

CHAPTER 79
and other sections of the
MUNICIPAL CODE OF CHICAGO
relating to

ELEVATORS, DUMBWAITERS, ESCALATORS,
and Mechanical Amusement Devices

Amended to March 1, 1954

HON. MARTIN H. KENNELLY, MAYOR

DEPARTMENT OF BUILDINGS
Room 702, City Hall
Roy T. Christiansen, Commissioner

12-22-52 p 3813
7-16-52 p 2819
5-2-40 p 2417
3-13-45 p 3142
9-16-45 p 3305

CONTENTS:	Pages
Chapter 79. Sections 79-1 to 79-188. Elevators, Dumbwaiters, Escalators, etc.....	7-47
Chapter 13. Sections 13-13 and 13-21. Department of Building--Elevator Inspectors ..	3
Chapter 43. Sections 43-15 and 43-26. Permits and permit fees	3-4
Chapter 46. Sections 46-9 to 46-15. Building Inspection--Elevators	3-4
Chapter 49. Section 49-9.2. Fire Protection--Elevator Framing	4-5
Chapter 62. Sections 62-3.3, 62-3.5 and 62-3.6. Fire Resistive Requirements--Elevator Enclosures.....	5
Chapter 67. Sections 67-3.1, 67-14 to 67-14.5. Escalators serving as exits	6
Chapter 85. Section 85-54. Refrigerant piping prohibited in elevator shafts	47
Chapter 88. Sections 88-620.1 to 88-620.75. Electrical equipment and wiring in elevators and dumbwaiters	48-52

MUNICIPAL REFERENCE LIBRARY
1005 City Hall
Frederick Rex, Librarian

PRICE FIFTY CENTS

3

Section 79-1.2 of the Municipal Code of Chicago is amended by adding thereto the following paragraph:

"(d) Where the method of operating a power elevator (except hydraulic-type freight elevators) is changed to continuous-pressure car and corridor operation, wood guide and posts will be permitted on freight elevators where the travel does not exceed four floors and with a maximum speed of seventy-five feet per minute."

Section 2. This ordinance shall be in force and effect from and after its passage and due publication.

Section 79-1.4. Amended to read as follows: (Date of Compliance.) On or before July 1, 1954, every existing power elevator, except rope-gear hydraulic elevators, steam elevators and gravity elevators (friction), shall be equipped with hatchway door interlocks of the hoistway unit system type which shall comply with the provisions of this chapter.
Council Proceedings 7-28-54.

Section 43-26 of the Municipal Code of Chicago hereby amended by striking the word "levelators" where same appears in paragraph (j) thereof and substituting therefor the words "platform lift".

Definition: Section 79-2. "Platform lift. A raising or lowering mechanism in a fixed position, designed for loading or unloading, with a travel not to exceed five feet, equipped with an open platform or a platform hinged at one end."
Council Proceedings 7-26-55.

B. Rudwate

CITY COUNCIL

1951-1955

CHICAGO

HON. MARTIN H. KENNELLY, Mayor
Ald. Dorsey R. Crowe, President Pro Tem.

Ludwig D. Schreiber
City Clerk
Philip Smolin
Deputy City Clerk

ALDERMEN

- Ward
- 1 John D'Arco, 100 N. LaSalle St. CE ntral 6-2792
 - 2 William H. Harvey, 3520 S. State St. CA lumbet 5-7073-7074
 - 3 Archibald J. Carey, Jr., 188 W. Randolph St. CE ntral 6-5277
 - 4 Abraham H. Cohen, 33 N. LaSalle St., Rm. 1833 RA ndolph 6-5250
 - 5 Robert E. Merriam, 1463 E. 35th St. BU tterfield 8-7411-7412
 - 6 David R. Muir, 6760 S. Stony Island Ave. MI dway 3-3300
 - 7 Nicholas J. Bohling, 231 S. LaSalle St. CE ntral 6-4395
 - 8 Roy E. Olin, 1244 E. 79th St. SA ginnaw 1-7611
 - 9 Reginald Dubois, 11106 S. Michigan Ave. CO mmadore 4-8382
 - 10 Emil V. Pacini, 9188 S. Houston Ave. SO uth Chicago 8-4217
 - 11 Stanley J. Nowakowski, 3659 S. Halsted St. CL iftside 4-6677
 - 12 Arthur V. Zeleninski, 1922 W. 47th St. I-A fayette 3-2153
 - 13 John E. Egan, 5968 S. Kedzie Ave. CR overhill 6-0090
 - 14 Joseph P. Burke, 4713 S. Halsted St. WA shburn 4-1400-401
 - 15 Frank Micek, 2919 W. 59th St. RE public 7-0292
 - 16 Paul M. Sheridan, 5608 S. Ivesia St. EN glewood 4-2107
 - 17 William T. Murphy, 33 N. LaSalle St. FI nancial 6-3355
 - 18 Thomas J. Corcoran, 7855-7857 S. Laflin St., ST ewart 3-6100-6101
 - 19 David T. McKiernan, 9449 S. Ashland Ave. BE rkeley 8-8766
 - 20 Kenneth E. Campbell, 5857 S. State St. CO rnell 7-1414
 - 21 Charles S. Bonk, 1851 S. Ashland Ave. CA nal 6-5700
 - 22 Otto F. Janousek, 3305 W. Cermak Road. BI shop 7-7227
 - 23 George J. Tourek, 4024 W. 25th Place. CR awford 7-6436
 - 24 Sidney D. Deutsch, 3726 W. Roosevelt Road. VA n Buren 6-2121
 - 25 Vito Marzullo, 832 S. Oakley Boulevard. SE dley 3-4903
 - 26 Matthew W. Bieszczat, 1942 W. Chicago Ave. SE dley 3-6200
 - 27 Harry L. Sain, 39 S. LaSalle St., Room 1215. ST ate 2-2247
 - 28 Patrick P. Perrone, 134 N. LaSalle St. ST ate 2-1414
 - 29 Joseph S. Gillespie, Room 303, City Hall, RA ndolph 6-8000, Ext. 322
 - 30 Daniel J. Roman, 215 S. Cicero Ave. CO lumbus 1-3374
 - 31 Thomas E. Keane, 2435 S. Augusta Boulevard. MI mboldt 6-6488
 - 32 Joseph P. Rosenkowsky, 1372 W. Evergreen Ave. AR midage 6-7600
 - 33 John B. Brandt, 2510 N. Rockwood St. AR midage 6-1200
 - 34 Herbert F. Gestler, 3522 W. Armitage Ave. DI ekens 2-2277
 - 35 Frank Peska, 1 N. LaSalle St. AX dower 3-4415
 - 36 Alfred J. Cichla, 3434 W. North Ave. NA tional 2-3332-3233
 - 37 William J. Lancaster, 5638 W. Lake St. AU stin 7-1424
 - 38 P. J. Culleton, 5837 W. Belmont Ave. BE rkeley 7-0900
 - 39 Ray N. Jacobs, 3925 W. Irving Park Road. CO rnell 7-1090
 - 40 Benjamin M. Becker, 33 N. LaSalle St., Rm. 1131. FI nancial 6-2662
 - 41 Joseph P. Immel, Jr., 4915 N. Milwaukee Ave. KI hare 5-8000
 - 42 Dorsey R. Crowe, Room 303, City Hall, RA ndolph 6-8000, Ext. 322
 - 43 Mathias Bauler, Room 202, City Hall, RA ndolph 6-8000, Ext. 400
 - 44 John C. Burnmeister, Jr., 125 W. Jackson Boulevard. WA bash 2-3951
 - 45 **Vacancy**
 - 46 James F. Young, 209 S. LaSalle St. FI nancial 6-1545
 - 47 John J. Hoellen, 1940 W. Irving Park Road. FA ginate 7-4700
 - 48 Allan A. Freeman, 1053 W. Lawrence Ave. LO ngbeach 1-9493
 - 49 Brian J. Ducey, 231 S. LaSalle St. CE ntral 6-5067
 - 50 Robert S. Brenner, 1 N. LaSalle St., Suite 5700. CE ntral 6-5370

CHAPTER 13

DEPARTMENT OF BUILDINGS

Chief elevator inspector

13-13. The chief elevator inspector shall be appointed by the commissioner according to law. The person certified to fill this position shall be a mechanical engineer, or an efficient elevator constructor. He shall be versed in the principles of both mechanical and electrical engineering and shall have had at least five years experience in the design and construction of elevators. He shall enforce all elevator, escalator, dumbwaiter and amusement park building and riding device regulations of this code. [Passed. Coun. J. 12-22-52, p. 3813.]

Inspection Services

Bureau of elevator inspection

13-21. The bureau of elevator inspection shall be in charge of an assistant chief elevator inspector, who under the direction of the chief elevator inspector, and with the assistance of elevator inspectors provided by the city council, shall make all elevator, escalator, dumbwaiter and amusement park and riding device inspections as required by law. The bureau of elevator inspection shall enforce all elevator, escalator, dumbwaiter, amusement park and riding device regulations of this code. Permits for the above installations shall be issued in the bureau of elevator inspection by the mechanical engineer of the bureau, under the direction of the chief elevator inspector and the assistant chief elevator inspector. [Passed. Coun. J. 12-22-52, p. 3813.]

CHAPTER 43

BUILDING PERMITS

Elevator construction or alteration

43-15. Before proceeding with the construction, installation, or alteration of any elevator or mechanical equipment used for the raising or lowering of any curtain, stage, or orchestra floor, or any platform, dumbwaiter, escalator, or mechanical amusement device or apparatus, application for a permit for such construction, installation, or alteration shall be submitted to the commissioner of buildings either by the owner or agent of the building, or of the premises on which such equipment is to be installed. A permit shall be obtained for any alteration in such elevator equipment except that this requirement shall not apply to the replacement of existing parts with other parts which are identical with those which are replaced.

The application for a permit shall specify the number and kind of equipment which it is desired to install, or the nature of the alteration to be made and the location of the building, structure, or premises, and shall be accompanied by such drawings and specifications as shall be necessary to inform said commissioner of the plan of construction, type of elevator, dumbwaiter, escalator, or mechanical amusement device, method of alteration, and the location thereof. Every application for a permit for a mechanical amusement device shall also be accompanied by a detailed drawing and description of the construction proposed, with a certificate signed by an architect or engineer certifying to the strength and safety of such device. If such drawings and specifications show that the equipment is to be installed or altered in conformity with the building provisions of this code, the commissioner of buildings shall approve the same and shall issue a permit to such applicant upon the payment by such applicant of the permit fee hereinafter named. It shall be unlawful for any owner, agent, or contractor to permit or allow the installation or alteration of any such equipment until a permit has been obtained, and the permit fee paid.

43-26. Permit fees shall be charged as follows:

- 43-26. Permit fees shall be charged as follows:
- Installed and escalators—power operated, five floors or less in height, 15.00
- Each additional floor above five 3.00
- Hand operated 10.50
- Levelators 10.50
- Theatre curtains 37.50
- Stage or orchestra platforms 15.00

(1) Elevators and escalators—power operated, five floors or less in height,

BUILDING PERMITS

Dumbwaiters--power operated--five floors or less in height, installed or altered.....	15.00
Each additional floor above five.....	3.00
Hand operated--five floors or less in height.....	10.00
Temporary Construction Towers over 30 feet in height.....	2.00
(k) Amusement devices, mechanical riding, sliding, sailing or swinging:.....	15.00
Permanent--for each assembly or installation.....	10.00
Permanet--installed or altered.....	82.50
[Amend. Coun. J. November 30, 1953 p. 51100-1]	

CHAPTER 46
BUILDING INSPECTION

Amusement Parks and Devices

46-9. The commissioner of buildings shall inspect, or cause to be inspected, all buildings to be used for purposes of exhibition, amusement, or entertainment, which are attended by the public, that are within or connected with an amusement park, each year before said buildings are open to the public, for the purpose of ascertaining whether they comply with the provisions of this code and the rules and regulations of the department of buildings. The fee for such annual inspection shall be six dollars for each building so inspected. [Amend. Coun. J. 11-18-47, p. 1191.]

46-10. The commissioner of buildings shall inspect, or cause to be inspected annually, all amusement devices, mechanisms, and structures, other than riding devices and other than buildings, within an amusement park, for the purpose of ascertaining whether they comply with the provisions of this code and the rules and regulations of the department of buildings; and the fee for such annual inspection shall be twelve dollars for each device, mechanism, and structure so inspected. The commissioner of buildings shall inspect annually, or cause to be inspected, all amusement devices operated by animals or by other motive power and all other riding, sliding, sailing, swinging, or rolling devices situated on any lot or tract of land outside of any amusement park before said devices are opened to the public. Where said devices are taken down, removed, and re-assembled or re-erected in another location, the commissioner of buildings shall inspect or cause said devices to be reinspected after each removal and before said devices are opened to the public, for the purpose of ascertaining whether they comply with the provisions of this code and the rules and regulations of the department of buildings. A fee, as provided in section 43-30 shall be paid for every such annual inspection or reinspection. [Amend. Coun. J. 11-18-47, p. 1191.]

Elevators, Dumbwaiters, Escalators, and Movable Platforms

46-11. Every elevator, movable stage, movable orchestra floor, movable platform, dumbwaiter, or escalator now in operation, or which may hereafter be installed, together with the hoistway and all equipment thereof, shall be inspected under and by the authority of the commissioner of buildings at least once every six months, and in no case shall any new equipment be placed in operation until an inspection of the same has been made. It shall be the duty of every owner, agent, lessee, or occupant of any building wherein any such equipment is installed, and of the person in charge or control of any such equipment, or escalator, and all devices used in connection therewith upon demand being

BUILDING INSPECTION

made by the commissioner of buildings or by his authorized elevator inspector within five days after such demand has been made.

46-12. Whenever any elevator, movable stage, movable orchestra floor, movable platform, dumbwaiter, or escalator has been inspected and the tests herein required shall have been made of all safety devices with which such equipment is required to be equipped and the result of such inspection and tests show such equipment to be in good condition, and that such safety devices are in good working condition and in good repair, it shall be the duty of the commissioner of buildings to issue or cause to be issued a certificate setting forth the result of such inspection and tests and containing the date of inspection, the weight which such equipment will safely carry and a statement to the effect that the shaft doors, hoistway, and all equipment, including safety devices, comply with all applicable provisions of chapter 79 of this code, upon the payment of the inspection fee required by the provisions of this code. It shall be the joint and several duty of the owner, agent, lessee, or occupant of the building in which such equipment is located and of each person in charge or control of such equipment to frame the certificate and place the same in a conspicuous place in each elevator and near each dumbwaiter, movable stage, movable orchestra floor, movable platform, or escalator. The words "safe condition" in this section shall mean that it is safe for any load up to the approved weight named in such certificate. [Amend. Coun. J. 7-16-52, p. 2819.]

46-13. Where the result of such inspection or tests shall show that such elevator, movable stage, movable orchestra floor, movable platform, dumbwaiter, or escalator is in an unsafe condition or a bad repair, or shall show that any of the safety devices, which are required by the provisions of chapter 79 of this code, have not been installed or if installed, are not in good working order or not in good repair, such certificate shall not be issued until such elevator, its hoistway, and its equipment, or such dumbwaiter, movable stage, movable orchestra floor, movable platform, or escalator, or such device or devices have been put in good working order. [Amend. Coun. J. 7-16-52, p. 2819.]

46-14. Whenever any elevator inspector finds any elevator or dumbwaiter, its equipment and hatchway, including doors, or any escalator, movable stage, movable orchestra floor, or movable platform in an unsafe condition, he shall immediately report the same to the elevator inspector in charge, who shall report it to the commissioner of buildings, together with a statement of all the facts relating to the condition of such equipment. It shall be the duty of the commissioner of buildings, upon receiving from the elevator inspector in charge a report of the unsafe condition of such equipment and hatchway, including doors, to order the operation of such equipment to be stopped and to remain inoperative until it has been placed in a safe condition and it shall be unlawful for any agent, owner, lessee, or occupant of any building wherein any such equipment is located, to permit or allow the same to be used after the receipt of a notice from the commissioner of buildings, which notice is in writing, that such equipment is in an unsafe condition and until it has been restored to a safe and proper condition as required by the provisions of this code. [Amend. Coun. J. 7-16-52, p. 2819.]

46-15. The fee for semi-annual inspection of an elevator, movable stage or orchestra floor or platform, dumbwaiter, or escalator shall be nine dollars. The fees herein required shall be paid either at the time application is made for inspection or upon the completion of such inspection and tests. [Amend. Coun. J. 11-18-47, p. 1191. November 30, 1953 p. 1191.]

CLASSIFICATION OF BUILDINGS BY CONSTRUCTION TYPE

Elevator Framing

49-9.2. Structural members or frames for elevators, located wholly within elevator shaft enclosures or in penthouses, shall not be required to be fire protected.

FIRE-RESISTIVE REQUIREMENTS

62-3.3. (a) Elevator Enclosures.

(1) Elevator shafts shall be enclosed with walls or partitions providing fire resistance of not less than two hours, except that walls and partitions separating adjacent shafts shall provide fire resistance of not less than one hour.

(2) Not more than three elevators shall be placed in one shaft enclosure.

(b) Escalator Enclosures. Escalators shall be enclosed with walls and partitions complying with the requirements for stairway enclosures as required in section 62-3.2 with the following exception:

(1) Escalators not required as a means of exit shall not be required to be enclosed providing effective means are provided which will prevent the spread of fire or gases from one floor to another in the event of fire.

62-3.5. Wells and similar openings through a floor shall be enclosed with construction providing fire resistance of not less than one hour, except that enclosure of wells shall not be required where open stairways are permitted.

62-3.6. Openings in all required stairway and shaft enclosures shall be limited to those essential to the purpose of the shaft and shall be protected with self-closing Class B fire doors or other approved protective assemblies complying with the requirements of section 65-5 with the following exceptions:

(a) In Residential Units not exceeding three stories in height, openings in the enclosures of stairways serving not more than four dwelling units in any floor may be protected with doors not less fire resistant than solid wood doors one and three-fourths inches thick.

(b) Door openings in elevator and dumbwaiter shafts shall be protected by opening protective assemblies having a fire resistive rating of one hour conforming to the test requirements of sections 65-5.1 to 65-5.3 inclusive, and sections 65-5.5 to 65-5.8 inclusive. Such doors shall not be required to be self-closing and no heat-actuated closing device shall be installed on any landing opening in an elevator or dumbwaiter hatchway. [Amend. Conn. J. 1-20-50, p. 5758; 7-16-52, p. 2819.]

EXIT REQUIREMENTS

67-3.1. Exits from a story above or below grade shall consist of interior stairways except as otherwise required in this section.

(a) Smokeproof Towers. A smokeproof tower may be used in lieu of any required interior stairway. At least one smokeproof tower shall be provided in every building, having a height exceeding 264 feet.

(b) Horizontal Exits. A horizontal exit may be used in lieu of an interior stairway when there is not less than one interior stairway or outside exit in each floor area connected by the horizontal exit.

(c) Escalators. An escalator may be used in lieu of one of three required interior stairways.

Escalators

67-14. Escalators serving as a required means of exit shall comply with the requirements of chapter 79 and with the requirements of sections 67-14.1 to 67-14.5, inclusive.

