warranty Period: 12 months from date of Substantial Completion.

2. At the start of the warranty period, notify the elevator maintenance program manager of the elevator warranty expiration date and provide program manager the 3rd party inspection documents provided at time of unit turnover. Provide program manager with call center information, vendor-specific elevator identification information.

3. At the start of Substantial Completion, provide 12 months’ full maintenance service by skilled employees of the elevator installer. Include monthly preventative maintenance, repair and replacement of work or defective components, lubrication, cleaning and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment. Address any elevator-related violation noted in a required bi-annual inspection of said inspection occurs during the warranty period.
   
   a. Perform maintenance, including emergency callback service, during normal working hours.
   
   b. Include 24-hour-per-day, 7-day-per-week emergency callback service. Response Time: Two hour or less except in cases of passenger entrapment. Entrapment Response Time: One hour or less.

4. Prior to the expiration of the one year warranty, the elevator maintenance program manager will conduct a 3rd party inspection of the elevator(s). The project manager and/or the construction manager will be notified of any deficiencies.
PART 2: ELEVATOR EQUIPMENT MANUFACTURERS

2.01 CUSTOMER PREFERRED ELEVATOR SYSTEM EQUIPMENT MANUFACTURERS

A. Equipment:

1. It is Cornell University’s intent to provide “customer preferred” elevator equipment comprising new elevator systems so as to standardize elevators with common equipment for ease of maintenance, parts inventory, and field diagnostics.

2. Paragraph “4.C” indicates “customer preferred” elevator equipment that shall be provided for by the design professional in the design of elevator systems. It is possible other elevator equipment manufacturers may offer products of equal or superior construction, wear resistance, and reliability.

3. Non-Proprietary Equipment: Where an offered manufacturer’s product is not indicated within “4.C”, other elevator used in the elevator design must meet the following minimum criteria and be submitted during the design development (DD) phase submissions to Cornell University for consideration and approval:

   a. The purchase of equipment must be unrestricted and available to anyone.
   b. Spare parts must be available from distributor known to Cornell University with stocked supply of all parts available.
   c. A published spare parts price list shall be submitted to Cornell with the DD submission without delay in shipment after order is placed.
   d. Exchange only provisions on replacement parts will not be implemented.
   e. Provide a declaration to Cornell that approval is not required from anyone, such as but not limited to; elevator contractors, code enforcement officials, etc., in order to purchase parts.
   f. Equipment provided with closed loop, or control systems shall be provided with complete diagnostic tools, manuals, instructions to provide for unrestricted access to all levels of maintenance, adjustment, troubleshooting.
   g. Purchaser of equipment shall have unrestricted access to all control software, software upgrades or upgrades to tools, maintenance and instruction manuals.
   h. Factory or other approved on site training is available to anyone who wishes to enroll and learn about installation, adjustment or maintenance. Training fees must be published, reasonable and appropriate for the equipment purchased.
   i. A technical support telephone number shall be provided by the manufacturer for use by anyone. Free engineering support and assistance shall be promptly provided.

B. Proprietary elevator manufacturer’s “factory packaged” elevator systems, comprising elevator systems equipment, devices, or materials of construction which are exclusively the standard catalog products of the following manufacturers, but not limited to this list, shall not be provided.
1. Proprietary elevator manufacturers are, but not limited to:
   a. Kone/Montgomery.
   b. Schindler.
   c. Thyssen-Krupp.
   d. UTC/Otis.

2. However, proprietary elevator manufacturers or their regional service companies may provide complete elevator systems comprising equipment of the approved “customer preferred” elevator parts manufacturers.

C. Cornell University “Customer Preferred” Equipment Manufacturers and Elevator Materials:

1. GAL Manufacturing Corporation:
   Door operating safety equipment: operators, safety edges, door clutches, center parting door interlocking devices, spirator door closer, hanger and roller assemblies, track assemblies, leveling logic controls.

2. Adams Equipment Company, Elevator Specialties, PTL Equipment Manufacturing:
   Door protection systems, operating signals and fixtures, elevator car controls, car panels, position indicators, travel lanterns, lobby control panels, hall stations, audio bells, floor position indicators.

   AC hoist electrical motors, VVVF electrical hoist motors, gearless traction electrical motors.

