

**CHAPTER 7. ELEVATORS, LIFTS, ESCALATORS,
DUMBWAITERS, HOISTS AND TRAMWAYS**

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Authority

The provisions of this Chapter 7 issued under act of June 2, 1913, P.L. 396 (71 P.S. § 1442), unless otherwise noted.

Source

The provisions of this Chapter 7 adopted December 15, 1924, unless otherwise noted.

Cross References

This chapter cited in 34 Pa. Code § 6.31 (relating to cables, ropes, block and tackle); 34 Pa. Code § 39.31 (relating to elevators); and 34 Pa. Code § 60.33 (relating to buildings).

Subchapter A. PRELIMINARY PROVISIONS

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GENERALLY

§ 7.1. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

Aerial passenger tramway—A general usage which denotes a device used to transport passengers by single and double reversible tramway; chair lifts, gondola lifts and skimobiles; T-bar lifts, J-bar lifts, platter lifts and similar devices; or a fiber rope tow.

Automatic control elevator—An elevator, the operation of which is controlled by electric buttons or switches in such a manner that all stops at landings are made automatically and which may be started by switches or buttons at the landing.

Basement—A floor level partly or completely below grade as measured from the floor level immediately above; it shall be considered a story if more than 33-1/3% of the exterior wall perimeter is five feet or more above grade.

Basement lift—A sidewalk elevator.

Bucket—A metal bucket or tank operating in guides raised and lowered by steel cables and used for the purpose of distributing concrete or other building material to various floor levels.

Builder's hoist—An elevator erected for temporary use, built in or adjoining a building under construction or alterations.

Car door or gate—The door or gate in an elevator car.

Chair lifts, gondola lifts, and skimobiles—A type of transportation in which passengers are carried on chairs or cars, or in gondola cabs attached to and suspended from a moving wire rope or attached to a moving wire rope or chain and supported on a standing wire rope or other structure.

Diameter—Tread diameter when it refers to sheaves, wheels, or pulleys.

Double-button control elevator—An elevator, the operation of which is controlled by self-centering buttons or switches located in the car and at the landings in such a manner that the elevator operates only when the button or switch is held closed manually and stops when the button or switch is released.

Double-deck—An elevator consisting of a car structure containing two elevator cabs or compartments.

Drive sheave, or bull wheel—The tread diameter which ranges from three to 14 feet, depending upon the type of installation. Either designation refers to the main drive sheave.

Dual control elevator—An elevator capable of operation either by an authorized operator in the car or automatically by electric buttons or switches.

Dumbwaiter—A miniature freight elevator.

Elevator—A car, cage, or platform raised or lowered vertically in permanent guides or rails, including the necessary operating mechanism, used to transport persons or materials.

Elevator car—The load carrying unit, including the platform supporting and guiding frame, and enclosure.

Escalator—A moving continuous inclined stairway or runway used for raising or lowering persons. Wheeled vehicles of any type are not permitted on escalators.

Fiber rope tow—A type of transportation which pulls skiers riding on skis by a traveling fiber rope which the skier grasps by hand.

Fire-resistive materials—Approved materials having fire-resistive qualities, such as brick, concrete, hollow tile, terra-cotta blocks, or concrete plaster on expanded metal lath supported by metal studs of an approximate total thickness of not less than 2 1/2 inches.

Freight elevator—An elevator constructed and used for carrying materials.

Full automatic door or gate—A door or gate which is opened and closed automatically by the motion of the elevator car.

Grade—The level or the surface of the ground established by law, or on record where not established by law. This term includes the average level of the surface of the ground.

Gravity elevator—A freight elevator used for lowering materials in a car, cage, or platform through a shaftway, the operation of which is accomplished by the excess weight of the car, cage or platform and the load over the car counterweights.

Hand elevator—A freight elevator, the machinery of which is actuated by a rope or cable operated exclusively by hand.

Independently-operated door or gate—A door or gate operated by power from an auxiliary source in no way derived from the motion of the car.

Landing—The floor, balcony, or platform used to receive or discharge passengers or freight from an elevator car.

Landing door or gate—The door or gate at the shaftway entrance of any landing.

Locking device—A device which prevents the operation of an elevator away from the landing while any gate or door at that landing is open and unsecured and also prevents the opening of the door unless the car is at the landing; this term is also referred to as “interlock.”

Lumber elevator—A platform equipped with screws to raise or lower stacked lumber in a vertical direction at a speed not exceeding 15 feet per minute, with a travel not exceeding 20 feet.

Machinery—The hoisting mechanism and equipment used in the operation of an elevator.

Manlift—The type of elevator which operates by an endless vertical belt which revolves over fixed pulleys at the top and bottom limits of travel and to which steps and hand holds are attached so that persons may ride on it.

Manually-operated door or gate—A door or gate which is opened and closed by hand.

Orchestra elevator—A platform for raising and lowering musicians in an orchestra in a vertical direction at a speed not exceeding 15 feet per minute.

Organ console elevator—A platform for raising and lowering an organ console, including the organist, in a vertical direction at a speed not exceeding 15 feet per minute.

Passenger elevator—An elevator constructed and operated to transport persons.

Private dwellings—Convents, rectories, and parsonages, which are exempt from this chapter, unless portions thereof are used for the housing or assembling of persons other than members of the religious order, if the occupancy is not in excess of 25 persons.

Rated capacity—The capacity established by the designer of equipment.

Rope—Wire rope, and cable are interchangeable, except for rope tows if rope means a fiber rope.

Safety gate stops—A device which automatically stops a tramway when in contact with a passenger or the weight of a passenger.

Semiautomatic door or gate—A door or gate which is manually opened but automatically closed when the elevator car leaves the landing.

Shaftway—A shaft, well-hole, hatchway or other vertical opening or space, partly or wholly enclosed within which an elevator is raised or lowered in a vertical direction.

Sheaves—Pulleys or wheels grooved for rope.

Sidewalk elevator—An elevator which travels from a point below the sidewalk level to the sidewalk, or to an elevation not to exceed wagon or freight car loading level.

Single or double reversible tramway—A type of transportation in which passengers are carried in one or more enclosed cars that reciprocate between terminals.

Stage elevator—A platform consisting of a section of the stage arranged to be raised and lowered above and below the stage level in a vertical direction at a speed not exceeding 15 feet per minute.

Stairway inclined lift—A power passenger inclined lift installed on a stairway for raising or lowering persons from one floor to another.

Standard railing—A railing not less than 42 inches in height with an additional rail midway between the top rail and the floor.

T-bar, J-bar and platter lifts and similar devices—Types of transportation which pull skiers riding on skis by devices propelled by a main overhead traveling wire rope.

Toeboard—A board at least 6 inches in height, placed at right angles with floor or platform to prevent objects from falling from the floor or platform to the spaces below.

Winch—A hand or power-operated machine having a rope coiled on one or more drums for the purpose of hauling, hoisting or lowering a load.

Workmen's hoist—A hoist installed in or outside of buildings during construction, alteration or demolition, and used primarily to raise or lower workmen and other persons connected with or related to the building project.

Authority

The provisions of this § 7.1 issued under act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. §§ 1341—1356).

Source

The provisions of this § 7.1 amended through December 19, 1980, effective December 20, 1980, 10 Pa.B. 4723. Immediately preceding text appears at serial pages (17285) and (36688).

§ 7.2. Scope.

This chapter sets forth rules to safeguard the lives, limbs, maintenance and health of workers involved in the installation, operation and maintenance of elevators, lifts, escalators, dumbwaiters, hoists and tramways in this Commonwealth, and places the responsibility of compliance with the rules upon both employer and employe.

§ 7.3. Penalty.

Any person who violates any of the provisions of this chapter is subject to summary proceedings before an alderman, magistrate or district justice and upon conviction, shall be penalized as provided in section 16 of the act of May 2, 1929 (P. L. 1513, No. 451) (35 P. S. § 1356).

ADMINISTRATION**§ 7.11. Equipment of special design.**

The operation, erection and installation of types of hoisting and lowering equipment other than those covered in this chapter is subject to approval by the Department. When installing elevators with specially designed apparatus or equipment not provided for by this chapter, the elevators may not be operated until the design in question has been approved by the Department.

Cross References

This section cited in 34 Pa. Code § 7.251 (relating to general).

§ 7.12. Rules of operation.

(a) Passenger or freight elevators, except when operated by automatic control or double-button control, shall be operated only by authorized persons who have received instruction in the proper operation thereof.

(b) No person shall be allowed to operate an elevator unless he is at least 18 years of age and is selected with consideration for his ability to perform his duties in a careful and competent manner, and is free from mental or serious physical defects.

(c) Operators of elevators shall see that all the provisions of this chapter are complied with. Operators shall report to their employers any violations or defects which come to their attention.

(d) No person shall ride on elevators constructed and used as power-driven freight elevators, except the operator and designated assistants (not more than three). No person shall ride upon hand elevators, gravity elevators, dumbwaiters, or hoists.

(e) A duplex elevator requires operators in each cab or compartment.

(f) When seats are placed in the cars of elevators for the use of elevator operators they shall be of the collapsible type and without legs.

(g) The provisions of this section apply to all installations.

Cross References

This section cited in 34 Pa. Code § 7.251 (relating to general); 34 Pa. Code § 7.37 (relating to combination elevators); and 34 Pa. Code § 7.283 (relating to safety requirements).

§ 7.13. Repairs.

(a) Any existing device subject to this chapter which is damaged by fire or other causes including ordinary wear, when major repairs or replacement become necessary, shall be replaced or rebuilt in conformity with the requirements of this chapter for new construction and installation of such devices, except that it is not required that the hoistway be fireproof when the existing hoistway is used.

(b) The removal and reerection of elevators, escalators, and dumbwaiters in new locations shall be in conformity with the requirements for new elevators, escalators, and dumbwaiters. Existing hoists, when used as permanent installations, may not be reerected in new locations.

(c) Before work costing \$1,000 or more is commenced on the repair of elevator devices, duplicate applications for such repair work shall be filed with the Department by the building owner or the elevator contractor. Before work costing \$1,000 or more and involving major repairs as defined in subsection (e) is commenced on the repair of elevator devices, duplicate applications for such repair work plus a \$50 fee for a permit shall be filed with the Department by the building owner or the elevator contractor and a permit covering such repairs or changes shall be obtained from the Department.

(d) After work costing \$1,000 or more is completed, the building owner or elevator contractor shall notify the Department and such repairs may be inspected by the Department for approval. After work costing \$1,000 or more and involving major repairs as defined in subsection (e) is completed, the building owner or elevator contractor shall notify the Department and such repairs will be inspected by the Department for approval.

(e) Major repairs shall include but shall not be limited to the following changes in an elevator: increase in the rated load or speed, increase in the dead weight of the car, change in travel, change in the type of operation or control, change in the size or number of suspension ropes, change in the size or type of guide rails, change in classification from freight elevator to passenger elevator, change in the power supply, change in the type of car or counterweight safety, installation of a new driving machine, installation of a new controller, installation of new brakes, replacement of hoistway doors, addition of landing door interlocks, addition of door operating devices, addition of auxiliary rope fastening devices, addition of car leveling, addition of roller guide shoes, and addition of new car or counterweight safety. As to hydraulic elevators, major repairs shall include the preceding changes as appropriate, and shall include but shall not be limited to the following changes: installation of different control valves, replacement of existing relief and check valves, replacement of existing supply pipings and fittings, replacement of existing tanks, replacement of cylinder, replacement of plunger, and increase in the working pressure by more than 3.0%.

Authority

The provisions of this § 7.13 issued under act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. §§ 1341—1356).

Source

The provisions of this § 7.13 amended December 19, 1980, effective December 20, 1980, 10 Pa.B. 4723. Immediately preceding text appears at serial pages (8045) and (8046).

Cross References

This section cited in 34 Pa. Code § 7.251 (relating to general).

§ 7.14. Tests.

(a) New passengers and freight elevators shall be tested in the presence of a Department inspector to see that the car safeties, speed governors, brakes, bumpers, limit switches, and the like, perform their proper functions. The car safeties shall be tested with the elevator car carrying the maximum allowable load. In making the final test the hoisting cables shall be detached from the car, while at a height sufficient to indicate the efficiency of the car safeties. A run-away test is acceptable in lieu of the free drop test when approved safety devices are installed. For reostatic control elevators, the safeties shall be tested by tripping the governor. Broken rope safety devices shall be tested as such.

(b) Existing installations shall be tested as follows:

(1) The car safety of existing installations shall be tested with rated load in the car by tripping the governor by hand at rated speed, within five years of effective date and at least every five years thereafter by a reputable elevator company. Results of the test shall be certified by the elevator company on forms furnished by the Department, indicating the load for which the elevator was tested and a record of such test shall be filed with the Department.

(2) A metal data plate furnished by the company performing the test shall be fastened to the car crosshead and show the date of the test and the company performing the test.

(3) The governor shall be tested and the trip speed measured by a tachometer and, if necessary, adjusted to conform to the requirements of this section. Governors shall be resealed after each test. Speed governors for car safeties shall be set to trip at over speeds as follows:

(i) At not less than 115% of rated car speed.

(ii) At not more than the tripping speed listed opposite the applicable rated speed in the following table:

*Maximum Speeds at which Speed Governor Trips
and Governor Overspeed Switch Operates*

| <i>Rated Speed (in feet per minute)</i> | <i>Maximum Governor Trip Speed (in feet per minute)</i> | <i>Maximum Speed at which Governor Overspeed Switch Operates (down feet per minute)</i> |
|---|---|---|
| 0—125 | 175 | 175 |
| 150 | 210 | 190 |
| 175 | 250 | 225 |
| 200 | 280 | 252 |
| 225 | 308 | 277 |
| 250 | 337 | 303 |

| <i>Rated Speed (in feet per minute)</i> | <i>Maximum Governor Trip Speed (in feet per minute)</i> | <i>Maximum Speed at which Governor Overspeed Switch Operates (down feet per minute)</i> |
|---|---|---|
| 300 | 395 | 355 |
| 350 | 452 | 407 |
| 400 | 510 | 459 |
| 450 | 568 | 512 |
| 500 | 625 | 563 |
| 600 | 740 | 703 |
| 700 | 855 | 812 |
| 800 | 970 | 921 |
| 900 | 1085 | 1031 |
| 1000 | 1200 | 1140 |
| 1100 | 1320 | 1254 |
| 1200 | 1440 | 1368 |
| 1300 | 1560 | 1482 |
| 1400 | 1680 | 1596 |
| 1500 | 1800 | 1710 |

(4) Speed governors, where provided for counterweight safeties, shall be set to trip at an overspeed greater than, but not more than 10% above, that at which the car speed governor is set to trip.

(5) Broken rope safeties shall be drop tested.

(6) The provisions of this subsection do not apply to hand-powered freight elevators.

(c) New escalators shall be tested in the presence of a Department inspector. The test shall consist of a physical examination of the escalator parts together with a running test of the escalator without load, including a test of all the safety features prescribed in § 7.324 (relating to safety equipment).

(d) On the completion of any device provided for by this chapter, the owner, builder, contractor, manufacturer, or other responsible party or parties, shall file with the Department notice in writing that such installation has been constructed and installed in accordance with the plans as approved. Upon receipt of such notice the Department may arrange for inspection of the installation by a Department inspector.

(e) New elevators, escalators, dumbwaiters, gravity elevators and hoists shall not be operated temporarily pending final completion without permission of the Department.

Source

The provisions of this § 7.14 amended through June 21, 1974, 4 Pa.B. 1282. Immediately preceding text appears at serial pages (8047) and (8048).

Cross References

This section cited in 34 Pa. Code § 7.251 (relating to general).

§ 7.15. Inspection.

(a) *Frequency.* Inspection of equipment regulated by this chapter shall take place as follows:

(1) All passenger elevators and escalators shall be inspected at least once every 3 months.

(2) Freight elevators, including gravity elevators, shall be inspected at least once every 6 months.

(3) Dumbwaiters, hoists, and other types of lifting apparatus covered by this chapter shall be inspected once every 12 months. Building hoists may be inspected by a Department inspector at the time of erection at every building.

(4) Inspections shall be made by approved inspectors. During inspections all safety appliances shall be thoroughly examined and all violations reported. Casualty insurance companies insuring such installations shall inspect them periodically, in keeping with the type of equipment insured. When installations are idle for an extended period of time they are not subject to the requirements of this section if they are placed under State seal, but may be thoroughly inspected by a Department inspector before again being placed in operation.

(b) *Reports.* Approved inspectors shall file with the Department duplicate copies of all inspection reports which pertain to and cover all elevators and hoists inspected, and which are located within the jurisdiction of the Department.

(c) *Certificates.* Upon the receipt of reports, the Department will, upon the payment of a fee proportionate to an annual fee of \$4.00, issue certificates of inspection covering all installations which are found to conform to the provisions of this section. Certificates shall be posted in the cars of elevators, and in conspicuous places in connection with escalators and hoists. The name of the inspector making the inspection and the dates of issuance and expiration shall appear on all certificates. If such installation is insured, the name and address of the insurance carrier shall also be placed upon the certificate. Elevators shall not be operated before the certificate is received from the Department and posted, or after the effective period of the certificate expires. Approved elevator inspectors and other inspectors regularly employed by the Department may order an elevator to be placed out of service if the foregoing provision is violated. The insurance company carrying the risk shall notify the Department when risk expires.

(d) *Noncompliance with recommendations.* In all instances when imperative recommendations are issued, and when such recommendations have not received the attention of owners, the issuance of certificates of inspection may be withheld, until such time as the substandard conditions are rectified.

(e) *Unsafe conditions.* Approved inspectors finding a violation which causes a dangerous condition will immediately notify the building owner or agent of the building owner of the violation and advise such person to place the elevator out

of service. Immediately thereafter he shall notify the local elevator inspector of the Department so that a seal may be placed on the elevator. No elevator shall be operated after being placed out of service by an inspector until the violations have been corrected and approved by the Department.

Cross References

This section cited in 34 Pa. Code § 7.134 (relating to approval and operation); 34 Pa. Code § 7.174 (relating to approval and operation); 34 Pa. Code § 7.213 (relating to approval and operation); and 34 Pa. Code § 7.251 (relating to general).

§ 7.16. Inspectors.

(a) The Department will hold examinations for applicants as approved elevator inspectors, four times a year, on the first Thursday after the first Wednesday in March, June, September and December, or at such other times as the Board may direct. Special examinations may be held when necessary. Persons desiring to take the examination shall forward their applications to the Department not less than ten days prior to the date of examination, accompanied by a fee of \$40.

(b) All applicants found competent through examinations will be awarded, upon the payment of a fee of \$20, a commission and a credential card, authorizing them to inspect elevators, escalators, dumbwaiters, gravity elevators and hoists in the names of the agencies they represent. Credential cards will be renewed annually upon the payment of a fee of \$10.

(c) No elevator inspector will be approved who is an employe of the owner or user of the elevators to be inspected, nor will elevator inspectors be approved to inspect elevators under the jurisdiction of the Department if they are not employes of the Department or of casualty and insurance companies authorized to do business in this Commonwealth or of a firm engaged in the making of inspections on a fee or contract basis when performing inspections on such basis for an insurance carrier.

(d) No person shall inspect elevators who is not a bona fide employe of the Commonwealth or of an insurance carrier authorized to do business in this Commonwealth or of a firm engaged in the making of inspections on a fee or contract basis when performing inspections on such basis for an insurance carrier. For the purposes of this rule, the term employe means any person who is directly responsible to the employer for all work performed, and who receives as compensation a regular salary based on full or part-time employment and for whom compensation insurance is carried by the employer. It does not include the relationship of agent on a commission basis.

Source

The provisions of this § 7.16 amended through June 12, 1975, 5 Pa.B. 1558. Immediately preceding text appears at serial page (8050).

Cross References

This section cited in 34 Pa. Code § 7.134 (relating to approval and operation); 34 Pa. Code § 7.174 (relating to approval and operation); 34 Pa. Code § 7.213 (relating to approval and operation); and 34 Pa. Code § 7.251 (relating to general).

§ 7.17. Prohibited installations.

(a) No hand elevator shall be equipped with any attachments or equipment for applying power, unless the hoisting machinery is permanently and completely converted into power-driven machinery. In such cases, all requirements for power-driven freight elevators shall be complied with.

(b) No back guide elevator car, except a hydraulic plunger type, shall be constructed and installed unless the plunger is located under the center of the elevator car platform.

(c) The operation of elevators by friction gearing or clutch mechanism is prohibited when such friction gearing and clutch mechanism form the primary means for the transmission of the power required to operate the elevator at normal speed.

(d) The installation or operation of elevators of the multiple or four-point suspension type is prohibited. Existing four-point suspension type sidewalk elevators are not precluded.

(e) The operation of passenger elevators raised and lowered by single hoisting cables is prohibited, except when the mechanism of such elevators is in a reasonably safe condition and may be made to conform to the requirements applicable to existing installations, if the present drums are properly scored to accommodate an additional cable and the additional cable is installed, and new drums are provided with the proper scoring for two or more cables and the additional cable is installed. This requirement also applies to new hand and gravity types of freight elevators but not to existing hand and gravity elevators.

(f) The installation of passenger elevators in blind shaftways is prohibited unless a side emergency exit is provided to a contiguous elevator, or emergency entrances are provided in the blind portion of the shaftway, as required by § 7.54(e) (relating to landing doors and locking devices).

(g) New installations of hand rope control elevators are prohibited.

(h) A platform shall not be located on the car top of any elevator for the purpose of hauling passengers or materials. This does not apply to a working platform while the elevator is under construction or alterations are being made to the hoistway.

Source

The provisions of this § 7.17 amended July 22, 1971, 1 Pa.B. 1652.

Cross References

This section cited in 34 Pa. Code § 7.251 (relating to general).

**SPECIFICATIONS—
ALL HOISTING AND LOWERING EQUIPMENT**

§ 7.31. Submission and approval of plans.