67-14.1. Escalators shall comply with all applicable requirements of interior stairways as provided in section 67-10.

67-14.2. Escalators shall be of the horizontal tread type operating in the direction of travel.

67-14.3. An escalator flight shall have a vertical travel of not more than thirty-five feet.

67-14.4. The angle of inclination of an escalator shall not exceed thirty degrees from the horizontal.

67-14.5. Escalators serving as required exits shall be enclosed and protected as required for stairways in section 62-3.

CHAPTER 79

ELEVATORS, DUMBWAITERS, ESCALATORS, MECHANICAL AMUSEMENT DEVICES

General provisions	79-1. Scope of provisions	79-39. Double safety devices
79-1.1. Compliance required—exceptions	79-1.1. Compliance required—exceptions	79-40. Car buffers
79-1.2. Limited compliance	79-1.2. Limited compliance	79-41. Spring type buffers
79-1.3. Changes not requiring compliance	79-1.3. Changes not requiring compliance	79-42. Oil type buffers
79-1.4. Date of compliance	79-1.4. Date of compliance	79-43. Counterweight buffers
79-2. Definitions	79-2. Definitions	79-44. Speed retarding devices
79-3. Operation of passenger elevator	79-3. Operation of passenger elevator	79-45. Location and access of buffers
79-4. Reporting accidents	79-4. Reporting accidents	79-46. Approval of buffers
Hatchway requirements for power elevators	79-5. Clearance between cars, counterweights, enclosures	79-47. Counterweights
79-5. Clearance between cars, counterweights, enclosures	79-6. Pits	79-48. Car frames
79-6. Pits	79-7. Car clearance	79-49. Steel stresses
79-7. Car clearance	79-8. Counterweight clearance	79-50. Plunger heads
79-8. Counterweight clearance	79-9. Overtravel for sidewalk type elevators	79-51. Cast iron
79-9. Overtravel for sidewalk type elevators	79-10. Installation of machinery	79-52. Other metals
79-10. Installation of machinery	79-11. Protection around equipment	79-53. Platform aprons
79-11. Protection around equipment	79-12. Stops for counterweights	79-54. Sidewalk type elevator construction
79-12. Stops for counterweights	79-13. Wiring	79-55. Tracks on cars
79-13. Wiring	79-14. Passenger elevator interlocks	79-56. Lifting fixtures
79-14. Passenger elevator interlocks	79-15. Passenger elevator door closers	79-57. Glass
79-15. Passenger elevator door closers	79-16. Passenger elevator emergency release	79-58. Car compartments
79-16. Passenger elevator emergency release	79-17. Passenger elevator opening devices	79-59. Cars counterbalancing one another
79-17. Passenger elevator opening devices	79-18. Passenger elevator door hangers	79-60. Two elevators in single hatchway
79-18. Passenger elevator door hangers	79-19. Freight elevator interlocks or electric contacts	79-61. Passenger elevator enclosures
79-19. Freight elevator interlocks or electric contacts	79-20. Freight elevator emergency release	79-62. Freight elevator enclosures
79-20. Freight elevator emergency release	79-21. Freight elevator opening devices	79-63. Construction of enclosures
79-21. Freight elevator opening devices	79-22. Service key	79-64. Open crill-work for enclosures
79-22. Service key	79-23. Emergency key	79-65. Enclosure top
79-23. Emergency key	79-24. Key receptacle	79-66. Emergency exits
79-24. Key receptacle	79-25. Hatchway door interlocks	79-67. Car doors and gates
79-25. Hatchway door interlocks	79-26. Closed position for elevators	79-68. Power doors or gates
79-26. Closed position for elevators	79-27. Operation of interlocks	79-69. Operation of gates and doors
79-27. Operation of interlocks	79-28. Interlocks and springs or electric circuits	79-70. Hangers for doors
79-28. Interlocks and springs or electric circuits	79-29. Approval of interlocks	79-71. Contracts for gates or doors
79-29. Approval of interlocks	79-30. Hatchway door electric contacts	79-72. Approval of gates and doors
79-30. Hatchway door electric contacts	79-31. Electric contacts and springs or circuits	79-73. Emergency release for gate or door
79-31. Electric contacts and springs or circuits	79-32. Approval of electric contacts	79-74. Car and counterweight safeties
79-32. Approval of electric contacts	79-33. Emergency releases	79-75. Governors
79-33. Emergency releases	79-34. Door counterweight enclosures	79-76. Required types of safeties
79-34. Door counterweight enclosures	79-35. Space under hatchways and counterweights	79-77. Governor construction
79-35. Space under hatchways and counterweights	Power elevators	79-78. Capacity of safeties
Power elevators	79-36. Scope of provisions	79-79. Replacement of governor cables
79-36. Scope of provisions	79-37. Guide rails	79-80. Rated load
79-37. Guide rails	79-38. Installation of guide rails	79-81. Capacity displayed
79-38. Installation of guide rails		79-82. Special loads
		79-83. Freight elevators carrying passengers
		79-84. Drums and sheaves
		79-85. Factor of safety
		79-86. Construction
		79-87. Brakes
		79-88. Special construction for hydraulic construction
		79-89. Pumps
		79-90. Pressure tanks
		79-91. Discharge tanks
		79-92. Terminal stopping devices
		79-93. Normal terminal stopping devices

- 79-94. Final terminal stopping devices
- 79-95. Operation of terminal stopping devices
- 79-96. Contacts and switches for terminal stopping operation and control
- 79-97. Elevator operation and control
- 79-98. Hand-ropes
- 79-99. Car switch devices
- 79-100. Disconnecting switch
- 79-101. Construction of controller switches
- 79-102. Operating levers and switches
- 79-103. Automatic operation elevators
- 79-104. Continuous pressure
- 79-105. Phase rotation or failure
- 79-106. Hand operating devices
- 79-107. Circuit-breakers
- 79-108. Operation of sidewalk elevators
- 79-109. Condensers
- 79-110. Limits of speed
- 79-111. Cables
- 79-112. Cable plates and tags
- 79-113. Factor of safety for cables
- 79-114. Number and size of cables
- 79-115. Cable fastenings
- 79-116. Cable sockets
- 79-117. Cable attachment to sockets
- 79-118. Emergency signals
- Stages, orchestra, and other elevators of special character
- 79-119. General requirements
- Hand elevators
 - 79-120. Clearances and general construction
 - 79-121. Hatchway door hangers
 - 79-122. Car enclosures
 - 79-123. Frames and platforms
 - 79-124. Glass
 - 79-125. Gates
 - 79-126. Safety devices
 - 79-127. Capacity
 - 79-128. Guides
 - 79-129. Buffers
 - 79-130. Counterweights
 - 79-131. Brakes
 - 79-132. Construction
 - 79-133. Suspension members
- Dumbwaiters
 - 79-134. Machinery and sheaves
 - 79-135. Electric contacts and locks
 - 79-136. Construction
 - 79-137. Capacity
 - 79-138. Factor of safety
 - 79-139. Guides
 - 79-140. Counterweights
 - 79-141. Means of suspension
 - 79-142. Power dumbwaiters
- Escalators
 - 79-143. General requirements
 - 79-144. Balustrades
 - 79-145. Treads and landings
 - 79-146. Construction
 - 79-147. Drive
 - 79-148. Marks of approval
 - 79-149. Stop buttons
 - 79-150. Speed governors, other devices
 - 79-151. Brakes
 - 79-152. Electrical phase protection
- Tests of interlocks before approval
 - 79-153. General requirements
 - 79-154. Separate devices
 - 79-155. Endurance test
 - 79-156. Current interruption test
 - 79-157. Tests in moist atmosphere
 - 79-158. Tests without lubrication
 - 79-159. Misalignment tests
 - 79-160. Insulation tests
 - 79-161. Force and movement test
- Tests of buffers before approval
 - 79-162. General requirements
 - 79-163. Retardation test
 - 79-164. Oil leakage test
 - 79-165. Churning test
 - 79-166. Plunger return test
 - 79-167. Test for lateral movement of plunger
- Field tests of elevators
 - 79-168. General requirements
 - 79-169. Buffers
 - 79-170. Car safeties
 - 79-171. Wedge clamp safeties
 - 79-172. Gradual guide clamp safeties
 - 79-173. Flexible guide clamp safeties
 - 79-174. Stopping distance
- Field tests of escalators
 - 79-175. General requirements
 - 79-176. Speed
 - 79-177. Reversal
 - 79-178. Broken chain
 - 79-179. Miscellaneous safety devices
- Other tests of equipment
 - 79-180. Field test of dumbwaiters
 - 79-181. Tests of electric contacts
 - 79-182. Test of emergency release
- Mechanical amusement devices
 - 79-183. General requirements
 - 79-184. Construction
 - 79-185. Safeties
 - 79-186. Lighting
 - 79-187. Test
- Violation of chapter provisions
 - 79-188. Penalty

79-1. Except as herein otherwise expressly provided, the provisions of this chapter shall apply only to the following devices which may hereafter be installed: elevators, dumbwaiters, escalators, mechanical equipment used for or in connection with, the raising or lowering of any stage, orchestra floor or any platform and all mechanical amusement devices and apparatus in parks, carnivals

and the like. All such devices heretofore installed shall comply with the ordinances of the city of Chicago in force at the date they were installed except as herein otherwise expressly provided. This chapter shall not apply to raising, lowering or conveying devices other than the devices above mentioned, nor to elevators used only for handling building materials or tools in buildings in the course of construction, but the commissioner of buildings shall make such reasonable requirements as he may deem necessary for public safety in the operation of such elevators. [Amend. Coun. J. 5-2-40, p. 2417; 3-13-45, p. 3142; 4-16-45, p. 3305; 7-16-52, p. 2819.]

79-1.1. Except as otherwise provided in sections 79-1.2 and 79-1.3, any device to which this chapter applies shall comply with all the provisions of this chapter if it is hereafter altered any way so as to change:

- (a) The speed or capacity of the device.
- (b) The purpose for which it is used.
- (c) Its basic operating, controlling or safety equipment.
- (d) An existing non-passenger elevator to a passenger elevator.
- (e) The type of an elevator from electric to hydraulic or from hydraulic to electric.

The provisions of this chapter shall not apply to the repairs of such existing devices which are necessary to keep them in safe operating condition nor to the replacement of parts which serve a similar purpose to those replaced, provided that safe conditions are maintained. [Added. Coun. J. 7-16-52, p. 2819.]

79-1.2. Notwithstanding the provisions of section 79-1.1,

(a) Where the method of operating a power elevator is only changed to any other type car switch or hold down button car only operation, such elevator need only comply with the ordinances of the city of Chicago in force at the date it was installed and also with the provisions of this chapter relating to interlocks, electric contacts and locks and terminal stopping devices, except that where any elevator is changed to automatic control then the provisions of the code with respect to car gates and hatchway doors shall apply.

(b) Where a power elevator (except steam driven, hydraulic or drum type machines) is changed so as to increase the rated speed by not more than fifteen per cent, such elevator need only comply with the ordinances of the city of Chicago in force at the date it was installed and also with the provisions of this chapter relating to car and counterweight safeties, buffers, speed governors, interlocks, electric contacts and locks and terminal stopping devices, except that the limit of the pull out of the governor cable may be six feet.

(c) Where a power elevator (except steam driven, hydraulic or electric drum type machines) is changed so as to increase its rated load not more than 15% such elevator need only comply with the ordinances of the city of Chicago in force at the date it was installed and also with the provisions of this chapter relating to car and counterweight safeties, interlocks, electric contacts and locks, and terminal stopping devices, unless in so doing adequate factors of safety are exceeded. [Added. Coun. J. 7-16-52, p. 2819.]

79-1.3. The following changes shall not require the device to comply with the provisions of this chapter:

- (a) A change in the electric power supply from direct current to alternating current or any other change in the character of the electric power supply, provided that all parts affected by the change from direct to alternating current

or other change in the character of the electric power supply be changed or adapted to operate on the changed electric power supply.

(b) The installation of additional equipment which complies with the provisions of this chapter.

(c) Changes in the enclosure of elevator hatchways.

(d) The installation of new elevator cabs without major changes in other parts of the elevator installation. [Added. Coun. J. 7-16-52, p. 2819.]

79-1.4. On or before July 1, 1953, every existing power elevator shall be equipped (or such equipment shall have been contracted for) with hatchway door interlocks of the hoistway unit system type which shall comply with the provisions of this chapter. [Added. Coun. J. 7-16-52, p. 2819.]

79-2. The terms used in this chapter are hereby defined as follows:

Buffer. A device designed to absorb the impact of an elevator, or dumbwaiter car, or counterweight, at the extreme limits of travel.

Cab, elevator. An enclosure consisting of walls and top built upon a car platform.

Car. The load carrying unit.

Car door or gate. A door or gate in or on an elevator or dumbwaiter car.

Car leveling device. Any mechanism or control which will move a car within a limited zone toward, and stop the car at, the landing. For an elevator, the device may also be used for emergency operation of the car throughout its entire travel and for safe lifting purposes.

Car frame. A supporting frame to which the platform upper and lower sets of guide shoes and the hoisting cables are usually attached.

Car platform. The structure which forms the floor of the car and directly supports the load.

Clearance, bottom. The vertical distance between any obstruction in the pit, exclusive of the compensating device, buffer and buffer supports, and the lowest point of the understructure of the car exclusive of the safeties, car frame channels, and guide shoes and other necessary equipment attached to the underside of the platform, when the car floor is level with the bottom terminal landing.

Clearance, top.

(a) *Car.* The top clearance of a car is the distance the car floor can travel above the level of the top terminal landing without any part of the car, or devices attached thereto, coming in contact with the overhead structure.

(b) *Counterweight.* The top clearance of a counterweight is the shortest vertical distance between any part of the counterweight structure and the nearest part of the overhead structure, or any other obstruction when the car is level with the bottom terminal landing.

Door closer. A device, operated by gravity or other means, which will automatically close a door when released by the operator, or by suitable automatic means.

Door unit contact system. A contact system which requires that the hatch-

way door or gate, at which the elevator is standing, must be closed before the elevator can leave the landing, but which does not prevent the operation of the car if other doors in the hatchway are not closed.

Dumbwaiter. A raising and lowering mechanism equipped with a car, the floor area of which does not exceed nine square feet, whose compartment height does not exceed four feet, the capacity of which does not exceed five hundred pounds and which is used exclusively for carrying freight.

Electric contact, car door or gate. A device to open the control circuit, or an auxiliary circuit, unless the car door or gate is in the closed position and thus prevent operation to move the car away from the landing.

Electric contact, hatchway door or gate. A device to open the control circuit, or an auxiliary circuit, unless the hatchway door or gate at which the car is standing, is in the closed position and thus prevent operation to move the car away from the landing.

Elevator. A raising and lowering mechanism equipped with a car or platform which moves in guides in a substantially vertical direction, further defined as of the following types:

(a) Auxiliary power elevator. An elevator having a source of mechanical power in common with other machinery.

(b) Chain driven elevator. An elevator having its machine connected to a reversible motor, engine, or turbine by a chain.

(c) Double-belted elevator. An auxiliary power elevator in which the direction of travel is changed without reversal of the prime mover.

(d) Electric elevator. An elevator operated by an electric motor directly applied to the elevator machinery.

(e) Freight elevator. An elevator designed for carrying freight and the operator and persons necessary for loading and unloading.

(f) Gravity elevator. An elevator in which gravity is the source of power.

(g) Hand elevator. An elevator driven by manual power.

(h) Hydraulic elevator. An elevator operated by liquid under pressure.

(1) Plunger elevator. A hydraulic elevator having a ram or plunger directly attached to the under side of the car platform.

(2) Rope geared hydraulic elevator. A hydraulic elevator in which the movement of the car is obtained by multiplying the travel of a piston or ram by a system of sheaves over which the hoisting ropes operate.

(1) Passenger elevator. An elevator which is designed to carry persons.

(f) Power elevator. An elevator operated otherwise than by gravity or manually.

(k) Private residence elevator. A power passenger elevator serving a single family, installed in a dwelling and having a rated capacity of not more than seven hundred pounds and a rated speed of not more than fifty feet per minute.

(1) Sidewalk type elevator. A freight elevator having a speed of not more than fifty feet per minute and having the top landing not more than four feet above grade level at the point where the elevator is located, the platform of which elevator is suspended or supported at or below the platform level and in such a manner as will not permit tipping of the platform.

(m) Single-belted elevator. An elevator machine connected to a reversible motor, engine, or turbine by a belt.

(n) Steam elevator. An elevator operated by a steam engine directly applied to the elevator machinery.

Elevator control. A system of regulation by which the starting, stopping, direction of motion, acceleration, speed, and retardation of an elevator are governed and further defined as of the following types:

(a) Generator field control. A system in which control is accomplished primarily by the use of an individual generator for each elevator, in which the voltage applied to the hoisting motor is adjusted by varying the strength and direction of the generator field.

(b) Multi-voltage control. A system in which control is accomplished primarily by impressing successively on the armature of the hoisting motor a number of substantially fixed voltages.

(c) Rheostatic control. A system in which control is accomplished

primarily by varying resistance or reactance in the armature or field circuit of the hoisting motor, or by any combination thereof.

Emergency release. A device to make the door or gate electric contacts or door interlocks inoperative in case of emergency.

Emergency stop switch. A device in a car used to cut off the power from the machine independently of the operating devices.

Escalator. A moving inclined continuous stairway or runway used for raising or lowering passengers.

Hatchway. The space in which an elevator or dumbwaiter is designed to operate.

Hatchway door or gate. The hinged or sliding portion of the hatchway enclosure for access to the car at any landing.

Hatchway door interlock. A device, the purpose of which is to prevent the operation of the machine to move the car away from a landing unless the hatchway door at that landing is locked in the closed position; and to prevent the opening of the hatchway door from the landing side except by special key, unless the car is at rest within the landing zone, or is coasting through the landing zone, with its operating device in the stop position.

(a) Door unit interlock system. An interlock system which requires that the hatchway door at which the elevator is standing must be locked in the closed position before the elevator can leave the landing, but which does not prevent the operation of the car if other doors in the hatchway are not locked.

(b) Hatchway unit interlock system. An interlock system which will prevent the operation of the car unless all hatchway doors are locked in the closed position.

Hatchway enclosure. Any structure which separates the hatchway, either wholly or in part, from the floors or landings through which the hatchway extends.

Hatchway rail contact system. A contact system which will prevent the operation of the car unless all hatchway doors are closed.

Loading. That portion of a floor or platform used to receive and discharge passengers or freight.

Landing zone. The space from a point not more than eighteen inches below the landing to a point not more than eighteen inches above the landing.

Load rated. The load which the elevator or dumbwaiter is designed to carry at rated speed.

Machine. The machinery and its equipment used in raising or lowering the car or platform, of the following types:

(a) Direct-drive machine. A machine in which the power is transmitted directly to the driving sheave or sheaves without intermediate mechanism or gears.

(b) Spur-gear machine. A machine in which the power is transmitted to the driving sheaves or drum through spur gearing.

(c) Traction machine. A machine in which the movement of the car and counterweight is obtained by means of traction between the driving drum, sheave or sheaves and the hoisting cables.

