

5.15 Elevators

5.15.1 General

5.15.1.1 Guidelines for All Elevator Devices

1. Any deviations to the items in this section are to be reviewed and accepted in writing by FM&D.
2. Do all work in compliance with latest edition of the CSA B44, Safety Code for Elevators including Appendix E (Barrier Free Access).
3. Comply with Alberta Building Code, latest edition.
4. The decision as to the type of elevator equipment provided must be arrived at through a thorough load analysis and traffic study where required. This study and all the information used to generate it must be reviewed with the University of Calgary Elevator coordinator before approval of the type(s) and quantity of Electric Elevator that will be used for the particular application. Under-elevating or proposing equipment which must operate at or near its maximum potential is not acceptable.
5. Only elevator constructors, licenced by all necessary bodies in the province of Alberta are to install, alter and maintain the elevating devices.
6. Only allow elevator equipment to be installed that can be maintained by any competent and licenced maintenance provider (select 3rd party non-proprietary equipment). Acceptable manufacturers are (or substitutions with the University of Calgary's permission):
 - a. Elevator Controls Corporation (EC)
 - b. Motion Control Engineering (MCE)
 - c. GAL Manufacturing
 - d. Smartrise
 - e. JRT Controls
7. The approved installer is to be experienced in the installation of elevators and is to furnish proof of at least five (5) years experience with elevators like these specified for this project.
8. Include selective collective automatic operation of elevating devices.
9. Selected Elevator Contractor to pay all patent licence fees and royalties necessary for the completion of the contract. The University of Calgary shall not be held responsible for infringements of patents of the elevator subcontractor in the completion of his contract.

10. Selected Elevator Contractor to obtain and pay for certificates of approval and all other necessary permits, inspections, and re-inspections, if necessary, due to failure of any elevator equipment.
11. Provide building emergency power to elevators as required by code. Unless required by code for the installation it is acceptable to provide battery lowering for hydraulic elevators.
 - a. Provide an advance transfer signal from the transfer switch to the elevator controller in all cases where building emergency power is used for the elevators. Install four #12 conductors in 19 mm conduit from auxiliary contacts on the transfer switch in the emergency switchboard to the elevator controller to signal the elevator controller that the power system is in emergency mode and that retransfer is imminent.
 - b. All feeders and signals from emergency power source to the elevator equipment room shall be enclosed and protected per code requirements.
12. At the time of final acceptance, arrange with the University of Calgary to provide a seminar for the University of Calgary staff and delegated representatives.
13. Include in the seminar a complete review of the documentation, operation of the equipment and demonstration of any special features.
14. All stainless steel provided is to be brushed finish #4.
15. Connection to building Fire Alarm for phase 1 automatic and phase 2 recall operation where required by code.
16. Ensure Logbook is available in the machine room and filled out for all calls, repairs, maintenance, and upgrades. The logbook is to be updated and available in the machine room at all times. Provide a copy of the proposed logbook for approval prior to completing the installation.
17. Arrange equipment in machine room so that rotating elements, sheaves and other equipment can be removed for repairs or replacement without dismantling or removing other equipment components.
18. Elevator controller shall be LiftNet ready

5.15.1.2 Construction Requirements – Work by Other Trades

1. A properly framed and enclosed hoistway. Do not construct front hoistway entrance partition walls until after the hoistway entrance frames and sills are in place. If front partition walls are poured concrete load bearing walls, provide rough openings to accept hoistway entrance frame and infill after the frames and hall call buttons and hall indicators are set in final position. Provide a vertical surface immediately below the finished floor level and flush with the hoistway face of the corridor wall, suitable for fastening of sill support.
2. Access to the machinery space and pit as required by the governing authority and code.