(a) No elevator, dumbwaiter, escalator, gravity elevator, hoist or manlift shall be constructed and installed without a permit from the Department. The architect, contractor, owner or manufacturer responsible for such installations shall file with the Department plans in triplicate, each showing the location of the machinery and equipment together with an application for a permit in duplicate, on forms provided by the Department. Such plans shall specify the capacity and the car speed of the installation, the weight of the car complete, car controlling mechanism, type of limit stops and switches, diameter of sheaves, size, number and material of hoisting and counterweight cables, type of speed governor and safeties, overhead and pit clearance, type of buffers, machine and overhead grating, the weight of the machine if overmounted, the material, quality and spans of overhead supporting members, and the construction of shaftway gates or doors, and car gates or doors, where required.

(b) Each set of plans submitted to the Department for an elevator permit for work to be accomplished in a new or existing hoistway in an existing structure shall bear the seal and signature of an architect or engineer licensed in this Commonwealth, together with his certification on the drawing to the following statement:

I have examined and checked the building structure or building plans surrounding this elevator hoistway, pit and machine room and hereby certify it is adequate for the loads to be imposed on it and is in accord with applicable laws and regulations of this Commonwealth.

(c) An exception exists as regards oil-electric or hydraulic elevators designed for class A freight loading or passenger loading. In lieu of the above certification on the elevator plans, a letter which shall accompany the request for elevator permit from the architect or engineer on his letterhead and bearing his seal and signature together with the above certification will be acceptable. Such letter shall identify in detail the elevator drawing in question including final revisions.

(d) Before work is commenced on the removal, or repair of existing installations, duplicate applications for the work shall be filed with the Department for approval, and a permit for the work obtained.

Source

The provisions of this § 7.31 amended through September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (13389).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); 34 Pa. Code § 7.134 (relating to approval and operation); 34 Pa. Code § 7.174 (relating to approval and operation); 34 Pa. Code § 7.213 (relating to approval and operation); 34 Pa. Code § 7.251 (relating to general); and 34 Pa. Code § 7.291 (relating to general).

§ 7.32. Fire prevention.

(a) *Skylights and windows.* Skylights and windows in the enclosing walls of elevators shaftways shall be constructed of fixed metal sash and frame with wire glass. Existing skylights and windows shall be reconstructed of fire-resistive materials when, in the judgment of the Department, it is deemed necessary.

(b) *Inflammable materials.* Materials, explosives or other highly inflammable substances may not be placed or stored in or near a shaftway.

(c) *Pipes, wires and conduits.* No pipes, wires or conduits, other than those necessary for the operation, lighting and fire protection, or heating of the elevator may be located in an elevator shaftway. When no hazard is involved, the Department may, with the approval of the Board, accept existing installations. However, this subsection does not apply to the machine room space located in general mechanical areas if the power unit and controls are properly secured against entry.

(d) *Fire emergency sign.* A sign shall be posted in a conspicuous place at new and existing elevator landings and in new and existing elevator cars reading: "In case of fire do not use elevator," or the equivalent.

Authority

The provisions of this § 7.32 issued under act of May 2, 1929 (P.L. 1518, No. 452) (35 P.S. §§ 1341—1356).

Source

The provisions of this § 7.32 amended through December 19, 1980, effective December 20, 1980, 10 Pa.B. 4723. Immediately preceding text appears at serial page (36694).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

§ 7.33. Operation of elevators under fire or other emergency conditions.

(a) Automatic elevators serving three or more landings in line and having a travel of 25 feet or more above the lowest grade elevation, shall conform with the following:

- (1) A three position—on, off and by-pass—keyed switch shall be provided at the main floor for each single elevator or for each group of elevators. The key shall be removable only in the "on" and "off" positions. When the switch is in the "on" position, elevators controlled by this switch which are on auto-

matic service shall return nonstop to the main or approved floor and the doors shall open and remain open.

(2) Elevators without a terminal landing at grade level shall be returned to that landing closest to grade level or other approved level.

(3) An elevator traveling away from the main or approved floor shall reverse at the next available floor without opening its doors.

(4) Elevators equipped with automatic power operated doors and standing at a floor other than the main or approved floor with doors open shall close the doors without delay and proceed to the main or approved floor.

(5) Door reopening devices for power operated doors which are sensitive to smoke, heat or flame shall be rendered inoperative.

(6) Elevator and corridor call buttons shall be rendered inoperative and call registered lights and direction lanterns shall be extinguished and remain inoperative.

(7) An elevator stopped at a landing shall have its "Emergency Stop" switch rendered inoperative as soon as the doors are closed, and it starts toward the main or approved floor. A moving elevator, traveling to or away from the main or approved floor, shall have its "Emergency Stop" switch rendered inoperative immediately.

(8) A sensor in each elevator lobby which when activated prevents elevators from stopping at that floor may not be substituted for the requirements of this subsection.

(9) In addition to the keyed switch required in this subsection, an approved type heat and smoke or products of combustion sensing device shall be installed in each elevator lobby at each floor except the main or approved floor. The activation of a sensing device at any floor shall cause all elevators in the group that serves that floor to return nonstop to the main or approved floor. The operation shall conform to the requirements of this section. The keyed switch required, when moved to the "bypass" position, shall restore normal service independent of the sensing device.

(i) *Exception No. 1.* Sensors are not required in each elevator lobby of buildings which are completely protected by an approved automatic sprinkler system, providing a smoke sensor is installed either on each elevator car top or at the top of the elevator hoistway the activation of which shall return the elevators to the main or approved floor.

(ii) *Exception No. 2.* Sensors are not required for elevators located in or opening into manufacturing areas or elevators serving unenclosed landings, providing a smoke sensor is installed either on each elevator car top or at the top of the elevator hoistway the activation of which sensor shall return the elevators to the main or approved floor.

(iii) *Exception No. 3.* As an alternate to sensors a building equipped with an approved fire alarm system may arrange such system so that when acti-

vated it shall cause all elevators to return nonstop to the main or approved floor in an operation conforming to the requirements of this section.

(b) All elevators having a travel of 70 feet or more and elevators having a terminal landing 70 feet or more above the lowest grade elevation surrounding the building shall be provided with the following operation:

(1) A two position, on and off, keyed switch shall be provided in or adjacent to an operating panel in each elevator and shall be effective only when the main or approved floor keyed switch is in the position or when a sensor has been activated and the elevator has returned to the main or approved floor. The key shall be removable only in the "off" position and, when in the "on" position, shall place the elevator on emergency service.

(2) The operation of elevators on emergency service shall be as follows:

(i) An elevator shall be operable only by a person in the elevator.

(ii) Elevators shall not respond to elevator landing calls.

(iii) The opening of power operated doors shall be controlled only by continuous pressure "open" buttons or switches. If the switch or button is released prior to the doors reaching the fully open position, the doors shall automatically reclose. Open doors shall be closed by registration of an elevator call or by pressure on "Door Close" switch or button.

(c) All switches required by subsections (a) and (b) shall be operated by the same key but shall not be part of a master key system.

There shall be a key for the corridor switch and for each elevator in the group and these keys shall be kept on the premises by persons responsible for maintenance and operation of the elevators, in a location readily accessible to authorized persons in an emergency, but not where they are available to the public.

(d) Elevators operated only by a designated attendant in the elevator shall be provided with a signal system consisting of both visual and audible signals to signal the attendant from the main floor or approved level to return nonstop to the main floor or approved level. Provisions shall be made to signal the attendant in the same manner when a heat and smoke or products of combustion sensing device is activated.

(e) Elevators arranged for dual operation shall, when on automatic operation, conform to subsection (a) and when on operation by a designated attendant in the elevator, conform to subsection (d).

(f) When an automatic elevator is on attendant service such as independent hospital service and inspection service, it shall be considered as being on operation by a designated attendant in the elevator and shall comply with subsection (d) of this section.

(g) All elevator hoistways shall have floor numbers, not less than six inches high with the principal strokes of letters not less than 3/4 inches wide, placed on the walls or doors, or both, of hoistways at intervals such that a person in a stalled elevator, upon opening the elevator door, can determine his floor position.

(h) The provisions of this section shall apply to existing automatic elevators which service an area above the tenth story and are located in buildings with office, group habitation, or public assembly occupancy. For purposes of this section, office buildings are defined as buildings having office space above the tenth story. For purposes of this section, group habitation buildings include but are not limited to hotels, motels, motor inns, apartments, dormitories, lodging houses, nursing homes, homes for the elderly, condominiums and personal care homes having group habitation above the tenth story. For purposes of this section, public assembly buildings include but are not limited to buildings used for purposes of sales, government, education, recreation, transportation, dining, entertainment and worship having public assembly above the tenth story. Compliance is mandatory on June 1, 1981. Subsection (b) must be satisfied in any single elevator or no fewer than two elevators in any group serving the building or portion of the building in which new elevators meet the travel requirements of subsection (b) or in which existing elevators meet the travel requirements of this subsection.

(i) The requirements of this section shall not apply to any elevator or bank of elevators in hospitals which are licensed by the Department of Health.

(j) The provisions of this section shall apply to all existing elevators which meet the travel requirements of subsection (a) and which in addition have a new controller installed.

Authority

The provisions of this § 7.33 issued under act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. §§ 1341—1356).

Source

The provisions of this § 7.33 amended through December 19, 1980, effective December 20, 1980, 10 Pa.B. 4723. Immediately preceding text appears at serial page (40538).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

§ 7.34. Lighting and electric wiring.

(a) The cars and landing floors or platforms of elevators, dumbwaiters, escalators, gravity elevators, hoists and manlifts shall be illuminated at all times of operation. The minimum intensity of illumination on the car and landing floors shall be five foot-candles. In new installation adequate lighting shall be provided in all machinery space to which access is required for maintenance or inspection, such as machine rooms, penthouses, pits, secondary levels and sheave rooms. A switch for such lighting shall be provided at the entrance to such spaces.

(b) Electric wiring, when possible, shall be in conduit or approved equivalent, when properly installed and protected against damage. Electric wiring and appa-

ratus shall conform to the provisions of Chapter 39, Subchapter B (relating to electric safety) and with the revisions of the National Electric Code at the time of installation.

(c) The installation of electric knife switches not approved by the Department, except those mounted on switchboards and panelboards, is prohibited. There shall be an approved, enclosed fused main line or circuit breaker switch in the machine room located adjacent to the entrance door.

(d) The substitution of wire or other current-carrying devices in place of the proper fuses or circuit breakers is prohibited.

Source

The provisions of this § 7.34 amended April 28, 1971, 1 Pa.B. 1272.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

§ 7.35. Electrical insulating floor mats.

Floor matting of proper dielectric properties shall be provided extending the full length of all control and relay panels located at both the front and rear with a minimum width of 24 inches.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

§ 7.36. Data plates and numbering.

(a) Metal plates with the permissible load in pounds marked on such plates shall be posted in a conspicuous place in the cars of all elevators.

(b) Metal tags on which are stamped the diameter, stranding, date of installation or renewal, and material of cables, shall be attached to all hoisting and counterweight cables, as required by §§ 7.56(i) and 7.280(j) (relating to cables).

(c) When more than one elevator is located in a building, numbers shall be placed upon each for permanent identification.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

§ 7.37. Combination elevators.

(a) Elevators intended for both freight and passenger service shall be constructed, installed and operated in conformity with the requirements for passenger elevators, except that counterbalanced biparting and vertical two-speed types of landing doors and vertical-rising car gates may be used as provided in subsec-

tion (d) when not of the semiautomatic type and when equipped with locking devices, as required in § 7.54(d) (relating to landing doors and locking devices).

(b) When it is desired to use existing freight elevators for the carrying of passengers such elevators shall be reconstructed to conform to the requirements for new passenger elevators, except that counterbalanced biparting and vertical two-speed types of landing doors and vertical-rising car gates may be used as provided for in subsection (d) when not of the semiautomatic type and when equipped with locking devices as required in § 7.54(d).

(c) The requirements of this section apply to every freight elevator used for the carrying of passengers, exclusive of operators and necessary assistance for handling heavy loads, as permitted by § 7.12(d) (relating to rules of operation).

(d) Biparting or vertical-operating doors and vertical-rising car gates are prohibited at the shaftway openings of combination freight and passenger elevators through which the public is allowed access to the elevator car.

Cross References

This section cited in 34 Pa. Code § 7.54 (relating to landing doors and locking devices); 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.291 (relating to general).

Subchapter B. PASSENGER ELEVATORS

GENERAL PROVISIONS

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GENERAL REQUIREMENTS

§ 7.51. Shaftway construction.

(a) *General.* New and existing shaftways of passenger elevators shall conform to the following:

(1) *New shaftways.* The shaftways of new passenger elevators in buildings over two stories in height shall be enclosed by continuous walls of fire-resistive construction, except when overhead loads are carried on a steel or angle iron tower or by the structural parts of the building, in which case fire-resistive curtain walls may be provided in lieu thereof. There shall be no openings other than those for fire-resistive doors, windows, or skylights. When basement machines are installed, and when the openings in the shaftway walls for cables or sheaves exceed ten square feet, the machine rooms shall be constructed of fire-resistive materials. When fire-resistive construction is not required, the shaftways of passenger elevators shall be enclosed with a solid or substantial grille or latticework on all sides to ceiling height, except space required for landing doors. The open spaces in such grille or latticework shall be such that a ball two inches in diameter will not pass, and the wire or material used shall not be less than No. 10 standard steel wire gauge (.135 inch). When bordering on counterweight runways, or when moving parts are within four inches of such enclosures, the open spaces shall be such that a ball 3/8 inch in diameter will not pass. Machine room doors shall be locked at all times, except when repairs are being made or when the machinery is being inspected or serviced. Oil-electric pump units installed in basement areas do not require a machine room if the controller is enclosed in a fire-resistive cabinet equipped with a lock and the pumping unit is properly guarded.

(2) *Existing shaftways.* The shaftways of existing passenger elevators are not required to be of fire-resistive construction unless, in the judgment of the Department, such construction is essential for the protection of the occupants of the buildings in which such elevators are located. When such existing enclosures are composed of grille or metalwork of open construction which does not extend to full height from floor to ceiling, the owner may be required to continue such enclosures to the full height on the open side or sides of the car and on such other sides where hazards exist, such as stairways and similar conditions. All portions of enclosures within four inches of moving parts shall be further protected by wire screen of not more than 3/8 inch mesh to a height of not less than six feet from the floor and to a distance of at least six inches to the right and left of such moving parts.

(b) *Overhead loads.* Overhead loads shall conform to section 105 of the ANSI A17.1-1971 Code, Rules 105.1 through 105.5 inclusive and all subsequent

amendments thereto. Overhead loads supported by bearing walls shall conform to the following:

| <i>Material</i> | <i>Ultimate Tensile Strength (in pounds per square inch)</i> |
|-----------------|--|
| Medium steel | 60,000 |
| Cast iron | 16,000 |
| Ash | 9,000 |
| Yellow pine | 9,000 |

(1) When overhead loads are carried by bearing walls of brick, concrete, or other approved materials and are erected independently of walls carrying building loads or resisting stresses or when independent shaftway and building walls jointly carry loads, they shall be designed and constructed in accordance with the values governing safe bearing loads as follows:

*Safe Bearing Loads
Brick Work*

| <i>Type of Mortar</i> | <i>Pounds per Square Inch</i> |
|---------------------------|-------------------------------|
| <i>Lime</i> | 100 |
| <i>Portland cement</i> | 200 |
| <i>Rosendale cement</i> | 150 |

| <i>Material</i> | <i>Masonry Pounds per Square Inch</i> |
|--|---|
| Granite, capstone | 700 |
| Stonework, squared | 350 |
| Sandstone, capstone | 350 |
| Stonework, squared | 175 |
| Rubble stonework in lime mortar | 80 |
| Rubble stonework in cement mortar | 150 |
| Limestone, capstone | 500 |
| Squared stonework | 250 |
| Rubble, in lime mortar | 80 |
| Rubble, in cement mortar | 150 |
| Concrete (one Portland, two sand, five broken stone) | 150 |

| <i>Material</i> | <i>Foundation Soils Tons per Square Foot</i> |
|-------------------------------------|--|
| Hard rock in native bed | 100 |
| Rock equal to ashlar masonry | 25—40 |
| Rock equal to best brick | 15—120 |
| Clay beds, dry and thick | 4—6 |
| Clay beds, moderately dry and thick | 2—4 |

| <i>Type of Motor</i> | <i>Pounds per Square Inch</i> |
|--|-------------------------------|
| Clay beds, soft | 1—2 |
| Gravel and coarse sand, well cemented | 8—10 |
| Sand, well cemented and compact | 4—6 |
| Sand, clean and dry | 2—4 |
| Quicksand, alluvial soils, <i>etc.</i> | 0.5—1 |

(2) Existing shaftway construction is acceptable if, in the judgment of the Department, such shaftways properly protect the occupants of buildings in which they are located and conform in other respects to safe practices.

(c) *Contiguous shaftways.* If passenger elevator shaftways are contiguous and are required to be of fire-resistive construction, it is not necessary to erect walls between such shaftways.

(d) *Windows.* As regards new installations, windows in the outside walls of buildings opening into passenger elevator shaftways shall be constructed of fire-resistive materials. In all cases, windows shall be set in fixed sash. Elevator shaftway windows located within the first seven stories above a street or within four stories of the roof of an adjacent building shall be fitted with approved metal bars or rods at least 5/8 inch in diameter not more than 10 inches apart except when inside window protection is provided in accordance with subsection (e). When, in the judgment of the Department, outside window guards are necessary on existing installations, they shall be provided.

(e) *Other recesses.* Recesses other than for windows or recesses other than necessary for installation of elevator equipment shall not be permitted. Beams, floor slabs or other building construction shall not project more than 4 inches inside the general line of the hoistway unless the top surface of the projection is beveled at an angle of not less than 75° with the horizontal. When setbacks occur in the enclosure wall, the top of the setback shall be beveled at an angle of not less than 75° with the horizontal. Separator beams between adjacent elevators are not required to have bevels. The following shall also apply:

(1) *New installations.* All recesses or offsets in shaftways of fireproof construction, except door lintels in the enclosing walls on the open sides of the car, shall be protected by substantial curtain walls, grating or vertical bars set on a flush line with the interior walls of the shaftway, the distance between the vertical members not to exceed two inches. Such grating or bars shall be of metal. No part of the curtain walls, grating or bars shall be more than 3 inches from the car platform on any open side of the car. When the distance between the edge of the car top and rear shaftway wall exceeds 18 inches, a protective railing shall be installed the width of the car.

(2) *Existing installations.* When the distance from car sill to shaftway wall on any open side of a car exceeds 7 inches, curtain walls, fascia plates, vertical metal bars spaced not more than 2 inches, or a substantial metal grill

of not more than 2 inch mesh shall be provided, unless the car gate on that side is equipped with an approved interlock. When the clearance exceeds 15 inches, the car door shall be solid and equipped with an approved interlock or the shaftway constructed as specified.

(f) *Shaftways shorter than buildings.* Passenger elevator shaftways which are required to be of fire-resistive construction and which do not extend to the entire height of the building shall be protected with a fire-resistive, unpierced covering.

(g) *Skylights and ventilators.* Skylights and ventilators are permitted in passenger elevator shaftways if the walls of the shaftway are continued to a point not less than 3 feet above the level of the roof. Skylights and glass ventilators shall be of wire glass not less than 1/4 inch in thickness.

(h) *Penthouses.* In new installations, where penthouses are provided over fire-resistive passenger elevator shaftways, such penthouses shall be constructed of approved fire-resistive materials with a permanent means of entrance provided from the roof level. Penthouse doors shall be locked at all times, except when repairs are being made or when the machinery is being inspected or serviced. Penthouses shall not have less than a clear inside height of 6 feet and shall permit free access to all parts of machinery and apparatus therein. In existing structures, fire-resistive penthouses are not required unless conditions necessitate such construction. Access to all penthouses, overhead machinery and machine rooms shall be provided by means other than through the shaftway.

(i) *Depth of shaftways.* Shaftways and counterweight runways of elevators serving the street levels shall extend to the pit floor of the lowest cellar or basement, and the bottom of the shaftway shall be covered with concrete or other approved fire-resistive material to a thickness of at least 4 inches. When the space below the shaftway is used for a passageway, is occupied by persons, or, if unoccupied, is not secured against unauthorized access, the cars and counterweights shall be provided with governor-operated safeties, except that safeties operated as a result of the breaking of the suspension means may be used for dumbwaiters. Also, car and counterweight-buffer supports shall be of sufficient strength to withstand without failure the impact resulting from buffer engagement at governor-tripping speed or at 125% of rated speed when no governor is provided.

(j) *Shaftways used as thoroughfares.* No elevator shaftway shall be used as a thoroughfare when the elevator is above or below the landing or when the elevator is at the landing, except upon special permission of the Department. Existing shaftways used as thoroughfares may be required to be removed or reerected in new locations or their use as thoroughfares abandoned.

Source

The provisions of this § 7.51 amended June 11, 1976, 6 Pa.B. 2278. Immediately preceding text appears at serial page (8057).

Cross References

This section cited in 34 Pa. Code § 7.55 (relating to machinery); 34 Pa. Code § 7.71 (relating to conflicts); 34 Pa. Code § 7.141 (relating to hoistway enclosure); and 34 Pa. Code § 7.181 (relating to hoistway enclosure).

§ 7.52. Shaftway equipment.

(a) *Bumpers.* Bumpers shall be installed pursuant to the following:

(1) Passenger elevators shall be provided with spring, air, or oil bumpers or other devices which reduce the velocity of the car at the maximum rate of 64.4 feet per second with an equivalent load of one person, descending at full speed. Spring, air or oil bumpers or their equivalent shall be used in connection with a car speed not exceeding 250 feet per minute. Oil bumpers or their equivalent shall be used in connection with a car speed in excess of 250 feet per minute. Gauges shall be provided to indicate the amount of oil in oil bumpers. All bumpers shall be so located as to strike the center sill or girder of the elevator car. Bumpers shall be tested by running the car into them with rated load in the car and with a minimum load of 150 pounds in the car at a car speed of not more than 115% of rated speed.

(2) Adequate pit and buffer protection shall be provided in the bottom of existing passenger elevator shaftways, especially when the car speed exceeds 100 feet per minute and when gradually-applied car safeties are used.

(3) If reduced stroke oil bumpers conforming to ANSI A171.1-1971, are permitted, they shall be tested in accordance with paragraph (4).