(d) Winding drum machine. A machine in which the cables are fastened to and wind on a drum.

(e) Worm-gear machine. A machine in which the power is transmitted to the driving sheaves and drum through worm gearing.

Mechanical unassent device. Any device designed or used to move a person or to permit the movement of a person by mechanical means in any direction for amusement and operated within a space or over a route devoted exclusively to such use.

Operating device. The device used to actuate the control.

Operation. The method of actuating the control, of the following types:
(a) Automatic operation. Operation by means of buttons or switches, both in the car and at the landings, the momentary pressing of which will cause the car to start and automatically stop at the floor corresponding to the button pressed.

(a-1) Single automatic operation. Operation by means of one button in the car for each landing level served and one button at each landing so arranged that if any car or landing button has been pressed, the pressure of any other car or landing operating button will have no effect on the operation of the car until the response to the first button has been completed.

(a-2) Non-selective collective automatic operation. Operation by means of one button in the car for each landing level and one button at each landing, wherein all stops registered by the momentary pressure of landing or car buttons are made, irrespective of the number of buttons pressed, or the sequence in which the buttons are pressed. With this type of control the car stops at all landings for which buttons have been pressed, making the stops in the order in which the landings are reached after the buttons have been pressed, but irrespective of its direction of travel.

(a-3) Selective collective automatic operation. Operation by means of one button in the car for each landing level served and by "up" and "down" buttons at the landings, wherein all stops registered by the momentary pressure of the car buttons are made as defined under non-selective collective automatic operation, but wherein the stops registered by the momentary pressure of the landing buttons are made in the order in which the landings are reached in each direction of travel after the buttons have been pressed. With this type of control, all "up" landing calls are answered when the car is traveling in the "up" direction and all "down" landing calls are answered when the car is traveling in the "down" direction, except the uppermost or lowermost calls which are answered as soon as they are reached, irrespective of the direction of travel of the car.

(b) Car-switch automatic floor stop operation. Operation in which the stop is initiated by the operator from within the car with a definite reference to the landing at which it is desired to stop, after which the slowing down and stopping of the elevator is automatically effected.

(c) Car-switch operation. Operation wherein the movement of the car is directly and solely under the control of the operator by means of a switch or buttons in the car.

(d) Continuous-pressure operation. Operation with "up" and "down" buttons or an "up" and "down" switch in the car and at each landing, except the terminal landings, at each of which there may be one button or switch, any one of which may be used to control the movement of the car in the direction for which the buttons is pushed or the switch actuated, but only so long as the button or switch is manually held in the operation position. Landing stops are not automatic.

(e) Dual-operation. Operation whereby the elevator is arranged to be operated as an automatic operation elevator through landing and car buttons or switches, or as a manual operation elevator by an operator in the car, who may either use a car switch or the buttons provided in the car. When operated by an operator, upon the throwing of a suitable switch, or switches, the car can no longer be started by the landing button. These buttons may, however, be used to signal the operator that the car is desired at a certain landing.

(f) Pre-register operation. Operation in which signals to stop are registered in advance by buttons in the car and at landings. At the proper point in the car travel, the operator in the car is notified by a signal to initiate the stop, after which the landing stop is automatic.

(g) Signal operation. Operation by means of buttons or switches in the car and "up" and "down" direction buttons or switches at the landings, by which predetermined landing stops may be set up or registered for an elevator or for a group of elevators. The stops set up by the momentary pressure of the car buttons are made automatically in succession as the car reaches those landings, irrespective of its direction of travel, or the sequence in which the buttons are pressed. The stops set up by the momentary pressure of the "up" and "down" buttons at the landing are made automatically by the next car in the group approaching the landing in the corresponding direction, irrespective of the sequence in which the buttons are pressed. With this type of operation the car can be started only by means of a starting switch or button in the car.

Overhead structure. All of the equipment supporting structure and platforms at the top of the hatchway.

Overtravel bottom.

(a) Car. The bottom overtravel of the car is the distance the car

floor can travel below the level of the bottom terminal landing until the fully loaded car rests on the buffers, and includes the resulting buffer compression.

(b) Counterweight. The bottom overtravel of the counterweight is the distance the counterweight can travel below its position when the car rests on the buffers, and includes the resulting buffer compression.

Overtravel, top. The distance provided for the car floor to travel above the level of the upper terminal landing until the car is stopped by the normal terminal stopping device.

Pit. That portion of a hatchway extending below the level of the bottom landing to provide for bottom overtravel and clearance and for parts which require space below the bottom limit of car travel.

Power operated door or gate. A door or gate opened and closed by power as hereinafter described, of the following types: (a) Power closed door or gate. A door or gate which is manually opened and is closed by power other than by hand, gravity, springs, or the movement of the car.

(b) Power-operated, self-closing door or gate. A door or gate which is opened by power other than by hand, gravity, springs, or the movement of the car, and when released by the operator is closed by energy stored during the opening operation.

(c) Power operated door or gate, automatically opened. A door or gate which is opened other than by hand, gravity, springs, or the movement of the car, the opening of the door being initiated by the arrival of the car at or near the landing. The closing of such door or gate may be under the control of the operator or may be automatic.

(d) Power operated door or gate, manually controlled. A door or gate which is opened and closed by power other than by hand, gravity, springs, or the movement of the car, the door movement in each direction being controlled by the operator.

Power operated door or gate device. A device to operate the hatchway door and car door or gate by power other than by hand, gravity, springs, or the movement of the car.

Safety, car or counterweight. A mechanical device attached to the car or counterweight frame to stop and hold the car or counterweight in case of pre-terminated overspeed free fall or through slackening of the cables.

Speed, rated. The speed which the car is designed to attain when carrying its rated load in the "up" direction.

Terminal stopping device, final. An automatic device for stopping the car and counterweight from rated speed within the top clearance and bottom overtravel, independently of the operation of the normal terminal stopping device and the operating device.

Terminal stopping device, normal. An automatic device for stopping the car within the overtravel independently of the operating device.

Travel or rise. The vertical distance between the bottom terminal landing and the top terminal landing. [Amend. Coun. J. 5-2-40, p. 2417.]

79-3. It shall be unlawful for any operator of any elevator in the city, wherein passengers are conveyed, to start such elevator until all doors of such elevator and landing into such elevator are closed and locked, or to open the doors of such elevator until said elevator has come to a full and complete stop, unless the elevator is equipped with interlocks and a slow speed automatic leveling or landing device, which will stop the car at the floor.

79-4. Whenever any accident shall occur, causing injury to life or limb to any person in or about an elevator, dumbwaiter, escalator or mechanical amusement device, or while setting on or off of same, or which shall in any way imperil the safety of the equipment, such accident shall be reported at once by the operator of the equipment, owner, superintendent, lessee or manager of the building to the commissioner of buildings. No broken or damaged parts of such elevator, dumbwaiter, escalator, or mechanical amusement device shall be moved or displaced, nor shall repairs be made thereon, nor shall said elevator, dumbwaiter,

escalator, or mechanical amusement device be operated until an investigation into such accident has been made by the commissioner of buildings or his duly authorized agent. A full report in writing of the result of such investigation shall be filed in the department of buildings and the commissioner of buildings shall keep a complete record of all such accidents and reports thereon.

Hatchway Requirements for Power Elevators

79-5. The minimum clearance between cars, counterweights, and hatchway enclosures shall be as follows:

Car and hatchway enclosure. Between the sides of the car and the hatchway enclosure three-fourths inch.

Car and counterweight. Between the car and its counterweight one inch.

Car and thresholds. Between the car platform and the landing thresholds for an elevator using side post construction one-half inch and for an elevator using corner post construction three-fourths inch.

Landing and enclosure. The maximum clearance between the landing side of the car platform and the hatchway enclosure shall be as follows: (a) Between the loading side of the car platform at the car entrance and the enclosure, five inches, except where doors are installed wholly within the hatchway where this distance may be increased to seven and one-half inches.

(b) Between the car platform and the landing threshold, one and one-half inches.

79-6. The depths of pits measured from the thresholds of the bottom landing shall be not less than the following: (a) Elevators having a total travel of not more than fifteen feet, a speed not more than fifty feet per minute and not equipped with buffers, and private residence elevators, two feet.

than six inches, plus one and one-half times the stroke of the buffer corresponding to governor tripping speed of the elevator at full speed, plus two feet. If retarders are installed which reduce the speed of the car at terminal landings, and the stroke of the buffer is reduced correspondingly, not less than the clearance between the bottom of the counterweight buffer and its striking block, in any case not less than six inches, plus the stroke of the buffer corresponding to governor tripping speed of the elevator at full speed, plus two feet, plus one-half of the at counterweight engagement, not less than the clearance between the bottom of the counterweight buffer and its striking block, in any case not less than six inches, plus the stroke of the buffer used, plus two feet. If precompression is used, the clearance may be reduced by the amount of precompression provided a spring return type of buffer is used.

(c) When the car crosshead is two feet from the nearest obstruction above it, no projection on the car shall strike any part of the overhead structure.

(d) Where the depth of an elevator pit is reduced, as hereinafter described the top clearance may be reduced accordingly. [Amend. Coun. J. 5-2-40, p. 2417.]

79-8. When an elevator car is level with the bottom landing, the clearance between the top of the counterweight and any obstruction in the hatchway above it shall be not less than:

(a) If spring buffers or their equivalent are used, the clearance between the top of the car buffer and its striking block, in any case not less than three inches, plus the compression of the buffer, plus six inches.

(b) If oil buffers or their equivalent are used, the clearance between the top one and one-half times the stroke of the buffer corresponding to the governor tripping speed of the car at full speed, plus six inches. If provision is made to eliminate the jump of the counterweight at car buffer engagement, not less than not less than three inches, plus the stroke of the buffer used, plus six inches. If retarders are installed which reduce the speed of the car at terminal landings and between the top of the car buffer and its striking block, in any case not less than three inches, plus the stroke of the buffer corresponding to the governor tripping speed of the car at full speed, plus six inches, plus one-half the stroke of the buffer used. If precompression is used, clearance may be reduced by the amount of precompression.

(c) When the depth of an elevator pit is reduced, as hereinafter described, the top clearance may be reduced accordingly. [Amend. Coun. J. 5-2-40, p. 2417.]

79-9. For sidewalk type elevators there shall be provided an overtravel of not less than six inches at the top and of not less than three inches at the bottom.

79-10. Machinery and sheaves shall be so supported and held as to prevent any part from becoming displaced. No elevator machinery, except overhead sheaves for private residence elevators, and idler and deflecting sheaves with their frames or frames and devices for limiting or retarding the car speed and their accessories, shall be hung underneath the supporting beams at the top of the hatchway. Supporting members for elevator machinery hung underneath beams shall not depend solely on cast iron in tension.

79-11. Exposed gears, sprockets, tape sheaves and ropes, and tapes passing through secondary levels shall be protected with substantial metal guards securely fastened in place and arranged to provide adequate protection for attendants and the public against injury. Detecting sheaves extending below the machine level shall be provided with adequate guards. Substantial metal guards shall be installed to separate every counterweight hatchway from every pit and shall extend at least six feet above the floor of such pit except where compensating chains or cables are attached to the counterweight, in which case such guards shall not be required on the side of the counterweight facing the elevator. [Amend. Coun. J. 5-2-40, p. 2417.]

79-12. Where winding drum machines are used, a permanent beam or bar shall be provided at the top of the counterweight guides and beneath the counterweight sheaves to prevent the counterweights from being drawn into the sheaves. It shall be so arranged, and of such strength, that the cables will be pulled out of the sockets before there is any undue deflection of the beam.

79-13. All wiring in connection with elevators shall be done to conform with the requirements of the electrical provisions of this code.

79-14. Hatchway door interlocks shall be provided on the hatchway doors of passenger elevators.

79-15. The hatchway doors of hydraulic passenger elevators shall also be provided with an automatic door closer which will close the doors should the car creep more than six inches away from the landing.

79-16. An emergency release shall be installed in each car, which is arranged for operation through a car switch by an operator in the car, including dual operated elevators, by which such operator can operate the car from within the car only, independent of the position of the hatchway doors. The emergency release in dual operated elevators shall be arranged so as to be inoperative when the car is operated as an automatic elevator. [Amend. Coun. J. 5-2-40, p. 2417.]

79-17. Hatchway doors shall be arranged to be opened by hand from the hatchway side, except when locked out of service. Neither the main exit doors, nor the doors at the bottom terminal landing shall be locked out of service while the elevator is in operation. Hatchway doors for passenger elevators shall be arranged so that it is unnecessary to reach back of any panel, jamb, or sash to operate them. If the entire control of a passenger elevator is located in the car, the hatchway doors shall be so arranged that they cannot be opened from the landing side, except by service or emergency keys as hereinafter prescribed. If the control is not located entirely in the car, the hatchway doors shall be so arranged that unless the bar is in the landing zone, the doors cannot be opened from the landing side, except by service or emergency keys.

79-18. Hangers for power operated hatchway doors shall be designed to withstand a downward thrust of five times and an upward thrust of four times the weight of the door. Means shall be provided to prevent hangers for all sliding hatchway doors from jumping the tracks. Stops shall also be provided to prevent the hanger carriage from leaving the ends of the track, or suitable stops may be provided on the door only.

79-19. Hatchway doors for freight elevators, where the elevator can be operated only from inside the car, shall be provided with interlocks or electric contacts and locks. Hatchway doors for automatic and double button elevators, having a speed not to exceed one hundred fifty feet per minute and equipped with vertical type doors or gates, shall be provided with interlocks or electric contacts and locks. Hatchway doors for other freight elevators, except hatch covers for sidewalk type elevators, shall be provided with interlocks. Where electric contacts are provided on a hatchway door and are not a part of an interlocked system, the lock or latch and contact shall be so arranged as to insure the door being in position to be locked or latched when or before the contact is closed. Door electric contacts and door locks or latches shall be so located as normally to be inaccessible from the landing side.

79-20. An emergency release shall be installed in each car, except a sidewalk type elevator arranged for operation by an operator in the car, by which such operator can operate the elevator from within the car only, independent of the position of the hatchway doors. The emergency release in dual operated elevators shall be arranged so as to be inoperative when the car is operated as an automatic elevator.

79-21. If the entire control of a freight elevator is located in the car the hatchway doors shall be so arranged that they cannot be opened from the landing side except by service or emergency keys hereinafter prescribed. If the control is not located entirely in the car, the hatchway doors shall be so arranged that unless the car is in the landing zone, the doors cannot be opened from the landing side, except by service or emergency keys.

79-22. A service key shall be provided for every elevator, except of the automatic or the continuous control type, to open the hatchway door from the landing side at the landing where the car is normally parked out of service. This key shall open this door only when the car is in the landing zone and shall open no other door in the hatchway. Where two or more cars are normally parked out

of service at the same landing, the service key may be arranged to open all the hatchway doors at the landing. [Amend. Coun. J. 5-2-40, p. 2417.]

79-23. An emergency key shall be provided for every elevator which, irrespective of the position of the car, will from the landing side open the hatchway door only at the landing where the car is normally parked and at the lowest landing; or if for an elevator operating in a blind hatchway, it shall also open the first hatchway door above the blind portion and no other door in the hatchway. For an elevator operating in a single hatchway it shall open all hatchway doors. Emergency keys shall be especially designed to prevent easy duplication. [Amend. Coun. J. 5-2-40, p. 2417.]

79-24. The emergency key shall be placed in a break glass receptacle clearly marked "ELEVATOR DOOR KEY, FOR FIRE DEPARTMENT AND EMERGENCY USE ONLY" at the landing of each elevator or group of elevators that is nearest the street entrance to the building. If there is more than one street entrance, an emergency key in a receptacle marked as described shall be located in a position conveniently reached from each entrance. The same emergency key shall fit the hatchway doors of all elevators in any group. [Amend. Coun. J. 5-2-40, p. 2417.]

79-25. The door interlock system shall prevent the opening of any hatchway door from the landing side except by a special key as hereinbefore described, unless the elevator is at rest within the landing zone, or is coasting through the landing zone with its operating device in the "STOP" position. The interlock shall permit the operation of the car when the emergency release is in temporary use, or when the car is being moved by a car leveling device. An interlock system of the door unit type is prohibited. [Amend. Coun. J. 5-2-40, p. 2417.]

79-26. For elevators employing a type of operation that does not require the presence of an operator in the car, and for all elevators where the hatchway door is not equipped with a door closer, the door shall be considered in the closed position only when the door is within three-eighths inch of the nearest face of the door jamb, or, if the doors are of the bi-parting type, only when the doors are within three-eighths inch of contact with each other.

Where the hatchway door of an elevator, requiring the presence of an operator in the car is equipped with a door closer, the door shall be considered to be in the closed position and the car may be started when the door is within four inches of the nearest face of the jamb, or, if the doors are of the bi-parting type, when the sections are within four inches of contact with each other. If at this position and any other up to full closure, the door cannot be opened from the landing side more than four inches from the jamb, or bi-parting sections more than four inches from each other, provided the door closer is of a type which will eventually close the door to the fully closed position and lock it in this position. [Amend. Coun. J. 5-2-40, p. 2417.]

79-27. The interlocks for all hatchway doors shall be so designed that the doors are locked in the closed position before the car can be operated, except that for private residence elevators the interlocks may be so arranged that after the doors are closed the car may move away from a landing a distance of not more than twelve inches before the locking operation takes place, providing that should the locking operation fail to take place, further movement of the car will open the circuit and apply the brake. If a private residence elevator is arranged to be operated in this manner, an apron shall be installed on the front of the car platform extending below the car floor a distance equal to that which the car can travel before the door is locked.

79-28. Interlock contacts shall be positively opened, and the functioning of the interlock to prevent movement of the car shall not be solely dependent upon the action of a spring or springs, nor gravity, nor an electric circuit. If an electric circuit is used, its interruption shall prevent the movement of the car. [Amend. Coun. J. 5-2-40, p. 2417.]

79-29. The type and make of door interlock shall be approved by the commissioner of buildings on the basis of the "tests of interlocks" hereinafter described, made by or under the supervision of a competent recognized laboratory. Approved interlocks shall be suitably and plainly marked for identification. The marking shall be permanent and so placed as to be readily visible when the interlocks are mounted in position. Auxiliary appliances forming a part of, or used in conjunction with, an interlock shall be similarly marked. Marking shall include

the manufacturer's name or trade-mark, type or style letter, or number and rated voltage.

79-30. The contact shall permit the operation of the car when the emergency release is in temporary use, or when the car is being moved by a car-leveling device. An electric contact of the door unit type is prohibited. Hatchway door contacts shall be designed so that they are positively opened by a lever or other device attached to and operated by the door.

79-31. The functioning of a hatchway door electric contact to prevent the movement of the car shall be independent of the action of a spring or springs in tension and of the closing of an electric circuit. If springs are used, they shall be in compression. If an electric circuit is used, its interruption shall prevent the movement of the car.

79-32. Each type and make of hatchway door electric contact shall be approved by the commissioner of buildings on the basis of "endurance test," "cut-resistant interruption test," "test in moist atmosphere," "mis-alignment test" and "insulation test" hereinafter described, made by or under the supervision of a competent recognized laboratory. Approved contacts shall be suitably marked for identification as required for interlocks.