3. Suitable machine room with legal access and ventilation, sealed concrete floor, temperature maintained between 5°C and 25°C with a humidity of up to 95% (non-condensing).
4. Adequate rail bracket supports. Maximum bracket spacing as required by elevator contractor.
5. Provision of rough opening in poured concrete shaft walls to accept hoistway entrance frames and building-in of these frames.
6. Recesses as required to accommodate hall call buttons and signal fixtures.
7. A dry pit, reinforced to sustain normal vertical forces from guide rails and impact loads from buffer and cylinder.
8. A well lit and painted (walls and floor) elevator machine room.
9. Any cutting, patching and painting of walls, floors, or partitions together with finish painting of hoistway and cab entrance doors and frames if specified to be supplied shop primed.
10. Necessary electrical power for lights, tools, hoists, etc. during erection as well as electrical power for starting, testing and adjusting the elevator for correct operation.
11. Holes and access as needed for elevator equipment in floors and walls (e.g. hydraulic cylinders, wire ropes).
12. Venting of the hoistway as required by code and the authority having jurisdiction.
13. All fixed conduits, wiring and fittings for remote systems (telephones, cameras, remote position indicators, intercommunications, alarms, emergency power, etc.) with feeders terminating at the elevator controller in the machine room.
14. Communications equipment (telephone, intercommunications, remote position indicators, alarms, etc.).
15. Pit drain for all elevators installed with Fireman Service (FEO). Drainage requirements as per code requirements.
16. Pit ladder as per code requirements.
17. Genetec Camera, programming and all necessary IT requirements for the video communication system.
18. Division 16 - Electrical service as follows:
 - a. Fused lockable main line switch for each elevator in the machine room including conduit and conductors from main line switch to controller or starter. Switch to be labeled to indicate source and load (panel, circuit # and load and panel location). Provide an auxiliary disconnect if there is no direct line of sight to the elevator machine from the main line switch.

- b. Supply an auxiliary set of dry contacts in the disconnect when the elevator is provided with battery lowering. These contacts shall indicate when the elevator disconnect is in the open position.
- c. Separate 120 V, 15 Amp light and fan supply, for each elevator, in the machine room including lockable and fuseable switches or circuit breaker and connected to terminal connections on each controller. Switch to be labeled to indicate source and load (panel, circuit # and load and panel location).
- d. Separate 120V, 15 Amp emergency communication supply for each group of elevators, in the machine room, that is fuseable lockable in the open position. Switch to be labeled to indicate source and load (panel, circuit # and load and panel location).
- e. Permanent lighting system in the machine room, the pit and the secondary level. Minimum lighting level to be 100lx in the elevator pits, and 200lx in the machine rooms/ machine spaces or control spaces. For MRL (machine room less) elevators, the top of shaft is considered a control space.
- f. Telephone conduit, wiring and connections to the controller for the elevator cab.
- g. Empty conduit for elevator devices located outside elevator machine and elevator hoistway.
- h. Fire alarm signal wiring to elevator controller(s).
- i. Security conduit, cable and connections to the elevator controller.
- j. Empty coax conduit to the elevator controller for a future camera.
- k. Suitable light and GFCI convenience outlets in the elevator pit and the elevator machine room, with light switches located within 457mm of lock jamb side of machine room door.
- l. Connection to the University of Calgary network via fiber cable for the emergency video communication system. All components must have a 4 hour battery back up or UPS system.
- m. GFCI outlet located in the elevator machine room/machine spaces or control spaces and elevator pit. For MRL elevators, the top of shaft is considered a control space.

5.15.1.3 Related Work Specified Elsewhere

- 1. Section 01500 - Construction Facilities
- 2. Section 03300 - Cast in Place Concrete (Grouting of sills, equipment bases)
- 3. Section 04220 - Concrete Masonry Units (Frame infill, etc.)
- 4. Section 05121 - Structural Steel

5. Section 05500 - Metal Fabrications (ladders, sill supports)
6. Section 07120 - Bituminous Dampproofing (Waterproofing of pit)
7. Section 09651 - Resilient Flooring