(4) If reduced stroke oil bumpers are permitted and where an emergency terminal speed limiting device conforming to the requirements of ANSI A17.1-1971 is installed which will limit the speed at which the car or counterweight can strike its bumper, the bumpers shall be tested by running the car into them with rated load in the car and with a minimum load of 150 pounds in the car at a car speed of not more than 115% of the predetermined reduced speed.

(5) Bumpers shall be provided for counterweights under the same conditions as required for cars.

(b) *Openings in pit bottoms.* There shall be no openings in the pit bottoms of new shaftways, except those necessary for wires or cables used in the operation of the elevator mechanism or for drainage. Doors may be installed to provide access into elevator pits but they shall be kept locked with the key in the permanent possession of a responsible person. In pits over five feet in depth a permanent metal ladder shall be installed to provide access from the lowest landing entrance, except when an access door to the pit is provided. In existing shaftways, such openings shall be eliminated when, in the judgment of the Department, such action is necessary.

(c) *Overhead protecting platforms.* A substantial iron working platform capable of sustaining a live load of not less than 50 pounds to the square foot

shall be securely fastened underneath the overhead machinery of all passenger elevators, except when a reinforced concrete roof or ceiling is located beneath such machinery. The greatest dimensions of the open spaces in such a platform shall not be more than one inch, except the necessary open spaces for cables. Platforms shall cover the entire area of the shaftway, except when such area exceeds 100 square feet, in which case the platforms may be provided under that portion of the shaftway occupied by machinery, including vibrating, deflecting, and secondary sheaves. The platforms, however, shall be large enough to provide a working space of at least two feet beyond the edge of the machinery. In such cases standard railings and toeboards shall be provided. If doors are placed in platforms, they shall be accessible from the top of the car and hinged so they open upwards and self-close automatically. Underslung elevators constructed so that no elevator overhead sheaves, hitches, governors or other elevator equipment occurs directly over the car may be erected without an overhead working platform, provided the governor is made easily accessible from some point other than through the shaftway. Existing installations shall also be provided with platforms, except that the concessions granted for shaftway areas in excess of 100 square feet will, for existing installations, be granted for shaftway areas in excess of 80 square feet. Existing platforms may remain in position when, in the judgment of the Department, they are sufficiently strong.

(d) *Counterweights.* Counterweight runways shall be located in the elevator shaftway and the exposed sides of such runways shall be provided with solid metal guards to a height of not less than 7 feet from the bottom of the pit. A shorter guard elevated to the required height of 7 feet may be used, but in such cases the clearance between the bottom of the pit and the lowest point of the guard shall not exceed 12 inches. When winding drum machines are used, there shall be a permanent substantial beam or bar at the top of the counterweight sheaves to prevent the counterweights from being drawn into the sheaves. When compensating chains or cables are used from the car to the counterweights, the guarding at the bottom of the shaftway may be eliminated. When independent car counterweights are used, they shall be so proportioned as not to cause the slackening of any cables during the starting or stopping of the elevator car. In new installations, counterweights shall operate within the shaftway in guides, and their various sections shall be securely fastened together by thru-bolts, be secured in position by nuts, locknuts and cotter pins. In existing installations, counterweights shall operate in guides or in substantial boxing, the interior surfaces of which shall be flush. However, tie rods are not required where evidence is submitted to the Board indicating alternate, adequate means are provided to retain weight sections in place if they become broken.

(e) *Guide rails.* Guide rails for powerdriven passenger elevator cars and counterweights shall be constructed of iron or steel. The lower ends of guide rails shall have securely anchored footings and be secured to the walls or structural members of the building, and where the intervals between the points of support

are in excess of 13 feet, such guide rails shall be suitably reinforced with steel. Car guide rails shall have a uniform weight of not less than seven pounds per lineal foot. For passenger elevators of 1,200 pounds capacity or less, car and counterweight guide rails, constructed of iron or steel having a uniform weight of seven pounds per lineal foot, may be used, if the intervals between the points of support are not in excess of 10 feet. In existing structures, guide rails may remain in position, if they are substantial and of suitable proportions for the car speed, load, and travel, and the proper functioning of the car safeties. Guide rails for cars and counterweights shall be permanently and securely fastened in position. However, guide rails other than conventional shape may be used on hydraulic elevators provided they meet the design criteria of the ANSI A17.1 Code.

(f) *Beveled plates.* On sides where there are car openings and where no leveling or floor-finding devices are used, substantial beveled plates of metal or of wood with metal facing, except as provided in this section, shall be located under all thresholds, beams, and other fixed construction projecting into the shaftway beyond its flush line. Beveled plates shall extend from the edge of the projection to the wall or to a point at least four inches horizontally from the edge of the car; the beveled surfaces shall have an angle of not less than 60° with the horizontal. An angle of 75° is preferred. In lieu of plates, the beveled surfaces may be of concrete, troweled to a smooth finish. When leveling or floor-finding devices are used, the shaftways shall be made flush, and aprons shall be provided under the car which exceed the length of the leveling range.

Source

The provisions of this § 7.273 amended through September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial pages (31539) through (31541).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); 34 Pa. Code § 7.146 (relating to counterweights); and 34 Pa. Code § 7.186 (relating to counterweights).

§ 7.53. Shaftway clearances.

(a) *General.* Passenger elevators, except hydraulic plunger elevators, shall be so constructed that the minimum clearance between the highest point of the elevator car, the top of the crosshead, and any overhead construction when the car platform is flush with the upper terminal landing and that the minimum clearance between the lowest point of the elevator car and the bottom of the shaftway or the top of any construction contained in such shaftway when the elevator car is at the lower terminal landing shall conform to the following:

- (1) Shaftway clearances as provided in sections 106 and 107 of the ANSI (A17.1-1971).
- (2) In existing installations, shaftway clearances and over travel may be accepted, except when insufficient for the safety of repairmen, oilers, and inspectors, subject to change at the discretion of the Department.

(b) *Plunger elevators.* Shaftway clearances for plunger elevators shall comply with the following:

(1) *New installations.* Plunger hydraulic and plunger hydro-steam elevators shall be so constructed that the minimum clearance between the lowest point of any overhead construction and the top of the crosshead shall be two feet when the car platform has reached its highest limit of travel. The installation of plungers longer than necessary for present travel is prohibited unless the plunger is provided with a positive mechanical stop which would be adequate to absorb the maximum impact load. The clearance at the bottom, however, shall be the same as for electric passenger elevators, with an overrun of not less than six inches.

(2) *Existing installations.* Shaftway clearances and overhead travel may be accepted, except when, in the judgment of the Department, changes are necessary for the safety of repairmen, oilers, or inspectors.

(c) *Clearance between car and sill.* The clearance between the elevator car sill and the landing sill shall not be less than 1/2 inch nor more than 1 1/2 inches.

Source

The provisions of this § 7.53 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (31542).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.274 (relating to shaftway clearances).

§ 7.54. Landing doors and locking devices.

(a) *General.* The shaftways of passenger elevators shall be equipped with landing doors. The main or lowest landing door of all elevators except automatic control, dual control, or double-button control elevators shall be provided with a removable service key by which the door may be opened when the car is at that landing. Doors at the lowest level and next to the lowest level of elevators located in adjacent or multiple shaftways in new installations except as noted in subsection (e) of this section, shall be equipped in such a manner that they may be opened, regardless of the location of the car, with a formed emergency key located under glass in the entryway or corridor on the lowest floor. Such elevators may have all landing doors so equipped. If an elevator is installed in a single shaftway, the emergency key shall open all shaftway doors. This rule also applies to existing installations when new landing doors are installed. A notice shall be placed on or over the enclosure for the key, to the effect that the key is not to be used except in case of emergency.

(b) *Landing doors.* The landing doors of passenger elevators shall conform to the following:

(1) *Position.* The landing doors of all passenger elevators shall have the inner side set as near flush with the interior walls of the shaftway as is consistent with the proper operation of such doors.

(2) *Doors.* Swinging doors may be used at the shaftway entrances of automatic control elevators. Landing doors of the butterfly, or folding, and slide-swung types are permissible. The swinging panel arrangement shall be used only for emergency loads and not for passenger traffic. Biparting or vertical operating doors are not permitted on passenger elevators used exclusively for passenger service but may be installed on combination passenger and freight elevators as provided in § 7.37(d) (relating to combination elevators). Landing doors shall be at least 6 feet, 6 inches in height and shall be so constructed that when opened the opening does not have a width in excess of the opening of the elevator car, when the elevator car door or gate is in an open position.

(3) *Construction of entrances.* Landing entrances shall be securely attached to the walls of the shaftway and constructed of approved fire-resistive materials. Each door panel of such entrances shall be constructed to withstand a constant force of 250 pounds applied at right angles to, and approximately at the center of, the door panel without causing the door to be displaced, break, or be permanently deformed. When fireproof shaftway construction is required the door panels shall be of approved 1 1/2 hour fire-resistive construction, and shall bear certification to this effect from a recognized official testing laboratory. Such door panels shall be self-closing and kept normally closed. When transom panels are installed, they shall be of the same construction as the door panels. Where biparting or vertically opening doors are permitted, such entrances shall have a one hour certified fire-resistive test rating.

(4) *New doors.* New doors shall be provided if interlocks cannot be fitted to existing doors or if doors are in such condition as to prohibit the necessary changes or repairs being made. Existing hollow metal doors of existing shaftways meeting the intent of this provision may be reused upon approval by the Department.

(c) *Operation—sliding doors.* When horizontal sliding or rolling doors are used at the shaftway entrances of passenger elevators, they may be opened but shall not be closed by independent power, except when the mechanism employed has been approved by the Board. In such cases means shall be provided to permit the manual operation of the landing doors and car doors or gates from within the car in the event of failure of power. Kinetic energy and force limitations for power door operators used with horizontally sliding hoistway doors and horizontally sliding car tops or gates shall comply with Rule 112.4 of the ASA A17.1-1960.

(d) *Locking devices.* Elevators, except water or steam hydraulic passenger and freight elevators that are now in use or that may hereafter be constructed for the carriage of passengers, shall have placed on them or attached to them an automatic locking device, subject to the following:

(1) Locking devices shall be of the mechanical or electro-mechanical type, designed and constructed so as to secure the elevator car in the stop position or place the power of controlling the elevator beyond the control of the attendant while any gate or door at the landing which is used for entrance to the car is open and unsecured.

(2) The shaftway doors of hydraulic elevators shall be provided with an approved electro-mechanical locking device. On maintained-pressure hydraulic elevators it shall operate in conjunction with an approved, normally closed, electrical valve operating system.

(3) Locking devices shall be approved before use. No locking device of any kind other than an approved type is permitted on any hoistway door.

(4) Locking devices shall be such that they are not affected by ordinary deviation from true alignment of either the car or the landing doors and shall not project into the shaftway to such an extent as to create a hazard.

(5) On elevators installed subsequent to December 15, 1924, the operation of locking devices shall not cause the unlocking of the landing door as the car passes the landings with the controller in the "on" position.

(6) Each locking device installed in this Commonwealth shall be stamped or otherwise have irremovably placed thereon a type or model number which shall correspond to the type model number listed with the Department when such device was approved, and no change shall be made in the design of approved locking devices unless the Board is notified and agrees to such change.

(7) Interlocks using hoistway door-closer arms as a door-locking device shall conform to the following:

(i) Interlocks shall be so designed, installed, and adjusted that the making of the electric contact to permit operation of the driving machine will occur only when the door arms are in such a position as to prevent the manual opening of a closed hoistway door, from the landing side, except with a formed emergency key.

(ii) During the door-closing operation, means shall be provided for a substantial latitude in the relation between the mechanical lock of the door-closer arms, and the making of the electric contact, by auxiliary means, either by overtravel of door arms below horizontal, or other comparably approved means to prevent misadjustment and to provide adequate contact wiping action, satisfactory contact pressure, and reliable operation.

(iii) The design shall be such that the relationship between the locked position of the door arms and the making of the electric contact may not be readily misadjusted or changed, and will maintain proper adjustment between the mechanical lock and electric contact.

(iv) Interlocks using door-closer arms as a mechanical locking device are not permitted.

(v) Interlocks not conforming with these requirements may be submitted to the Board for special approval.

(8) When springs are used in locking devices to create and maintain a condition of safety, they shall be of such strength as to insure against a hazardous condition through breakage or misplacement.

(9) If the locking device is so constructed that it prevents the operation of the car due to the opening of any shaftway door or car gate other than the one at which the car may be standing, there may be an approved emergency release switch located in the car. Such emergency release, if furnished, shall be under glass cover. When actuated, such device will permit the operation of the car without regard to the position of the doors. Such a release shall be so constructed and installed that in order to allow the car to be moved in the event of emergency, it will be necessary to break the glass and hold the release in the operating position. The design of this device shall be such that it cannot be tampered with or plugged in the operating position. Its use shall be confined only to emergencies and a sign to this effect together with instructions for the proper use of the device shall be posted adjacent thereto. Inching buttons may, however, be used for the operation of elevators at creeping speed with landing door open provided such inching buttons will move the car only in a direction towards the landing, and are limited to a zone nine inches above or below the landing. Emergency release switches shall not be used on any elevators controlled from a landing. An emergency release switch is intended to release both car gates and landing doors.

(e) *Emergency entrances.* Each elevator operating in a single blind shaftway shall have emergency entrances provided in the blind portion of the shaftway. Such emergency entrances shall be provided at every third floor, but not over 36 feet apart, to permit access to the elevator in the blind portion of the shaftway. Such emergency entrances shall be at least 30 inches wide, 48 inches high, easily accessible, and free from obstructions. Such doors shall also be provided with a contact and a lock approved for the purpose. The special key used to operate such locks from the corridor side shall open all emergency entrances and shall be kept behind a break glass cover in the entry way or corridor at the main or street floor, and marked for emergency entrances in the blind shaftway.

Source

The provisions of this § 7.54 amended through September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial pages (31543) through (31545), (8067), and (17297).

Cross References

This section cited in 34 Pa. Code § 7.17 (relating to prohibited installations); 34 Pa. Code § 7.37 (relating to combination elevators); 34 Pa. Code § 7.71 (relating to conflicts); 34 Pa. Code § 7.149 (relating to hoistway doors); and 34 Pa. Code § 7.189 (relating to hoistway doors).

§ 7.55. Machinery.

(a) In new installations, overhead machinery for passenger elevators shall be securely fastened or cleated to its supports to prevent movement. Overhead bearings shall be placed on the tops of the beams or structural parts to which they may be secured, except that those for idler sheaves, may be placed below the beams, if the parts of the bearings in tension are composed of steel or wrought iron. Such bearings and supports shall possess a strength as specified in § 7.51 (relating to shaftway construction). In existing installations, the Department may, when it deems necessary, require that overhead machinery be relocated or so changed as to conform to safe practices.

(b) No new machinery may be located directly under the elevator shaftway. Existing machinery may remain in such a place, if there is sufficient pit depth, buffer support, and no other hazards involved, and subject to approval by the Board.

(c) Set screw fastenings shall not be used in lieu of keys in the construction or installation of hoisting and car safety mechanisms, except in new installations when the device has been approved by the Department. Cleats are not required when the ropes lead perpendicularly from both sides of the driving shaft.

(d) The operation of elevators by friction gearing or clutch mechanisms is prohibited when such mechanisms form the primary means for the transmission of the power required to operate elevators at normal speeds.

Source

The provisions of this § 7.55 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial pages (17297) and (8069).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.56. Cables.

(a) At least three hoisting cables shall be used on all traction-type passenger elevators not already in use.

(b) Hoisting and counterweight cables shall be composed of iron or steel of high quality. The minimum diameter for any cable shall be 1/2 inch. When different diameters of cables from those given in subsection (c) are necessary, the strength of such cables shall be computed in the same ratio as shown in that subsection. When the material of existing hoisting and counterweight cables is unknown such cables shall be assumed to be of iron and the lifting capacity of the installation rated accordingly.

(c) No hoist or counterweight cable shall be stressed beyond a factor of safety as follows:

| <i>Cable Speed (in feet per minute)</i> | <i>Factor of Safety</i> |
|---|-------------------------|
| 50 | 7.60 |
| 100 | 7.95 |
| 150 | 8.25 |
| 200 | 8.60 |
| 250 | 8.90 |
| 300 | 9.20 |
| 350 | 9.50 |
| 400 | 9.75 |
| 450 | 10.00 |
| 500 | 10.25 |
| 600 | 10.70 |
| 700 | 11.00 |
| 800 | 11.25 |
| 900 | 11.45 |
| 1000 | 11.55 |
| 1200 | 11.80 |
| 1400 | 11.90 |
| 1500 | 11.90 |

(d) Only approved types of cable fastenings shall be used.

(e) Where cables pass through the floors on the outside of shaftway enclosures, solid enclosures or standard metal guards shall be provided to a height of at least six feet.

(f) In new installations, the diameters of drums and sheaves shall be at least 40 times the diameter of the cables used. In existing installations, the drums and sheave diameters may be accepted if changes are not considered necessary by the Department.

(g) There shall be at least two wraps of the hoisting and counterweight cables on the drums of passenger elevators of the winding drum type when either the car or counterweights are at the limits of travel. The ends of the cables shall be clamped on the inside of the drum.

(h) Cables shall be provided with a means for equalizing. Drum-type elevators shall be provided with eveners. On existing installations the requirement for cable equalizers need not be complied with until the next cable renewal. Such equalizers shall be fastened in position with a nut, locknut, and cotter pin. Coil or helical springs, when used, shall be of a design which does not permit full compression under normal load. The ropes of the car and drum counterweights of power-driven elevators having drum type driving machines shall be reshackled every 2 years, except when auxiliary rope fastening devices are installed. Reshacking is required when the auxiliary rope fastener indicates failure of any rope fastening. Crosby clips and heart shackles shall be included, two to one

roped under slung drum elevators are exempted. A metal tag shall be placed on the rope to show the reshackling date and the person who performed the work.

(i) A metal data tag shall be securely attached to one of the wire rope fastenings. A new tag shall be installed at each rope renewal. A data tag shall bear the following data:

- (1) The diameter in inches.
- (2) The breaking strength, as rated by the manufacturer.
- (3) The grade of material used.
- (4) The month and year the ropes were installed.
- (5) Whether nonperformed or performed.
- (6) The construction classification.
- (7) The name of the person or firm who installed ropes.
- (8) The name of the manufacturer of the rope.

Source

The provisions of this § 7.56 amended through June 28, 1967.

Cross References

This section cited in 34 Pa. Code § 7.36 (relating to data plates and numbering); and 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.57. Elevator cars.

(a) Elevator cars shall be constructed according to the following:

(1) *Existing installations.* Passenger elevator cars shall be completely enclosed, except at the door or gate openings. The tops and sides of such elevator cars may be of grillework or other open construction, if the places opposite moving parts which are within 4 inches of the car are covered with a wire screen having a mesh of not more than 3/8 inch to a height of at least 6 feet.

(2) *New installations.* The cars of passenger elevators shall be enclosed, except at door or gate openings. Such enclosures shall be of solid construction, to a height of not less than 6 feet above the car floor. Above the solid panel and extending to the top frame of the car, open work may be used, if the spacing between the members does not exceed 1 inch. That portion of the car enclosure bordering on the counterweight runways shall be of solid construction to its full height, or of wire mesh not less than No. 10 standard steel wire gauge or .135 inch diameter. Expanded metal, when used, shall not be less than No. 18 U.S. gauge or .05 inch in size, which will reject a ball 3/8 inch in diameter. Car frames shall be constructed of wrought iron or steel. The tops of passenger elevator cars shall be constructed to sustain a concentrated load of 150 pounds at any point. Any material used for insulating, padding, sound-deadening, decorative purposes, or any material used for light diffusion in pas-

senger elevator cars shall conform to Rule 204.2, Subparagraph 2 including exception of ANSI A17.1-1971.

(b) Car openings shall conform to the following:

(1) The cars of passenger elevators shall not have door or gate openings on more than two sides. Such openings shall have sliding or rolling doors or collapsing gates. When collapsing gates are used, the openings in the fully expanded gates shall not exceed 3 inches.

(2) Doors or gates shall be equipped with an electrical or mechanical device so constructed and installed that the car will be immovable when the doors or gates are open.

(3) When collapsible car gates on automatic or double-button-controlled passenger elevators are opened by power, approved curtains or other approved devices shall be provided. Curtains are required only on power-operated collapsible car gates when the opening movement of the gate is sufficient to cause a shearing hazard. When curtains are used they shall be at least 4 feet in height and extend from approximately 1 foot of the car platform to 5 feet from the car platform.

(4) When self-leveling or floor-finding devices are installed on elevators, the car gate may be open while the elevator is leveling without interference with the operating circuit, if the shaftway is flush and the car is provided with an apron which exceeds the length of the leveling zone.

(5) When the requirements of this rule are not met on existing elevators the continued use of such elevators is subject to the approval of the Board.

(c) Emergency exits for elevator cars shall be provided as follows:

(1) The cars of passenger elevators shall have trapdoors located in the top enclosure of such size as to afford an easy means of egress for passengers. Such exits shall not contain fans or light fixtures. Such trap doors shall be installed so that they may be opened from the outside of the car enclosure only.

(2) When two or more cars operate in contiguous shaftways, and the distance between car platforms does not exceed 2 feet 6 inches, and when there are no intervening shaftway partitions, counterweights, or any fixed obstructions between the car, additional means of egress shall be provided in the sides of the cars. If such elevators are not permitted to have side exits, each elevator shall be treated as though it were in a single shaftway. Plunger oil hydraulic elevators are excluded, provided that all shaftway doors are equipped with emergency key-ways.

(3) Side exits shall be located so that they are not obstructed by car frame members, and, if possible, traveling cables and other hoistway equipment shall not be located in line with or so as to obstruct the exit. Exits from adjacent cars shall be directly opposite each other to allow easy transfer of passengers. Such exit doors shall be installed so that they may be opened from the inside and the outside of the car enclosure.

(4) Emergency trap doors and side exits shall be equipped with electric contacts to prevent the operation of the car when the panel or trap door is opened or removed.

(5) The cars of existing passenger elevators shall have trapdoors located in the top enclosure of such size to afford an easy means of egress for passengers. When two or more cars are operated in contiguous shaftways, additional means of egress may be provided in the sides of the cars.