79-33. The emergency release shall be in the car plainly visible to the occupants of the car. It shall be easily accessible to the operator and shall be provided with a break glass cover and with means for breaking the glass. It shall be of such a design that the operator must hold the emergency release in the operative position to operate the car. Emergency releases shall be constructed so that they cannot be readily tampered with, or plugged in the release position. Rods, connections, and wiring used in the operation of the emergency release, which are accessible from the car shall be enclosed and protected from injury. Each make and type of emergency release shall be tested and approved by the commissioner of buildings if found to show compliance with the foregoing requirements and the "insulation test" hereinafter described.

79-34. Door counterweights shall run in metal guides from which they cannot become dislodged or shall be enclosed or boxed in. The bottoms of the guides or enclosures shall be so constructed as to retain the counterweight if the counterweight rope breaks.

79-35. If the space under elevator hatchways and counterweights is used for any purpose, buffers equipped with safety devices conforming to the requirements prescribed for "car and counterweight buffers" and "car and counterweight safeties and speed governors" shall be provided for both cars and counterweights.

Power Elevators

79-36. The provisions of the following sections of this chapter dealing with power elevators apply to all types of power elevators except stage and orchestra floors and other elevators of a special character, and dumbwaiters, which are separately treated in the chapter.

79-37. Car and counterweight guide rails shall be of rolled steel, except where steel would constitute an accident hazard, where wood guide rails may be used. The weights of steel guide rails, except for sidewalk type elevators having a travel of not more than fifteen feet, shall be not less than the following:

Maximum permitted weight of car and load or counterweights, per pair of rails (Pounds)	Minimum weight of steel (Pounds per foot)	With guide rails (Pounds per foot)	Minimum weight of each counterweight without guide rail safeties 1 to 1 Hoisting (Pounds per foot)	Minimum weight of each counterweight with guide rail safeties 2 to 1 Hoisting (Pounds per foot)
4,000	7 1/2	7 1/2	6 1/2	6 1/2
15,000	14	14	7 1/2	7 1/2
27,500	22 1/2	22 1/2	14	14
40,000	30	30	14	14

Where seven and one-half pound rails are effectively bracketed or tied at intervals of not more than six feet, the load permitted under the preceding table may be doubled for counterweights with guide rail safeties. Where seven and one-half pound rails are effectively bracketed or tied at intervals of not more than seven feet six inches, the load permitted under the preceding table may be increased to five thousand pounds for cars with guide rail safeties. [Amend. Conn. J. 5-2-40, p. 2417.]

79-38. Guide rails shall be securely fastened with iron or steel brackets, or their equivalent, of such strength, design, and spacing that the deflection of the rails and their fastenings will be not more than one-fourth inch under normal operation. Where the distance between rail supports is more than fourteen feet, the rails shall be suitably backed or bracketed to secure rigidity. Joints of guide rails shall be accurately machined with tongue and groove, or other substantial construction which will maintain true alignment and shall be fitted with fishplates each secured with at least four substantial bolts through each rail. Guide rails a fully loaded car or the counterweight. Rails shall be extended at the top and bottom to prevent guide shoes running off within the limits of the bottom over-travel and the top clearance. Guide rails for sidewalk type elevators, the top landing of which is not more than four feet above grade shall be arranged to be extended to permit the elevator to rise to the top limit of its travel.

79-39. The maximum weights of car and load as given in the preceding table for each pair of guide rails shall apply when only one safety device gripping both rails in a horizontal plane is used. When two such safety devices are used on the same guide rail and arranged so that both will be applied at practically the same time and with substantially equal retarding force, the total weight may exceed that shown in the table, but shall in no case, exceed the maximum weight given in the table multiplied by the following factors, based on distance between safeties:

Distance between safeties	Factor
15 (or over)	2.0
15	1.83
12	1.67
9	1.50
6	1.33
Counterweight Safeties	
15 (or over)	2.0
10	1.67
9	1.50
3	1.33

79-40. Buffers of the spring, oil, or equivalent type shall be installed under the cars of elevators, except sidewalk type elevators having a travel of not more than fifteen feet. [Amend. Conn. J. 5-2-40, p. 2417.]

79-41. Spring buffers or their equivalent may be used with elevators having a rated speed of two hundred feet per minute or less. [Amend. Conn. J. 5-2-40, p. 2417.]

79-42. Oil buffers or their equivalent shall be used with elevators having a rated speed greater than two hundred feet per minute. The minimum total stroke of oil buffer shall be based on an average retardation of thirty-two and two-tenths feet per second per second, based on governor tripping speed. Where precompression is used, the buffer shall be so installed that when the car is level with the terminal landing, the remaining buffer stroke shall not be less than fifty per cent of the gravity stopping distance corresponding to the governor tripping speed used. Where the car or counterweight oil buffer is compressed more than three inches when the car is level with the lower or upper terminal landing, respectively, buffers shall be provided with a switch which will prevent movement of the car in a direction to compress the buffers at a speed greater than one-half the rated speed until the buffers are restored to their normal position. Oil buffers shall be provided with means for gauging the amount of oil in them.

79-43. Buffers similar to those required for cars shall be installed under the counterweights.

79-44. Where structural conditions make it impracticable to provide buffers of the stroke prescribed, speed retarding devices, independent of normal and final stop switches may be provided for retarding car or counterweight, or both, to a definite limiting speed before the buffer is engaged and the stroke reduced but it shall not be less than the distance corresponding to gravity retardation from one hundred twenty per cent of such reduced speed rather than from governor tripping speed, provided that for rated speeds in excess of five hundred feet per minute the buffer stroke shall be not less than eighteen inches. Such speed retarding devices shall be so designed that the retarding force is quickly but gradually applied, substantially constant and the retarding distance is not less than the sliding distance hereinafter prescribed for undercar safeties. [Amend. Conn. J. 5-2-40, p. 2417.]

79-45. Except where precompression is used, buffers shall be located so that under ordinary operating conditions, the car or counterweight does not strike them. [Amend. Conn. J. 5-2-40, p. 2417.]

79-46. Each type and size of oil buffer used shall be approved by the commissioner of buildings after tests hereinafter described made by or under the supervision of a competent recognized testing laboratory. Approved buffers shall be marked by the manufacturer with the range of speed and load for which they have been approved.

79-47. Counterweights shall run in guides and shall be guided at top and bottom of counterweight. If two counterweights run in the same guides the car counterweights shall be above the machine counterweights and there shall be a clearance of not less than eight inches between the counterweights. The cables of the machine counterweight shall be covered or protected by suitable sleeves of not less than six inches longer than the car counterweight and firmly attached to the cables. The ends of the sleeves shall be carefully reamed before being placed on the cables. If an independent car counterweight is used it shall not be of sufficient weight to cause undue slackening in any of the cables during acceleration or retardation of the car. Counterweight sections shall be secured by at least two tie rods passing through holes in all the sections, or by other approved means. The tie rods and suspension rods shall have lock nuts and cotter pins at each end. Suspension rods shall be free from welds.

79-48. Elevator cars shall have metal car frames and metal outside frames of platforms and shall be provided with top and bottom guide shoes. Non-metallic shoes may be used. Where wood platform flooring is used, the underside of car platforms shall be covered with metal not less than No. 27 U. S. gauge, except for sidewalk type elevators the travel of which does not exceed one story.

79-49. The allowable working stresses of rolled steel sections or annealed cast steel in the construction of car frames and platforms, except for elevators of the plunger type, which have no counterweights, based on the static load imposed on them, shall be not more than the values given in the following table for steels meeting the standard specifications of the American Society for Testing Materials, Designation A 7-34, for steel having an ultimate strength of from fifty-five thousand to sixty-five thousand pounds, per square inch for rolled sections or cast steel; and forty-six thousand to fifty-six thousand pounds per square inch for rivets. For steels of greater strength the allowable working stresses may be increased proportionately, based on ultimate strength.

	Passenger Elevators	
	Maximum allowable stress	Basis
Loading		
	(Pounds per sq. in.)	
Tension	10,000	Net area
Bending	10,000	Gross section
Shear on shop rivets	8,000	Net area
Bearing on shop rivets	16,000	Gross section
Bearing on bolts in clearance holes	7,000	Gross section
Shear on bolts in clearance holes	14,000	Gross section
Bolts or threaded portions of rods in tension	6,000	Gross area
Compression	11,700-49 L/R	

Freight Elevators

Tension	12,000	Net area
Bending of car frame member and platform	12,000	
Framing at entrance	15,000	Gross section
Bending of platform stringers	9,500	Gross section
Shear on shop rivets	19,000	Net area
Bearing on shop rivets	8,000	Net area
Bearing on bolts in clearance holes	16,000	Gross section
Bolts or threaded portions of rods in tension	8,000	Gross section
Compression	14,000-59 L/I	Gross area
L = effective free length of member in inches.		
R = least radius of gyration in inches.		

79-50. Plunger heads in tension shall be cast steel.

79-51. No cast iron shall be used in the construction of any member of car frame or platform subject to tension, torsion, or bending, except for compensating cable anchorages, releasing carriers, and guide shoe stands.

79-52. When material other than steel is used in the construction of frames or platforms, the maximum allowable working stresses shall be thirteen per cent of the ultimate strength of the material for passenger elevators, and fifteen and six-tenths per cent for freight elevators.

79-53. When a car is equipped with a car leveling device, the car platform shall be provided with a substantial vertical apron flush with its outer edge extending a sufficient distance below the car floor so that there shall be no horizontal opening into the hatchway while the car is within the landing zone and the hatchway door is fully or partially open.

79-54. A sidewalk type elevator, equipped with a hinged hatch cover, shall be provided with a bow iron not less than seven feet six inches high. A sidewalk type elevator, equipped with a vertical lifting cover shall be provided with stanchions framed together at the upper ends to be of sufficient strength to lift and support the hatch cover. Stanchions shall be provided with suitable buffer springs and shall be of such height as to permit the cover to be completely buffer when the car platform is level with the first landing below the grade. Guide shoes for sidewalk type elevators shall be not less than twenty-four inches long unless two sets of shoes are used, and spaced eighteen inches on centers. Where a vertical lift cover is used for a sidewalk type elevator, the vertical distance between the centers of the guide shoes remaining on the guide rails when the car platform is level with the top landing shall be not less than one-third of the height of the hatch cover stanchions. Where single guide shoes, not less than twenty-four inches long are used, six inches of the shoe may be off the rails when the platform is level with the top landing.

79-55. If there is a railroad track on the elevator car, the tops of the rails shall be flush with the car floor.

79-56. Elevator cars, except sidewalk type elevators, shall be equipped with electric lamps which will provide adequate illumination at the landing edge of each car platform. A light socket or receptacle shall be provided under the car platform and on top of the car for inspection purposes, except sidewalk type elevators. For passenger elevators each lighting device provided with a glass or metal shade or reflector, shall have an integral metal base, husk, and spring clamp holder. If suspended glass bowls or glass plates are used, each such bowl or plate shall rest in, and be fastened to, a metal supporting frame provided with at least three point suspension. Glass bowl or plate shall not be drilled for attachment to frame suspensions. Glass bowl or plate shall not be less than one-half inch thick. No. 22 steel wire gauge and of a mesh which will reflect a one-half inch diameter ball. Guards shall be securely fastened to the holder or suspension.

79-57. No glass shall be used in any elevator car except to cover certifies.

79-58. No elevator car shall be constructed with more than one compartment on the same landing level. If an elevator car has upper and lower compartments, each compartment shall be equipped with an operating device. There shall be an operator in each compartment which is in use with exclusive control of that car door or gate and hatchway door and it shall be impossible to start the car unless both operating devices are in the starting position. When any compartment is out of use, its car door or gate shall be locked in the closed position and when so locked the car may be started with the operating device in that compartment in the "off" position. Each compartment shall be equipped with an emergency stop switch and with an emergency release effective for the door or gate of that compartment and the corresponding hatchway door. Each compartment shall be provided with emergency exits as hereinafter prescribed for car enclosures. If impossible to provide the required exits in the sides of the enclosure the upper compartment shall have a trap door in the floor connecting with the top exit of the lower compartment.

79-59. Elevator cars shall not be arranged in such a manner as to counter-balance one another.

79-60. Two single elevators may be used in a single hatchway provided both elevators are equipped with all the safeguards prescribed herein for a single elevator both with relation to each other and to top and bottom terminals.

79-61. The car for every passenger elevator shall be enclosed over the top and at the sides, except the opening necessary for entrance or exit in normal operation.

79-62. The car for every freight elevator shall be enclosed at the sides, except at the opening necessary for loading and unloading. The enclosure, except of a sidewalk type elevator, shall extend to a height of not less than six feet above the platform or to the crosshead if the crosshead is lower. The section or such a car enclosure opposite the counterweight shall extend to the crosshead or car top. The enclosure of a sidewalk type elevator shall extend to a height of not less than six feet above the platform.

79-63. No part of a power elevator car enclosure shall deflect so as to reduce the actual running clearance between cars, counterweights and hatchway enclosures hereinafter prescribed. The car enclosure shall be secured to the car floor and sling or frame in such a manner that it cannot work loose or become dislodged in ordinary service. Cast iron shall not be used for a car top. The enclosure, including the sides, ceiling and car doors for a passenger and freight elevator, shall be of solid or open work. If of combustible material it shall be covered on the exterior, including the top, with sheet metal not less than No. 27 U. S. standard gauge. Ventilating openings less than seven feet above the car platform shall reject a ball two inches in diameter.

79-64. If an enclosure, except of a sidewalk type elevator, is of open work, it shall reject a ball two inches in diameter at sides of enclosure and one-half inch in ceiling. Where the clearance from any part of the hatchway structure or the counterweight is less than five inches, openings which will pass a ball one-half inch or larger in diameter shall be covered to a height of not less than six feet above the car platform with wire netting with a mesh not larger than one-half inch square made of wire not less than No. 20 steel wire gauge. The enclosure of a sidewalk type elevator, if of open work, shall reject a ball four inches in diameter. If the car enclosure on a freight elevator is cut away to provide access to the hand-ropes, the enclosure shall be cut large enough to prevent injury to the operator's hand.

79-65. Every freight elevator car twelve feet or more long and having hatchway openings at only one end shall be provided with a top on the end where

the landings occur to a line six feet from the opposite side of the crosslead and the full width of the platform; and every other freight elevator car, except side-ball one and one-half inches in diameter and made of wire not less than No. 10 steel wire gauge or its equivalent. The top shall be sufficiently strong to sustain a concentrated load of one hundred fifty pounds applied on any four square inches and a distributed load of seventy-five pounds per square foot over any four square foot area, except the hinged sections next to the car entrances. Where no car gate is provided, at least the front section of the elevator car top shall be hinged along a line approximately eighteen inches from the edge of the car. A top may be provided on a sidewalk type elevator enclosure only if the clearance between the top and any obstruction above it is at least two feet when the car is at the limit of its top overtravel. [Amend. Coun. J. 5-2-40, p. 2417.]

79-66. Every passenger elevator car shall be provided with an emergency enclosure, the emergency exits may be located in the sides of the adjacent cars directly opposite each other. Where there is no such elevator in an adjoining hallway, or where it is not practicable to provide the emergency exit in the side of the car, it shall be located in the ceiling of the car. Where the size of the car is not less than sixteen inches and shall extend from the floor or base to the soffit of the ceiling frame; and in no case shall the clear height be less than three feet. It shall be located so that it is not obstructed by car frame members; and traveling cables and other hallway equipment shall not be located in front of an exit if such obstruction can be avoided. A side emergency exit panel shall be held securely in place and arranged so that it can be opened from the inside of the car by a key kept in the car and from the outside by a non-removable key. If the car is of the automatic operation type, the side exit panel shall be provided with an electric contact to prevent the operation of the car when the exit panel is open. Where the size of the car platform permits, the emergency exit, if in the ceiling of the car, shall be not less than sixteen inches wide and four hundred square inches in area. A ceiling exit panel shall be held in place in such a manner that the exit cover can be readily opened from both the inside and outside of the car. All equipment and working platform mounted above the top of a car shall be located as not to obstruct access to or from the emergency exit. If a working platform is placed so as to cover any of the required area of an emergency exit it shall be provided with a trap door, without a catch, opening upward.

79-67. A car door or gate shall be provided at each entrance on both passenger and freight elevator cars, except freight elevators having a type of operation requiring the presence of an operator in the car and handling motor vehicles or hand trucks of over two thousand pounds capacity. Each sidewalk type elevator car, the top hallway opening of which is located in an area accessible to the public, shall have gates on the sides used for loading or unloading at the grade level, which gates shall extend from the car platform to the top of the enclosure. Car doors or gates for passenger elevators, when closed, shall guard the full height and width of the opening; for freight elevators, when closed, they shall guard the full opening to a height of at least six feet. If a weight is used to close a car door or gate automatically it shall run in metal guides from which enclosures shall be so constructed as to retain the weight if the rope breaks. [Amend. Coun. J. 5-2-40, p. 2417.]

79-68. For passenger and freight elevators employing a type of operation not requiring the presence of an operator in the car, power car doors or gates other than those closed by hand shall be driven by a mechanism so designed and set that the force necessary to prevent the closing of the gate on any car shall not be more than thirty pounds, and the kinetic energy of the gate plus all parts connected rigidly thereto, computed for the average closing speed shall not be more than five foot-pounds, except that if the same mechanism also closes the hallway door, the total kinetic energy may be increased to not more than seven foot-pounds. For automatic operation passenger elevators having power closed, power operated or automatically released self-closing car doors or gates, and manually closed or self-closing hallway doors, arrangement shall be made so

that the door or gate on any car cannot be closed unless the hallway door is closed.

79-69. Car gates of the scissors or pantograph type, used for passenger elevators shall be of such design that when fully expanded they shall reject a ball of three inches in diameter. For freight elevators, except sidewalk type elevators, such gates when fully expanded shall reject a ball four and one-half inches in diameter. Every car gate shall be of such design and so constructed that it will not deflect beyond the line of the car platform threshold when a force of approximately fifty pounds is applied across two adjacent bars approximately at the center of the bars when the gate is fully extended. Sliding car doors shall be guided top and bottom.

79-70. Hangers for power operated car doors shall be designed to withstand a downward thrust of five times and upward thrust of four times the weight of the door.

79-71. An electric contact shall be provided on every car door or gate which will prevent the operation of the car unless the door or gate is in the closed position. The car door or gate shall be considered in the closed position when the clear open space between the edge of the door or gate and the nearest face of the jamb does not exceed two inches, except that when the car is fitted with a door closer and attended by an operator and the hallway door is fitted with a door closer, this distance can be increased to four inches. The car door or gate electric contact shall permit the operation of the car when the emergency release is in use or when the car is being moved by a leveling device. An automatic operation elevator may be operated with an open gate if there is no person in the car. Freight elevator cars operating in hallways outside a structure, which are enclosed only at the ground landing shall be protected by a structure, which are by independently operated gates equipped with electric contacts. The car door or gate contact shall be designed so that it is positively opened by a lever or other device attached to and operated by the door or gate. The functioning of a door or gate contact to prevent the movement of the car shall be independent of the action of a spring or springs in tension, and of the closing of an electric circuit. If springs are used they shall be in compression. If an electric circuit is used, its interruption shall prevent the movement of the car. [Amend. Coun. J. 5-2-40, p. 2417.]