5.15.1.4 Elevator Information Submittal Requirements

1. Submit to the University of Calgary/ Elevator Consultant shop drawings in accordance with Section 01300, Submittals.
2. Provide detailed layout drawings for all areas where elevator equipment is to be installed including:
 - a. All machine room dimensions and component details noting areas where elevator trade work joins that of another trade. Include reaction loads where applicable.
 - b. All hoistway dimensions and component details including weights, reaction loads and required work by other trades to complete the installation
3. Indicate on general arrangement drawings:
 - a. Hoistway entrances and doors showing method of operation, details of construction and method of fastening to structural members of building.
 - b. For the cab design specified show details of construction, fastening to platform, lighting, ventilation and location of car equipment.
 - c. Include catalogue illustrations of vandal proof operating and signal fixtures.
4. Provide equipment data including:
 - a. Description of elevator system's method of operation and control, including group supervisory control system, motor control system, door operation, signals, Phase I, Phase II and Emergency Power Recall sequence of operation and special or non-standard features provided including PVC evacuation testing.
 - b. Parts catalogues giving complete list of repair and replacement parts with cuts, identifying numbers and exploded views of all major components.
 - c. Legible matte faced Mylar schematic wiring diagrams covering electrical equipment as supplied and installed, including changes made in final work, with symbols listed corresponding to identity or markings on both machine room and hoistway apparatus. Cover one copy in plastic laminate and mount on wall in machine room.
 - d. Operation and maintenance requirements of PVC evacuation and pressurization system.
 - e. Adjusting procedures, settings and other pertinent information on solid state components.

- f. Copy of the Maintenance Control Program and any special procedures for the elevator system.
5. Provide the University of Calgary with three complete sets of keys for elevator and elevator equipment (other than Best key for independent service).

5.15.1.5 Elevator Use for Construction

1. The University of Calgary reserves the right to refuse use of the elevator for construction purposes (where the University of Calgary has made substantial payments for the elevator) unless and until certain conditions have been met. These conditions are as outlined below:
 - a. If the General Contractor requires the use of the elevator prior to Substantial Performance and Acceptance, it shall be inspected by the enforcing authorities for safety and, if passed, will be taken over by the General Contractor, who will take all responsibility (liability and financial commitments) for the elevator. The General Contractor is to arrange and pay for a third party inspection to document condition of the elevator prior to its use as a construction elevator.
 - b. When this temporary arrangement is terminated the elevator will be put into "as new" condition, by the elevator subcontractor, at no cost to the University of Calgary, before being accepted as substantially complete.
 - c. Temporary use shall have no bearing on the terms of the Warranty, nor upon the period of the Maintenance period included in the main elevator contract.
 - d. The elevator subcontractor is not obligated to provide this temporary service, and any agreement between this subcontractor and the Contractor must cover the elevator subcontractor for costs of Government inspections, any involvement by the University of Calgary / Consultant, the maintenance of the equipment during this period, and all final cleaning and repairs or replacements of damaged or worn parts which are necessary to return the equipment to the "as new" condition.
2. The general contractor shall provide without expense, if required, temporary car enclosures, requisite guards or other protection for elevator hoistway openings, main line switch with wiring, necessary power, special labor or equipment needed to permit this temporary usage. The general Contractor shall pay for the cost of power and operations.

5.15.2 Elevator Equipment Requirements

5.15.2.1 Fixtures and Finishes

1. All exposed finished metal surfaces are to be stainless steel #4 with a brushed finish.
2. U of C Standard Visual Communication System - Emercom.
3. U of C Standard independent service key - Best A4 (key and lock supplied by University of Calgary)