(d) When double-deck elevators are installed, operating, emergency, and door safety equipment shall be installed in each cab or compartment in accordance with this chapter.

(e) No device shall be installed in elevator cars for the purpose of operating car doors or gates unless approved by the Board.

Source

The provisions of this § 7.57 amended through January 27, 1978, 8 Pa.B. 251. Immediately preceding text appears at serial page (8072).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.58. Capacity.

(a) Net platform area shall not exceed the area given in the following table for various lifting capacities of passenger elevators. Intermediate capacities not listed shall have their maximum area interpolated from the ratings given:

| <i>Lifting Capacity</i> | <i>Maximum Net Area (in square feet)</i> |
|-------------------------|--|
| 500 | 7.00 |
| 600 | 8.30 |
| 700 | 9.60 |
| 1000 | 13.25 |
| 1200 | 15.60 |
| 1500 | 18.90 |
| 1800 | 22.10 |
| 2000 | 24.20 |
| 2500 | 29.10 |
| 3000 | 33.70 |
| 3500 | 38.00 |
| 4000 | 42.20 |
| 4500 | 46.20 |
| 5000 | 50.00 |
| 6000 | 57.70 |
| 7000 | 65.30 |

| <i>Lifting Capacity</i> | <i>Maximum Net Area (in square feet)</i> |
|-------------------------|--|
| 8000 | 72.90 |
| 9000 | 80.50 |
| 10000 | 88.00 |
| 12000 | 103.00 |
| 15000 | 125.10 |
| 18000 | 146.90 |
| 20000 | 161.20 |
| 25000 | 196.50 |
| 30000 | 231.00 |

(b) The lifting capacity of an existing elevator shall be equal to a live load of not less than 75 pounds per square foot of floor area of the elevator car; 50 pounds per square foot may be accepted when elevators are located in hospitals and special permission is secured from the Department. The number of passengers permitted to ride on a passenger elevator at any one time is based on a ratio of one passenger to 2 square feet of floor area. Such rating shall be designated on the data plate posted in the car.

Source

The provisions of this § 7.58 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (8074).

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.59. Safety equipment.

(a) *Slack cable device.* A slack cable device shall be used in connection with all passenger elevators of the winding drum type, which will automatically shut off the power, apply the brake, and stop the machinery, in case the car is obstructed in its descent. The device shall be so designed and installed that, after functioning, the mere resetting of the device shall not be sufficient to move the elevator car unless the operator is in the car and starts it in the regular manner.

(b) *Limit switches and terminal stops.* Normal terminal stopping devices for electric traction elevators may be located on the car or in the hatchway or in the machine room and shall be operated by the movement of the car. Electric passenger elevators shall be provided with top and bottom final limit switches so connected that the functioning of either switch will automatically shut off the power, apply the brake, and prevent the operation of the elevator in either direction until necessary adjustments are made to again place the elevator in operation. Such switches shall be in addition to directional switches. Limit switches may be located in the shaftway with a cam on the car or on the car with cams in the

shaftway. When necessary because of flood conditions, lower shaftway limit switches may be actuated by the counterweight at the top of the shaftway. Cams actuating limit switches shall be composed of metal. Automatic terminal stops shall be provided on the machines of power-driven passenger elevators of the winding drum type, such devices to operate independently of the car-controlling mechanism.

(c) *Brake.* All passenger elevators, except hydraulic, shall be equipped with an effective magnet release brake which is automatically applied when the controlling mechanism of the car is in a stop position. The brake magnet shall be so installed that its action is not retarded by any motor field discharge or counter electro-motive force or by any single ground or accidental short circuit. When direct current elevator motors derive current from an alternating current power source through a nonrotating rectifying unit, means shall be provided to absorb a sufficient amount of energy regenerated by the motors under overhauling load conditions to prevent any elevator from attaining at any time, or under any conditions of load, more than 120% of the contract speed of the elevator. When a single rectifier is installed to supply power for a number of elevators, or elevators in conjunction with other electrical equipment in the building, separate means for absorbing the generated power shall be installed for each elevator and other equipment in the building shall not be depended upon for the absorption of this power.

(d) *Car safeties.* Passenger elevators shall be provided with car safeties as follows:

(1) All passenger elevator cars suspended from cables shall be provided with safeties, located under the car floors. Such safeties shall be capable of stopping or holding the elevator car at any point of its travel.

(2) Passenger elevators having a speed of 100 or less feet per minute shall be provided with car safeties actuated by a centrifugal speed governor, except when the car travel does not exceed 20 feet, in which case car safeties of the spring grip or broken rope type may be used.

(3) When the speed is in excess of 100 feet per minute, regardless of car travel, the car shall be provided with car safeties of the friction clamp or other approved type, actuated by a centrifugal speed governor in such a manner as to bring the elevator car to a gradual stop within a distance of approximately eight feet.

(4) A rack and pawl is not acceptable as a car safety device.

(5) Governor cables shall be iron or steel, monel metal, phosphor bronze or equivalent and shall be not less than 3/8 inch in diameter. Tiller rope construction shall not be used for governor cables except that it may be used for the portion of the cable wound on the safety drum.

(6) The size, material, and construction of the governor rope, and the proper tripping speed of the governor, shall be stamped on the governor stand or on a brass plate attached to it in letters not less than 1/4 inch in height.

(7) Friction-type governors without cable clamp dogs may not be used.

(e) *Counterweights*. When counterweights in an existing installation operate in the elevator shaftway they shall be guarded in accordance with the requirements for new installations. When counterweights do not operate in an elevator shaftway they shall be entirely enclosed on all sides.

(f) *Shaftway doors*. Shaftway doors providing entrance to air cushions shall be of the gravity type, with inside latches; and, at the lower terminal landings, shall be provided with emergency exits. The plates of such emergency exits shall be thoroughly braced.

Source

The provisions of this § 7.59 amended July 22, 1971, 1 Pa.B. 1651.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.60. Motive power.

The motive power of all passenger elevators shall be one of the following types:

- (1) Direct connected electric, either drum or traction.
- (2) Hydraulic plunger.
- (3) Horizontal or vertical cylinder.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.61. Control apparatus.

(a) New passenger elevators having a car speed in excess of 150 feet per minute, except hydraulic and automatic control-type elevators, shall be controlled by electric car switches. Passenger elevators having a car speed less than 150 feet per minute, except the automatic control type, may be operated either by hand wheels, levers, or electric car switches.

(b) Existing types of control apparatus shall be subject to change, at the discretion of the Department, when deemed necessary for safe operation.

(c) Electric car control switches shall be so designed and installed that, upon the removal of the hand of the operator, the switch handles automatically return to center in a locked position. When electric elevators are operated by lever or wheel, such low voltage and no voltage protection shall be installed and connected so that the elevator car does not restart upon the restoration of voltage or service until the elevator operator has first returned the controlling mechanism to the off position.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

SPECIAL REQUIREMENTS**§ 7.71. Conflicts.**

In addition to the special requirements of this section and §§ 7.72—7.75 for various types of passenger elevators, the general requirements contained in §§ 7.51—7.61 and §§ 7.31—7.37 shall also be complied with, except in cases of direct conflict, where these provisions shall govern.

§ 7.72. Electric passenger elevators.

(a) Electric passenger elevators operated by polyphase alternating current motors shall be provided with relays of the potential type or other approved devices which prevent the starting of the motor if the phase rotation is in the wrong direction, or if there is a failure in any phase.

(b) No potential difference in excess of 250 volts shall be used in connection with the car switch or automatic control circuits of electric passenger elevators. When direct current is the only available source of power supply and it is impracticable to keep within this requirement, application may be made to the Department for special permission to use a higher voltage. Full information shall be given with every application for special permit. When stepdown transformers are used in connection with alternating current car switch and automatic control circuits, they shall be of the two-winding type.

(c) The machine controllers of electric passenger elevators shall be equipped with a potential switch of either the manually or power-closing type, so designed that when the current is interrupted from any cause whatever it will automatically apply the brake and stop the elevator car.

(d) An emergency switch shall be installed in every electric elevator car except automatic control. Such emergency switch shall operate to open a main line switch independent of the car-controlling circuit wiring.

(e) When the power for elevator control circuits is dependent upon main line circuit breakers, potential switches, or other similar electric apparatus, connections shall be made so that the operation of any fire alarm system which may be connected to such main line circuit breakers, potential switches, or other similar electric apparatus, does not cut off the power to the elevator control circuit.

(f) Switches shall be provided in connection with electric passenger elevators so that the motor control circuit and the brake control circuit shall be opened before or at the time the governor trips, or, in existing installations, when the safety operates as well.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); 34 Pa. Code § 7.145 (relating to pipes and wiring); and 34 Pa. Code § 7.185 (relating to pipes and wiring).

§ 7.73. Automatic control passenger elevators.

(a) Automatic control passenger elevators shall not be constructed and installed unless a special permit is first obtained from the Department. Their use is at all times subject to any special regulations applied to them by the Department for the protection of the public and employees.

(b) Such elevators are subject to all of the requirements covering electric passenger elevators, except as to door interlocks, emergency releases, emergency stop switches, and operators.

(c) The landing doors of automatic control passenger elevators shall be equipped with approved interlocking switches so arranged that the elevator car is held immovable while any landing door is opened or unlocked, and so that such door or doors are not opened after the elevator car has left the landing. Retiring cams are not required on one story two-landing elevators erected prior to January 1, 1954. Such devices shall not be affected by ordinary deviation from true alignment of either the car or the landing doors and shall not project into the shaftway to such an extent as to create a hazard. On all elevators installed subsequent to December 15, 1924, the operation of such a device shall not cause the unlocking of the landing door as the car passes the landing with the power on.

(d) The cars of automatic control passenger elevators shall not have openings on more than two sides. Sliding or rolling doors or collapsible gates are required at all car openings; and such gates shall be equipped with switches so connected to the car control circuit as to hold the car immovable while the gates are open.

(e) The control circuit shall be so arranged as to make it impossible for the elevator car to be started automatically upon the manual closing of any landing door, car door, or gate, but will operate only by the buttons or switches at the landing or in the elevator car. Such doors or gates shall also be so connected to the control circuit that if the car is started for a given landing no impulse may be given from any landing to send the car in the reverse direction until it reaches the destination corresponding to the first impulse. An exception exists when the car has stopped at an intermediate landing to take on or discharge passengers desiring to go in the direction determined by the first impulse when the closing of the car gate may be sufficient to start the car.

(f) In new installations, in addition to the directional buttons in the cars of automatic controlled elevators, a switch or button shall be provided to enable passengers to stop the car at any point of its travel. When a self-restoring switch or button is used and the car has been started from within, releasing the switch or button shall not permit restarting the car except by the operating device in the car, unless the car gate or hoistway landing door has been opened and closed. Switches and buttons shall be plainly marked "stop," and the operating button or handle shall be of a different color from any other switch in the car. For new construction, contacts of emergency stop switches or buttons shall be directly opened mechanically and such operation shall not be dependent upon springs. In

existing installations, in addition to the directional buttons in the cars of automatic-controlled elevators a switch or button shall be provided to enable passengers to stop the car at any point of its travel.

(g) Independent constant-pressure control buttons shall be provided in the cars of collective pushbutton elevators, which permit the car to be operated in either direction without interference from landings or normal car control buttons. The necessary controlling switches to make such buttons operative shall be located in the penthouse or on the main control board. When existing installations are provided with such switches in the cars, these switches may remain if they are properly marked and placed under glass cover. In new installations, independent constant-pressure control buttons shall be provided in or on top of all electric automatic-controlled elevators which permit the car to be operated in either direction at a speed not to exceed 150 feet per minute without interference from landing or normal car control buttons. If these control buttons are located on top of the car, a red manual stop button or switch shall be provided. Buttons shall be plainly marked to indicate their purpose.

(h) Pushbuttons shall not control the operation of elevators in school buildings, sanitariums for the mentally deficient, and similar classes of buildings where there is danger of the abuse of the purpose of such buttons, unless the pushbuttons are made inaccessible to the occupants or are key operated. A decision on this point all be made at the time of the approval of the plans for such elevators.

(i) Automatic operation elevators shall be provided with an audible emergency signal gong, at least 4 inches in diameter, operative from the car and located outside of the hoistway, or with a telephone connected to a central exchange.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts) 34 Pa. Code § 7.149 (relating to hoistway doors); 34 Pa. Code § 7.189 (relating to hoistway doors); and 34 Pa. Code § 7.293 (relating to automatic and dual control freight elevators).

§ 7.74. Dual control passenger elevators.

(a) Dual control elevators are subject to all the requirements covering automatic control passenger elevators.

(b) Emergency releases, if used, shall be so arranged as to be inoperative when the elevator is being operated as an automatic controlled elevator.

(c) Car gate contacts shall be mounted on the gate in such a position as to require the closing of the car gate while operating the car from either the car switch or the pushbutton circuit.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts); and 34 Pa. Code § 7.293 (relating to automatic and dual control freight elevators).

§ 7.75. Double-button control passenger elevators.

(a) Double-button control passenger elevators shall not be constructed and installed unless a special permit is first obtained from the Department. Their use is at all times subject to regulations applied to them by the Department for the protection of the public and employees.

(b) Such elevators are subject to the same requirements as electric passenger elevators, except as to door interlocks, emergency releases, emergency switches, operators, and speed.

(c) The landing doors of double-button control passenger elevators shall be equipped with approved interlocking switches so arranged that the elevator car is immovable while any landing door is open, and so that such door or doors may not be opened unless the car is at that landing.

(d) The cars of such elevators shall not have openings on more than two sides. Sliding or rolling doors or collapsible gates are required at all car openings. Such gates shall be equipped with switches so connected to the car control circuit as to hold the car immovable while the gates are open.

(e) The wires to the safety switch shall be run in a special cable. Means shall be provided to prevent any interference from the hall buttons or switches when the elevator is being operated from within the car, such means to be automatic, or provision shall be made to enable the person operating the elevator from within the car to prevent interference from the landing buttons or switches, and to maintain complete control of the car.

(f) In addition to the directional buttons in the car of a double-button control elevator, a safety switch shall be provided in the car to enable the person operating the elevator from within the car to stop the car at any point of its travel. Such switch shall be manually operated.

(g) Double-button control passenger elevators are limited to a speed not exceeding 100 feet per minute.

(h) Pushbuttons shall not be permitted to control the operation of elevators in school buildings, sanitariums for the mentally deficient, and similar classes of buildings where there is danger of the abuse of the purpose of such buttons, unless the pushbuttons may be made inaccessible to the occupants or are key operated. A decision on this point shall be made at the time of the approval of the plans for such elevators.

(i) Automatic operation elevators shall be provided with an audible emergency signal gong, at least four inches in diameter, operative from the car and located outside of the hoistway, or shall be provided with a telephone connected to a central exchange.

Cross References

This section cited in 34 Pa. Code § 7.71 (relating to conflicts).

§ 7.76. Hydraulic passenger elevators.

(a) The valve chambers and cylinders of all hydraulic passenger elevators shall be equipped with means for removing any accumulation of air.

(b) New hydraulic and oil-electric elevators shall be equipped with supply and discharge pipes of sufficient area as to be unaffected by the operation of any other elevator on the same system. Supply tanks shall be of sufficient capacity to provide for an adequate liquid reserve to prevent the entrance of air or other gas into the system and to permit a travel of at least three feet beyond the upper terminal landing. Such permissible minimum liquid level shall be clearly indicated.

(c) In new installations, structural steel guides shall be provided for every crosshead having a travel in excess of 15 feet; structural steel hangers shall be provided for traveling sheaves when the travel of the sheaves exceeds 15 feet. In existing installations, structural steel guides shall be provided for every crosshead when necessary to prevent swaying of the crosshead.

(d) Each pump shall be equipped with an automatic bypass. Each pump connected to pressure tanks of hydraulic passenger elevators shall be equipped with one or more water relief valves, which shall be of ample capacity to prevent a pressure in excess of the maximum allowable pressure of the pump or tank. There shall be no shutoff valve between the water relief valve and the pump or tank which it protects. The discharge from the water relief valves shall be conducted to the discharge tank or to the pump suction.

(e) Pressure tanks of hydraulic passenger elevators shall be equipped with a water relief valve of sufficient capacity to discharge the pump delivery without an increase of more than 15 pounds above the allowable working pressure of the tank. If, in the judgment of the Department, the water relief valve on the pump will provide sufficient protection, the water relief valve for the pressure tank may be omitted.

(f) In new installations, the car platform of a direct plunger passenger elevator shall be securely fastened to the head of the plunger by not less than four 5/8 inch diameter bolts or by any other means whereby a factor of safety of four shall be maintained provided such alternate means be submitted to the Industrial Board for approval. When the plunger consists of more than three sections and the elevator car is equipped with counterweights, the car platform shall be further secured to the bottom section of the plunger by a noncorrosive cable inside of such plunger.

(g) When a new elevator car is equipped with counterweights the plunger head shall be constructed of steel or wrought iron material.

(h) The plunger of every uncounterweighted hydraulic elevator having a travel in excess of 75 feet shall be equipped with a traveling guide or follower which will remain midway between the car and the stuffing box throughout the entire length of travel.

(i) All pressure tanks for hydraulic passenger elevators and pipe materials other than threaded heavy-duty metal pipe shall first be approved by the Board.

(j) Each hydraulic passenger elevator shall be provided with automatic limit stops arranged to bring the car to a gradual stop at terminal landings independent of the car-controlling mechanism. For plunger elevators having a car speed of 100 or less feet per minute, the automatic limit stop may be an independent cable with button stops on the car, such cable to be connected to the main operating valve. For horizontal or vertical cylinder machines having a car speed of 100 or less feet per minute the automatic limit stop may be an independent cable actuated by the traveling crosshead and connected to the main operating valve. Each hydraulic passenger elevator having a car speed more than 100 feet per minute shall be provided with independent automatic stop valves.

(k) The capacity of operating and stop valves shall not be more than will permit the operation of the car with the maximum load at the allowable rate of speed.

(l) Piston rods shall be thoroughly examined by an approved inspector at least once every three years.

(m) Cylinder or plunger passenger elevators in which the motive power is steam, gas, or air shall, when possible, come within the requirements for hydraulic passenger elevators.

(n) Existing installations of every type of hydraulic elevator shall be changed to meet the requirements for new installations, when necessary for safe operation, if ordered by the Department.

(o) Electrically controlled hydraulic and oil electric elevators shall be equipped with two magnetic switches both of which shall be closed to complete the motor circuit unless there is a second control means (for example, a valve) in which case only one such magnetic switch is required in the motor control circuit.

(p) Each hydraulic passenger or freight elevator shall be equipped with an approved electrically-controlled normally closed valve, operating devices and control equipment, including anti-creep leveling devices, and terminal stopping devices.

(q) When electrically-operated valves are installed to replace existing mechanically-operated valves, for rated speeds of more than 100 feet per minute, existing terminal stopping devices, consisting of an automatic stop valve independent of the electric control valve and operated by the movement of the car as it approaches the terminals, where provided, shall be retained.

(r) Anti-creep leveling devices shall maintain the car within three inches of the landing from any point within the interlock zone irrespective of the position of the hoistway door. For electric hydraulic elevators, it is required to operate the car only in the "up" direction. For maintained-pressure hydraulic elevators, it is required to operate the car in both directions, and shall operate in conjunction with an approved electrically-controlled, valve-operating system. The closing of

this control device shall not be dependent on the completion or maintenance of an electric circuit for the interruption of the power. However, movement of the car in response to the anti-creep leveling device shall be prevented by the operation of either the stop switches in the pit or on the car top or by the electric contacts provided for top or side emergency exits. This exception shall apply to all installations for which a permit has been issued subsequent to the effective date of this exception.

(s) Prior to the approval of the electrical control valve and related parts for water hydraulic elevators, the manufacturer of each control valve to be approved shall submit the following to the Board:

- (1) Two complete sets of assembly and detail drawings of the control valve and related parts.
- (2) All drawings shall be to scale.
- (3) All pertinent information as to materials and clearances.

(t) Devices approved pursuant to subsection (s) shall be inspected and tested in the field under maximum operating conditions by a Department inspector.

Source

The provisions of this § 7.76 amended through January 27, 1978, 8 Pa.B. 251. Immediately preceding text appears at serial page (15209).

Cross References

This section cited in 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

Subchapter C. SIDEWALK ELEVATORS

| | |
|--------|--|
| Sec. | |
| 7.91. | Basement lifts. |
| 7.92. | Prohibited types. |
| 7.93. | Car travel and location. |
| 7.94. | Opening of doors. |
| 7.95. | Upper limit of travel. |
| 7.96. | Shaftway enclosures and gates. |
| 7.97. | Brakes. |
| 7.98. | Specifications of sidewalk doors. |
| 7.99. | Sheaves and drums of hoisting chains and cables. |
| 7.100. | Removal and reerection. |
| 7.101. | Stop switch and light. |

§ 7.91. Basement lifts.

The provisions of this subchapter apply to basement lifts, also designated as sidewalk elevators.

§ 7.92. Prohibited types.

Sidewalk elevators of the multiple or four point suspension type shall not be installed.

§ 7.93. Car travel and location.

Sidewalk elevators shall be limited to a car travel not exceeding 25 feet, except when special permission has been obtained from the Board. Such elevators shall not be located inside of any building.

§ 7.94. Opening of doors.

(a) The cars of new sidewalk power-driven elevators shall be provided with a substantial guard or bow to open and close the sidewalk doors. Constant-pressure key switches on street landings of sidewalk elevators shall be used for the entire control of the elevator within the distance of travel from the sidewalk level necessary to open or completely close the sidewalk doors. Control from the car, lower, or intermediate landings is permitted only within the car travel which does not cause the sidewalk doors to open or close.

(b) The cars of existing power-driven sidewalk elevators shall be provided with a substantial guard or bow to open the sidewalk doors, or the sidewalk doors shall be arranged to open by hand. When a guard or bow is used, substantial removable railings at least 42 inches in height shall be placed at the sidewalk level, constructed, and installed so that the car-controlling mechanism is locked and the elevator car held immovable until the railing is placed in position. A constant-pressure key switch on the street landings of sidewalk elevators may also be used in lieu of guardrails. When doors are to be opened by hand, the controlling mechanism shall be arranged to hold the car immovable while the doors are being opened, and the removable railing may be dispensed with, if other conditions meet the requirements of subsection (c).