79-72. Each type and make of car door and gate contact shall be tested and approved by the commissioner of buildings on the basis of "endurance test," "current interruption test," "test in moist atmosphere," "misalignment test," and "insulation test," hereinafter described, made by or under the supervision of a competent recognized testing laboratory. Approved contacts shall be suitably marked for identification.

79-73. Except sidewalk type elevators, an emergency release shall be installed in each car which is arranged for operation through a car switch by an operator in the car, including dual operated elevators, and which is equipped with a gate or door, by which an operator can operate the elevator from within the car independent of the position of the car door or gate. This emergency release shall be independent from the emergency release installed on the hallway doors. The emergency release in dual operated elevators shall be arranged so as to be inoperative when the car is operated as an automatic elevator. [Amend. Coun. J. 5-2-40, p. 2417.]

79-74. Every elevator car suspended by cables shall be provided with a car safety or safeties capable of stopping and sustaining the car with rated load, attached to the car frame, except sidewalk type elevators not inside of a building and having a travel of not over twenty feet. When one safety is used, it shall be located beneath the car frame.

The application of the safety or safeties shall not cause the car platform to become out of level more than one-half inch per foot measured in any direction. When the car safety or safeties are applied, no decrease in the tension of the governor cable or motion of the car in the descending direction shall release the car safety or safeties. No car safeties which depend for application upon the completion or maintenance of an electric circuit shall be used. Car safeties shall be applied mechanically. The gripping surfaces of car or counterweight safeties shall not be used to guide the car or counterweights. Paws and ratcatchers alone shall not be used as safety devices. Counterweight safeties shall be capable of stopping and sustaining the weight of the counterweight. The application of

counterweight safeties shall not cause the counterweight frame to become out of level more than one-half inch per foot in any direction. When a counterweight safety is applied, no decrease in the tension of the governor cable or motion of the counterweight in the descending direction shall release the counterweight safety. Jaws and other parts of car and counterweight safeties of the sliding type shall be made of forged steel of an ultimate strength of not less than fifty thousand pounds per square inch, and cast steel of an ultimate strength of not less than sixty-five thousand pounds per square inch, in which case they may in action be stressed to seventeen thousand pounds per square inch. If steels of greater strength are used, the allowable stress may be increased proportionately, based on ultimate strength.

79-75. Car safeties shall be operated by speed governors, except that instantaneous safeties of the broken rope type may be used, (1) for private residence passenger elevators; (2) for sidewalk type elevators not inside of a building and having a travel of not over twenty feet; and (3) freight elevators inside of a building having a travel of not more than fifteen feet, a maximum platform area of fifty square feet and a maximum speed of fifty feet per minute. Instantaneous safeties of the governor controlled type may be used on elevators having a rated speed of not more than one hundred feet per minute provided that the elevator speed is not more than one hundred ten feet per minute on the up travel with rated load in the car. On overspeed such safeties shall be applied by the governor. On the parting of the hoisting cables such safeties shall apply instantly and independently of the speed action of the governors. Car safeties shall not be installed for stopping ascending cars. If an ascending car is to be stopped on account of overspeed, a safety shall be applied to the counterweights for this purpose. The car safety may be permitted to stop the ascending car above the top terminal landing, provided the retardation of the car second. The governor may open the motor circuit and apply the brake in case of overspeed in the up direction. The governor shall be located where it cannot be struck by the car in case of overtravel and where there is sufficient space for the full movement of governor parts. For elevators having a rated speed of four hundred seventy-five feet per minute, or more, the pull-out of the governor cable from the normal running position until the safety jaws begin to apply pressure to the guide rails shall be not more than thirty inches. The car speed governor shall be set to cause the application of the safety at a speed not less than fifteen per cent nor more than forty per cent above the rated speed, except that no governor shall be required to trip at a car speed less than one hundred seventy-five feet per minute. For rated speed exceeding five hundred feet and not exceeding seven hundred feet per minute the maximum governor tripping speed shall be thirty-three and one-third per cent above rated speed and for rated speed exceeding seven hundred feet per minute, twenty-five per cent above rated speed. A governor for the operation of a counterweight safety shall comply with the requirements for a governor used with a car safety of the same type, except that it shall be adjusted to trip at a speed not more than ten per cent in excess of the tripping speed of the car governor. A single governor may operate car and counterweight safety, but the counterweight safety must be tripped at a speed ten per cent in excess of the tripping speed of the car governor. Broken rope safeties of the instantaneous type may be used on counterweights within the limits of the instantaneous Rated speed

(Feet per minute)	Total weight of counterweight (Pounds)
250	2,000
200	3,000
160	4,000
125	5,000

[Amend. Coun. J. 5-2-40, p. 2417.]
 79-76. Safeties shall be of the following types:
 Type J. Instantaneous.
 Type W. C. Wedge clamp with constant retarding force.
 Type C. W. C. Gradual wedge clamp with gradually increasing retarding force.

Type F. G. C. Flexible guide clamp with constant retarding force. Each safety shall be marked for identification with letters "F", "W.C.", "G.W.C." or "F.G.C." depending on whether it is type 1, 2, 3, or 4. The distance between the safety jaws shall be not less than the thickness of the guide rail plus three thirty-seconds inch and the jaws shall not drag against the rail.

79-77. Where governor controlled safeties are used, the motor control circuit and the brake control circuit shall be opened before or at the time the governor trips by a switch located on the governor or car safety device. Governor cables shall be of iron, steel, monel metal, or phosphor bronze. The cable shall be at least three-eighths inch in diameter. Miller rope construction shall not be used for governor cables. The portion of the cable wound on the safety drum shall be of corrosion resisting metal. Governor ropes shall run clear of governor jaws during the normal operation of the elevator. The size, material, and construction of the governor rope, together with the proper tripping speed of the governor, shall be stamped on the governor stand or stated on a brass name plate attached to it in letters at least one-fourth inch in height. The arc of contact between the governor rope and its driving sheave shall, in conjunction with a tension device, provide sufficient traction to cause proper operation of the governor. The design and length of governor jaws shall be such that no serious cutting, tearing, or deformation of the rope shall result from the operation of the safety. The governor shall so function that the safety rope will pull through the governor jaws on the application of a stress exceeding that required to operate the safety so as to stop the car, except in the case of instantaneous type safeties. Governors shall have a protective covering over sheave and exposed gears. Winding drum machines shall be provided with a slack-cable device which will cut off the power and stop the elevator machine if the car is obstructed in its descent. Slack-cable switches shall be so constructed that they will not automatically reset when the slack in the cable is removed.

79-78. Safeties shall be marked by the manufacturers with the range of weight and speed for which they are designed; such weight shall include the complete car structure, the safety, the rated load in the car, and all moving equipment, the weight of which is borne by the safety.

79-79. Replacements of governor cables on elevators installed after July 20, 1938, shall be of the size, material, and construction stamped on the governor stand or name plate. Replacements of governor cables on elevators installed prior to July 20, 1938, shall be of the material and design required by this code and of the size and construction required by the governor, except that in cases where the present governors, if in satisfactory condition, will not permit the use of iron, steel, monel metal, or phosphor bronze cables, the existing type of cables may be used.

79-80. The rated load of a passenger elevator in pounds shall be not less than the following:

Maximum Horizontal Free Area Inside of Car (Square feet)	Rated Load (Pounds)
Up to 5.0	310
5.0 to 6.0	380
6.0 to 7.0	450
7.0 to 8.0	520
8.0 to 9.0	590
9.0 to 10.0	650
10.0 to 11.0	740
11.0 to 12.0	820
12.0 to 13.0	900
13.0 to 14.0	980
14.0 to 15.0	1050
15.0 to 17.0	1250
17.0 to 20.0	1500
20.0 to 23.5	1750

23.5	to	26.5	2000
26.5	to	29.0	2250
29.0	to	32.0	2500
32.0	to	34.0	2700
34.0	to	37.0	3000
37.0	to	39.0	3250
39.0	to	42.0	3500
42.0	to	46.5	4000
46.5	to	51.0	4500
51.0	to	56.0	5000
56.0	to	60.5	5500
60.5	to	65.0	6000
65.0	to	70.0	6500
70.0	to	74.5	7000
74.5	to	79.0	7500
79.0	to	84.0	8000
84.0	to	93.0	9000
93.0	to	102.0	10000
102.0	to	111.0	11000
111.0	to	120.0	12000

The rated load of a freight elevator is the load to be carried at rated speed. The elevator may carry a heavier load at lower speed if all parts are designed for the heavier load.

79-81. A metal plate bearing (1) the weight of the complete car including the safeties, (2) the rated capacity in pounds and the rated speed in feet per minute at which the car is designed to travel, and (3) the cable data prescribed hereinafter, shall be placed on the crosshead of passenger and freight elevators and on the bow iron or other conspicuous place of sidewalk type elevators. The capacity of freight elevators shall be indicated in a conspicuous place in the car in letters and figures at least one inch high by the word "CAPACITY," followed by figures giving the rated load in pounds.

79-82. Passenger and freight elevators, if designed for carrying safes or other one piece loads greater than the rated load of the elevator, shall be provided with the following features:

(a) A locking device so designed that it will hold the car at any landing independently of the hoisting cables while the safe or other object is being loaded or unloaded, and that it cannot be unlocked unless the entire weight of the car and load is suspended on the cables. The wrench or other device for operating the locking device shall be removable. The locking device shall be designed to withdraw the bars should it come in contact with the landing locks if the car is operated on the "up" motion.

(b) A metal plate in the elevator car bearing the words "Capacity Lifting Safes" in letters followed by figures giving the capacity in pounds for lifting safes for which the machine is designed. The letters and figures shall be at least one-fourth inch high, stamped, etched, or raised on the surface of the plate.

(c) A car platform, car frame, sheaves, shafts, cables, guide rails, and locking device designed for the specified "Capacity Lifting Safes" with a factor of safety of at least five.

(d) Car safeties designed to stop and hold the specified "Capacity Lifting Safes" with the aid of the cables and counterweights.

(e) A machine designed to operate with the "Capacity Lifting Safes" at low speed and the car safely designed to stop and hold the specified "Capacity Lifting Safes" independently of the cables where the space under the hatchway is used for any purpose.

(f) Additional counterweights added for traction machines so that the total overbalance is at least equal to forty-five per cent of the "Capacity Lifting Safes."

(g) The locking device hereinbefore prescribed shall be provided for any passenger elevator installed for carrying safes or other one piece loads where

the weight of such safes or one piece load equals or exceeds seventy-five per cent of the rated load.

(h) The maximum "Capacity Lifting Safes" of any traction elevator shall be one and one-third times the rated load of the elevator.

(i) Elevator machines equipped for carrying safes or other concentrated loads greater than the rated load of the elevators shall be provided with special switches for operating the bars under such conditions.

79-88. Passengers may be carried on freight elevators installed after July 20, 1938, provided the elevators comply in all respects with the requirements herein prescribed for passenger elevators. Passengers may be carried in freight elevators installed prior to July 20, 1938, subject to the restrictions for new freight elevators, provided the elevators comply in all respects with the rules for passenger elevators installed prior to July 20, 1938.

79-84. Drums and leading sheaves shall be of cast iron or steel and shall have finished grooves which may be faced with materials other than iron and steel having sufficient traction. U grooves shall be not more than one-sixteenth inch larger than the cables. Hoisting rope sheaves for traction machines shall have sheave grooves designed so that the traction will not be decreased materially by the wear of the grooves. The diameter of sheaves or drums for hoisting or counterweight cables for private residence elevators shall be at least thirty times the diameter of the cables. For other elevators the diameters of sheaves or drums for hoisting or counterweight cables shall be at least forty times the diameter of the cables, except for sidewalk type elevators; provided, however, that where structural conditions make this impracticable, the diameter of sheaves or drums may be reduced to not less than thirty times the diameter of the cables. Openings in drums shall be drilled at an angle of less than forty-five degrees with the run of the ropes and be provided with a rounded corner with a radius at least equal to that of the ropes. [Amend. Conn. J. 5-2-40, p. 2417.]

79-85. The factors of safety based on the static loads including the rated loads plus the weight of the car, cables, counterweights, and other appurtenances to be used in the design of any elevator hoisting machine shall be not less than eight for wrought iron or wrought steel and ten for cast iron, cast steel, or other materials.

79-86. Keys shall be used for fastenings except that set screws may be used where the connection is not subject to torque. No friction gearing or clutch mechanism shall be used for connecting the drums or sheaves to the main driving gear. No elevator machines shall be belt or chain-driven nor shall any worm gearing with cast iron teeth be used.

79-87. Winding drum and traction machines shall be equipped with brakes applied automatically by springs or gravity when the operative device is at the "stop" position. Electric elevator machines shall be equipped with electrically released brakes. Brakes shall be of such design that they cannot be released before power has been applied to the motor. The brake construction shall be such that no single ground short-circuit or counter-voltage will prevent the setting of the brake during normal operation, and no motor field discharge, counter-voltage, single ground, or accidental short-circuit will retard its setting during emergency stops.

79-88. Hydraulic elevator machines shall be so constructed that the piston will be stopped before the car can be drawn into the overhead work. Stops of ample strength shall be provided to bring the piston to rest when under full pressure without causing damage to the cylinder or cylinder head. Traveling sheaves for vertical hydraulic elevators shall be guided. Guide rails and guide shoes shall be of metal. Side frames of traveling sheaves for vertical hydraulic elevators shall be either structural or forged steel. The construction commonly known as the "U-strap connection" between the piston rods and the traveling sheaves shall not be used. Where more than one piston rod is used on the vertical pulling type hydraulic elevators, an equalizing crosshead shall be provided for attaching the rods to the traveling sheave frame to insure an equal distribution of load on

each rod. Equalizing or cup washers shall be used under the piston rod nuts to insure a true bearing. Cylinders of elevator machines shall be provided with means for releasing air or other gas. Piston rods of tension type hydraulic elevators shall have a factor of safety of at least eight based on the cross-sectional area at the root of the thread. A true bearing shall be maintained under Automatic stop valves shall be packed with cup leathers, or other means shall be used to prevent sticking of the valve stems. In the design of a plunger elevator, provision shall be made to stop both the plunger and the car.

79-88. Each pump connected to the pressure tank of a hydraulic elevator shall be equipped with one or more relief valves piped to discharge into the discharge tank or the pump suction and so installed that they cannot be shut off. The relief valve, or valves, shall be of sufficient size and so set as to pass the full capacity of the pump at full speed without exceeding the safe working pressure of the pump or tank. Elevator pumps, unless equipped with working regulators which control the motive power, shall be equipped with automatic by-passes.

79-90. Pressure tanks shall be made and tested in accordance with the requirements prescribed in chapter 84 of this code for steam boilers and unfired pressure vessels. Each pressure tank shall be provided with a water gauge glass having brass fittings and valves attached directly to the tank and so located as to show the level of the water when the tank is more than half filled. Each pressure tank shall have a pressure gauge which correctly indicates pressure to not less than one hundred fifty per cent of the normal working pressure allowed in the tank; this gauge shall be connected by a corrosion resisting pipe equipped with an indicating shut-off cock. Each pressure tank shall be provided with a one-fourth inch pipe size valved connection for attaching an inspector's gauge while the tank is in service. Any pressure tank that may be subject to vacuum shall be provided with one or more vacuum relief valves having openings of sufficient size to prevent the collapse of the tank if a vacuum occurs. Outlets of pressure tanks shall be so located as to prevent the probability of the entrance of air or other gas into the elevator cylinder. Pressure tanks shall be so located and supported that inspection may be made of the entire exterior.

79-91. Discharge tanks of hydraulic elevators, open to the atmosphere, shall be so designed that when completely filled the factor of safety shall be at least four based on the ultimate strength of the material. Each discharge tank shall be provided with a cover and with a suitable vent to the atmosphere.

79-92. Each elevator shall be provided with upper and lower terminal normal stopping devices arranged to stop the car automatically from any speed attained in normal operation within the top and bottom overtravel independent buffers; except that in the case of a hand-roppe or rod operating device the normal terminal stopping device may operate in conjunction with the operating device.

79-93. Normal terminal stopping devices shall be installed as follows:

(a) *Winding drum machines.* Each electric elevator having a winding drum machine except a sidewalk type elevator, and except an elevator operated by a hand-roppe, wheel, or lever device, shall have stopping switches on the car or in the hatchway operated by the movement of the car. Each electric elevator having a winding drum machine, with a lever or wheel operating device shall have a device to center the operating device automatically.

(b) *Traction machines.* Each electric elevator having a traction machine, except an elevator operated by a hand-roppe device, shall have stopping switches on the car or in the machine room, or in the hatchway, operated by the movement of the car. When located in the machine room, the stopping contacts shall be mounted on and operated by a stopping device mechanically connected to the car and designed so that it is not dependent on friction as a driving means. An automatic safety switch shall be provided which will stop the car if the means for mechanically connecting the stopping device to the car should fail.

(c) *Hand-ropes or rods.* Each electric elevator with a hand-roppe or rod operating device shall have stop balls securely fastened to the rope or rod arranged to center the operating device, and, except for a sidewalk type elevator, if a winding drum machine is used it shall also have an additional device to center the operating device automatically.

(d) *Hydraulic elevators.* Each hydraulic elevator having a rated speed of more than one hundred feet per minute shall have an automatic stop valve independent of the normal control valve or valves operated either by the car or the machine. Each hydraulic elevator, having a rated speed of not more than one hundred feet per minute, with a hand-roppe or rod operating device, shall have stop balls on the operating device.

(e) *Sidewalk type elevators.* Each electric sidewalk type elevator having a winding drum machine and hand-roppe or pull chain operating device shall have a stopping device on the machine and on the operating device. Each electric sidewalk type elevator having a winding drum machine and either automatic or continuous pressure operation shall have a stopping device on the machine and in the hatchway. These stopping devices shall not control the same switches unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel.

79-94. Each electric elevator, except a sidewalk type elevator, shall be provided with upper and lower final terminal stopping devices arranged to stop the car and counterweight automatically from rated speed within the top clearance and bottom overtravel independently of the operation of the normal terminal stopping devices and the operating device in the car, but with buffers operative. Final limit switches and oil buffers shall be located so that the engagement of the buffer and the opening of the limit switch will occur as nearly simultaneously as possible. When spring buffers are provided, the final limit switches shall be opened before the buffer is engaged. Where means are provided to prevent jumping of the car or counterweight it shall only be necessary that the limit switch open before the buffer is fully compressed. Final terminal stopping devices shall be installed in connection with electric elevators, except sidewalk type elevators, as follows:

Winding drum machines. Each electric elevator, having a winding drum machine, shall have stopping switches on the machine and also in the hatchway operated by the movement of the car.

Traction machines. Each electric elevator having a traction machine shall have stopping switches in the hatchway operated by the movement of the car.