4. Provide three sets of keys for each elevator; keys must match existing keys in use at the University of Calgary (list available upon request).
5. Vandal proof pushbuttons in COP and Hall call stations c/w Red LED illumination.
6. Acceptable fixture manufacturers are:
 - a. Dupar
 - b. Schaefer
 - c. Mad
7. Cab interior requirements:
 - a. Weigh the elevator upon award of the modernization contract and provide all relevant data to the Owner and Consultant.
 - b. Carry all necessary engineering, labour and costs to increase the dead weight of the elevator for the installation of the new elevator cab interior as noted below.
 - c. Demolition and removal of existing interior finishes, including the light valences.
 - d. Provide and install new fire rated Formica plastic directly on the rear wall and each side wall above and the handrails- 2 vertical panels on the rear wall, and two vertical panels on each side wall. Formica colour shall be Storm Solidz 3505-58
 - e. Provide Stainless steel #4 below the handrail.
 - f. Provide new built-out brushed #4 finish stainless steel reveals between the laminate, behind handrails, at kick plate and above new wall sections.
 - g. Supply and install three (3) new 2" stainless steel brushed # 4 finish flat handrails on the rear and each side wall mounted at code compliant height as per the Appendix "E" Elevator Requirements for Persons with Physical Disabilities.
 - h. Remove the old flooring material and replace the sub floor as required.
 - i. Install new Noraplan commercial grade flooring material. Color: Norament Satura 5220.
 - j. Provide and install one (1) new brushed # 4 stainless steel six section island ceiling, with (6) six LED pot lights and new matching chrome trims.
 - k. The ceiling will have six (6) panels with the emergency escape hatch location removal as per elevator safety code. All corners will be mitred, welded, and polished out to ensure a smooth finish is achieved. The ceiling will have proper hanging bracket which are through bolted into the cab roof from the elevator car top as per the elevator safety code. Provide all electrical disconnections and connections.
 - m. Provide stainless steel cladding for the front header, reveals around the car operating panel, door jambs.

- n. Include for the cab interior scope in the application for alteration with the AHJ.
 - o. Provide one set of cab pads and hooks to cover the non access walls of the elevator.
 - p. Panels shall be of the “hang on” type, such that they can be removed in the future for simple replacement.
8. Each car operating panel is to include:
- a. Pushbuttons to correspond with landings served
 - b. University of Calgary independent service key switch mounted on the face of the COP and identified as such.
 - c. A lockable service cabinet containing switches and key switches for cab light, fan, independent service emergency stop keyswitch, 15A receptacle and hoistway access, volume and emergency light test switch.
 - d. Engraving shall include car capacity, building name, car number.
 - e. Fire service controls as required by code.
 - f. All switches and keyswitches to meet code requirements for security and be Dupar brand or equivalent.
 - g. Visual display for the video communication texting system
 - h. separate “YES” and “NO” button for the video communication texting responses.
 - i. Lexan card reader window for card reader installation.
 - j. Car operating panel shall have no visible fasteners, only a minimum of three keyed locks to secure it in the closed position.
9. Each hall station is to include:
- a. Single pushbutton at each terminal landing.
 - b. Two buttons at each intermediate landing.
10. Main recall landing is to include
- a. Controls for fire service and emergency power as required by code.
 - b. Communication failure notifier and reset keyswitch
11. Where the rise is greater than 60’, means for the Fire Department to view and communicate with the occupants of the elevator cab shall be provided. This system shall be manufactured by Emercom.

5.15.2.2 Minimum Maintenance Requirements

1. Include complete maintenance of elevator equipment for a period of 12 months from date of Substantial Performance.
2. Maintenance shall be completed per the University of Calgary comprehensive maintenance specification in place at the time of substantial completion.

5.15.2.3 Elevator Warranty Minimum Requirements:

1. Provide written guarantee signed and issued in name of the University of Calgary stating that the materials and workmanship of the apparatus furnished under these specifications is guaranteed for one (1) year from date that the University of Calgary has exclusive use of the elevator for the purposes intended. This warranty is in lieu of any other warranty thereof, either expressed or implied and whether imposed by law or otherwise. This warranty shall include coverage on or for, but not be limited to, the following:
 - a. Blistering, spalling or peeling of factory applied paint due to improper surface preparation or material application.
 - b. Opening of joints due to improper design or use of ineffective fastening devices.
 - c. Any defects not due to ordinary wear and tear or improper use of all components.
 - d. Repairs, replacement or equipment part failure made necessary by reason of negligence, misuse, accident, or improper or inadequate maintenance, all on the part of the installing contractor.
2. In the event of an emergency failure of any products, materials, or systems during the warranty period, and the issuer of the warranty is unable to or chooses not to respond to a request by the University of Calgary for immediate emergency repair/replacement of the affected items, then the University of Calgary may recover from the issuer of the warranty all costs incurred by the university for the immediate repair/replacement required.