(c) Sidewalk protection shall be achieved in accordance with the following:

(1) *New installations.* The doors at the sidewalk level of all sidewalk elevators shall not be permitted to be in an open position when the car is not at the street or sidewalk level.

(2) *All installations.* The doors of all sidewalk elevators shall not be in an open position when the car is not at the street or sidewalk level unless the following are present:

(i) There is a distance of at least 42 inches from the sidewalk to the top of the doors, when open, and the loading side of the shaftway is protected by a railing, bar, chain, or equivalent, at least 42 inches in height with a wire screen fastened below, the wire of which is at least No. 10 standard steel wire gauge.

(ii) When doors are not sufficiently large to maintain a height of 42 inches and it is desired to leave them open when the car is away from the

sidewalk, additional railings 42 inches in height with wire screen, shall be provided alongside the doors.

§ 7.95. Upper limit of travel.

The upper limit of travel of a sidewalk elevator car shall not exceed three feet beyond the sidewalk or street level. When there is any travel beyond the sidewalk or street level, aprons shall be provided for the exposed side of the car.

§ 7.96. Shaftway enclosures and gates.

(a) *Power-driven sidewalk elevators.* Power-driven sidewalk elevators shall conform to the following:

(1) *New installations.* The shaftways of new power-driven sidewalk elevators or basement lifts, shall be enclosed on three sides, except for necessary openings for machinery. The loading sides of the lower and intermediate landings shall be provided with standard manually-operated gates or freight type doors, constructed and installed in accordance with the requirements for freight elevators; and be equipped with approved type interlocks. The cars of power-driven sidewalk elevators shall have all sides not used as a means of ingress or egress thereto solidly enclosed to a height of at least 6 feet. A car gate and contact shall be provided at the side served by the openings below the sidewalk level. The shaftway door at the basement landing shall be equipped with an emergency key.

(2) *Existing installations.* The shaftways of existing power-driven sidewalk elevators or basement lifts, shall be enclosed on three sides to a height of at least 6 feet, except for necessary openings for machinery. The loading sides or the lower and intermediate landings shall be provided with standard semiautomatic gates, constructed and installed in accordance with the requirements for freight elevators.

(b) *Hand sidewalk elevators.* Gates and shaftway enclosures are not required in connection with hand sidewalk elevators or basement lifts, except that semiautomatic gates shall be installed at intermediate landings.

§ 7.97. Brakes.

(a) Brakes shall be provided which are capable of stopping and holding the elevator car at any point of its travel with the car carrying its full-rated load.

(b) The machines of power-driven sidewalk elevators shall be provided with at least one dependable automatic terminal stop which automatically cuts off the power and applies the brake.

§ 7.98. Specifications of sidewalk doors.

(a) In new installations, sidewalk doors shall, when closed, be capable of sustaining a live load of at least 300 pounds per square foot. The dimensions of any sidewalk openings shall not exceed 5 by 7 feet except by special permission of the Board.

(b) In existing installations, sidewalk doors shall, when closed, be of sufficient strength to carry the loads to which they are subjected, without dangerous deflection.

§ 7.99. Sheaves and drums of hoisting chains and cables.

(a) When chains or cables are used for raising or lowering the cars of new power-operated sidewalk elevators, the sheaves or winding drums shall not be less than ten inches in diameter. The sheaves or winding drums of hand-operated sidewalk elevators shall be at least 10 inches in diameter when cables are used, but when chains are used a lesser diameter is permitted, if the sheaves are pocketed to receive the chains. Cable sizes shall be at least 3/8 inch in diameter. Sheaves or winding drums shall be equipped with substantial retaining flanges.

(b) Power-driven sidewalk elevators suspended from cables or chains shall be provided with approved rope-type car safeties. Such safeties shall be capable of stopping or holding the fully-loaded elevator car at any point of its travel.

§ 7.100. Removal and reerection.

The removal and reerection of any sidewalk elevator in a new location shall be in conformity with the requirements governing the installation of new sidewalk elevators.

§ 7.101. Stop switch and light.

A stop switch and light shall be installed in the cars of new sidewalk elevators.

**Subchapter D. STAGE, ORCHESTRA, ORGAN CONSOLE
AND LUMBER ELEVATORS**

Sec.

- 7.111. Shaftway construction.
- 7.112. Lifting capacity.
- 7.113. Control apparatus.
- 7.114. Driving mechanism.
- 7.115. Electrical equipment.
- 7.116. Platform construction.

§ 7.111. Shaftway construction.

(a) The shaftways of orchestra and organ console elevators shall be of fire-resistant construction below the top landing. The inside surface of such shaft-

ways, within the limits of travel, shall have a smooth finish without any projections or recesses except for landing entrances, guides and guide brackets, vertical slots when required for concealed guides, and junction boxes and conduits for wiring. Projections or recesses at landing entrances shall be beveled on the underside or guarded with metal plates. The angle of such bevels or guard plates shall not be less than 60° from the horizontal.

(b) The shaftways of lumber elevators shall be enclosed on all sides not used for loading or unloading with solid partitions not less than 6 feet in height and shall be flush. All points of loading and unloading shall be protected by movable bars or railings. Gates, as specified in § 7.278(c) (relating to landing gates) are required where the travel exceeds 6 feet and there are two or more landings. All shearing points shall be protected by flaring at an angle of not less than 60° from the horizontal.

(c) A pit shall be provided at the bottom of every shaftway of such depth that when the platform is at its lowest limit of travel the distance between the lowest point of the underside of the platform framing and to the floor of the pit shall not be less than 2 feet.

(d) The bottom landing openings of orchestra and organ console shaftways shall be protected by sliding doors of fire-resistive construction. If swinging doors are used they shall open outward.

(e) Railings and toeboards shall be provided at the floor levels of orchestra and organ console elevators.

(f) Steel rails shall be used for guides of stage, orchestra, and organ console elevators. Lumber elevators shall be provided with substantial guides of either wood or steel.

(g) Shaftway landing doors shall be equipped with approved locking devices.

§ 7.112. Lifting capacity.

(a) The lifting capacity of an orchestra or organ console elevator shall be equal to a live load of not less than 25 pounds per square foot of floor area of the platform.

(b) The lifting capacity of a stage elevator shall be equal to a live load of not less than 75 pounds per square foot of floor area of the platform.

(c) Railings, aprons, wiring, conduits, outlets, and the like, are considered as part of the weight of the movable platforms.

§ 7.113. Control apparatus.

(a) Operating switches shall be provided in a suitable location on the platforms of orchestra and organ console elevators. Emergency stop switches shall be provided and placed adjacent to the operating switches in as convenient a location as possible. A manually-operated double-pole disconnecting service switch shall be installed in the main line to cut off power from the operating machinery. When alternating current is used, reverse phase relays shall be provided.

(b) Lumber elevators shall be operated by switches or buttons located at a point where the entire shaftway is visible. Buttons shall be of the constant pressure type. Hand switches shall be of the self-centering type.

§ 7.114. Driving mechanism.

(a) When elevating screws are used they shall be of the direct connected type, either worm or beveled gears, and all gears shall be enclosed in a housing, except that chain drive lumber hoists are permitted when provided with equalizing chains or when approved slack chain switches are installed and enclosed.

(b) When a stage, orchestra, or organ console elevator is not supported or operated by either screws, plungers, or similar means, car safeties shall be provided under the platform capable of stopping and holding the platform with a full-rated load at any point of its travel.

(c) When lumber elevators are so installed that they are not within the intent of this subchapter, they shall be made to comply with the requirements for freight or passenger elevators.

§ 7.115. Electrical equipment.

(a) A suitably lighted room shall be provided outside of the shaftway for the motor controller and brake unless the motor and controller are placed in the pit, in which case stone or masonry piers or columns shall be provided to take sufficiently the impact of a full-loaded car.

(b) When the motor and controller are located in a shaftway pit or in a pit adjacent to the hoist, access to such pit shall be provided by means of a door entirely below the bottom of the platform when the platform is at its lowest limit of travel.

(c) Terminal limit switches located in the shaftway, or a stop motion device on the operating machine, shall be provided and arranged to automatically bring the platform to rest as it approaches either terminal landing.

(d) Final limit switches shall be provided at the top and bottom of the shaftway arranged to cut off the current and stop the platform if it runs by the terminal limit switches.

§ 7.116. Platform construction.

(a) The platforms of stage, orchestra, organ console and lumber elevators shall be of steel frame construction designed with a factor of safety of not less than six based on the rated load, uniformly distributed. Other parts of the equipment shall have a safety factor as required by this chapter.

(b) When orchestra and organ console elevators are installed in the same shaftway, the adjacent sides shall be provided with aprons of substantial construction or railings and toeboards, or all if necessary, to avoid a shearing hazard.

(c) When the travel of a stage, orchestra or organ console elevator extends above the top of the shaftway enclosure, aprons of substantial construction shall

be provided on the platform of sufficient depth to enclose the space between the top of the shaftway enclosure and the underside of the platform when the platform is at its limit of travel.

(d) When the travel of a lumber elevator extends above the top of the surrounding floor level, an apron of substantial construction shall be provided on all sides of the platform of a sufficient depth to enclose the space between the floor level and the underside of the platform when the platform is at its limit of travel.

Subchapter E. PERSONAL SERVICE ELEVATORS

GENERAL REQUIREMENTS

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GENERAL REQUIREMENTS

§ 7.131. Scope.

This subchapter applies only to the elevators installed for the personal use of an individual, and one attendant, who submits to the Department certificate of a physician stating that the individual is not physically able to walk up and down stairs and therefore requires the use of a personal service elevator, to be used exclusively by him.

§ 7.132. Removal from service.

Personal service elevators shall be removed or sealed out of service upon the termination of the service for which they were originally installed.

§ 7.133. Limitations.

The following may not be exceeded:

- (1) The inside area of car shall be 12 square feet or less.
- (2) The speed with load shall be 50 feet or less per minute.
- (3) The contract load shall be 700 pounds or less.
- (4) The operation shall be only by means of key-operated pushbuttons.

§ 7.134. Approval and operation.

Plans and specifications for personal service elevators shall be filed with the Department and an erection permit secured in accordance with § 7.31 (relating to submission and approval of plans) and section 11 of the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1351), before the work of installation is started. On the completion of the elevators, they shall be inspected and tested by the Department and not placed in operation until the Department issues a certificate of operation. The elevators shall be subject to reinspection at least once every 12 months, in accordance with §§ 7.15 and 7.16 (relating to inspection; and inspectors), and section 7 of the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1347).

SPECIFICATIONS

§ 7.141. Hoistway enclosure.

The hoistway shall be constructed and enclosed in accordance with § 7.51 (relating to shaftway construction).

§ 7.142. Clearance.

- (a) There shall be a clearance of at least 3/4 inch between the car and the hoistway enclosure, and between the car and its counterweight.
- (b) The clearance between the car platform and the landing threshold shall be at least 1/2 inch, but not more than 1 1/2 inches.

§ 7.143. Pits and overtravel.

- (a) The structure at the bottom of a hoistway shall be sufficiently strong to withstand without failure the impact of the car with contract load and the impact of the counterweight, when either is descending at contract speed, or at governor-tripping speed if a governor-operated safety is used.
- (b) A pit at least 2 feet in depth shall be provided at the lowest story served.

(c) At the top landings there shall be a clearance between the top of the car crosshead and machine supports, or another obstruction vertically above the car, of at least 2 feet when the counterweight rests on its fully compressed buffers and a clearance between the top of the counterweight and an obstruction vertically above it of at least 6 inches when the car rests on its fully compressed buffers. When no counterweight is provided, clearance between the top of the car crosshead and the machines, supports, or other obstruction vertically above it when the car is at its uppermost landing shall be at least 2 feet, 6 inches.

§ 7.144. Overhead support.

(a) Machinery and sheaves shall be so supported and secured as to effectually prevent any part becoming loose or displaced. The supporting beams shall be composed of steel, sound timber or reinforced concrete.

(b) In computing the loads on overhead beams and their supports, the total load on overhead beams shall be assumed to be equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams. The object in doubling the suspended load is to allow for impact, acceleration, stresses and the like. The load resting on the beams shall include the complete weights of the machine, sheaves, controller and the like. The load suspended from the beams shall include the sum of the tensions of all cables suspended from the beams.

(c) No elevator machinery or sheaves may be fastened to the underside of the supporting beams at the top of the hoistway, except the idler or deflecting sheaves with their guards and frames. Supporting members for sheaves and other elevator machinery hung underneath beams may not be of cast iron in tension.

(d) The factor of safety for overhead beams and their supports shall be five for steel and six for timber and reinforced concrete.

§ 7.145. Pipes and wiring.

(a) Wiring shall comply with the requirements of Chapter 39, Subchapter B (relating to electric safety).

(b) No pipes conveying steam, gas or liquids, which if discharged into the hoistway would endanger life, may be installed in the elevator or counterweight hoistway.

(c) Voltage of control circuits shall conform with the requirements of § 7.72 (relating to electric passenger elevators).

(d) All live parts of electrical apparatus in the hoistway shall be suitably enclosed to protect against accidental contact.

§ 7.146. Counterweights.

(a) Counterweights, when used, shall operate in guides located within the elevator shaftway, in accordance with the requirements of § 7.52(d) (relating to shaftway equipment).

(b) If a car counterweight is used, it shall not be of sufficient weight to cause slackening of any car hoist cable at the start or stop of the car.

(c) The counterweight sections, whether or not carried in a frame, shall be fastened together to prevent rattle and displacement.

§ 7.147. Guide rail construction.

(a) Car and counterweight guide rails shall be constructed of steel.

(b) Guide rails shall be securely fastened in accordance with the following:

(1) Guide rails and their fastenings shall not deflect more than 1/4 inch under normal operation.

(2) Joints of guide rails shall be well-fitted and strongly secured.

(3) Guide rails and their joints and fastenings shall withstand the application of the safety when stopping the fully-loaded car.

(c) Guide rails shall extend from the bottom of the hoistway to a height above the top landing sufficient to prevent the guide shoes from running off the guides when the car or counterweight is at the extreme upper position.

§ 7.148. Protection of hoist cables.

Hoist and counterweight ropes or suspension chains shall be located inside the hoistway enclosure.

§ 7.149. Hoistway doors.

(a) Landing openings shall be protected by doors of the horizontally swinging or sliding type. Grille or lattice-type construction shall not be used when fire-resistant hoistway enclosures are required.

(b) When swing-type doors are used the clearance between the hoistway enclosure door or gate and the hoistway edge of the landing sill shall not exceed two inches and the distance between the hoistway face of the landing door and the car door or gate shall not exceed four inches. When sliding-type doors with door closures are used the clearances specified may be increased to 2 1/4 inches and 5 1/2 inches respectively.

(c) The hoistway face of the landing door or gate shall not project into the hoistway beyond the landing sill. No hardware, except that required for door-operating devices, locks, contacts, or signals shall project into the hoistway beyond the line of the landing sill.

(d) Hoistway doors or gates shall be provided with locking devices and electric contacts conforming to the requirements of §§ 7.54 and 7.73 (relating to landing doors and locking devices; automatic control passenger elevators).

(e) No means shall be provided to open any landing door from the landing side when the car is not in the landing zone.

(f) Hoistway doors shall be so arranged that it will not be necessary to reach behind any panel, jamb, or sash to operate them.

(g) Means shall be provided to prevent hangers for sliding hoistway doors from jumping the track. Stops shall be provided to prevent the hanger carriage from leaving either end of the track, or suitable stops shall be provided on the door.

§ 7.150. Elevator cars.

(a) *Construction.* Elevator cars shall have metal or combination metal and wood suspension frames and platforms with a safety factor of not less than five, based on the contract load. Cast iron shall not be used in the construction of any member of the car frame or platform other than for guide shoes and guide shoes brackets, nor shall glass be used in an elevator car except for lights and appliances necessary to the operation of the car. Cars shall have only one compartment.

(b) *Enclosure.* Except at the entrance, cars shall be enclosed at the sides and top. The enclosure at the sides shall be solid or of open work which will reject a ball of 1/2 inch diameter. The car enclosure shall be secured in such a manner that it does not work loose or become displaced in regular service.

(c) *Gates.* A car door or gate shall be provided at each entrance to a car, as follows:

(1) The door or gate shall, when closed, guard the opening to a height of at least five feet, six inches, and, if on an electric or electrically controlled hydraulic elevator, shall be provided with an electric contact which prevents operation of the elevator unless the car door or gate is within two inches of full closure.

(2) The car door or gate may be manually operated, power operated, or closed by a weight or spring. Collapsible gates shall not be power-opened more than nine inches from full closure.

(3) Car gates shall be of such a design that when fully expanded they will reject a three inch ball.

(4) Car door or gate contacts shall be positively opened by a lever or other device attached to and operated by the door or gate.

(5) Car door or gate contacts shall be maintained in the open position by the action of gravity or a restrained compression spring or both, or by a positive linkage.

(d) *Light.* There shall be an electric light to illuminate the car, with its switch placed near the car entrance within easy reach of a person before entering the car.

(e) *Safety.* Elevator cars suspended by wire ropes or chains shall be provided with a car safety capable of stopping and sustaining the car with contract load, as follows:

(1) The car safety shall be of a type operated as the result of the breaking of the suspension means, or by a speed governor. If of the speed governor type, it shall operate to set the safety at a maximum speed of 175 feet per minute,

except that on breaking the hoist ropes, the safety shall operate without appreciable delay and independently of the governor speed action.

(2) If a speed governor is used, it shall be located where it is not struck by the car or counterweight in case of overtravel and where there is sufficient space for full movement of the governor parts.

(3) The motor control circuit and the brake control circuit shall be opened before or at the same time the safety applies.

(4) The governor cable shall be of iron, steel, monel metal or phosphor bronze, not less than 1/4 inch in diameter. Tiller rope construction shall not be used for governor ropes.

(5) Elevators of the winding drum type with wire rope suspension shall be provided with a slack rope device of the manually reset type which cuts off the power and stops the elevator machine if the car is obstructed in its descent and the hoist ropes slacken. When the car is suspended by chains, slack chain devices shall be provided which cut off the power and stop the elevator machine if the car is obstructed in its descent and the suspension chains slacken. This device is not required to be of the manually reset type if the chain sprockets are guarded to prevent the chain from jumping off the sprockets.

(6) No safety device which depends upon the completion and maintenance of an electric circuit for the application of the safety shall be used. Car safeties shall be applied mechanically. Cast iron shall not be used in the construction of a car safety when its breakage might result in the failure of the safety to function to sustain the car.

(f) *Tests.* Tests of the car safety described in subsection (e), with contract load in the car, shall be made before the elevator is put into service. Governor operation of instantaneous-type safeties shall be tested at contract speed by tripping the governor by hand. Safeties operated as the result of the breaking of the hoist ropes shall be tested by obtaining the necessary slack rope to cause them to function.

(g) *Capacity plates.* A metal plate shall be fastened in a conspicuous place in the car stating the contract load in pounds, in letters and figures not less than 1/4 inch in height.

(h) *Emergency signal.* An emergency signal shall be provided, operative from the car, and audible outside the hoistway and may be a telephone connected to a central exchange.

§ 7.151. Limitations.

When the contract load exceeds 700 pounds or the contract speed exceeds 50 feet per minute, or the net inside car platform area exceeds 12 square feet, the elevator shall conform to all requirements of this chapter.

§ 7.152. Machines and sheaves.

(a) Winding drums, traction sheaves and overhead and deflecting sheaves shall be of cast iron or steel, of a diameter not less than 30 times the diameter of the wire hoist ropes. The rope grooves shall be machined. Where eight by 19 plow steel ropes are used, the diameter of drums and sheaves may be reduced to 20 times the diameter of the rope.

(b) The factor of safety based on the static load, that is, the contract load plus the weight of car, ropes, counterweights, and the like, to be used in the design of personal service elevator hoisting machines shall not be less than eight for wrought iron and steel, and ten for cast iron, cast steel, or other material.

(c) Set-screw fastenings shall not be used in lieu of keys or pins at a connection subject to torque or tension.

(d) No friction gearing or clutch mechanism shall be used for connecting the hoist drum or sheaves to the main driving gear.

(e) Gearing having cast iron teeth shall not be used.

(f) Electric elevator machines shall be equipped with electrically-released, spring-applied brakes.

(g) No single ground, short circuit, counter-voltage or motor field discharge shall prevent the brake magnet from allowing the brake to set in the intended manner during normal operation.

(h) An electric elevator machine shall be arranged for manual operation by crank in case of power failure, and a suitable crank shall be provided and kept near the machine.

§ 7.153. Limit switches.

Upper and lower normal stopping devices shall be provided, set to stop the car at the upper and lower terminal landings. Final stopping devices shall be provided and set to operate if the car passes the terminal landings. Such stopping devices shall stop the car before it strikes the overhead or pit bottom. The final terminal stopping device shall act to prevent movement of the car in both directions of travel. 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.

§ 7.154. Operation.

(a) The following methods of operation are permitted:

(1) Double-button control.

(2) Momentary-pressure operation with "up-down" buttons or switches in the car and "up-down" buttons or switches, or call buttons, at each landing. It is not required that the operation be selective.

(3) Single automatic operation.

- (4) Car and landing operating buttons shall be key-operated. The use of such key shall be limited to the individual for whom the elevator was installed.
- (b) A stop switch shall be provided on or adjacent to the operating panel. Stop switches shall be of the manually opened and closed type and shall be conspicuously marked "stop," and the operating button or handle shall be of a different color from any other switch in the car.
- (c) The control system shall be so designed that the direction of travel of the elevator may be reversed at any point in the hoistway after stopping the elevator from the stop switch or any other method. No control system shall be used which depends upon completion of maintenance of an electric circuit for the following:
- (1) Interruption of the power and application of the electro-mechanical brake at the terminals.
 - (2) Operation of the car safeties.
 - (3) Stopping in response to the opening of the emergency stop switch.
- (d) Hand-rope operation shall not be used.
- (e) The sticking or freezing of any single electrically-operated switch, relay, or contactor, or the occurrence of a single accidental ground shall not permit the car to start if any hoistway landing door is open or unlocked, or if any car door or gate is not within two inches of full closure.