79-95. Final terminal stopping devices shall act to prevent movement of the car in both directions. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. When 2-phase or 3-phase alternating current is used to operate the elevator the above switches shall be of the multiple type. In the case of hand-roppe, rod, wheel, or lever operating devices the normal and final terminal stopping devices may control the same switch on the controller. When the final terminal stopping device controls the same controller switch, or switches, as the operating device or the normal terminal stopping device, it shall be connected into the control circuit on the opposite side of the line. No chain, rope, or belt-driven machine terminal stopping device shall be used on elevators having winding drum machines. Each electric elevator having a winding drum machine, driven by 2-phase or 3-phase alternating current, shall have an automatic terminal stopping device mounted on the machine or in the hatchway operated by a cam attached to the elevator car except where a direct current brake is used and a direct current main line or potential switch. This stopping device shall be arranged to open the main line circuit to the motor and brake directly. This device shall prevent the movement of the machine in either direction before or coincident with the operation of the final terminal stopping device.

79-96. The contacts of all terminal stopping devices shall be directly opened mechanically without the use of springs or gravity, or both. Normal and final terminal stopping switches unless located in the machine room shall be of the enclosed type. Normal and final terminal stopping devices, where on the car or in the hatchway, shall be securely mounted in such a manner that the movement of the switch lever or roller to open the contacts shall be as nearly as possible at right angles to a line drawn between the car guide rails. The cams for operating the terminal stopping switches shall be of metal and shall be so located and of sufficient length to maintain the switch in the open position when the car is in contact with the overhead structure or resting on the fully compressed buffer with the overhead structure and the buffer in their normal position. Each electric elevator, equipped with a floor controller, or other similar device for automatic stops at landings, need be provided with only one set of stopping contacts for the terminal floors, provided these contacts and the means of operating them comply with the following:

Metal contacts. If metal to metal contacts, either gravity or spring opened, or a combination of these are used, there shall be at least two independent breaks. *Mechanically opened.* If contacts are directly opened mechanically. *Circuit interrupted.* If breaking of the circuit to stop the car is independent of the operation of springs in tension or the completion of another electric current.

79-97. No elevator having a rated speed of more than one hundred feet per minute shall be operated by direct hand operated ropes, cables, or rods. No elevator having a rated speed of more than one hundred fifty feet per minute shall be operated by wheel or lever mechanism except hydraulic elevators. Each hydraulic elevator, operated by a wheel operating device, shall be provided with an indicating device in the car to show the position of the control valve. Such device shall be marked to indicate "up," "down" and "off."

79-98. No elevator shall be operated by a rope or cable which is accessible from the outside of the hatchway. Overhead tension weights for hand-ropes shall be secured by chains or cables attached to the weights and to a suitable anchorage. When hand-ropes are used, guards shall be provided which will keep the hand-ropes on the sheaves. Each freight elevator, except sidewalk type elevator, operated by means of a direct operated hand-ropes, shall be provided with a centering device which will insure the operating mechanism being placed in the stop position when it is desired to stop the car. It shall also be provided with rope locks to hold the car at any landing. [Amend. Coun. J. 5-2-40, p. 2417.]

79-99. The handle of car switch operating devices and the switch operating devices used with continuous pressure operation, except push button, shall be arranged to return to and lock automatically in the stop position when the hand of the operator is removed. Where more than one operating device is used in a car, except in automatic operation elevators, the operating devices shall be so interlocked that only one can be used at a time. If a single operating device is used, it shall be located near the car opening, or if for more than one opening, near the car opening serving the greatest number of landing openings. An emergency stop-switch, which will cut off the source of power, shall be provided in the car adjacent to the operating device for each electric elevator. If the stop button of an automatic operation or continuous pressure operation elevator is a red button marked "Stop," it may be used as an emergency stop-switch. One lead to the emergency stop-switch shall run to the car through a separate and independent traveling cable where electric elevators have winding drum machines. [Amend. Coun. J. 5-2-40, p. 2417.]

79-100. A manually operated multi-pole disconnecting service switch shall be installed in the main line of electric elevator machines and motor generator sets. This switch shall be located adjacent to and visible from the elevator machine or motor generator set. It shall be so arranged that the disconnecting machine cannot be closed from any other part of the building.

79-101. Where metal to metal contacts, gravity or spring opened, or a combination of the two, are used on controller switches for stopping elevator machines, there shall be at least two independent breaks. Breaking the circuit to stop an automatic control elevator at the terminals shall be independent of the

operation of springs in tension or the completion of any other electric circuit. If springs are used they shall be in compression. If an electric circuit is used, its interruption shall prevent the movement of the car. The frame of an electric elevator machine, the frame of the controller, the operating rope if used, and the frames of electric appliances in or on the elevator car shall be effectively grounded. Electric slack cable switches shall be enclosed. No control system shall be used which depends on the completion or maintenance of an electric circuit for the interruption of the power and for the application of electro-mechanical brakes at the terminals, for the operation of safeties or the closing of a contact or by an emergency stop button, except for dynamic braking and speed control devices.

79-102. Car switching and hand-operating levers shall be so arranged that the movement of the lever toward the opening which the operator usually faces will cause the car to descend and the movement of the lever away from the opening will cause the car to ascend. On a mechanically operated passenger elevator, the operation of directional switches or operating valves shall not depend solely upon bolts or upon cast or malleable iron chains. If a handrope is used, the cable shall be securely anchored to the operating sheave or drum. No circuit breaker operated automatically by a fire alarm system shall be used to cut off the power, or to interrupt the operating circuit of a power elevator. [Amend. Coun. J. 5-2-40, p. 2417.]

79-103. An automatic operation elevator, except a sidewalk type elevator the travel of which does not exceed one story, shall comply with the following requirements:

(a) *Non-reversing.* If the car has started for a given landing it shall be impossible for an impulse to be given from any landing to send the car in the reverse direction until it has reached the destination corresponding to the first impulse.

(b) *Continuity of direction.* If the car has been stopped at an intermediate landing and is to continue in the direction determined by the first impulse, the car may be started by closing the door or car gate.

(c) *Hatchway door locks.* It shall be impossible to start the car under normal operation unless every hatchway door is closed and locked in the closed position. No devices employing locks and contacts of a type where the contact is made when the door is closed and the locking of the door takes place subsequently shall be used, except as hereinbefore provided.

(d) *No sending buttons.* Where the elevator is used by the general public, no buttons shall be provided at any landing to send the car to any other landing.

(e) *Floating platform.* The floating platform construction may be used to permit operation of the car from the landing buttons with the car gate open when there is no passenger in the car if: (1), each landing floor is flush with the hatchway edge of its landing threshold and hinged within a tolerance of one-fourth inch, plus or minus; (2), the platform will prevent the operation of the car from the car push buttons unless the platform is depressed; (3), it is impossible to operate the elevator from the car push buttons unless the car gate is closed; (4), the platform will operate when a weight of thirty pounds is placed on it at any point; (5), the platform is so constructed that there is no pocket or recess capable of holding refuse or dirt beneath the platform; and (6), the entire platform within the enclosure and the platform threshold sill will float. No handrails shall be provided in the elevator car.

(f) *Inspector's switch.* An inspector's switch shall be installed on the machine controller to render all landing buttons inoperative and when the operating of the emergency stop switch or button does not cancel all registered car and hall calls, the inspector's switch on the controller shall also render all car buttons inoperative, and there shall be furnished on the car an "Up" and "Down" inspection switch or button which will enable the inspector to operate the elevator in either direction as long as the switch or button is held in contact. [Amend. Coun. J. 5-2-40, p. 2417.]

79-104. Continuous pressure operation shall not be used for a passenger elevator except when it is provided with all of the safety devices required for an automatic operation elevator.

79-105. Each electric elevator driven by a polyphase alternating current motor shall be provided with a device which will, except in the case of an alternating current motor used in a motor generator set, prevent starting the motor if the phase rotation is in the wrong direction, or if there is a failure in any phase.

79-106. Each electric elevator operated by a hand cable, lever or wheel operating device, shall be so arranged that in case of failure of power, or the opening of a car gate, landing door or limit switch, it will be necessary to return the operating device to the "OFF" position before the elevator can again be started.

79-107. If an overload circuit-breaker is used for a direct current rheostatic control electric elevator, the wiring shall be arranged so that the circuit of the brake magnet coil is opened at the same time that the line circuit is opened.

79-108. Each sidewalk type elevator, the hatch opening of which is located in area accessible to the public, shall be provided with a device which normally will prevent the car from opening or closing the hatch cover. A switch which can be operated only by a special key and which when closed will permit the car to open and close the hatch cover shall be installed at an easily accessible point above grade level and adjacent to the elevator. It shall be so arranged that it is necessary to hold the key or button manually in position to keep the circuit closed. The installation may be so made that the elevator will be operated by the key switch or button.

79-109. No condensers, the operation or failure of which will hold in any magnet, or keep alive any circuit so as to interfere with the proper operation of any elevator apparatus, shall be installed in connection with any elevators after July 20, 1938. All such condensers installed in connection with any elevators prior to July 20, 1938, shall be removed.

79-110. The maximum rated speed of passenger freight elevators, except as otherwise prescribed herein, shall be limited only by the top and bottom clearances in the hatchway. The maximum rated speed of freight elevators without a regular operator, except sidewalk type elevators, unless provided with automatic operation or continuous pressure operation, shall be one hundred feet per minute. The maximum rated speed of electric freight elevators with continuous pressure operation, except sidewalk type elevators, shall be one hundred fifty feet per minute.

79-111. Car and counterweight cables shall be of iron or steel without covering except that where liability to excessive corrosion or other hazard exists, marine covered cables may be used for freight elevators only. Chains shall not be used for hoisting, except for sidewalk type elevators the travel of which does not exceed twenty feet.

79-112. The capacity plates hereinbefore prescribed shall bear the following legend with blanks filled in:

For Winding Drum Machines.		
Cable Specifications.		
Cable	Number	Rated ultimate strength in pounds
Hoisting
Car
Counterweights
Machine
Counterweights

ELEVATORS, DUMBWAITERS, ESCALATORS, ETC.

For Traction Machines and Drum Machines Without Counterweights.

Cable Specifications.

Cable	Number	Diameter in inches	Rated ultimate strength in pounds
Hoisting Cables	.....	.....	.....
For Hydraulic Machines.			
Cable Specifications.			
Cable	Number	Diameter in inches	Rated ultimate strength in pounds

In addition, a metal tag stating the diameter, rated ultimate strength, material of the cable, and the date of the cable installation shall be attached to the cable fastenings.

79-113. The factor of safety based on static loads for car and counterweight cables for elevators shall be not less than the following, corresponding to the rated speed of the car:

Passenger elevators	Car speed (Feet per minute)	Factor of safety
50	100	6.6
50	150	7.4
100	200	7.7
100	250	8.0
150	300	8.2
200	350	8.4
250	400	8.6
300	450	8.8
350	500	9.0
400	550	9.25
450	600	9.5
500	650	9.6
550	700	9.75
600	750	9.9
650	800	10.0
700	850	10.2
750	900	10.3
800	950	10.4
850	1000	10.5
900	1050	10.7
950	1100	10.9
1000	1150	11.0
1050	1200	11.1
1100	.....	11.2
1150	.....	11.4
1200	.....	11.5
.....	.....	11.6
.....	.....	11.7

The factor of safety based on static loads used for hoisting chains and cables of sidewalk type elevators shall be not less than five for chains and seven for cables.

79-114. The number and diameter of the cables shall be determined by using the required factor of safety and the rated ultimate strength of the cable. The computed load on the cables shall be the weight of the car, plus its rated load, plus the weight of hoisting cables and the compensation. The minimum number of cables used with traction elevators shall be three. The minimum number of cables used with winding drum elevators and for private residence elevators shall be two. No hoisting ropes for elevators shall be less than one-half inch in diameter, except for private residence elevators where ropes may be reduced to not less than three-eighths inch.

79-115. Cables anchored to winding drums shall have not less than one complete turn of each cable on the winding drum when the car or counterweight shall be reached the extreme limit of its overtravel. No car or counterweight cables shall be repaired or lengthened by splicing. The winding drum ends of car or counterweight cables shall be secured by clamps on the inside of the drums or by one of the methods hereinafter described for fastening cables to cars or counterweights. The car and counterweight ends of cables shall be fastened by individual tapered babbitted sockets. Other fastenings may be used for compensating counterweight cables and for plunger elevators. Adjustable shackle rods shall be used to attach cables to cars and counterweights in such a manner that all portions of each cable, except the portion in the socket, shall be readily visible.

79-116. The length of a babbitted socket shall be at least four and seventy-five hundredths times the diameter of the cable. The hole at the small end shall be not more than one-sixteenth inch larger in diameter than the actual cable diameter for cables having a nominal diameter from one-fourth to seven-sixteenths inch; three thirty-seconds inch larger for cables having a nominal diameter of one-half inch to three-fourths inch; one-eighth inch larger for cables having a nominal diameter of seven-eighths inch to one and one-eighth inch and three-fourths inch larger for cables having a nominal diameter of one and one-fourth inch to one and one-half inches. The hole at the large end of the socket shall be least two and one-fourth times the diameter of the cable. A socket shall be drop forged steel or steel casting. The socket shall be of such strength that the cable will break before the socket is appreciably deformed. [Amend. Coun. J. 5-2-40, p. 2417.]

79-117. The ends of wire rope shall be served with three seizings at each side of any point at which the rope is to be cut. Only annealed iron wire shall be used as seizing wire. The wires shall be wound tight and even. The twisted ends of the seizing shall be so placed that they fall into the valley between strands and away from the center of the rope. For five-eighths inch and smaller cables, the first two seizings shall be at least one-half inch long and the third seizing, at least three-fourths inch long; for larger cables, seizings shall be increased accordingly. The first seizing shall be close to the cut and the second seizing shall be spaced within two and one-fourth inches from the first seizing. The third seizing shall be at a distance from the second seizing equal to the length of the socket. Tape shall not be used for annealed iron wire seizing. The ropes thus served shall be slipped into the socket a sufficient distance for manipulating and after removing the first two seizings the strands shall be opened up and the hemp center cut out as close as possible to the remaining seizings. All grease shall be wiped off the extended strands and the lubricant carefully removed by washing with gasoline. The ends of the strands shall then be bent in and bunched close together, and the rope pulled back as far as possible so that the strands rest in the basket with the third seizing slightly projecting outside the mouth of the socket. The socket shall be warmed and shall be held vertical and truly axial with the rope to be socketed. Tape or waste may be wound around the rope at the base of the socket to prevent the metal from seeping through, but must be removed after the babbit has cooled off. Pure babbit only, free of dross, shall be used, heated to a temperature just sufficient to produce fluidity. The seizing and socketing shall be done so that there will be no loss of rope lay. [Amend. Coun. J. 5-2-40, p. 2417.]

79-118. Each automatic operation passenger or freight elevator, except a sidewalk type elevator the travel of which is not more than twenty feet, shall be provided with an audible emergency signal operative from the car and located outside of the hatchway by shall be provided with a telephone. The emergency alarm shall be clearly audible in a room in which an employe is ordinarily located. Each automatically operated elevator installed in a private residence shall be provided with a telephone permanently connected to a central exchange. The hatchway of each freight elevator, except automatic operation, continuous pressure operation, and sidewalk type elevators, shall be provided with a signal system by means of which signals can be given from any landing whenever the elevator is desired at that landing.

Stage, Orchestra, and Other Elevators of Special Character

79-119. Stage and orchestra elevators and other elevators of special character, shall comply with all of the foregoing requirements for elevators, which are applicable to the type of equipment used and for the purpose for which the elevator is installed; also all additional parts and accessories necessary for their full operation.

Hand Elevators

79-120. In hand elevators the clearance between a car platform and the landing threshold shall be not more than two inches for passenger elevators and three and three-fourths inches for freight elevators, except that where the operating rope is located at the side of the platform, this clearance shall not exceed one inch. An overtravel of not less than eighteen inches shall be provided at the top for hand elevators, except for sidewalk type elevators. No overtravel is required at the bottom. Machinery and sheaves shall be so supported and held as to prevent any part from becoming displaced. The supporting beams shall be of steel or reinforced concrete. No elevator machinery except idler or deflecting sheaves with their guards or frames and devices for limiting and retarding the car speed and their accessories shall be hung underneath the supporting beams at the top of the hatchway.

79-121. Means shall be provided in hand elevators to prevent hangers for all sliding hatchway doors from jumping the tracks. Stops shall also be provided to prevent the hanger carriage from leaving the ends of the track, or suitable stops may be provided on the door only. Door counterweights shall run in metal guides from which they cannot become dislodged, or shall be boxed in. The bottoms of the guides or boxes shall be so constructed as to retain the counterweight if the counterweight rope breaks.

79-122. Cars of hand elevators, except for sidewalk type elevators, shall be enclosed on the top and sides not used for entrance. Enclosures shall be of solid or openwork rigidly braced with steel. Where slats, bars, or wire mesh are used, the openings shall reject a ball two inches in diameter. Where sheet metal is used, it shall be not less than No. 16 U. S. standard gauge. Where wire mesh is used, the wire shall be not less than No. 10 steel wire gauge. A car enclosure shall not deflect more than one-fourth inch when a force of seventy-five pounds is applied perpendicularly to the enclosure at any point. The car enclosure shall be securely fastened to the car platform or frame so that it cannot work loose or become displaced in ordinary service. Cars for sidewalk type elevators shall be enclosed on the sides not used for entrance to a height of not less than four feet or to the spring of the bow iron, if higher. If the enclosure is openwork of bars, slats, or wire mesh the openings shall reject a ball four inches in diameter. Hand mesh enclosures shall be of wire not less than No. 13 steel wire gauge. Hand elevator cars upon which persons are permitted to ride shall have only one compartment.

79-123. Car frames and platform hand elevators shall be of metal or sound seasoned wood designed with a factor of safety of at least four for metal or six for wood on the rated load uniformly distributed. The frame members shall be securely bolted or braced.

79-124. No glass shall be used in an elevator car except to cover the certificate, directory, light fixtures, and appliances necessary for the operation of the car. No piece of glass over one square foot in area shall be used unless it is shatterproof; the total area of such glass used in the car in connection with fighting fixtures, whether in one or more pieces, shall not exceed four square feet.

79-125. Hand elevator cars, operating in hatchways outside of structures which are enclosed only at the grade landing, shall be protected on the exposed sides by independently operated gates or by self-closing gates.

79-126. If the rise of an elevator exceeds fifteen feet it shall be equipped with an approved safety device attached to the underside of the car which will immediately stop and hold the car and rated load if the suspension means breaks.

79-127. The rated load of a hand passenger elevator shall be not less than fifty pounds per square foot of maximum clear horizontal area inside of the car enclosure. A metal plate bearing (1), the rated capacity of the elevator in pounds and (2), if a passenger elevator, the maximum number of passengers to be carried, based on one hundred fifty pounds per person, in letters or figures not less than one-fourth inch high, etched or raised on the surface of the plate shall be fastened in a conspicuous place in the elevator car.