4. Motion Controls Engineering (MCE), O. Thompson Co.:
   Elevator car control systems, selector leveling systems.

5. Elevator Controls Corporation:
   Elevator control systems, VVVF hoist electrical motors.

6. Elevator Equipment Corporation (EECO), CEMCO Lift, D.L. Martin:
   Hydraulic cylinders and pistons.

7. Hollister Whitney Elevator, Titon:
   Traction machines, car slings and platforms, counter weight frames, oil and spring buffers, over speed governors and safety devices, guide rails, counterweights.

8. ECCO, Maxton Manufacturing: Hydraulic control valves.
9. EECO, CEMCO, Minnesota Elevator: Hydraulic elevator power units.


15. Republic Wire and Cable: Traveling cable.


17. United Drilling: In ground well hole and casing work for hydraulic elevators.

18. ALTRO Flooring, America Rubber Company: ALTRO “Atlas 40” Stronghold 30" safety flooring, hard duty use, slip resistant, seamless elevator car finished flooring, 0.16 inch thickness seamless composition flooring; finish pattern and color to be selected.

19. Medaco, TriLok: Key switch cylinders.

20. MCE, CE Electronics, Adams Equipment: Microprocessor based, digitized voice announcer, produces speech in a pleasant, natural sounding voice from stored vocabulary, adjust voice speed and sound output control for announcements of: floor arrival, direction of travel, special emergency use (when car control panel is keyed for function(s), door closing, door keep clear stand by.


PART 3: ELEVATOR SYSTEMS

3.01 ELEVATOR SYSTEMS PERFORMANCE AND EQUIPMENT PROFILE

A. The design professional shall review and incorporate the following criteria into the elevator system design proposed:

1. Machine Room:
   a. For hydraulic driven elevators, priority is to provide machine room at the lowest landing with one machine wall enclosure shared with adjacent to hoistway. Remote locations by approved exception only.
   b. Machine room generated noise (particularly with hydraulic oil pump units) shall be isolated from the building structure and adjacent spaces. Potential for hydraulic driven machine room noise in residence halls should be given close scrutiny.
   c. 48 inch minimum working clearance in front of equipment access points. Maintain 7'-0" vertical clearance around all equipment. Minimum 6" free space shall be maintained between back and sides of equipment to adjacent wall(s).
   d. All entrance doors to machine rooms to be a minimum width of 3'-0".
   e. Design machine rooms with the same floor elevation throughout.
   f. Verify that electrical disconnect switches comply with all pertinent codes.
   g. Hydraulic oil storage tanks and pump units shall be accessible from two sides for inspection underneath of oil leaks, clean up and servicing of equipment.
   h. Provide no less than two GFI duplex receptacles in machine room located on opposite walls.
   i. Provide a minimum of 60 foot-candles of lighting measured 30-inches above finished floor in the machine room.

2. Elevator Car:
   a. Car interior height from finished floor to underside of finished ceiling shall be 96 inches unless otherwise approved by Cornell University. False ceiling construction inside the car shall not be provided.
   b. Car sling, car platform construction and guide rails for hydraulic lifted elevators shall be designed and sized for acceptable forces or downward loads imposed by or resulting from future over speed safety device operation if installed at a later date. Hoistway size, spacing of guide rails shall also be factored into use of future over speed control devices. Isolation springs shall be provided only for car load weighing controls systems.
   c. Car door panels and landing doors shall be minimum clear opening of 48" wide and 80" high.
   d. Car door panels and landing doors finish shall be, 16 gage, #304 stainless steel with #4 satin finishes. Doors shall be of internally reinforced hollow construction, filled with fire proof sound deadening insulation. Door panels shall be single speed center folding. Provide finest quality rubber astragal.
1) Only upon special request and as approved by the Project Manager, two speed side slide doors may be used.
2) Two speed center folding doors shall NOT be used.
3) Each door panel shall be provided with two nonmetallic, removable bottom door gibbs.
4) Hoistway construction and minimum hoistway dimensions shall be recognized by the design professional early on in the schematic phase to accommodate landing door requirements.

e. Car interior panels shall be of durable scratch resistant material if stainless steel.
f. Car floor shall be slip resistant seamless, composite flooring material.
g. Car door returns shall house up down visual indicators.