5.15.2.4 Products

1. Use major elevator components from standard product line of one manufacturer unless otherwise approved. These products shall be used unless written permission is obtained from the University of Calgary.
2. Use major components only which have performed satisfactorily together under conditions of normal use in not less than two other elevator installations of similar design and duty and for a period of at least one year. Provide references to confirm this requirement is met.
3. 'Major components' means Controller, Motor, Machine, Cylinder and Plunger (incl. PVC), Power unit, Muffler, Positioning and Door Operator systems.
4. U of C standard products:

- a. Controllers provided by GAL Manufacturing, Motion Control Engineering, EC Corporation, Smartrise, JRT Controls.
 - b. GAL MOVFE2500 Harmonic door operator
 - c. Keys - only keys presently in use at the University of Calgary may be used
 - d. Lamps - only LED illumination may be used
 - e. Hall Position Indicators - CE GTCH-MXXX model
5. Include basic materials as follows:
- a. Steel sheet metal: to ASTM A366-72 cold-rolled sheet, commercial quality: to ASTM A525-77 with wiped zinc coating.
 - b. Stainless steel sheet metal: to CSA G110.6-1968, type 304 with No. 4 finish.
 - c. Stainless steel bars, wire and shapes: to CSA G110.4-1968, type 304 with No. 4 finish.
6. Use hoisting ropes, installed on any one elevator, from same factory production run.
- a. Hoist ropes shall be traction steel of size, construction and number to ensure proper operation of the elevator and give satisfactory wearing qualities.
 - b. Governor ropes shall be steel.
 - c. Hoist belts (elastomeric coated steel suspension members) shall not be allowed on any installation.
7. All ropes shall be chosen to provide a service life of at least 25 years. Rope life calculations may be requested at the time of tender.
- a. Automatic rope lubricators shall be provided for all traction elevator installations.
8. Use steel compression type fittings where electrical metallic tubing is used. Fittings with set screws are not acceptable unless a separate identified grounding conductor is also installed in raceway. Minimum conduit size to be 20mm (3/4"). Provide the following as it relates to electrical wiring within the elevator system:
- a. Include at least 10% spare conductors and three (3) spare pairs of shielded audio cables in travelling cables and one (1) coax for future camera. These spare conductors to be isolated and tagged as to the location of the other end.
 - b. Do not parallel conductors to increase current carrying capacity.
 - c. Do not use armoured flexible metal conduit as grounding conductor. Provide ground wire.
 - d. Travelling cable shall be continuous from the controller to the C.O.P. 'Halfway' boxes are not permitted.

- e. Include wiring and connections to elevator devices remote from hoistway (ie: lobby panels).
9. Provide sound isolation between elevator components and building structure where necessary to eliminate transfer of noise or vibration outside of the machine room and hoistway areas.
10. Paint machinery equipment with oil resistant machinery enamel, grey in color, unless otherwise specified. Finish the equipment according to the following, where applicable:
 - a. Free structural parts of rust. Paint with rust resistant paint.
 - b. Thoroughly clean and bonderize or equally prepare steel other components other than stainless steel in baked enamel.
 - c. Apply sufficient number of mineral filler coats, each baked and sanded perfectly smooth, to provide flat even surface.
 - d. Apply heavy coat of baked enamel primer sanded and rubbed smooth.
 - e. Finish in plain colour baked enamel consisting of two colour coats of high grade synthetic material baked on and brought to semi-gloss finish.
 - f. Do not use manufacturing techniques such as spot welding which may cause visual imperfections or visual distortion of exposed stainless steel surfaces.
11. Include means of lubricating bearings, requiring periodic lubrication.
 - a. When used, provide grease fittings which fit same gun.
 - b. Where grease cups are provided, use automatic feed compression type.
 - c. Provide visible and easily accessible lubrication points.
12. Roller guides shall be 6" minimum on passenger cars and tandem rollers on service and freight cars. Manufacturer shall be ElSCO.
 - a. Provide each guide with, durable oil resistant, resilient tired ball bearing rollers running on three finished rail surfaces.
 - b. Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial springs or by resilient mountings.
 - c. Provide guide operation which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.
 - d. Use tire material which will not develop flat spots after standing idle for 24 hours under average environmental conditions.