79-128. Car and counterweight guide rails for hand elevators shall be of rolled steel except where steel would constitute an accident hazard, where wood guide rails may be used, and except further, that wood guide rails may be used where the car travel is not more than thirty-five feet. Joints in steel rails shall be either tongued and grooved or doweled and fitted with splice plates. Joints in wood rails shall be tongued and grooved or doweled and screwed to backing pieces or brackets. Guide rails shall be securely fastened with through bolts, wood screws, or clips of such strength, design, and spacing that the maximum deflection of the guide rails and their fastenings will be not more than one-fourth inch under normal operation. Guide rails, and their fastenings, shall withstand the application of the safety when stopping a fully loaded car or the counterweight. The guiding surfaces of the guide rails for elevators requiring safeties shall be finished smooth. Guide rails shall be bottomed on suitable supports and extended at the top to prevent guide shoes running off in case the overtravel is exceeded.

79-129. Car buffers of the spring type or their equivalent shall be installed in the pits of hand passenger elevators.

79-130. Counterweights of hand elevators shall run in guides; they shall not be boxed unless incombustible material is used. Sections of counterweights for hand passenger elevators, whether carried in frames or otherwise, shall be secured by at least two of the rods passing through holes in the sections. The tie rods shall have lock nuts at each end, secured by cotter pins.

79-131. Automatic brakes shall be provided on all hand elevators having a travel of thirty-five feet or more. Hand brakes operating in both directions of motion or combined automatic brakes and speed retarders operating in both directions of motion, except when motive power is derived through use of a self-locking or non-overhauling worm gear drive, shall be provided on all other elevators.

79-132. The factors of safety, based on the static loads to be used in designing parts of hoisting machines shall be not less than eight for wrought iron or wrought steel and ten for cast iron or other materials. Keys or pins shall be used for fastenings except that set screws may be used where the connection is not subject to torque. No sheaves or idlers in cast iron stirrups shall be suspended from the underside of the supporting beams. No hand elevator machine shall be equipped with any means or attachment for supplying any other power, unless such elevator is permanently and completely converted into a power elevator complying with the requirements for power elevators. No rope gripping attachments or clutch mechanisms shall be used as a means of applying power to hand elevators.

79-133. A metal tag shall be attached to the suspension fastenings stating the size, rated ultimate strength, and material of the suspension and the date of its installation. The number of suspension members for both car and counterweight shall be at least two. Suspension members shall be of iron, steel, or marine covered, and shall be installed in the manner heretofore prescribed for power elevators. The factor of safety used in determining the size of the suspension member shall be at least five, based on the weight of the car and its rated load. Suspension members shall be so adjusted that either the car or the counterweight shall be bottomed before the counterweight or the car strikes any part of the overhead structure. Suspension members secured to a winding drum shall have not less than one complete turn of the suspension member on the winding drum when the car or counterweight has reached the extreme limit of its overtravel. The drum end of cables shall be secured by clamps or sockets inside the drum.

Dumbwaiters
79-134. Machinery and sheaves shall be supported and held as to prevent any part from becoming displaced.

79-135. Hatchway doors for a power dumbwaiter shall be equipped with electric contacts and locks which will prevent the operation of the machine while any hatchway door is open and prevent the opening of a door unless the car is at a landing.

79-136. Dumbwaiter cars shall be of such strength and stiffness that they will not deform appreciably if the load leans or falls against the sides of the car. Cars shall be made of wood or metal, reinforced at the point of suspension. Metal cars, if sectional, shall be rigidly riveted, welded, or bolted together. Dumbwaiter cars, machines, and suspension means shall at least be capable of sustaining the rated load.

79-137. Cars shall be constructed to carry their rated loads with a factor of safety of not less than six. Cars having a total clear platform area, including shelves, if any, of four square feet or more, shall be capable of sustaining not less than the loads given in the following table, but the motive power need not be sufficient to raise the structural capacity load:

(Square feet)	Structural capacity loads (Pounds)
4.0	100
5.0	150
6.25	300
9.0	500

A metal plate bearing the name of the manufacturer and the rated load shall be placed in a conspicuous place in each dumbwaiter car and on its machine. [Amend. Coun. J. 5-2-40, p. 247.]

79-138. Dumbwaiter machines shall be securely fastened to their supports. The factors of safety, based upon the ultimate strength of the materials, and the rated load plus the weight of the car, suspension means, counterweights, and similar apparatus used in the design of dumbwaiter machines shall be not less than six for steel and nine for cast iron or other materials. Keys or pins shall be used for fastenings except that set screws may be used where the connection is not subject to torque. Sheaves or idlers shall not be suspended in cast iron stirrups from the underside of supporting beams.

79-139. Guides shall be of wood or metal, except that metal guides shall be used where the rated speed is more than one hundred feet per minute unless the use of steel would constitute an accident hazard, in which case wood may be used. Guides shall be rigidly secured to the hatchway. Joints in metal guides shall be either tongued or grooved and doweled and fitted with splice plates. Joints in wood guides shall be either tongued and grooved or doweled and screwed to backing pieces or brackets. One set of guides may be used for both the car and counterweight.

79-140. Counterweights for hand dumbwaiters and for power dumbwaiters with a rated load of not more than one hundred pounds and a rated speed of not more than one hundred feet per minute, if sectional, shall be carried in suitable

frames. Counterweight sections for power dumbwaiters, having a capacity of more than one hundred pounds or a speed of more than one hundred feet per minute, shall be secured by not less than two the rods passing through holes in the rods shall have lock nuts at each end; the lock nuts shall be secured by cotter pins.

79-141. Suspension means for hand dumbwaiters may be of hemp. Suspension means for power dumbwaiters shall be of metal and where exposed to corrosion shall be provided with suitable protective covering. Suspension means for a dumbwaiter may consist of a single number. The minimum factor of safety of suspension means for hand dumbwaiters shall be five. The minimum factor of safety of the suspension means for power dumbwaiters shall be not less than the following:

Factor of Safety for Suspension Means for Power Dumbwaiters.	
Rated speed (Feet per minute)	Factor of safety (Except for tapes)
Up to 50	5.0
Over 50 to 75	5.2
75 to 100	5.3
100 to 150	5.4
150 to 200	5.6
200 to 250	5.8
250 to 300	6.05
300 to 350	6.3
350 to 400	6.55
400 to 450	6.8
450 to 500	7.0
500 to 550	7.25
	7.50

Add twenty-five per cent to the above minimum factors of safety for tapes. The number and size of the suspension means shall be determined by using the rated factor of safety and the rated ultimate strength of the suspension means. The computed load on the suspension means shall be the sum of all suspended weights plus the rated load. No suspension means shall be repaired or lengthened by splicing. The winding drum ends of the car and counterweight suspension means shall be secured by clamps or sockets inside the winding drum. Suspension means secured to a winding drum shall have not less than one turn on the winding drum when the car or counterweight has reached the extreme limit of its over-travel.

79-142. The maximum speed for power dumbwaiters controlled by hand ropes shall be fifty feet per minute. Guards which will keep the ropes on the sheaves shall be installed unless means are used to maintain the hand ropes on the proper tension automatically. Power dumbwaiters, except hydraulic dumbwaiters, shall be equipped with brakes which are automatically applied when the power is cut off the motor. A power dumbwaiter having a travel of more than thirty feet, a capacity of more than one hundred pounds, and operated by a winding drum machine, except a hydraulic dumbwaiter, shall be provided with a slack cable device which will cut off the power and stop the machine if the car is obstructed in its descent. Each power dumbwaiter shall be provided with a means independent of manual operation to stop the car automatically at each terminal within the limits of over-travel.

Escalators

79-143. The maximum angle of inclination of an escalator shall be thirty degrees from the horizontal in new buildings and thirty-three degrees in existing buildings. The width of an escalator shall be not less than twenty-four inches nor more than forty-eight inches measured between the balustrading at a vertical height of twenty-four inches above the nose line of the treads. All escalators shall have a horizontal tread formation. The maximum speed of an esc-

lator, measured along the angle of inclination, shall be one hundred twenty-five feet per minute, except that if the line of entrance and exit is not in the vertical plane of travel, the maximum speed shall be one hundred feet per minute. [Amend. Conn. J. 5-2-40, p. 2417.]

79-144. Every escalator shall be provided on each side with solid balustrading. On the escalator side the balustrading shall be smooth without depressed or raised paneling or molding and without glass panels. There shall be no abrupt changes in the width of the balustrading; should any change be necessary it shall be not more than eight per cent of the greatest width and shall be made at an angle of not more than fifteen degrees from the line of escalator travel. Each balustrading shall be equipped with a handrail moving at the same speed and in the same direction as the travel of the escalator.

79-145. Escalator treads and landings shall be of material affording secure foothold. If the landing is of concrete it shall have edge insertions of metal, wood, or other material to prevent slipping. The track arrangement shall be designed to prevent the displacement of the treads and running gear if a tread chain breaks.

79-146. The rated load in pounds on an escalator shall be four and six-tenths times the width of the escalator in inches times the horizontal projected length of the exposed treads in feet. The factor of safety to be used in the design of an escalator truss or girder shall be not less than five based on the static loads. The escalator truss or girder shall be so designed that it will safely retain the steps and running gear in case of failure of the track system to retain the running gear in its guides. Chains shall have a factor of safety of not less than ten except where the chain is composed of cast steel links thoroughly annealed, when the factor of safety shall be not less than twenty. Access to the interior of the escalator shall be provided for inspection and maintenance.

79-147. Escalators shall be driven by individual electric motors.

79-148. Each escalator shall be marked by the manufacturer with the rated load and speed for which that size and type has been tested and approved in accordance with "escalator tests" hereinafter described.

79-149. An emergency stop button or other type of switch accessible to the public shall be conspicuously located at the top and bottom of each escalator landing. The operation of either of these buttons or switches shall cause the interruption of power to the escalator. It shall be impossible to start an escalator by means of these buttons or switches. The buttons or switches shall be marked "ESCALATOR STOP BUTTON" or "ESCALATOR STOP SWITCH." Where starting buttons or switches are accessible to the public they shall be either of the key operated type or enclosed in a box provided with a lock and key. Each escalator shall be equipped with means to cause the interruption of power to the escalator in case of accidental reversal of travel of an escalator operating in the ascending direction.

79-150. Each escalator shall be provided with a speed governor which will cause the interruption of power to the escalator in case the speed exceeds a predetermined value which shall be not more than forty per cent in excess of the normal running speed. Each escalator shall be provided with a broken chain device which will cause the interruption of power to the escalator in case a tread chain breaks. Where an escalator is equipped with a lightning device, operating by means of tension weights, provision shall be made to retain these weights in the escalator truss in case the weights should fall.

79-151. Each escalator shall be provided with an electrically released and mechanically applied safety brake of sufficient power to stop the fully loaded escalator engaged on the main drive shaft of the escalator. This brake shall automatically stop the escalator when operating, or tending to operate, in the descending direction in case any of the safety devices function, except that if the escalator drive machine is equipped with an electrically released mechanically applied brake of sufficient power to stop the fully loaded escalator, the above safety devices may apply this brake in lieu of the safety brake, if a device is

furnished which will apply the safety brake in case the connection between the escalator drive machine and the main drive shaft parts.

79-152. [Repealed Coun. J. 5-2-40, p. 2417.]

Tests of Interlocks Before Approval

79-153. Hatchway door interlock devices shall be examined with respect to their proper performance of the prescribed functions at temperatures from twenty-five to one hundred forty degrees Fahrenheit. Where the functioning of any such device might be affected by change of temperature, and coefficients of thermal expansion of the affected parts are known or measured, the effect of temperature may be computed and tests need not be carried out at more than one temperature. For interlocks employing a single switch operated by wire or tape to protect several hatchway doors, the switch shall be marked with the physical properties of the wire or tape used, and the certificate of approval shall cover the allowable maximum length of tape or wire of a given material which may be used with the device. During tests for (c) endurance, (d) current interruption, (e) in moist atmosphere and (f) without lubrication, interlocks shall have electrical parts connected in a non-inductive electric circuit having a constant resistance, in which a current of two amperes from a source of two hundred twenty volts direct current is flowing. During tests (c), (e) and (f), the electrical circuit shall be closed but shall not be broken at the contact within the device on each cycle of operation.

79-154. A separate device shall be used in each test described in the following sections as "endurance test," "tests in moist atmosphere," and "tests without lubrication."

If an electric contact which has been approved as a part of a door interlock or as a door or gate electric contact is submitted for test as part of another interlock, the electrical tests need not be repeated. Retiring cans or equivalent devices for operating interlocks need not be tested. [Amend. Coun. J. 5-2-40, p. 2417.]

79-155. The interlock device with initial lubrication and adjustment only, shall complete one hundred thousand cycles of operation without failure of any kind and without evident indications of approaching failure. If an interlocking device is not a complete and separate unit for each hatchway door, but includes any part which is common to the interlock operation of more than one hatchway door, that portion of the device which functions on every unlocking operation shall complete four hundred thousand additional cycles of operation without failure of any kind and without evident indication of approaching failure. [Amend. Coun. J. 5-2-40, p. 2417.]

79-156. One thousand cycles of operation shall be performed by the device used in the "endurance test," while making and breaking the circuit within the device.

79-157. Preliminary to this test, the device shall be given a wearing-in run of ten thousand cycles of operation fully lubricated. The interlocking device, except self-lubricating bearings, and bearings of a type not requiring frequent replenishment of lubricant, shall be taken apart and freed of lubricant by washing in gasoline. The device, after reassembly, shall be subjected continuously in a closed hatchway to an atmosphere saturated with a three and one-half per cent solution of sodium chloride for seventy-two consecutive hours being operated for only ten consecutive cycles at the end of each of the first two twenty-four hour periods and allowed to stand exposed to the air for an additional twenty-four hours, and shall not fail in a manner to create an unsafe condition. After having been lubricated it shall then, without adjustment and without further attention, complete fifteen thousand cycles of operation without failure of any kind.

79-158. Preliminary to this test the device shall be given a wearing-in run of ten thousand cycles of operation fully lubricated. The interlocking device shall then be taken apart and all bearings, except self-lubricating bearings and bearings of a type not requiring frequent replenishment of lubricant shall be freed of lubricant by washing in gasoline, and after reassembly without other attention than the usual initial adjustment, that is, without adjustment especially made to meet the conditions of this particular test, and without further attention, shall complete twenty-five thousand cycles of operation without failure of any kind or without evident indication of approaching failure.

79-159. The device shall operate successfully when the car, cam, or other equivalent operating device, used in making the test, has been displaced horizontally from its normal position, successively as follows:

- (a) In a direction perpendicular to the edge of the landing—backward one-fourth inch; forward one-fourth inch.
- (b) In a direction parallel with the edge of the landing—to the right one-fourth inch; to the left one-fourth inch. For horizontal sliding doors the device shall operate successfully.
- (c) When the bottom of the hatchway door has been displaced horizontally from its normal position in a direction perpendicular to the edge of the landing—backward one-fourth inch; forward one-fourth inch.
- (d) When the top of the hatchway door has been displaced horizontally from its normal position in a direction perpendicular to the edge of the landing—backward one-eighth inch; forward one-eighth inch.

79-160. Insulation of electrical parts shall be tested with a sixty cycle effective voltage twice the rated voltage plus one thousand volts applied for one minute.

79-161. If the interlock is of the type which is released by a car cam, before and after the "endurance test," the force required to release the interlock and the movement of the element engaged by the cam, shall be measured. The force recorded in each case shall be the maximum, acting in a horizontal plane, which must be applied to that member of the interlock which is directly actuated by the cam. The movement recorded shall in each case be the distance vertically from the movement recorded shall in each case be the distance vertically projected on a horizontal plane, which the member of the interlock directly actuated by the cam travels from its position when the cam is retired and the door locked to its position when the door locking member is first released from locking engagement. The car cam used to actuate any particular interlock shall exert a force at least double the average force, and shall have a movement at least one-half inch in excess of the average movement, as given in the test certificate for that interlock. The force and movement readings shall be determined with the interlock mounted in its normal position, as determined by the manufacturer. The test certificate shall state the average of the recorded forces and movements. [Amend. Coun. J. 5-2-40, p. 2417.]

Tests of Buffers Before Approval

79-162. Each type and size of oil buffer shall be subjected to the test described in the following sections dealing therewith.

79-163. The buffer shall be installed upon a suitable foundation so that the axis of the cylinder is vertical. It shall be filled with oil provided by the manufacturer. An elevator car of suitable size shall be dropped from two different heights, as specified below, freely in its guides, upon the buffer. The travel of the car shall be recorded accurately by means of a drum chronograph or by photographing a carefully calibrated tape. The error in the time readings by either method shall not exceed 0.005 second. From the time-travel curve the velocity and the retardation of the car shall be computed and plots shall be available to the manufacturer. No retardation peak having a duration greater than one twenty-fifth second shall exceed two and one-half times gravity, eighty and five-tenths feet per second per second for tests A-1 and A-2 and B-1 and B-2. Results of A-3 and B-3 shall be recorded for the purpose of examination to detect any abnormal performance. Upon completion of these tests no part of the buffer shall show any deformation or injury.

Schedule of Drops

Test drop in inches (bottom of car to striker or top of buffer).	Total load in pounds (weight of car plus loading).
(A) S (such a distance that the maximum velocity attained by the car during the buffer compression shall be equal to the governor tripping speed for which the buffer is rated).	1. Manufacturer's rated minimum. 2. Manufacturer's rated maximum. 3. One hundred ten per cent manufacturer's rated maximum.

(B) Buffer stroke

under twenty-four (24) inches	.51S	1. Manufacturer's rated minimum.
twenty-four (24) to thirty (30) inches	.56S	2. Manufacturer's rated maximum.
exceeding thirty (30) inches	.64S	3. One hundred ten per cent manufacturer's rated maximum.

[Amend. Coun. J. 5-2-40, p. 2417.]

79-164. The oil leakage test shall be made simultaneously with the above retardation tests. The oil level in the buffer, when filled prior to tests, shall be carefully marked. At the completion of the six drops, three different loads at each of two speeds, in each of which the car shall have remained on the fully compressed buffer for a period of five minutes, the buffer shall be allowed to stand one-half hour in the fully extended position to permit the return of oil to the reservoir and to permit the escape of any entrained air, after which the oil level shall again be measured. The oil level at the completion of these tests shall not show any drop, and shall in no case be more than one-sixteenth inch lower than the level at the start of the test for each foot of buffer stroke. [Amend. Coun. J. 5-2-40, p. 2417.]

79-165. In the churning test, the time of the buffer stroke after the car has dropped a distance equivalent to the stroke of the buffer shall be determined either from the chronograph or photographic record or by means of an automatic timer. Any automatic timing device shall be accurate, having the minimum possible lag, and be capable of being read to 0.01 seconds. The car shall then be run on to the buffer with cables attached at approximately one-half the velocity used in test B at intervals of one minute until ten such strokes have been made. The oil shall then be examined for foam. No oil foam shall appear on the outside of the buffer following this test. Upon completion of the ten strokes at one-half speed another free-fall equivalent to the buffer stroke shall be made immediately and the time of the stroke taken. The time of this second free-fall test shall be at least seventy-five per cent of that of the drop test made prior to the churning.

79-166. When the load is lifted, the buffer shall return to the fully extended position within ninety seconds. In case of sticking the manufacturer shall submit either a duplicate buffer or a new pressure cylinder and piston upon which equipment a second test shall be run. If sticking again results, the buffer shall be rejected. [Amend. Coun. J. 5-2-40, p. 2417.]