3. Controls and Car/Landing Door Operation, Call Stations:

a. Grouped elevators shall be provided with a solid state based closed loop, telemetry feedback central dispatcher control which shall coordinate movement and response of each elevator to a given hallway call or car call in the most efficient manner.
b. Each elevator’s movement and response to car or landing calls shall be controlled from a solid state closed loop, telemetry feedback controller which can monitor exact hoistway location, movement, and diagnose trouble malfunctions, trouble warnings or alarm conditions of that elevator.
c. Elevator controller shall be equipped with pre-torque capability to provide smooth acceleration from floor to floor travel.
d. Car control panel:
   1) Shall be self-contained with two way emergency voice communication, floor landing voice annunciation, all service key operations and emergency lighting. Elevator emergency call stations shall be programmed to dial 255-1111. Direct communication between the caller and CU Police is required. Taped or “canned” message are not acceptable. Refer to other applicable sections of this Standard for further description.
   2) Car panel push button devices shall be verified as “hard use” by review of actual samples indicating adequate construction of injection molded PB bodies and self-contained momentary contactors as immune to the damages of hard impacts or vandalism.
   3) Push buttons shall remain illuminated upon initiation employing LED lamps.
   4) Car door controls shall permit field adjustable closing and nudging times.
e. The car door operator system shall be provided with closed loop, telemetry feed back that shall be set through a field adjustable input to monitor the number of door operator mechanism attempts to open or close at any landing, and if the doors should fail to successfully open or close at that landing after reaching the preset upset, the car shall either move on to the next landing or remove itself from service depending upon whether the malfunction is in the open or close cycle.

f. A car directional lantern fixture containing two visual LED elements for up and down direction and an audible gong shall be recessed into each elevator cab entrance return column. The fixture mounting shall meet ADA requirements.

g. The top of the car door transom shall contain a recessed 2-1/2 inch high, segmented LED element readout and direction of car travel indicator which shall illuminate the numerals relating to the floor landing the elevator car is positioned at or passing through.

h. Each car shall be provided with a microprocessor based, digitized voice announcer, producing speech in a pleasant, natural sounding voice from stored vocabulary, adjust voice speed and sound output control for announcements of: floor arrival, direction of travel, special emergency use (when car control panel is keyed for function(s), door closing, door keep clear stand by.

4. Hoistway:

a. Hoistway surfaces shall be free of any sharp edges.

b. A continuous strut system to the highest landing shall be used for supporting landing door sills, door header and tracks to insure plumbness. Elevator manufacturer’s prefabricated sill structures shall not be used.

c. Hydraulic elevator system guide rails shall be no less than 15 lb. tee shaped rails or heavier as required by Code, and adequately sized to provide for adequate resistance to downward forces or loads imposed by future safety over speed arrester safety devices.

d. “Omega” type rails shall not be used.

e. Spring tension adjustable roller guides shall be provided. Slide guides shall not be used.

f. Adequacy of guide rail inserts and attachments to hoistway construction systems shall be reviewed by structural engineering design professional as early as the schematic design phase.

g. Landing door tracks systems shall be independent of door header construction and removable without requiring removal of the rest of door header assembly.

h. Door pocket depth and widths shall be factored into hoistway construction and size.
i. Elevator pit shall be designed to be waterproof and impervious to the entry of ground water. A depressed sump pit shall be provided into the hoistway pit construction with pit safety cover. The safety cover shall be provided with a telltale means of identifying the cover in case of pit flooding and offer means of removal for insertion of portable sump pump. The sump pump is to be tied into the local sanitary system.

j. Smoke vents shall be provided per Code.

k. Provide an overhead beam for hydraulic elevators at the top of the hoistway that will not interfere with car run by clearances or worker safety refuge, which is capable of sustaining the weight of the elevator car if temporarily rigged to it during maintenance or repair work.

l. For hydraulic elevators, provide a clear PVC piping system for piston oil accumulator unit.

m. Design and construct pit for hydraulic cylinder drilling access, usually a minimum 48" x 48" pit floor opening to accommodate drill rigging.

n. Elevator pit access ladder, pit stop switch, lighting fixture and switch, GFI outlet shall be on the day light side of the landing door.

o. Landing door sills shall not be cast into floor construction but provided as an independent sill.

p. Door tracks shall be hardened nickel alloy construction.

q. Pit floor size shall continue up full height of hoistway undiminished.