- e. Statically balance the car by removing the guide rollers on top of the car and adding the necessary balancing weights to allow the car to float upright without the top roller guide assembly contacting the guide rails.
13. Include car platform as follows:
 - a. Fabricate car platform of two layers of wood flooring supported on structural steel framing. Provide sheet steel sheathing at underside of steel framing.
 - b. Provide threshold plate of aluminum to ASTM B221-76 alloy 6351-T6.
 - c. Service elevators and high usage elevators shall be provided with a nickle silver sill.
 14. Design floor to accept the specified flooring, flush with sill, with minimum fastenings and with securely held front edge. Refer to Section 09651, Resilient Flooring, for details.
 15. On service and freight type cars the elevator manufacturer shall include and install the aluminum checker-plate floor (minimum 6mm (1/4") thick).
 - a. Service and freight cars - include 6mm / ¼ inch thick aluminum checker plate flooring, one-piece where practical, maximum three piece.
 16. Car top mounted emergency light and alarm unit with battery back up.
 17. Emergency Exit: provide an emergency exit of a suitable size equipped with an electrical device which prevents operation of the elevator if the cover is open more than 50mm and so designed that it can be opened only from the top of the cab, and which must be manually reset from the cab top after the cover is within 50mm of the fully closed position.
 18. Cab Top Inspection: provide a cab top inspection station with in "inspection" switch, and "emergency stop" switch and with constant pressure, "up - down" direction buttons which shall make the normal operating devices inoperative to permit operation of the elevator for inspection purposes. Panel shall be complete with 15 amp power receptacle and light switch, light socket and protective lamp cages.
 19. Include two-point suspension door hangers for each door panel with resilient sound absorbing wearing surfaces and replaceable hanger tracks.
 - a. Use ball or roller bearings sealed to retain grease lubrication and wipers to maintain rollers and track in clean condition.
 - b. Absorb up thrust with adjustable eccentric rollers equipped with ball or roller bearings.
 - c. Design for replacement of gibs without removing door from hanger tracks.
 - d. Use top and bottom door retainers to limit the ability of the hoistway doors to be removed or knocked off inadvertently by excessive force.
 20. Construct doors with stainless steel skin on lobby side of all floors.



- a. Reinforce hall doors to receive attachments and to withstand strains due to power operation.
 - b. Include sight guards.
 - c. Provide 100mm high reflective numbers on the hoistway side of all hall doors.
21. Construct door entrance frames for all floors of stainless steel 1.9mm thick Type 304, #4 finish, brake-formed to required profile combining rough buck, jamb and casing in one piece bolted construction.
22. Include extruded aluminium sills (or nickel silver sills on service cars) with anti-slip wearing surfaces to ASTM B221-74 alloy 6351-T6.
- a. Grout sills in position providing up to 50mm in thickness as required.
 - b. Include sill supports, where required and design for class of loading.
 - c. Do not use exposed fastenings.
23. Include emergency lighting in each car as follows:
- a. Use battery operated emergency lighting equipment, to CSA C22.2No.141-1972, to provide general illumination in car and 10 lx minimum illumination at operating panels and telephone cabinet for 4 h minimum.
 - b. Include means for convenient manual operation and testing of each unit from within car.
 - c. Design battery unit of sufficient strength to support 90kg person without causing malfunction or damage.
 - d. Include means of containing any leakage or spillage of electrolyte.
 - e. Battery to be located on the car top with install date labelled on battery.
24. Provide a position transducer device to transmit to the control system the position of the elevator.
25. Governors shall be manufactured by Hollister Whitney. Where the governor is mounted in the hoistway, it shall be furnished with remote test/reset capabilities.
26. Restrictors shall be of the vane type with the spring loaded vane on the car door, and flags mounted on the hoistway side of the hall doors and fascia.
27. Hoistway door locks shall be manufactured by GAL.
28. There shall be no visible contractor emblems painted on any floors or located on any equipment.