79-167. With the buffer casing clamped or otherwise securely fastened to a firm base, the lateral movement of the top of the plunger shall be accurately measured, the plunger head being moved from its extreme right to the extreme left in a vertical plane. This total movement shall be divided by two to determine the movement from the vertical position. The maximum permissible movement from the vertical shall be one-sixteenth inch per foot of buffer stroke.

Field Tests of Elevators

79-168. A test shall be made of every new elevator with rated load in the car and the brakes, limit switches, buffers, safeties and speed governor shall be caused to function. Field tests of buffers and car safeties shall be made as provided in the following sections dealing therewith.

79-169. Run on to buffers with rated load at rated speed with final limit switches operative, except that if buffer stroke has been reduced due to the use of a speed retarding device the car or counterweight shall be run on the buffer at the speed corresponding to the buffer stroke used.

79-170. An overspeed test with rated load in the car shall be made of the safeties, except that governor controlled instantaneous type safeties shall be tested at rated speed, the governor being tripped by hand, and broken rope in-

stantaneous type safeties shall be tested by obtaining the necessary slack rope to cause them to function. For wedge clamp, gradual wedge clamp, and flexible guide clamp safeties, this test shall be made to determine whether the safety test shall be made within the allowable limits of the maximum and minimum stopping distances. Overspeed tests shall be made with cables attached and all electric apparatus operative, except for the overspeed contact on the governor. For alternating current elevators, where the rated load is unable to bring about overspeed, the safety governor shall be tripped by hand at maximum obtainable speed. No test of the safeties with safe lifting load in the car is required. [Amend. Coun. J. 5-2-40, p. 2417.]

79-171. The maximum and minimum stopping distances of car and counterweight safeties of the wedge clamp type shall be within the limits given in the following table:

Governor tripping speed (feet per minute)	Maximum and Minimum Stopping Distances at Various Governor Tripping Speeds at Runway Test—Wedge Clamp Type Safeties	
	Maximum stopping distance (feet) for car with rated load and for counterweight	Minimum stopping distance (feet) for car with rated load and for counterweight
300	2.0	1.0
400	2.8	1.2
500	4.0	1.4
600	5.2	1.6
700	6.8	1.9
800	8.6	2.3
900	10.7	2.7
1000	13.0	3.0
1200	18.4	4.0
1500	28.2	5.7

[Amend. Coun. J. 5-2-40, p. 2417.]

79-172. The maximum and minimum stopping distances of car and counterweight safeties of the gradual wedge clamp type shall be within the limits given in the following table:

Governor tripping speed (feet per minute)	Maximum and Minimum Stopping Distances at Various Governor Tripping Speeds at Runway Test—Gradual Wedge Clamp Type Safeties			
	Maximum stopping distance (feet) for car with rated load and for counterweight	Minimum stopping distance (feet) for car with rated load	Minimum stopping distance (feet) for car with 150-lb. load	Minimum stopping distance (feet) for load and for counterweight
300	7.0	1.5		2.2
400	7.8	1.6		2.5
500	8.6	1.8		2.8
600	9.9	2.1		3.3
700	11.0	2.4		3.8
800	12.2	2.7		4.5
900	13.5	3.0		5.2
1000	14.6	3.5		6.1
1200	17.3	4.5		8.0
1500	21.2	6.2		11.2

[Amend. Coun. J. 5-2-40, p. 2417.]

79-173. The maximum and minimum stopping distances of the car and counterweight safeties of the flexible guide clamp type shall be within the limits given in the following table:

Maximum and Minimum Stopping Distances at Various Governor Tripping Speeds at Runaway Tests—Flexible Guide Champ Type Sateltes

Governor tripping speed (feet per minute)	Maximum stopping distance (feet) for car with rated load and for counterweight		Minimum stopping distance (feet) for car with 150-lb. load and for counterweight	
	counterweight	150-lb. load	counterweight	150-lb. load
300	1.6	.6	.8	1.2
400	2.5	.8	1.2	1.5
500	3.6	1.0	1.5	2.0
600	4.8	1.2	2.0	2.6
700	6.4	1.5	2.6	3.2
800	8.2	1.8	3.2	4.0
900	10.4	2.2	4.0	4.8
1000	12.8	2.6	4.8	6.7
1200	18.0	3.5	6.7	10.0
1500	28.0	5.2	10.0	

[Amend. Coun. J. 5-2-40, p. 2417.]

79-174. Stopping distance is actual slide as indicated by the marks on the rails. For elevators having a rated speed of four hundred and seventy-five feet per minute, or more, the pull-out of the governor cable from its normal running position until the safety jaws begin to apply pressure to the guide rails shall be not more than thirty inches.

Field Tests of Escalators

79-175. Each escalator shall be subjected to the tests set forth in the following sections dealing therewith, without load.

79-176. The application of the over-speed safety device shall be obtained by causing the escalator to travel at the governor tripping speed. With escalators driven by alternating current motors, the governor may be tripped by hand with the escalator traveling at its normal rate of speed.

79-177. The accidental reversal device prescribed shall be made to function by manually operating, or attempting to operate, the escalator in the reverse direction.

79-178. The application of the broken chain device shall be obtained by operating the device by hand.

79-179. Tests of escalator emergency stop buttons or switches shall be made to determine whether they function properly. Where the device which applies the safety brake, in case the connection between the escalator drive machine and the main drive shaft fails, is required, it shall be tested by operating the device by hand.

Other Tests of Equipment

79-180. A test shall be made of every new dumbwaiter with rated load in the car and the brake and all other safety devices shall be caused to function.

79-181. Electric door and gate contacts shall be subjected to the "endurance test," "current interruption test," "tests in moist atmosphere," "mis-alignment test," and "insulation test" heretofore described for interlocks.

79-182. Emergency releases shall be subjected to the "insulation test" heretofore described for interlocks.

Mechanical Amusement Devices

79-183. All mechanical amusement devices shall be built of the material hereinafter enumerated, or of other materials approved by the commissioner of buildings, substantially constructed and designed to withstand shocks and to afford adequate protection for passengers riding thereon. Structural features shall meet the requirements prescribed elsewhere in this code. Handrails, han-

dies, safety straps, or other protective devices of suitable design shall be provided in all cars of roller coasters, scenic railways, ferris wheels, whips, and other riding, sliding, rotating, and rolling devices of similar type. Each horse on a merry-go-round shall be equipped with a stirrup and a bridle, also a strap on the horse rod to snap or buckle under the arms of the rider.

79-184. No device shall extend more than three feet below the ground level unless the sides and bottoms of all pits are built of concrete; all pits shall be provided in the bottom with drains connected to the sewers. If pits are too deep to drain to the sewer by gravity, a siphon, automatic electric pump, or other device shall be installed in the drain connection. The structure shall be of wood, steel, or other serviceable material substantially fabricated and braced; no permanent structure more than thirty-five feet in height shall be of wood. In an amusement device of the dip type, the up grade in each dip shall be so constructed that the cars will run up the structure at a speed such that the cars will run over the top of the next dip without having a tendency to raise the passengers out of their seats or throw them out of the cars. The cars shall be of substantial construction; they shall be equipped with dogs to drop into a sprocket chain or other approved device to pull the car or train to the starting point of its travel. Ferris wheels, except of the portable type, shall have steel frames and steel tripods supported upon, and anchored to concrete piers. Cars shall be of all steel construction or of wood reinforced with steel. Ferris wheels of portable type used in carnivals and under similar conditions, shall be of steel construction set on suitable bases under the towers and the side tripods.

79-185. Every device shall be provided with a terminal brake; if designed for more than two car trains, it shall also be provided with an emergency brake, release of which will immediately stop the train, which shall be placed in some level spot on the structure; or, if approved by the commissioner of buildings, on one of the curves. The emergency brake shall be under the control of the brakeman or other attendant at the loading platform. Each car shall also be equipped with a safety device arranged to catch and hold the train at any point on the road should the chain break or any other accident occur to the machinery while a car or train is in transit.

79-186. All mechanical amusement devices shall be provided with electric lighting if they are to be in use after sunset.

79-187. A test shall be made of every new mechanical amusement device and all safety devices shall be caused to function.

Violation of Chapter Provisions

79-188. Any person violating, or resisting or opposing the enforcement of, any of the provisions of this chapter, where no other penalty is provided, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each offense. Every day such violation shall constitute a separate and distinct offense, and any builder or contractor who shall construct any building in violation of the provisions of this chapter, and any architect who shall design, draw plans for, or have supervision of such building, or who shall permit it to be constructed, shall be liable for the penalties provided and imposed by this section.

MECHANICAL REFRIGERATION

Location of piping and fittings

85-54. No refrigerant lines shall be located in any elevator, dumbwaiter, or other shaft containing moving objects.

88-620. ELEVATORS.

88-620.1. Scope. This article shall apply to the electrical equipment and wiring used in connection with elevators and dumbwaiters. Installations in hazardous locations shall also comply with 88-500. Installations in garages shall also comply with 88-510.

88-620.2. Voltage Limitations. The following voltage limitations shall apply to elevator-control and operating equipment:

a. Car Control System. No part of any electric circuit having a voltage in excess of 750 shall be used on any car control system. Circuits of higher voltage may be used in machine rooms or pent houses for the operation of motors and brakes, provided that all control and signal wiring is thoroughly insulated from such power circuits, and all machine frames and metal, hand-operated ropes are permanently grounded.

b. Automatic Elevators. The maximum voltage permitted in the operating devices of automatic elevators, having operating devices in the car and at the landings, shall be 300 volts to ground.

c. Push Buttons. The maximum voltage permitted on the push buttons of elevator signaling circuits shall be 300 volts to ground.

88-620.3. Live Parts Enclosed. All live parts of electrical apparatus in or on elevator cars or in elevator hoistways shall be enclosed to protect against accidental contact.

88-620.4. Insulation of Conductors. The insulation of conductors installed in or on elevator equipment shall comply with the following:

a. In Auxiliary Gutters. In auxiliary gutters used in machine rooms, under controllers, starters and similar apparatus for elevator machines, conductors shall be of the rubber-covered or thermoplastic covered type.

b. Control-Panel Wiring. Conductors between main circuit resistors and the back of control panels shall be suitable for an operating temperature of not less than 90C (194F). All other wiring on control panels, unless subjected to a temperature exceeding 60C (140F), shall be of the rubber-covered or thermoplastic covered type or shall be of other type specially approved for the purpose.

c. Elevator Controller Circuits. Conductors or groups of conductors having flame-retardant outer cover shall not be used as connections for the operating circuits of elevator controllers unless such outer covering is also moisture-resistant.

d. Traveling Cables. Traveling cables used as flexible connections between the car and the hoistway shall be types E or EO elevator cable, or other approved type, and shall have a flame-retardant and moisture-resistant outer cover.

e. Fixed Wiring. For wiring for elevator operating control circuits, and signaling circuits, conductors shall be rubber covered or thermoplastic covered with insulation of not less than 2/64 inch in thickness.

88-620.5. Minimum Size of Conductors. The minimum size of conductors for elevator wiring shall be as follows:

a. For lighting circuits, No. 14, except that for flexibility two or more No. 16 conductors may be used in parallel in traveling cables and on the car.

b. For elevator operating and control circuits, No. 16.

c. For signal circuits and for fixtures, No. 18.

88-620.6. Wiring Method. The following wiring methods shall be employed:

a. In Hoistways. Conductors located in the hoistway, except traveling cables and conductors used in signal systems of Classes 1 or 2, shall be installed in rigid conduit or electrical metallic tubing, except that flexible conduit or armored cable may be used between riser and limit switches, interlocks, push buttons or similar devices.

b. On the Car. Conductors and traveling cables on the car shall be run in rigid conduit, electrical metallic tubing or wireways; except that short runs of:

1. Flexible conduit or armored cable may be used if so located as to be kept free from oil, and securely fastened in place.

2. Type S cord may be used as the flexible connection between the fixed wiring on the car and the switch on the car door or gate if securely fastened in a position not liable to mechanical injury.

c. Between Motors, Generators and Control Panels. The conductors of circuits between motors, generators, and control panels may be grouped without any additional insulation of the separate conductors if the complete group is either taped or corded, and such covering properly painted with an insulating paint; provided that such conductors are not over 6 feet long, are supported at intervals not more than 3 feet and are not so located as to be subject to mechanical damage. If motor-generators are used with elevator motors and both are located adjacent to or underneath the control equipment and are provided with extra length terminal leads, such leads may be extended to connect directly to the elevator controller or motor-generator starter terminal studs without regard to the carrying capacity requirements of 87-430 and 87-445 provided, that no such lead is longer than 6 feet.

Installation of Conductors

88-620.11. Raceway Terminal Fittings. Conductors leaving raceways shall comply with the provisions of 87-300.8 and 87-300.9, but in no case shall the raceway terminate less than 6 inches from the floor.

88-620.12. Split Fittings. Split fittings or clamp fittings may be used on exposed conduit or electrical metallic tubing except where the conduit or tubing contains feeders.

88-620.13. Supports. Supports for pipes, conduits, and armored cable shall be securely fastened to the guide rail or hoistway construction.

88-620.14. Number of Conductors in Raceway. The number of operating and control-circuit conductors installed in a raceway may be in accordance with Table 9 of 88-10.

88-620.15. Auxiliary Gutters. The restrictions of 87-374.2 as to length of auxiliary gutters, and of 87-374.5 as to number of conductors in auxiliary gutters, shall not apply.

88-620.16. Lighting and Signal Circuits Separate. Conductors of car-lighting circuits, and signal systems when not an integral part of the elevator wiring system, shall be separated and run in separate traveling cables and raceways.

88-620.17. Different Systems in One Cable or Raceway. Conductors for elevator circuits, including operating, control and power conductors, and signal conductors when an integral part of the wiring system, may be run in the same traveling cable or raceway system when the power supply is from the same source, even though the characteristics of the voltage and/or current may be changed within the system by rectifying, transforming or other converting devices supplied from the elevator feeder circuit; provided that all conductors are insulated for the maximum voltage found in the cable or raceway system, and the live parts of the equipment are insulated from ground for this maximum voltage. Such a traveling cable or raceway may also include a pair of telephone conductors to serve a telephone in the car, provided such conductors are insulated for the maximum voltage found in the cable or raceway system.

88-620.18. Foreign Wires. No electric conduit or cables, except those used to furnish or control power, light, heat or signals for the elevator or hoistways, shall have an opening, terminal, outlet or junction within the hoistway, but shall be continuous between outlets or terminals situated entirely outside the hoistway.

Traveling Cables

88-620.31. Cable Assembly. Traveling cables for circuits other than signal shall be of a composite assembly of steel and copper strands or may have one or more supporting fillers of cotton or hemp rope, or of cotton-covered or rubber-covered steel wire laid up with the conductors under the outer covering of the cable. In cables containing six or more conductors the steel supporting strands shall run straight through and not be cabled with the conductors.

88-620.32. Suspension. Traveling cables for all signal circuits, and for all other circuits not over 100 feet in length, may be suspended by suitable clamps if the cables are so constructed that the weight of the cable is not carried by the individual conductors.

88-620.33. Hazardous Locations. In hazardous locations, traveling cables shall be secured to explosion proof cabinets by heavy-duty rubber-bushed threaded connector bushings sealed off at the enclosure as provided in 88-500.15. For traveling cables for use in hazardous locations see 88-10, Table 31.

88-620.34. Protection for Swinging Cables. Wherever the traveling cables in swinging may come in contact with projectors or corners of the building construction in the hoistway, such as I beams, ledges and the like, such irregular surfaces shall be made smooth by covering with heavy gauge sheet metal or other suitable means.

Control.

88-620.41. General. There shall be in addition to the elevator controller, a means for disconnecting all conductors of the circuit to the elevator motor, or in the case of generator field control, to the motor of the motor-generator set which supplies current to the elevator motor.

a. Type. The disconnecting means shall be a motor-circuit switch and may be (1) an externally-operable switch or (2) open switches or circuit-breakers on three or more circuits, grouped on a switchboard accessible to qualified persons only.

b. Location. It shall be located adjacent to and be visible from the elevator machine, unless a disconnect switch in the control circuit of the motor-generator set is placed adjacent to and is visible from the elevator machine.

88-620.42. Limit Switches. Final over-run limit switches, mounted in the hoistway and operated by the movement of the car, shall be provided for upper and lower limits of travel for all elevators, which shall act to prevent movement of the car in both directions of travel. See 88-510 for elevators located in garages.

88-620.43. Phase Protection. Electric elevators used to convey persons, if operated by a polyphase alternating-current motor, shall be provided with a device which will prevent starting the motor if:

- a. The phase rotation is in the wrong direction, or
b. There is a failure in any phase.

Overcurrent Protection.

88-620.51. No. 18 Conductors. If No. 18 conductor is used for signal circuits, it shall be protected by fuses rated at not to exceed 3 amperes.

Machine Room.

88-620.61. Guarding Equipment.

a. Elevator motors shall be located in fireproof rooms. The rooms shall be used only for the enclosure of the elevator machinery and the electrical control apparatus. The entire room, including floor, shall be of fireproof construction. For the fireproofing of the floor, concrete, tile or sheet metal shall be used. Concrete shall be at least three inches thick and when placed over wood floors all openings through such floors shall have the exposed ends of boards covered by sheet metal. Sheet metal used as a floor covering shall be not less than No. 14 U.S.S. gauge. Ceilings if of wood may be covered by metal lath and plaster or by transite board not less than 1/4 inch thick. All doors to the room shall be kept locked.

88-620.62. Clearance Around Control Panels. The following clearances shall be provided:

a. **Grouped Panels.** If a group of three or more elevator-control panels having wiring on the rear is located in a single machine room, there shall be a working space of at least 36 inches back of the live parts, and not less than 18 inches on at least one side of the group. There shall also be at least 36 inches of working space in front of the panels.

b. **Single or Double Panels.** An installation consisting of one or two panels shall have at least 24 inches working space in the rear, and at least 36 inches working space in the front of the panel or panels and there shall be at least 18 inches working space on one side if the panel is single, and on each side if the panel is a double one. Smaller clearances may be authorized in certain specific cases by special permission.

Grounding.

88-620.71. **Metal Raceways Attached to Cars.** Conduit or armored cable attached to elevator cars shall be bonded to grounded metal parts of the car with which they come in contact.

88-620.72. **Electric Elevators.** For electric elevators, the frames of all motors, elevator machines, controllers and the metal enclosures for all electrical devices in or on the car or in the hoistway shall be grounded.

88-620.73. **Non-Electric Elevators.** For elevators other than electric, if any electrical conductors are attached to the car, the metal frame of the car, if normally accessible to persons, shall be grounded.

88-620.74. **Hand-Operated Cables.** All hand-operated metallic shifting ropes or cables shall be grounded.

88-620.75. **Inherent Ground.** Equipment mounted on members of the structural metal frame of a building, shall be deemed to be grounded. Metal car frames supported by metal hoisting cables attached to or running over sheaves or drums of elevator machines shall be deemed to be grounded when the machine is grounded in accordance with 87-250.

[Passed. Coun. J. August 26, 1953, p. 5580.]