§ 7.155. Suspension means.

- (a) Suspension means shall be wire ropes or suspension chains. There shall not be less than two such ropes or chains.
- (b) Steel tapes or tiller rope as suspension means is prohibited.
- (c) On elevators having a contract load of less than 450 pounds and operating at a contract speed of less than 30 feet per minute, ropes shall not be less than 1/4 inch in diameter. When the contract load exceeds 450 pounds, or the contract speed exceeds 30 feet per minute, ropes shall not be less than 3/8 inch diameter.
- (d) The factor of safety of the suspension means shall not be less than seven. When the car and counterweight are suspended by wire ropes and the driving means between the machine and counterweight is an endless chain, the factor of safety of such chain with the rated load in the car shall be not less than eight.
- (e) The arc of contact of a wire rope on a traction sheave shall be sufficient to produce adequate traction under all load conditions. The arc of contact of a chain on a driving sprocket shall not be less than 140°.
- (f) Wire ropes anchored to a winding drum shall have not less than one full turn of rope on the drum when the car or counterweight has reached its extreme limit of possible overtravel.
- (g) No car or counterweight wire rope shall be lengthened or repaired by splicing. Broken or worn suspension chains shall not be repaired but the entire chain shall be replaced.

(h) The winding drum ends of car and counterweight wire ropes shall be secured by clamps on the inside of the drum or by one of the methods specified in subsection (i) for fastening wire ropes to car or counterweight.

(i) The car or counterweight ends of wire ropes shall be fastened by return loop, properly made individual, tapered, babbitted sockets, or attached fittings as recommended by wire rope manufacturers. Clamps of the U-bolt type shall not be used.

(j) A metal tag shall be placed on all wire ropes or chain fastenings, or be permanently fixed on the car frame, upon which shall be stamped the size, the material, the ultimate strength of the rope or chain, as rated by the manufacturer, and the date of installation or renewal.

Subchapter F. POWER-OPERATED SPECIAL INDUSTRIAL SERVICE ELEVATORS

GENERAL

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GENERAL

§ 7.171. Applicability.

This subchapter applies only to elevators installed in industrial buildings, such as grain and feed mills, chemical and alcohol distilleries, cement storage towers, radio towers and similar industries, which are not accessible to the general public, for the exclusive use of certain designated operating and maintenance employes when transportation of one or two men is required for a distance of several floors to attend machinery or equipment requiring frequent attention. No persons other than the employes may ride thereon.

§ 7.172. Removal from service.

Power-operated special industrial service elevators shall be removed or sealed out of service upon the termination of the service for which they were originally installed.

§ 7.173. Limitations.

The following may not be exceeded:

- (1) The inside area of car shall be 900 square inches or less.
- (2) The speed with load shall be 100 feet or less per minute.
- (3) The contract load shall be 300 pounds or less.
- (4) The operation shall be only by means of pushbuttons.

§ 7.174. Approval and operation.

Plans and specifications for power-operated special industrial service elevators shall be filed with the Department and an erection permit secured in accordance with § 7.31 (relating to submission and approval of plans) and section 11 of the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1351), before the work of installation is started. On the completion of the elevators, they shall be inspected and tested by the Department and not placed in regular operation until the Department issues a certificate of operation. The elevator shall be subject to reinspection at least once every 6 months, in accordance with §§ 7.15 and 7.16 (relating to inspection; and inspectors) and the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1347).

SPECIFICATIONS

§ 7.181. Hoistway enclosure.

The hoistway shall be constructed and enclosed in accordance with the requirements of § 7.51 (relating to shaftway construction), except that when a building is of open construction throughout, and the elevator does not travel through fireproof floors, grille, or latticework, an enclosure 6 feet high shall be provided around the shaftway at each floor. An enclosure of full height shall be provided

on the open side or sides of the car and on other sides where hazards exist, such as stairways. The grille or or latticework shall conform to § 7.51.

Cross References

This section cited in 34 Pa. Code § 7.191 (relating to limitations).

§ 7.182. Clearance.

(a) There shall be a clearance of not less than 3/4 inch between the car and the hoistway enclosure, and between the car and its counterweight.

(b) The clearance between the car platform and the landing threshold shall be not less than 1/2 inch, nor more more than 1 1/2 inches.

§ 7.183. Pits and overtravel.

(a) The structure at the bottom of a hoistway shall be sufficiently strong to withstand without failure the impact of the car with contract load, and the impact of the counterweight, when either is descending at contract speed, or at governor-tripping speed if a governor-operated safety is used.

(b) A pit not less than two feet in depth shall be provided at the lowest story served and a substantial spring bumper shall be located in such pit, set to strike the steel safety plank of the car. A minimum of one foot clearance shall be provided under the platform when the car rests on the fully compressed bumper.

(c) At the top landings there shall be a clearance between the top of the car crosshead and machine supports, or any other obstruction vertically above the car, of not less than two feet when the counterweight rests on its fully compressed buffers and a clearance between the top of the counterweight and any obstruction vertically above it of not less than six inches when the car rests on its fully compressed buffers. When no counterweight is provided, clearance between the top of the car crosshead and the machines, supports, or other obstruction vertically above it when the car is at its uppermost landing shall not be less than two feet, six inches.

§ 7.184. Overload support.

(a) All machinery and sheaves shall be so supported and secured as to effectually prevent any part becoming loose or displaced. The supporting beams shall be composed of steel, sound timber, or reinforced concrete.

(b) In computing the loads on overhead beams and their supports, the total load on overhead beams shall be assumed to be equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams. The object in doubling the suspended load is to allow for impact, acceleration, stresses, and the like. The load resting on the beams shall include the complete weights of the machine, sheaves, controller, and the like. The load suspended from the beams shall include the sum of the tensions of all cables suspended from the beams.

(c) No elevator machinery or sheaves shall be fastened to the underside of the supporting beams at the top of the hoistway, except the idler or deflecting sheaves with their guards and frames. Supporting members for sheaves and other elevator machinery hung underneath beams shall not be of cast iron in tension.

(d) The factor of safety for overhead beams and their supports shall be five for steel and six for timber and reinforced concrete.

§ 7.185. Pipes and wiring.

(a) Wiring shall comply with Chapter 39, Subchapter B (relating to electric safety).

(b) No pipes conveying steam, gas or liquids, which if discharged into the hoistway would endanger life, shall be installed in the elevator or counterweight hoistway.

(c) Voltage of control circuits shall conform with the requirements of § 7.72 (relating to electric passenger elevators).

(d) Live parts of electrical apparatus in the hoistway shall be suitably enclosed to protect against accidental contact.

§ 7.186. Counterweights.

Counterweights, when used, shall operate in guides located within the elevator shaftway, in accordance with the requirements of § 7.52(d) (relating to shaftway equipment). Sides of the counterweight runway exposed to the outside shaftway shall be guarded.

§ 7.187. Guide rail construction.

(a) Car and counterweight guide rails shall be constructed of steel or wood. If wood is used it shall be maple or equivalent and of not less than 1-1/2 by 2 inches.

(b) Guide rails shall be securely fastened, in accordance with the following:

(1) Guide rails and their fastenings shall not deflect more than 1/4 inch under normal operation.

(2) Joints of guide rails shall be well-fitted and strongly secured.

(3) Guide rails and their joints and fastenings shall withstand the application of the safety when stopping the fully-loaded car.

(c) Guide rails shall extend from the bottom of the hoistway to a height above the top landing sufficient to prevent the guide shoes from running off the guides when the car or counterweight is at the extreme upper position.

§ 7.188. Protection of hoist cables.

Hoist and counterweight ropes or suspension chains shall be located inside the hoistway enclosure.

§ 7.189. Hoistway doors.

(a) Landing openings shall be protected by manually-operated doors or gates of the horizontally swinging or sliding type or vertically sliding type. Grille or lattice-type construction shall not be used where fire-resistive hoistway enclosures are required. The construction of such doors and gates shall conform to the requirements of §§ 7.275 and 7.278 (relating to landing doors; landing gates).

(b) When swing-type doors are used the clearance between the hoistway enclosure door or gate and the hoistway edge of the landing sill shall not exceed two inches and the distance between the hoistway face of the landing door and the car door or gate shall not exceed four inches. When sliding-type doors with door enclosures are used the clearances specified may be increased to 2 1/4 inches and 5 1/2 inches respectively.

(c) The hoistway face of the landing door or gate shall not project into the hoistway beyond the landing sill. No hardware, except that required for door-operating devices, locks, contacts, or signals shall project into the hoistway beyond the line of the landing sill.

(d) Hoistway doors or gates shall be provided with approved interlocks conforming to the requirements of §§ 7.54 and 7.73 (relating to landing doors and locking devices; and automatic control passenger elevators).

(e) No means shall be provided which will open any landing door from the landing side when the car is not in the landing zone.

(f) Hoistway doors shall be so arranged as to make it unnecessary to reach in back of any panel, jamb or sash to operate them.

(g) Means shall be provided to prevent hangers for sliding hoistway doors from jumping the track. Stops shall be provided to prevent the hanger carriage from leaving either end of the track, or suitable stops shall be provided on the door.

(h) Gates shall be 5 feet, 6 inches, in height.

§ 7.190. Elevator cars.

(a) *Construction.* Elevator cars shall have metal car frames and outside frames of platforms with a safety factor of not less than five, based on the rated load. Cast iron shall not be used in the construction of any member of the car frame or platform other than for guide shoes and guide shoes brackets, nor shall glass be used in an elevator car except for car lights and appliances necessary to the operation of the car. Cars shall have only one compartment.

(b) *Enclosure.* Except at the entrance, cars shall be enclosed at the sides and top. The enclosure at the sides shall be solid or of open work which will reject a ball of 1/2 inch diameter. The car enclosure shall be secured in such a manner that it may not work loose or become displaced in regular service.

(c) *Gates.* A car door or gate shall be provided at each entrance to a car as follows:

- (1) The door or gate shall, when closed, guard the opening to a height of at least five feet, six inches, and, if on an electric or electrically-controlled hydraulic elevator, shall be provided with an electric contact which prevents operation of the elevator unless the car door or gate is within two inches of full closure. Car doors or gates may be horizontal or vertical sliding.
- (2) The car door or gate shall be manually operated.
- (3) Car gates shall be of such a design that when fully expanded they will reject a three inch ball.
- (4) Car door or gate contacts shall be positively opened by a lever or other device attached to and operated by the door or gate and shall not be solely dependent on gravity or springs or both for their opening.
- (5) Car door or gate contracts shall be maintained in the open position by the action of gravity or a restrained compression spring or both, or by means of a positive linkage.
- (d) *Light.* There shall be an electric light to illuminate the car, with its switch placed near the car entrance within easy reach of a person before entering the car.
- (e) *Safety.* Elevator cars suspended by wire ropes or chains shall be provided with a car safety located beneath the car platform and capable of stopping and sustaining the car with contract load, as follows:
 - (1) The car safety shall be of a type operated as the result of the breaking of the suspension means, or by a speed governor. If of the speed governor type, it shall operate to set the safety at the maximum speed of 175 feet per minute, except that on breaking the hoist ropes, the safety shall operate without appreciable delay and independently of the governor speed action.
 - (2) If a speed governor is used, it shall be located where it may not be struck by the car or counterweight in case of overtravel and where there is sufficient space for full movement of the governor parts.
 - (3) The motor control circuit and the brake control circuit shall be opened before or at the same time the safety applies.
 - (4) The governor cable shall be of iron, steel, monel metal, or phosphor bronze, not less than 1/4 inch in diameter. Tiller rope construction shall not be used for governor ropes.
 - (5) Elevators of the winding drum type with wire rope suspension shall be provided with a slack rope device of the manually reset type which cuts off the power and stops the elevator machine if the car is obstructed in its descent and the hoist ropes slacken. When the car is suspended by chains, slack chain devices shall be provided which cut off the power and stop the elevator machine if the car is obstructed in its descent and the suspension chains slacken. This device is not required to be of the manually reset type if the chain sprockets are guarded to prevent the chain from jumping off the sprockets.
 - (6) No safety device which depends upon the completion and maintenance of an electric circuit for the application of the safety shall be used. Car safeties

shall be applied mechanically. Cast iron shall not be used in the construction of a car safety when its breakage may result in the failure of the safety to function to sustain the car.

(f) *Tests.* Tests of the car safety described in subsection (e), with contract load in the car, shall be made before the elevator is put into service. Governor operation of instantaneous-type safeties shall be tested at contract speed by tripping the governor by hand. Safeties operated as the result of the breaking of the hoist ropes shall be tested by obtaining the necessary slack rope to cause them to function.

(g) *Capacity plates.* A metal plate shall be fastened in a conspicuous place in the car stating the contract load in pounds, in letters and figures not less than 1/4 inch in height.

(h) *Emergency signal.* An emergency signal shall be provided operative from the car, and audible outside the hoistway and may be a telephone connected to a central exchange.

§ 7.191. Limitations.

When conditions do not conform in all respects with the requirements of § 7.181 (relating to hoistway enclosure), the elevator shall conform to all requirements of this chapter.

§ 7.192. Machines and sheaves.

(a) Winding drums, traction sheaves, and overhead and deflecting sheaves shall be of cast iron or steel, of a diameter not less than 30 times the diameter of the wire hoist ropes. The rope grooves shall be machined. When eight by 19 plow steel ropes are used, the diameter of drums and sheaves may be reduced to 20 times the diameter of the rope.

(b) The factor of safety based on the static load, that is, the contract load plus the weight of car, ropes, counterweights, and the like, to be used in the design of these elevator-hoisting machines shall not be less than eight for wrought iron and steel, and ten for cast iron, cast steel or other material.

(c) Set-screw fastenings shall not be used in lieu of keys or pins at a connection subject to torque or tension.

(d) No friction gearing or clutch mechanism shall be used for connecting the hoist drum or sheaves to the main driving gear.

(e) Gearing having cast iron teeth shall not be used.

(f) Electric elevator machines shall be equipped with electrically-released, spring-applied brakes which apply automatically if the operating device or stopping contacts are in the stop position.

(g) No single ground, short circuit, countervoltage, or motor field discharge shall prevent the brake magnet from allowing the brake to set if the operating device or stopping contacts are in the stop position.

(h) An electric elevator machine shall be arranged for manual operation by crank in case of power failure and a suitable crank shall be provided and kept near the machine.

§ 7.193. Limit switches.

Upper and lower normal stopping devices shall be provided, set to stop the car at the upper and lower terminal landings. Final stopping devices shall be provided and set to stop the car before it strikes the overhead or pit bottom, if the car passes the terminal landings. The final terminal stopping device shall act to prevent movement of the car in both directions of travel. 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. Drum-type machines shall also be provided with automatic machine terminal stop switches.

§ 7.194. Operation.

- (a) The following methods of operation are permitted:
- (1) Double-button control.
 - (2) Momentary-pressure operation with “up-down” buttons or switches in the car and “up-down” buttons or switches, or call buttons, at each landing. It is not required that the operation be selective.
 - (3) Single automatic operation.
- (b) A stop switch shall be provided on or adjacent to the operating panel. Stop switches shall be of the manually opened and closed type and shall be conspicuously marked stop and the operating button or handle shall be of a different color from any other switch in the car. The opening of the switch contacts shall not be solely dependent on springs.
- (c) The control system shall be so designed that the direction of travel of the elevator be reversed at any point in the hoistway after stopping the elevator from the stop switch or any other method. No control system shall be used which depends upon completion of maintenance of an electric circuit for the following:
- (1) Interruption of the power and application of the electro-mechanical brake at the terminals.
 - (2) Operation of the car safeties.
 - (3) Stopping in response to the opening of the emergency stop switch.
- (d) Hand-rope operation shall not be used.
- (e) The sticking or freezing of any single electrically-operated switch, relay, or contactor or the occurrence of a single accidental ground shall not permit the car to start if any hoistway landing door is open or unlocked, or if any car door or gate is not within two inches of full closure.

§ 7.195. Suspension means.

(a) Suspension means shall be wire ropes or suspension chains. There shall not be less than two such ropes or chains.

(b) Steel tape or tiller rope as suspension means is prohibited.

(c) On elevators operating at a contract speed of less than 30 feet per minute, ropes shall not be less than 1/4 inch in diameter. When the contract speed exceeds 30 feet per minute, ropes shall not be less than 3/8 inch in diameter.

(d) The factor of safety of the suspension means shall not be less than seven. When the car and counterweight are suspended by wire ropes and the driving means between the machine and counterweight is an endless chain, the factor of safety of such chain with rated load in the car shall be not less than eight.

(e) The arc of contact of a wire rope on a traction sheave shall be sufficient to produce adequate traction under all load conditions. The arc of contact of a chain on a driving sprocket shall not be less than 140 degrees.

(f) Wire ropes anchored to a winding drum shall have not less than one full turn of rope on the drum when the car or counterweight has reached its extreme limit of possible overtravel.

(g) No car or counterweight wire rope shall be lengthened or repaired by splicing. Broken or worn suspension chains shall not be repaired but the entire chain shall be replaced.

(h) The winding drum ends of car and counterweight wire ropes shall be secured by clamps on the inside of the drum or by one of the methods specified in subsection (i) for fastening wire ropes to the car or counterweight.

(i) The car or counterweight ends of wire ropes shall be fastened by return loop, by properly made individual, tapered, babbitted sockets, or attached fittings as recommended by wire rope manufacturers.

(j) A metal tag shall be placed on wire rope or chain fastenings, or be permanently fixed on the car frame, upon which shall be stamped the size, the material, the ultimate strength of the rope or chain, as rated by the manufacturer, and the date of installation or renewal.

Subchapter G. MANLIFTS**GENERAL**

| | |
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| 7.212. | Removal from service. |
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- 7.222. Floor openings.
- 7.223. Landings.
- 7.224. Landing guards.
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- 7.226. Protection of entrances and exits.
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- 7.237. Safety.
- 7.238. Signs required.
- 7.239. Carriage of materials and tools.
- 7.240. Acceptance tests.

GENERAL**§ 7.211. Applicability.**

This subchapter applies only to new manlifts installed in parking garages and industrial buildings, such as grain and feed mills, chemical and alcohol distilleries, cement storage towers and similar industries, for the exclusive use of certain designated operating or maintenance employees, when transportation of the persons is required for a distance of several floors. No persons other than the employees may be permitted to ride thereon.

§ 7.212. Removal from service.

Manlifts shall be removed or sealed out of service upon the termination of the service for which they were originally installed.

§ 7.213. Approval and operation.

Plans and specifications for manlifts shall be filed with the Department and an erection permit secured in accordance with § 7.31 (relating to submission and approval of plans) and section 11 of the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1351), before the work of installation is started. On the completion of the elevators, they shall be inspected and tested by the Department and not placed in regular operation until the Department issues a certificate of operation. The elevators shall be subject to reinspection at least every 6 months, in accordance

with §§ 7.15 and 7.16 (relating to inspection; and inspectors), and section 7 of the act of May 2, 1929 (P. L. 1518, No. 452) (35 P. S. § 1347).

SPECIFICATIONS

§ 7.221. Locked doors.

When manlifts are located in buildings, such as parking garages, to which the public has access, they shall be located in an enclosure protected by self-closing, spring-locked doors, at all floors to which the public has access. Keys to the doors shall be limited to employees. In lieu of spring-locked doors, which require a key, a magnetic-type lock is permitted. If the actuating pushbutton is located at least 7 feet above the floor in an inconspicuous location.

§ 7.222. Floor openings.

(a) Floor openings for a manlift shall be uniform in size, be approximately circular and be located vertically above the opening below it.

(b) Floor openings for both up and down runs shall conform to the following:

| <i>Belt</i> (in inches) | <i>Floor Opening Width</i> (in inches) |
|----------------------------|---|
| 12 | 28—32 |
| 14 | 34—38 |
| 16 | 36—40 |

(c) Floor openings shall extend not more than 24 inches nor more than 28 inches from the face of the belt.

Cross References

This section cited in 34 Pa. Code § 7.223 (relating to landings).

§ 7.223. Landings.

(a) The clearance between the floor or mounting platform and the lower edge of the conical guard required by § 7.224 (relating to landing guards) shall be not less than 7 feet, 6 inches. When such clearance cannot be obtained, no access to the manlifts shall be provided and the manlift runway shall be enclosed where it passes through such floor.

(b) Adequate lighting of not less than three foot-candles shall be provided at each floor landing at all times when the manlift is in operation.

(c) The floor space adjacent to floor openings shall be free from obstruction and kept clear at all times.

(d) The landing surfaces at the entrances and exits to manlifts shall be so constructed and maintained as to provide safe footing at all times, with a coefficient of friction of not less than 0.05.

(e) When there is a travel of 50 feet or more between floor landings, one or more emergency platforms shall be provided so that there is a landing, either floor or emergency, for every 25 feet or less of travel. Such emergency landings shall be accessible from both runs of the manlift and shall give access to the ladder required in § 7.229 (relating to emergency exit ladders). Emergency platforms shall be enclosed with a standard railing and toeboard, which shall correspond in size and position to the floor openings required by § 7.222 (relating to floor openings). Such platforms may be arranged to give access to vertical bucket conveyors or other equipment for the purpose of inspection, lubrication, and repair. Runways to such equipment are considered part of the emergency platform and shall be provided with standard railings and toeboards.

Cross References

This section cited in 34 Pa. Code § 7.230 (relating to illumination).

§ 7.224. Landing guards.

(a) On the ascending side of a manlift, landings shall be provided with a bevel guard or cone meeting the following requirements:

(1) The cone shall make an angle of not less than 45 degrees with the horizontal. An angle of 60° or greater shall be used where ceiling heights permit.

(2) The guard shall extend at least 36 inches outward from the face of the belt, but not beyond the upper surface of the floor above.

(3) The cone shall be made of not less than No. 18 U.S. gage sheet steel or material of equivalent strength or stiffness. The lower ledge shall be rolled to a minimum diameter of 1/2 inch and the interior shall be smooth with no rivets, bolts, or screws protruding.

(b) It should be noted that cones on the down run of the belt serve as fairly effective fire stops and tend to prevent the loss of warm air from lower floors.