Operational Requirements:

29. Include automatic emergency power operation where required by code as follows:
 - a. Provide an advance warning signal to indicate when power switches from main (normal) supply to Standby (emergency) supply, or when switching back to normal power. Alternately, when switching back only, provide a suitable time delay between the interruption of standby power and the return of main supply.
 - b. Automatically start and return one elevator at a time to main floor at rated speed if there is failure of normal power supply and park with doors open with exception of cars that are out of service.
 - c. After all cars have returned to main floor, retain preselected car on emergency power operation.
 - d. Provide selector switch in central control room or hall fixture located at the recall landing arranged for restricted use by authorized persons only marked 'Emergency Power' in sixteen point red lettering to override automated operation after all cars have been returned to street floor level. A red LED shall indicate which elevator is selected to be on emergency power.
 - e. On return of normal power supply, arrange for all available elevators to be returned automatically to normal operation.
30. Provide 'Phase I' recall and alternate floor recall as required by code. Confirm with the University of Calgary Elevator coordinator and to obtain job-specific details.
31. Provide 'Phase II' firefighter's operation as required by code.
32. Include independent service to allow removal of a car from automatic service and to operate independently in response to car calls only and as follows:
 - a. Open doors automatically upon arrival
 - b. Render door protective devices inoperative.
 - c. Render hall signals inoperative.

Hydraulic Elevators – Service & Passenger***Cylinder and plunger for jacks***

33. Only direct acting holeless or direct acting buried hydraulic cylinders are permitted. Each plunger shall be manufactured of selected steel tubing machined true and finished to surface finish of 0.0008mm roughness height rating or better.
34. At top of cylinder include stuffing box and packing gland with seal or self-adjusting packing which does not require external adjustment.

35. Include means to automatically return oil which leaks past packing, to storage tank. Filter oil if exposed to atmosphere.
36. Design and install cylinder and plunger plumb and to allow operation with minimum friction.
37. Do not use a plunger follower guide.
38. All hydraulic elevators with buried piping or cylinders must have a sealed PVC encasement surrounding all buried sections of piping or cylinders.
 - a. There must be a positive means of confirming the presence of water in the sealed PVC encasement.

Pumping unit

39. Design pump and motor to be installed inside of the hydraulic tank.
40. Use positive displacement screw-type pump, with direct connection between drive motor and pump through flexible coupling, specially designed for quiet service.
41. Install oil tight drip pan beneath unit to retain leakage of hydraulic fluid. Provide drain plug in accessible location.
42. In machine room located on exterior walls, install thermostatically controlled heaters or other means to maintain fluid viscosity within limits necessary to provide consistent, reliable operation at all times. Install thermostatic protection of oil temperature in reservoir where pump or motor is submerged in reservoir.
43. Only petroleum type hydraulic oil shall be used.

Motor

44. Do not exceed EEMAC design B locked rotor current.
45. Design for minimum locked rotor torque of 150% and minimum breakdown torque of 200% at normal voltage.
46. Provide data plate on motor showing motor connections.
47. Where reduced voltage starting is provided, switch to full voltage not more than 1.5 seconds after interlock circuit is established.
48. Limit starting current of elevator motor to not more than 4 times full load running current.
49. Include class B motor insulation.
50. Size motor and pump to be rated for 80 starts per hour minimum.
51. Minimize transmission of fluid pulsations in pipeline between pumping unit and cylinder head with blow-out proof muffler.

52. Provide a soft start manufactured by Siemens.

Piping

- 53. Use threaded couplings or mechanical couplings which mechanically prevent separation of adjoining members.
- 54. Welding is permitted providing interior of pipe is thoroughly cleaned after welding or where welding method prohibits introduction of foreign material into interior of pipe.
- 55. Provide sound isolation couplings in pipeline between pump and cylinder.
- 56. Locate piping where it can be serviced.
- 57. Provide a gate valve in the machine room, and a secondary gate valve in the pit.
- 58. Rupture valve shall be installed where the machine room is greater than 15' from the hydraulic jack. The pipe fittings between the head of the jack and rupture valve shall be threaded.