5. Lobbies and Landing Doors:

a. Prior establish with local authority having jurisdiction, Fireman’s Phase 1 and Phase 2 service requirements including primary and alternate recall floors.

b. Door return spirators shall be used. Car door returns employing counter weights are not acceptable. Door restrictors shall be provided.

c. Elevator contractor shall be permitted to set his guide rails, car sling, landing sills and door frames, coordinated with the potential irregularities of the hoistway plumbness prior to general construction finish of hoistway landing entrance walls construction.

d. Where concrete masonry unit construction is provided at rough openings to door frames, masonry units shall be “saw-toothed” at door buck construction. General contractor shall coordinate final anchoring or infill of pockets at landing door frames with elevator contractor.

e. Wood or other stud partition construction if permitted must be fire covered and structurally adequate to secure landing doors, headers, trackers and the elevator door loads and forces exerted upon them. Installation of all station devices shall not compromise the fire rating of the wall.

f. Doors panels shall be equipped with barrel keys and keyed plug lock cover equal to Tri-Lock.

g. Provide all ADA call station signage.

h. Landing door sills shall be constructed with steel angle support running full hoistway width. Doors sills shall be framed first to maintain proper run by clearances before finished hoistway general construction work proceeds.
i. Landing doors shall be provided with automatic self-closing mechanisms arranged so that if the elevator car leaves the landing for some unexplained reason, the closing device shall automatically close and lock the landing doors.

j. Landing and car doors shall be provided with devices that prevent the manual opening of doors from inside the car unless the elevator car is correctly positioned within the car landing zone.

k. Call station fixture construction shall be vandal proof construction with momentary electrical push button contacts specifically designed for hard use. All push buttons shall illuminate upon activation.

l. Each elevator at the main floor lobby shall be provided with a hall positioning indicator for that car, mounted above the landing door frame, recessed 2-1/2 inch high, segmented LED element readout and direction of car travel indicator which shall illuminate the numerals relating to the floor landing the elevator car is positioned at or passing through.

6. Traction Machines:

a. Arrange lay out of overhead traction machines to avoid hoist cable deflector sheaves.

b. Provide special rigging beams or other post and lintel arrangements in penthouse for hoisting and removing for repair of traction electrical motors.

7. Hydraulic Driven Machines:

a. Hydraulic elevators shall be equipped with mufflers wherever the possibility of noise transmission through construction materials or hoistway will disturb building occupants.

b. Holeless hydraulic elevators shall not be used except as approved by Cornell University for building renovation of existing hydraulic elevators. Dual holeless pistons shall not be used.

c. Telescoping hydraulic cylinders shall not be used.

d. Hydraulic cylinders shall be designed and sized so as not to operate at pressures greater than 400 PSIG except on run by safety bypass test.

e. Hydraulic elevator pump systems which anticipate greater than 60 starts per hour at any peak time period, are designed for residence halls/dormitories, shall be provided with oil viscosity control after cooler devices. After coolers shall not disperse waste heat of compression into the respective elevator machine room, but hydraulic oil for cooling shall be piped from the gravity oil storage reservoir to a safe external location in the ambient atmosphere located fan operated radiator. Chilled water cooled after coolers shall not be used given the seasonal use of chilled water on Campus.

f. Hydraulic elevators shall be provided with “dry” pump units. Submersible pump units may only be used on elevators proposed for light or infrequent use.
g. Soft start motor starter controllers shall be employed. Wye-delta closed transition starters shall not be used.

h. A schedule 40 PVC thermoplastic oil leakage containment cylinder outer liner shall be used. A tolerance of at least 1-1/2 inches annular space between the cylinder outer steel wall and PVC inner liner, and minimum two inches annular space between the PVC liner outer wall and wellhole steel casing shall be provided for when evaluating minimum wellhole boring size.

i. Wellhole: Schedule 40 ASTM A-36 steel casing material. Drilling shall be plumb and straight without bends. A means of oil leak detection shall be provided. Inert material fill (Union guard) not to be used.

j. Piston cylinder shall be constructed of threaded joints with a continuous weld band about the circumference. Personnel performing welding shall be ASTM certified welders. Welding shall be provided so as not to warp or bend the cylinder wall during welding operations.