Cross References

This section cited in 34 Pa. Code § 7.223 (relating to landings).

§ 7.225. Floor opening guards.

(a) The floor opening at each landing shall be guarded on sides not used for entrance or exit by a standard railing and toeboard or by panels or wire mesh of not less than No. 10 U.S. gage, expanded metal of not less than No. 13 U.S. gage or sheet metal of equivalent strength or metal on a frame of angle iron not less than 1 1/4 inch by 1 1/4 inch by 1/8 inch or of 1 1/4 inch iron pipe.

(b) Such rails or guards shall be at least 42 inches in height on the up-running side and 66 inches on the down-running side. If a guardrail is used the section of the guard above the rail may be of the construction specified in subsection (a), or

may consist of vertical metal bars which will reject a ball 6 inches in diameter. Rails or guards shall be located not more than one foot from the edge of the floor opening.

§ 7.226. Protection of entrances and exits.

(a) The entrances and exits at all floors or landings affording access to a manlift shall be guarded by a maze (staggered railing) or a handrail equipped with self-closing gates.

(b) Such rails shall be standard guardrails with toeboards meeting the requirements of a standard railing and toeboard as prescribed in this chapter.

(c) Gates, if used, shall open outward and be self-closing. Corners of such gates shall be rounded.

(d) Maze or staggered openings shall offer no direct passage between enclosure and outer floor space.

(e) Rails shall be located at least 2 feet from the edge of the opening, measured at right angles to the face of the belt and on at least one side parallel with the face of the belt. If lesser clearance exists on the opposite side it shall be uniform throughout the travel of the manlift. The intersection of the top rail and the end post at openings shall be a bend or standard long sweep ell.

(f) Entrances at all landings shall be in the same relative position, except where the building layout prevents.

§ 7.227. Bottom arrangement.

(a) At the bottom landing the clear area shall not be smaller than the area enclosed by the guardrails on the floors above, and any wall in front of the down-running side of the belt shall be not less than 48 inches from the face of the belt. Such space shall not be encroached upon by stairs or ladder.

(b) The lower, or boot pulley shall be installed so that it is supported by the lowest landing served.

(c) A mounting platform shall be provided in front or to one side of the up-run at the lowest landing, unless the floor level is such that the floor or platform is at or above the point at which the upper surface of the ascending step assumes a horizontal position.

(d) An allowance for belt stretch shall be made in the original layout.

§ 7.228. Top clearances.

(a) A top clearance shall be provided of at least 11 feet above the top terminal landing. Such clearance shall be maintained from a plane through each face of the belt to a vertical cylindrical plane having a diameter of 2 feet greater than the diameter of the floor opening, and extending upward from the top floor to the ceiling on the up-running side of the belt. No encroachment of structural or machine-supporting members within such space is permitted.

(b) There shall be a clearance of at least 5 feet between the center of the head pulley shaft and any ceiling obstruction. The center of the head-pulley shaft shall be not less than six feet above the top terminal landing.

§ 7.229. Emergency exit ladders.

A fixed metal ladder accessible from both the up and down-run of the manlift shall be provided when the vertical distance between landings exceeds 20 feet, and be in accordance with existing laws governing ladders. An enclosing cage shall not be provided.

Cross References

This section cited in 34 Pa. Code § 7.223 (relating to landings).

§ 7.230. Illumination.

Both runs of a manlift shall be illuminated at all times when it is in operation. An intensity of not less than 1 foot-candle shall be maintained at all points. Landings shall be illuminated as provided in § 7.223 (relating to landings).

§ 7.231. Machines.

(a) *Types.* Machines shall be of the direct-connected type or shall be driven by multiple V-belts. Cast iron gears shall not be used.

(b) *Brake.* A mechanically-applied, electrically released brake shall be applied to the motor shaft for direct connected units or to the input shaft for belt-driven units. The brake shall be capable of stopping and holding the manlift when the descending side is loaded with 250 pounds on each step.

(c) *Belt.* Belts shall conform to the following:

(1) *Material.* The belts shall be made of hardwoven canvas, rubber-coated canvas, leather, or other material meeting the strength requirements of paragraph(s) of this subsection, and having a coefficient of friction such that when used in conjunction with an adequate tension device it will meet the brake test specified in subsection (b).

(2) *Width.* The width of belts shall conform to the following:

| <i>Minimum Width (in inches)</i> | <i>Total Travel (in feet)</i> |
|--------------------------------------|-----------------------------------|
| 12 | 0—100 |
| 14 | 100—150 |
| 16 | More than 150 |

(3) *Strength.* The strength of belts shall be not less than 1,500 pounds per inch of belt width for belts having a distance between pulley centers not in excess of 100 feet and 1,800 pounds per inch of belt width for belts having a distance between pulley centers of over 100 feet but in excess of 200 feet for over 200 feet, 2,450 pounds per inch of belt width.

(4) *Belt fastenings.* Belts shall be fastened by a lapped splice or shall be butt-spliced with a strap on each side of the belt as follows:

(i) For lapped splices, the overlap of the belt at the splice shall be not less than three feet when the total travel of the manlift does not exceed 100 feet and not less than four feet if the travel exceeds 100 feet.

(ii) When butt splices are used the straps shall extend not less than 3 feet on one side of the butt for a travel not in excess of 100 feet and 4 feet for a travel in excess of 100 feet.

(iii) For 12 inch belts, the joint shall be fastened with not less than 20 special elevator bolts, each of a minimum diameter of 1/4 inch. Such bolts shall be arranged symmetrically in five rows so arranged as to cover the area of the joint effectively. Reference should be made to Exhibit B of § 7.232 (relating to exhibits—safety diagrams).

(iv) The minimum number of bolts for a belt width of 14 inches shall be not less than 23 and for belt widths of 16 inches, the number of bolts shall be not less than 27.

(5) *Pulleys.* Drive pulleys and idler or boot pulleys shall have a diameter of not less than 20 inches.

(d) *Pulley protection.* The machine shall be so designed and constructed as to catch and hold the driving pulley in the event of shaft failure.

§ 7.232. Exhibits—safety diagrams.

The following diagrams identified as Exhibits A—C show safety standards for manlifts:

EXHIBIT A

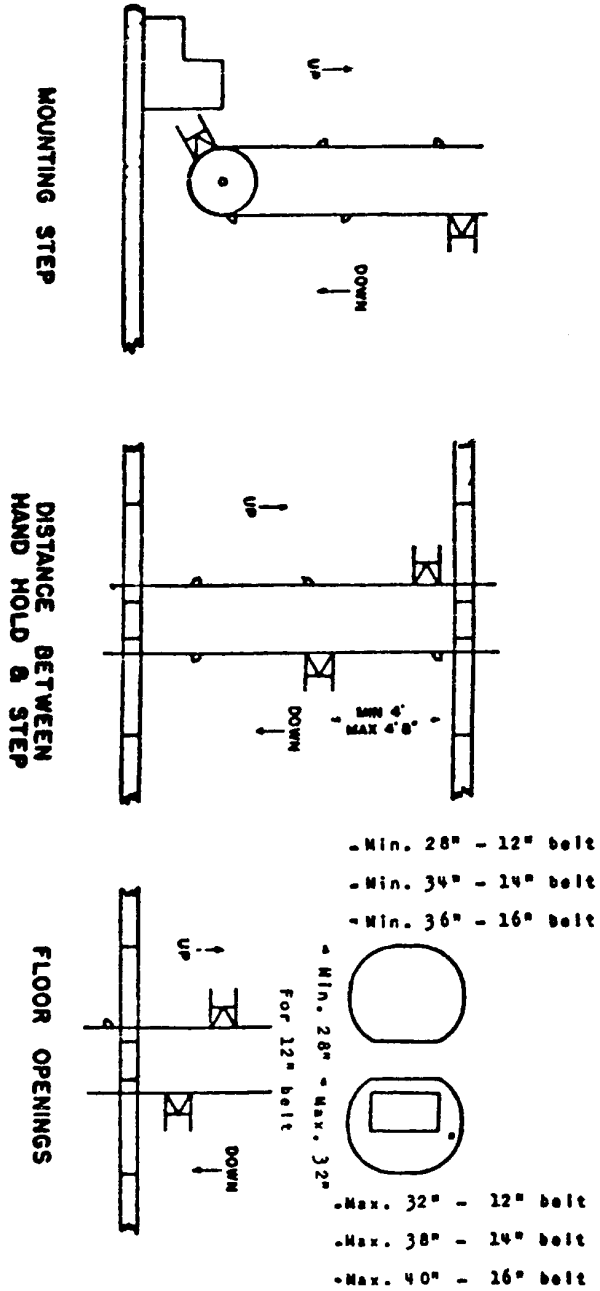


EXHIBIT B

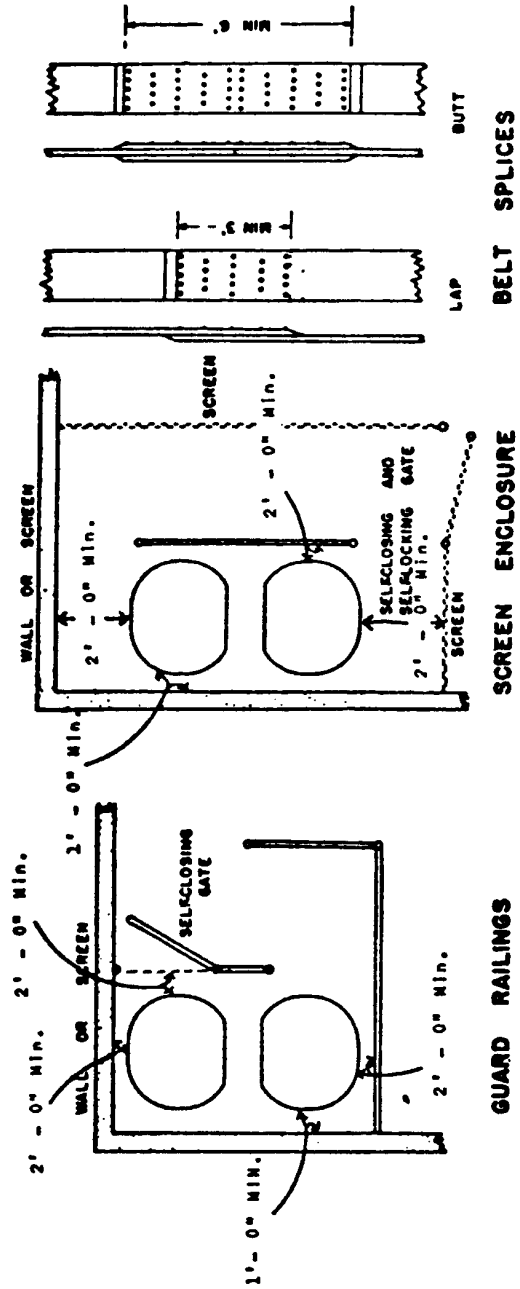
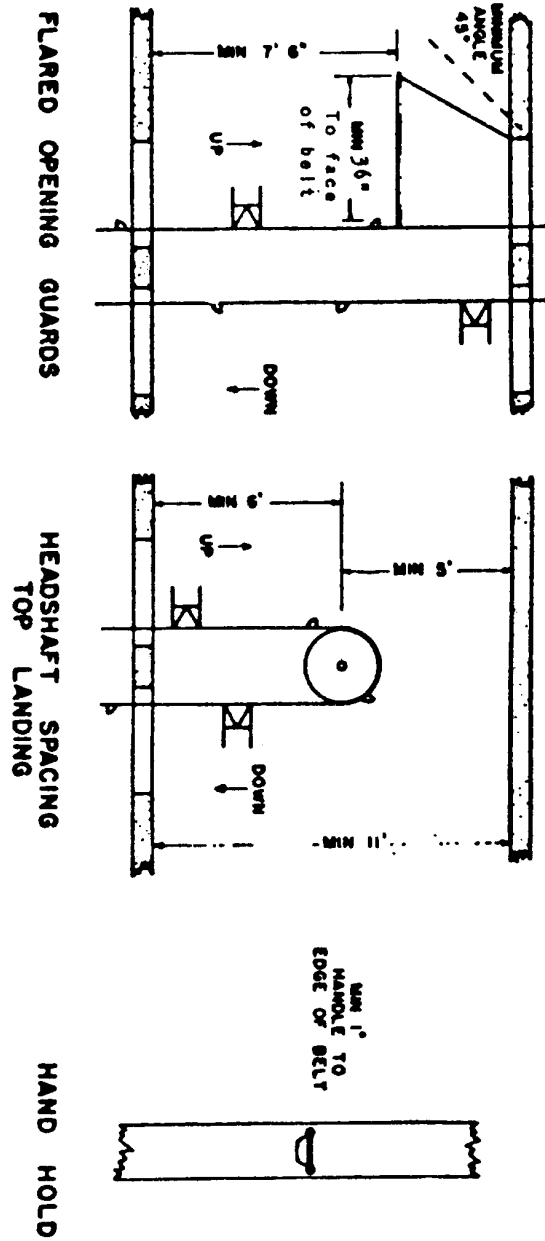


EXHIBIT C



Cross References

This section cited in 34 Pa. Code § 7.231 (relating to machines).

§ 7.233. Speed.

No manlift designed for a speed in excess of 80 feet per minute shall be installed.

§ 7.234. Steps.

(a) Steps or platforms shall be not less than 12 inches nor more than 14 inches deep, measured from the belt to the edge of the step or platform.

(b) The width of a step or platform shall be not less than the width of the belt to which it is attached.

(c) The distance between steps shall be equally spaced and not less than nine feet, measured from the upper surface of one step to the upper surface of the step above it.

(d) The surface of a step shall approximately make a horizontal position with the up and down-run of the belt.

(e) The upper or working surfaces of steps shall be of a material having inherent nonslip characteristics or be covered completely by a securely fastened nonslip tread.

(f) When subjected to a load of 400 pounds applied at the approximate center of the step, step frames or supports and their guides shall be of adequate strength to prevent any of the following:

(1) The disengagement of any step roller.

(2) Any appreciable misalignment.

(3) Any visible deformation of a step or its support.

(g) No step shall be provided unless there is a corresponding handhold above or below it meeting the requirements of § 7.235 (relating to handholds). If a step is removed permanently for repairs, the handholds immediately above and below it shall be removed before the lift is again placed in service.

§ 7.235. Handholds.

(a) Handholds attached to a belt shall be provided and so installed that they are not less than four feet nor more than 4 feet 8 inches, above the step tread, and shall be so located as to be available on both the up and down-run of the belt.

(b) The grab surface of handholds shall be not less than 4 1/2 inches in width. Fastenings shall not come within 1 inch of the edge of the belt.

(c) Handholds shall be capable of withstanding without damage a load of 300 pounds applied parallel to the run of the belt.

(d) No handhold shall be provided without a corresponding step. If a handhold is removed permanently or temporarily, the corresponding step and handhold for the opposite direction of travel shall also be removed before the lift is placed in service.

- (e) Handholds shall be of the closed type.

Cross References

This section cited in 34 Pa. Code § 7.234 (relating to steps).

§ 7.236. Stops.

(a) *Up limit stop.* Two separate automatic stop devices shall be provided to cut off the power and supply the brake when a loaded step passes the upper terminal landing, in accordance with the following:

(1) One automatic stop device shall consist of a switch mechanically operated by the belt or step roller. The other shall consist of one of the following:

- (i) A roller switch placed above and out of line with the first limit switch.
- (ii) A photocell and light source (electric eye).
- (iii) A switch actuated by a lever, rod or plate, the latter placed above the head pulley so as to just clear a passing step.

(2) After the manlift is stopped it shall be necessary to reset the automatic stop manually. The device shall be so located at the top landing that a person resetting it shall have a clear view of both the up and down-runs of the manlift. It shall not be possible to reset the device from any step or platform.

(3) The stopping device shall function so that the manlift is stopped before the loaded step has reached a point 24 inches above the top terminal landing.

(4) Electrical requirements are as follows:

- (i) When switches open the main motor circuit directly they shall be of the multiple type.
- (ii) When photoelectric devices are used they shall be so designed and installed that the failure of the light sources, light sensitive element, or of any other vacuum tubes employed in the circuit will result in shutting off the power to the driving motor.
- (iii) Unless of the oil-immersed type, controller contacts carrying the main motor current shall be copper to carbon, except when the circuit is broken at two or more points simultaneously.
- (iv) Electric manlifts, operated by polyphases alternating current motors, shall be provided with relays of the potential type or other approved devices, which prevent starting the motor if the phase rotation is in the wrong direction, or if there is a failure in any phase.

(b) *Down limit stop.* An automatic stop device shall be provided to cut off the power and apply the brake if a loaded step passes the bottom terminal landing.

(c) *Emergency stop.* An emergency stop means shall be provided, in accordance with the following:

- (1) The stop means shall be within easy reach of the ascending and descending runs of the belt.

(2) The stop means shall be so connected with the control lever or operating mechanism that it cuts off the power and applies the brake when pulled in the direction of travel.

(3) The stop may consist of a cotton rope with a wire center, manila or sisal rope, or may be made of suitable lengths of metallic pipe or tubing. If rope is used, it shall be not less than 3/8 inch in diameter. Wire rope, unless marlin-covered, shall not be used.

(4) The emergency stop may be used for normal starting and stopping where the manlift does not run continuously.

§ 7.237. Safety.

All parts of the machine shall have a factor of safety of six based on a load of 200 pounds on each horizontal step on the up and down-runs. Any stresses set up during acceleration or stopping are presumed to be taken care of in such factor of safety.

§ 7.238. Signs required.

(a) *Instruction signs.* Signs of conspicuous and easily read style giving instructions for the use of the manlift shall be posted at each landing or stenciled on the belt. Such signs shall be of letters not less than one inch in height and of a color having high contrast with the surface on which it is stenciled or painted, such as white or yellow on black or black on white or gray. The instruction shall read approximately as follows:

Face the belt.

Use the handhold.

To stop—pull rope.

(b) *Top floor warning.* At the top floor an illuminated sign shall be displayed, and shall conform to the following:

(1) It shall bear the words, "Top floor—get off."

(2) Such signs shall be in block letters not less than 2 inches in height.

(3) The sign shall be located within easy view of an ascending passenger and not more than 2 feet above the top terminal landing.

(4) As an alternate for such sign, a red light of not less than a 40-watt rating may be provided immediately below the upper terminal landing and so located as to shine in the face of a passenger.

(c) *Visitor warning.* A conspicuous sign having the legend: "Employees only—visitors keep off," shall be displayed at each landing. Such sign shall be of block letters not less than 2 inches in height and of a color offering high contrast with the background color.

§ 7.239. Carriage of materials and tools.

(a) No freight or packaged goods shall be carried on a manlift.

(b) No pipe, lumber or other construction material shall be carried on a manlift.

(c) No tools, except those which fit entirely within a pocket in usual working clothes, shall be carried on a manlift, except as provided in subsection (d).

(d) Tools may be carried in a canvas bag not larger than 11 by 13 inches and provided with carrying loops or handles. Such bag shall be provided with a leather bottom, and not provided with shoulder straps, but shall be carried in the hands of passengers while riding the manlift.

§ 7.240. Acceptance tests.

(a) *Up capacity.* A manlift with 200 pounds on each horizontal step of the up-run shall show no appreciable slip of the belt when standing or running at rated speed.

(b) *Down capacity.* A manlift with 200 pounds on each horizontal step of the down-run shall show no appreciable slip of the belt when standing or running at rated speed. The brake shall stop and hold the belt with test load.

(c) *Loaded step deflection.* Each step shall be subject to a 400-pound proof load applied to the center of the step with the machine stationary. The guides shall not be displaced and there shall be no visible deformation or misalignment of the step or its support during the test.

(d) *Strength of handhold.* Each handhold shall support a load of 300 pounds without appreciable deformation or injury to its fastenings. Such test shall be made with the machine stationary.

(e) *Final limit stop.* The “up” final limit shall be tested by placing a weight of 100 pounds on the approximate center of the step or platform and running the machine in the “up” direction until the lift is stopped by the limit stop.

(f) *Emergency stop.* The machine shall be stopped on both the up and down-run by means of the emergency stop.

(g) *Speed.* Speed shall be taken and checked against specified (rated) speed. It shall not exceed the rated speed by more than 10% when running empty.

Subchapter H. STAIRWAY INCLINED LIFTS IN BUILDINGS OTHER THAN PRIVATE RESIDENCES

| | |
|--------|--|
| Sec. | |
| 7.251. | General. |
| 7.252. | Capacity, load and speed. |
| 7.253. | Carriages. |
| 7.254. | Free passageway on stairway. |
| 7.255. | Power unit. |
| 7.256. | Operating device. |
| 7.257. | Winding drums, sheaves and rope grooves. |
| 7.258. | Connecting means. |

- 7.259. Terminal stopping devices.
- 7.260. Machine brake and driving machine.
- 7.261. Electric wiring.

§ 7.251. General.

The installation of stairway inclined lifts in buildings other than private residences is prohibited, except when all of the following are complied with, as well as the specifications set forth in the remainder of this Subchapter:

- (1) The lift shall not be installed on stairway locations which interfere with or obstruct full legal egress from the buildings, as required by Chapter 37 of this Title (relating to protection from fire and panic).
- (2) No lift shall be installed or operated having a greater incline than 38 degrees from the horizontal.
- (3) Each installation is subject to the requirements of §§ 7.11—7.17 of this Title (relating to administration) and § 7.31 of this Title (relating to submission and approval of plans). Regular inspections shall be made at least every 12 months.
- (4) In no case shall such lift provide transportation between more than two consecutive floors. Travel shall be limited to 35 feet, as measured on the incline.

§ 7.252. Capacity, load and speed.

- (a) The capacity of stairway inclined lifts in buildings other than private residences shall not exceed two persons.
- (b) The rated load shall be not less than 250 pounds for a single seat lift and not less than 400 pounds for a lift having two seats.
- (c) The rated speed measured along the incline shall not exceed 50 feet per minute.

§ 7.253. Carriages.