Oil storage tank

- 59. Provide oil storage tank capacity equal to volume of oil required to lift elevator to top terminal plus reserve of not less than 45 litres.
- 60. Clearly indicate minimum permissible oil level.
- 61. Include gauge glasses to indicate oil level if top of tank is more than 1200mm above floor level.

Low oil control or high oil temperature

- 62. Provide low oil control feature designed to automatically cause up-travelling car to descend to lower terminal landing if reservoir oil level is insufficient.
- 63. Arrange control so that the oil reservoir is refilled before elevator can be returned to service.
- 64. Open car and hoistway doors automatically at lower terminal landing. De-activate control buttons in car operating panel, except door-open button, and close hoistway doors.

Cylinder protection

- 65. Protect cylinder against corrosion including chemical and electrolytic corrosion with installation of a PVC encasement around all buried cylinder sections.
 - a. Provide a means to monitor the space between the PVC liner and the cylinder and to evacuate any contaminants from the interior of the PVC liner.



- b. Provide a twenty (20) year written guarantee on the hydraulic cylinder assuming proper maintenance and testing of the space between the PVC liner and the cylinder is completed according to manufacturer's instructions.

Electric Elevators – Service & Passenger

General

5.15.2.5 Motor

1. Include direct current or AC reversible type motor designed for elevator service as follows:
 - a. Conform to most current NEMA Standards.
 - b. Impregnate windings with insulation and bake to prevent absorption of moisture and oil. Include over temperature sensors in the windings.
 - c. Provide not less than one mega-ohm insulation resistance between motor windings and motor frame.
 - d. Arrange end of motor shaft to receive crank or provide other similar means to permit turning motor shaft by hand. Supply one crank or other means for this purpose and protect end of shaft during normal operation by means of removable cover.
2. OR perma magnet motor designed for the application.
 - a. Machines shall have low audible noise.
 - b. high grade rare earth magnets
 - c. smooth stepless motor control
3. Approved hoist machine type shall be:
 - a. Hollister Whitney
 - b. Imperial
 - c. Other manufacturer's may be approved with written approval from the University of Calgary.

5.15.2.6 Solid state feedback speed control

1. Provide a closed loop negative feedback control system.
2. Include in the system the following features:
 - a. A pattern generator to give a velocity input signal modified by position with constant peak acceleration and constant peak change of acceleration;

- b. A digital or analog tachometer generator to provide a velocity feedback signal;
 - c. A digital transducer to provide a position feedback signal;
 - d. A current transformer to provide a current feedback signal.
3. Provide the following safety devices:
- a. Means to stop the elevator in the event the error exceeds five percent of the signal.
 - b. Means to stop the elevator in the event the acceleration exceeds the normal acceleration by more than fifteen percent.
 - c. A circuit to cut off power in the event of excessive power module switching time.
 - d. Means to cut off power in the event of overheating of the solid state components.
 - e. A circuit to initiate a slowdown and stop at the next floor in the event of a disagreement between the position as derived from the integration of the velocity feedback signal.
4. Arrange the response of the system so that the elapsed time between the detection of a fault and the cut off of power does not exceed 100 milliseconds.
5. Provide protective devices so arranged that any one fault will not cause risk of injury to the passengers.
6. Arrange that, if a fault occurs such that a subsequent fault could cause an unsafe condition, the fault will be detected and the elevator shut down.

5.15.3 Wheelchair Stair Lift

5.15.3.1 General Requirements

1. Install platform lift work to CAN/CSA B355, local codes and regulations except where specified otherwise. Arrange and pay for all required tests and inspections.
2. Installer's qualifications: Installation shall be carried out by manufacturer's approved installers.
3. Acceptable manufactured wheelchair stairlift units:
 - a. Garaventa (Canada) Ltd.
 - b. Savaria
 - c. RAM

Revision History

Revision Date	Version	Description
Feb 2014	1.0	Baseline version
August 10, 2023	1.0	Added Revision History table to end of document and reset to Version 1.0.
February 4 th , 2026	2.0	Major updates throughout.