8. Elevator System Keys and Special Override Controls:

   a. Elevator car control panel shall be equipped with dedicated insert control/override key switches for the following functions:

      1) Ventilation fan.
      2) Elevator car lights.
      3) Independent service.
      4) Elevator car out of service.
      5) Service cabinet cover.
      6) Fireman’s Phase II service key switch.
      7) Fireman’s Phase I service station key insert switch shall be located in the corridor pushbutton station.
      8) Each lobby landing door shall be equipped with a “barrel type key” and plug lock.

   b. Design of the car control panel shall provide for a module for the key switches to be enclosed inside a hinged and key locked service cabinet which may be opened by any switch key.

   c. Elevator control panel keys shall be of the following type:

      1) Fireman’s service: Chicago H2389 (Dover module).
      2) Car control panel override services: Chicago XXXXX.

   d. Card swipe independent elevator operation (optional):

      1) Provide for a service module enclosure in the car control panel to permit installation of a dedicated car operation single reader “swipe card” provided by Cornell University and as manufactured by upon Best Access.
(a) Arrange service module enclosure so that card reader is mounted on the front hinged cover, 44 inches above finished floor to the top of the reader unit, vertically mounted with the LED at the top.

(b) Dimensions of service module enclosure shall be provided by Best Access.

(c) Arrange to provide 12 volts DC and 110 volt AC electrical power to the card swipe device housed in the control panel service module.

(d) Arrange to provide car control panel wiring contracts inside the car control panel and at least six pairs of wiring conductors in the hoistway traveling cable to permit control between the swipe card and elevator controller.

e. Landing doors shall be equipped with the following emergency access devices permitting a trained, qualified elevator technician who has possession of such key devices to open hoistway landing doors independently of the elevator car door panel operator:

1) Landing door release key: GAL barrel type.
2) Landing door panel release key access hole shall be concealed with a barrel plug key as manufactured by Tri-Lock.

9. Electrical:

a. Dedicated three phase feeder circuit with equipment grounding conductor for elevator drive motor. Grounding via the raceway system shall not be the only means of grounding.

b. Three percent line reactors shall be provided at a minimum to minimize harmonic output from the dedicated three phase electrical drive motor.

c. A dedicated 110 volt AC circuit shall be provided into the machine room to serve:

1) Elevator car operating power.
2) Hoistway pit GFI receptacle and lighting fixture.
3) Elevator machine room receptacles.
4) Hoistway pit sump pump and oil return accumulator receptacles.
5) Lighting fixtures in both machine room, hoistway pit, top of car, bottom of car and elevator car enclosure shall be fitted with vandal resistant lens covers and fixture housing.

d. Car lighting fixtures shall be equipped with LED lighting fixtures, operated from a key switch located on the car control panel face. Lamp quantity and arrangements shall provide for at least 40 foot-candles 30" above the elevator car floor.

e. Hydraulic elevator pump driven motors shall be provided with solid state “soft start” motor controls.
f. Hydraulic elevators shall be provided with a battery powered emergency lowering control device, which upon the elevator control system sensing loss of normal building AC power, shall permit the emergency device to automatically lower the elevator car to the next landing, stop, open and maintain open the elevator cab door panels and landing doors, and remove the elevator car from service. Refer to “Acceptable Equipment Manufacturers”.

g. If the building is supplied with emergency electrical power, then the elevator system shall also be powered by the standby source of emergency power.

10. Hoistway Fire Protection:

a. Verify with local authority having jurisdiction if automatic sprinkler devices are required in new construction hoistway and machine room.

b. Electrical equipment, except for that required for seismic or earthquake design considerations, shall be designed and constructed in accordance with NFPA 70 and NFPA 72, and shall automatically disconnect electrical power to elevator equipment located in the hoistway and machine room before any sprinkler head discharge in the elevator machine room. Signage indicating the location of such disconnects will be mounted in the elevator machine room.

c. Smoke detectors shall form a dedicated fire alarm (FA) zone serving the elevator hoistway and machine room. If the fire alarm system is not digital based addressable, then each fire detection device shall come furnished with an auxiliary base mounted LED light.

d. Smoke detection devices shall initiate Fireman’s elevator recall via the fire alarm system control panel, not fire or smoke detector auxiliary contacts.

e. All fire alarm system wiring shall be supervised.

f. Smoke hatch shall open in the event of the smoke detector at the top of the shaft activating the fire alarm system control panel.

11. HVAC Systems and Exhaust:

a. Provide a self-contained, split system air cooled condensing HVAC unit to maintain ambient temperatures in the machine room wherever digital based elevator controllers are used.

b. Where unavoidable and exhaust quantities must be used to maintain machine room temperature, CFM exhaust mass flow rates shall be based upon a 5°F. Temperature differential based upon the sum total of all machine room space internal and external heat gains.

c. Make-up air for exhaust shall be filtered with 80% ASHRAE efficiency, dust spot test methods to minimize contamination to solid state operated devices contained inside the machine room.