- (a) *Specifications.* The carriage or chair shall have a foot platform with a seat or seats and an outer arm rest and a back so arranged as to provide safe support for passengers, provided they are of the self-locking type. Swivel-type seats are permitted.
- (b) *Truck and guides.* The carriage shall be securely anchored to a truck which supports it. The truck shall be retained in a track or guide rail assembly. Supporting guide rails shall be securely anchored to the stairs or sidewall.
- (c) *Factor of safety.* The factor of safety used in the design of the carriage, truck, guide rails, sprockets and sheaves shall be not less than five, based on the rated load.
- (d) *Safety devices.* The carriage shall be provided with a safety of the instantaneous type operating on failure or slackening of the hoisting rope or chain. A slack-rope or chain switch shall be provided which removes power from the

motor and brake if the hoisting rope or chain fails or slackens. An exception exists where self-locking drives utilizing a lead screw or other positive gearing will stop and hold the carriage with rated load within less than four inches of down travel after power is removed.

§ 7.254. Free passageway on stairway.

Equipment shall be so constructed as to permit a free passageway width of not less than 32 inches throughout the length of the stairway. If the seat and platform fold automatically when not in use, this clearance may be measured from the folded position.

§ 7.255. Power unit.

The power unit may be mounted on the carriage or placed at a remote location. If remotely located, all intervening sheaves or sprockets shall be placed so that the rope or chain travels in proper alignment. All sheaves shall be enclosed or guarded.

§ 7.256. Operating device.

Operating shall be by continuous-pressure, key-operated switches, at the terminal landings only. Switches shall be so arranged that they do not remain in the "run" position unless forcibly held in such position, and automatically return to the "off" position and the key ejected from the switch if released. Keys shall be placed only in the hands of designated responsible persons and not be indiscriminately distributed, so that operation of the device may be closely supervised by a competent person at a terminal landing only. Key switches shall be so located as to permit an unobstructed view of the entire length of travel of the lift.

§ 7.257. Winding drums, sheaves and rope grooves.

Winding drums and sheaves shall be composed of cast iron or steel. The diameter of drums or sheaves shall be not less than 30 times the diameter of the wire hoist-ropes and shall have machined rope-grooves. An exception exists when eight by 19 elevator wire rope or seven by 19 aircraft cable is used as a connecting means between the carriage and the driving machine, the diameter of drums and sheaves may be reduced to 21 times the diameter of the rope or cable.

Source

The provisions of this § 7.257 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (8127).

§ 7.258. Connecting means.

(a) When the carriage is connected to the driving machine by a rope, cable or chain, any one of the following connecting means may be used:

- (1) Steel or iron elevator wire rope.

- (2) Steel aircraft cable.
- (3) Roller chain.
- (b) The diameter of ropes or cables shall be not less than the following:
 - (1) 1/4 inch for elevator wire rope.
 - (2) 1/8 inch for aircraft cable.
- (c) The connecting means shall have a factor of safety of not less than seven, based on the tension in the rope, cable, or chain when raising the carriage and its rated load. In no case shall the rated breaking strength of the rope, cable, or chain be less than 1,800 pounds.

§ 7.259. Terminal stopping devices.

Upper and lower normal terminal stopping switches operated by the carriage shall be provided and set to stop it at the normal top and bottom terminals of travel. A final terminal stopping switch, operated by the carriage, shall be provided and set to stop it should overtravel of the normal top terminal occur. The final terminal stopping device shall prevent movement of the carriage in both directions of travel. The normal and final terminal stopping devices shall not control the same switches on the controller unless two or more independent switches are provided, two of which shall be closed to complete the motor and brake circuits in each direction of travel.

§ 7.260. Machine brake and driving machine.

(a) A machine brake of the electrically-released, spring-applied type shall be provided. Self-locking drives utilizing a lead-screw or other positive gearing which will stop and hold the carriage with rated load within four inches of down travel after power is removed are excepted.

(b) The driving machine shall be directly connected to the motor, or may be connected to the motor by multiple V-belts, or by a multiple-link, belt-type chain. Where a chain-drive or belt-drive machine is used, a broken-chain or broken-belt device shall be provided to remove power from the motor and brake if the chain or belt fails or slackens.

§ 7.261. Electric wiring.

Electric wiring shall comply with Chapter 39, Subchapter B (relating to electric safety).

Subchapter I. FREIGHT ELEVATORS**GENERAL REQUIREMENTS**

| | |
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| 7.273. | Shaftway equipment. |
| 7.274. | Shaftway clearances. |
| 7.275. | Landing doors. |
| 7.276. | Latches. |
| 7.277. | Locking devices. |
| 7.278. | Landing gates. |
| 7.279. | Machinery. |
| 7.280. | Cables. |
| 7.281. | Elevator cars. |
| 7.282. | Speed and capacity. |
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SPECIAL REQUIREMENTS

| | |
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| 7.293. | Automatic and dual control freight elevators. |
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GENERAL REQUIREMENTS**§ 7.271. Applicability.**

This Subchapter applies to all types of freight elevators.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.272. Shaftway construction.

(a) *New shaftways—general.* Shaftways of freight elevators erected in buildings over two stories in height shall be constructed of fire-resistive material, except when overhead loads are carried on a steel or angle iron tower, or by the

structural parts of the building, in which case fire-resistive curtain walls may be provided in lieu of such fire-resistive material. There shall be no opening except for necessary fire-resistive doors, windows or skylights. When basement machines are installed, and the openings in the shaftway walls for cables or sheaves exceed ten square feet, the machine rooms shall be constructed of fire-resistive material. When fire-resistive construction is not required the shaftways of freight elevators shall be enclosed with a solid or substantial grille or latticework on all sides from floor to ceiling, except at landing gates and doors. The open spaces in such grille or latticework shall be such that a ball two inches in diameter will not pass, and the wire or material used shall not be less than No. 10 standard steel wire gauge (0.135 inch). When bordering on counterweight runways, or when moving parts are within four inches of such enclosures, the open spaces shall be such that a ball 3/8 inch in diameter will not pass. Machine room doors shall be locked at all times, except when repairs are being made or when the machinery is being inspected or serviced. Oil-electric pump units installed in basement areas will not require a machine room provided the controller is enclosed in a fire-resistive cabinet equipped with a lock and the pumping unit is properly guarded.

(b) *Existing shaftways—general.* The shaftways of freight elevators, when not completely enclosed with fire-resistive or other construction, shall be encased with a solid or wire mesh enclosure to a height of at least 6 feet from the floor at all landings. If wire screen is used it shall not be greater than two inch mesh and of not less than No. 10 standard steel wire gauge 0.135 inch in diameter. When moving parts are within 4 inches of the shaftway enclosures, such enclosures shall be covered with wire screen of not more than 3/8 inch mesh, to a height of not less than 6 feet from the floor and to a distance of at least 6 inches to the right and left of such moving parts. When shaftways are equipped with automatic horizontal hatch covers, standard railings and toeboards may be substituted for the enclosure specified in this subsection, if they are located at least 12 inches from the line of the shaftway. When in the judgment of the Department, fire-resistive construction is necessary for the protection of the occupants of buildings or employes, such construction shall be provided.

(c) *Grillework and enclosing walls.* The grillework and enclosing walls of freight elevator shaftways shall be flush with all floor openings at landings, as well as with the line of the elevator shaftway at each side; except that approved landing gates may be operated inside of the shaftway or enclosure.

(d) *Windows into shaftways.* Windows in the outside walls of buildings opening into new freight elevator shaftways shall be constructed of fire-resistive materials. In all cases, windows shall be set in fixed sash. Elevator shaftway windows located within the first seven stories above a street or within four stories of the roof of an adjacent building shall be fitted with approved metal bars or rods at least 5/8 inch in diameter, spaced not more than 10 inches apart except where inside window protection is provided in accordance with subsection (e). Such

window guards shall be provided in existing installations when, in the judgment of the Department, they are necessary.

(e) *Recesses in shaftway walls.* Recesses other than for windows or recesses other than necessary for installation of elevator equipment, are not permitted. Beams, floor slabs or other building construction shall not project more than 4 inches inside the general line of the hoistway unless the top surface of the projection is beveled at an angle of not less than 75° with the horizontal. When setbacks occur in the enclosure wall, the top of the setback shall be beveled at an angle of not less than 75° with horizontal. Separator beams between adjacent elevators are not required to have bevels. The following also apply:

(1) *New installations.* Recesses or offsets in shaftways of fireproof construction, except door lintels in the enclosing walk on the open sides of the car, shall be protected by substantial curtain walls, grating or vertical bars set flush with the interior walls of the shaftway, the distance between the vertical members not to exceed two inches. Such grating or bars shall be of metal. No part of the curtain walls, grating or bars shall be more than 7 inches from the car platform on any open side of the car. When the distance between the edge of the car top and rear shaftway wall exceeds 18 inches, a protective railing shall be installed the width of the car.

(2) *Existing installations.* When the distance from car sill to shaftway wall on any open side of car exceeds 7 inches, curtain walls, fascia plates, vertical metal bars spaced not more than 2 inches, or a substantial metal grille of not more than 2 inch mesh, shall be provided, unless the car gate on that side is equipped with an approved interlock. When such clearance exceeds 15 inches, the car door shall be solid and equipped with an approved interlock or the shaftway constructed as specified.

(f) *Overhead loads.* Overhead loads shall conform to the following:

(1) *All installations.* When overhead loads are carried on angle iron towers or on structural parts of a building, such supports, as well as the supporting members, shall possess in strength a factor of safety of not less than six for steel, eight for concrete and ten for cast iron or timber. It is recommended that such factors of safety be applied to a total load assumed to be equal to the weight of all apparatus resting on the supports plus twice the weight of the maximum load to be suspended from the supports. When medium steel, cast iron, ash or yellow pine is used, sections shall be proportioned upon an ultimate tensile strength (in pounds per square inch) of 60,000 for medium steel, 16,000 for cast iron, 9,000 for ash and 9,000 for yellow pine. Cast iron shall not be used in tension.

(2) *New installations.* When overhead loads are carried by bearing walls of brick, concrete or other approved materials, and such walls are erected independently of walls carrying building loads or resisting stresses, or when independent shaftway and building walls jointly carry loads, they shall be designed

and constructed in accordance with the values governing safe bearing loads, as set forth in the following table:

*Safe Bearing Loads
Brickwork*

| <i>Method</i> | <i>Pounds per Square Inch</i> |
|--------------------------------|-------------------------------|
| Laid in lime mortar | 100 |
| Laid in Portland cement mortar | 200 |
| Laid in Rosedale cement mortar | 150 |

Masonry

| <i>Material</i> | <i>Pounds per Square Inch</i> |
|--|-------------------------------|
| Granite, capstone | 700 |
| Sandstone, squared | 350 |
| Sandstone, capstone | 350 |
| Stonework, squared | 175 |
| Rubble stonework in lime mortar | 80 |
| Rubble stonework in cement mortar | 150 |
| Limestone, capstone | 500 |
| Square stonework | 250 |
| Rubble, in mortar | 80 |
| Rubble, in cement mortar | 150 |
| Concrete (one part Portland, two parts sand and five parts broken stone) | 150 |

Foundation Soils

| <i>Material</i> | <i>Tons per Square Foot</i> |
|---------------------------------------|-----------------------------|
| Hard rock in native bed | 100 |
| Rock equal to ashlar masonry | 25—40 |
| Rock equal to best brick | 15—20 |
| Clay beds, dry and thick | 4—6 |
| Clay beds, moderately dry and thick | 2—4 |
| Clay beds, soft | 1—2 |
| Gravel and coarse sand, well cemented | 8—10 |
| Sand, well cemented and compact | 4—6 |
| Sand, clean and dry | 2—4 |
| Quicksand, alluvial soils, etc. | 0.5—1 |

(3) *Existing installations.* Existing shaftway construction is acceptable when, in the judgment of the Department, such construction is composed of materials of the proper strength and quality, in consideration of the fire hazards and the loads to which such walls or shaftway construction are subjected.

(g) *Other types of shaftways.* Shaftways, in addition to conforming to the requirements of subsection (b), shall comply with the following:

(1) *Contiguous shaftways.* When freight elevator shaftways are contiguous, and are required to be of fire-resistive construction, it is not necessary to erect walls between such shaftways. This applies equally to cases where freight and passenger elevator shaftways are contiguous.

(2) *Shaftways not extending to entire height of buildings.* New freight elevator shaftways required to be of fire-resistive construction which do not extend to the entire height of a building, shall be protected by an unpierced covering, constructed of approved fire-resistive materials.

(3) *Shaftways used as thoroughfares.* No new elevator shaftway shall be used as a thoroughfare when the elevator is above, below, or at the landing, except upon special permission of the Department. Existing shaftways used as thoroughfares may be required to be removed or reerected in new locations or their use as thoroughfares abandoned.

(h) *Required depth of shaftways.* Freight elevator shaftways and counterweight runways shall be constructed with the pit floors and runways covered with concrete or other approved fire-resistive material to a thickness of at least four inches when the pit floor is located in the lowest cellar or basement. When the space below the shaftway is used as a passageway or is occupied by persons, or if unoccupied, is not secured against unauthorized access, the cars and counterweights shall be provided with governor-operated safeties, except that safeties operated as a result of the breaking of the suspension means may be used for dumbwaiters. Car and counterweight-buffer supports shall be of sufficient strength to withstand without failure the impact resulting from buffer engagement at governor-tripping speed or at 125% of rated speed where no governor is provided.

(i) *Shaftway enclosures.* When elevators are operated outside of building walls the shaftway shall be enclosed to a height of at least 12 feet except that when such elevators have two or more car openings the shaftway enclosure shall be extended the full height of the car travel on the sides where such openings occur. Such enclosures may consist of substantial wire mesh.

(j) *Skylights and ventilators.* Skylights and ventilators are permitted in freight elevator shaftways, provided the walls of the shaftways are continued to a point not less than three feet above the level of the roof. Skylights and glass ventilators shall be made of wire glass not less than 1/4 inch in thickness.

(k) *Penthouses.* When penthouses are constructed over fire-resistive freight elevator shaftways, they shall be made of approved fire-resistive materials and a permanent means of entrance other than through the shaftway shall be provided.

Penthouse doors shall be locked at all times, except when repairs are being made or when the machinery is being inspected or serviced. Penthouses shall have not less than a clear inside height of 6 feet and shall permit free access to all parts of machinery and apparatus therein. Existing penthouses are not required to be made fire-resistive unless existing conditions necessitate such construction. Access to all penthouses, overhead machinery, and machine rooms shall be provided by means other than through the shaftway.

Cross References

This section cited in 34 Pa. Code § 7.279 (relating to machinery); 34 Pa. Code § 7.291 (relating to general); and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.273. Shaftway equipment.

(a) *Bumpers.* Power-driven freight elevators, except those of the sidewalk type, shall be constructed with solid, spring, air, or oil bumpers, or equivalent devices. Such bumpers or equivalent devices, except solid bumpers, shall be capable of reducing the velocity of the elevator car at the maximum rate of 64.4 feet per second, with a load of 150 pounds, descending at full speed. Solid bumpers are permissible in connection with a car speed of 50 feet per minute or less. Spring, air, or oil bumpers, or their equivalent, shall be used in connection with a car speed in excess of 50 feet per minute and not exceeding 125 feet per minute. When oil bumpers are used, gauges shall be provided to indicate the amount of oil in them. Bumpers shall be so located as to strike the center sill or girder of the elevator car. Bumpers shall be tested by running the car into them with rated load in the car and with a minimum load of 150 pounds in the car at a car speed of not more than 115% of rated speed. Where reduced stroke oil bumpers conforming to Rule 201.4a-2, ANSI A17.1-1971, are permitted, they shall be tested in accordance with this subsection. Bumpers are required in existing installations unless, in the judgment of the Department, conditions necessitate their installation. Bumpers shall be provided for counterweights under the same conditions as required for cars. Where reduced stroke oil bumpers are permitted and where an emergency terminal speed limiting device conforming to the requirements of Rule 209.4, ANSI A17.1-1971, is installed which will limit the speed at which the car or counterweight may strike its bumper, the bumpers shall be tested by running the car into them with rated load in the car and with a minimum load of 150 pounds in the car at a car speed of not more than 115% of the predetermined reduced speed.

(b) *Openings in pit bottoms.* There shall be no openings in the pit bottoms of new shaftways except those necessary for wires or cables used in the operation of the elevator mechanism or for drainage. Doors may be installed to provide access into elevator pits but in such instances they shall be kept locked, with the key retained in the permanent possession of a responsible person. In pits over 5 feet in depth, a permanent metal ladder shall be installed to provide access from

the lowest landing entrance, except when an access door to the pit is provided. The Department may, in its discretion, request the elimination of such openings when necessary for the safe operation of existing installations.

(c) *Overhead protecting platforms.* A substantial iron or wood working platform, capable of sustaining a live load of not less than 50 pounds to the square foot, shall be securely fastened underneath the overhead machinery of all new freight elevators, except when a reinforced concrete roof or ceiling is located beneath such machinery. The greatest dimensions of the open spaces in such platform shall not be more than 1 inch, except for open spaces necessary for cables. If of wood, the platform shall be at least two inches in thickness and shall be of solid construction, with the exception of the spaces for cables. Platforms shall cover the entire area of the shaftway, except when the area exceeds 100 square feet, in which case platforms may be provided under the portion of the shaftway occupied by machinery and constructed so as to provide a working space of at least two feet beyond the edge of the machinery. In such cases the areas covered by platforms shall be provided with standard railings and toeboards. If doors are placed in platforms they shall be accessible from the top of the car and shall be hinged so that they open upwards. Such doors shall be automatically self-closing. Platforms shall be provided in existing installations as specified, except that the same concessions granted for shaftway areas in excess of 100 square feet will be granted for shaftway areas in excess of 80 square feet. Existing platforms may remain in position when, in the judgment of the Department, they are sufficiently strong.

(d) *Counterweights.* Counterweights shall comply with the following:

(1) *All installations.* When counterweights operate in elevator shaftways, the exposed sides of the runways shall be provided with solid substantial guards to a height of not less than 7 feet from the bottom of the pit. A shorter guard, elevated to a height of 7 feet, may be used, but in such case the clearance between the bottom of the pit and the lowest point of the guard shall not exceed 12 inches. When compensating chains or cables are used from the car to the counterweights, the guarding at the bottom of the shaftway may be eliminated. When the counterweights do not operate in elevator shaftways, they shall be entirely enclosed on all sides. When independent car counterweights are used, they shall be so proportioned as not to cause the slackening of any cables during the starting or stopping of the elevator car. When winding drum machines are used, there shall be a permanent substantial beam or bar at the top of counterweight guides and beneath the counterweight sheaves to prevent the counterweights from being drawn into the sheaves.

(2) *New installations.* Counterweights shall operate within the shaftway in guides, and their various sections shall be securely fastened together by thru-bolts, secured in position by nuts, locknuts and cotterpins.

(3) *Existing installations.* Counterweights shall operate in guides or in substantial boxing, the interior surfaces of which shall be flush.

(e) *Guide rails.* Guide rails shall conform to Section 200 of ANSI A17.1-1971 Code, Rules 200.1 through 200.11 inclusive and all subsequent amendments thereto. Guide rails may remain in position if they are of substantial and suitable proportions for the car speed, load, and travel and for the proper functioning of car safety devices. Guide rails for cars and counterweights shall be permanently and securely fastened in position and have securely anchored footings.

(f) *Beveled plates.* On sides where there are car openings, substantial beveled plates of metal or of wood with metal facing (substantial hardwood bevels are acceptable in lieu of metal facing in existing installations) shall be located under all thresholds, beams, and other fixed construction projecting into the shaftway beyond its flush line. The beveled plates shall extend from the edge of the projection to the wall or to a point at least four inches horizontally from the edge of the car, and the beveled surfaces shall have an angle of at least 60° with the horizontal. An angle of 75° is preferred. In lieu of the plates the beveled surfaces may be of concrete troweled to a smooth finish.

Source

The provisions of this § 7.273 amended through September 17, 1976, 6 Pa.B. 2277. Immediately preceding text appears at serial pages (8136) and (17302).

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general); and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.274. Shaftway clearances.

Shaftway clearances shall conform to the following:

(1) New freight elevators, except handpower, sidewalk, plunger, hydraulic or plunger hydrosteam types, shall be so constructed that the minimum clearance between the highest point of the elevator car crosshead and the lowest point of any overhead construction when the car platform is flush with the upper terminal landing and the minimum clearance between the lowest point of such elevator car bottom of safety plank and the pit floor or top of any construction contained therein when the elevator car is at the lowest terminal landing shall conform to the following table:

| <i>Location</i> | <i>Allowance in Feet</i> | | |
|--------------------|--------------------------|--------------|--------------|
| | <i>Overrun</i> | <i>Clear</i> | <i>Total</i> |
| Top of shaftway | 2 | 2 | 4 |
| Bottom of shaftway | 2 | 2 | 4 |

(2) When bumpers are used, the clear distances specified in paragraph (4) mean when the bumpers are fully compressed.

(3) For speeds in excess of 125 feet per minute, the table set forth for passenger elevators in § 7.53 (relating to shaftway clearances) shall apply.

(4) Plunger hydraulic and plunger hydrosteam elevators shall be so constructed that the minimum clearance between the lowest point of any overhead construction and the top of the crosshead is two feet when the car platform has reached its highest possible limit of travel. The installation of plungers longer than necessary for present travel is prohibited unless the plunger is provided with a positive mechanical stop which would be adequate to absorb the maximum impact load. The clearance at the bottom, however, shall be the same as for electric freight elevators with an overrun of not less than six inches.

(5) Existing clearances and over travel will be accepted, except where changes are necessary for the safety of repairmen, oilers, and inspectors.

Source

The provisions of this § 7.274 amended through December 21, 1967.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); 34 Pa. Code § 7.298 (relating to gravity elevators); and 34 Pa. Code § 7.300 (relating to electric or oil-electric platform elevators).

§ 7.275. Landing doors.

Landing doors shall be provided in conformance with the following:

(1) *All installations.* The shaftways of freight elevators, where required to be of fire-resistive construction, shall be equipped at floor landings with approved fire-resistive landing doors. New installation of such doors shall be of approved one-hour fire-resistive construction and shall bear the certification to this effect from a recognized official testing laboratory. The maximum clearance between the doors, sills, lintels, and frames shall not exceed 7/8 inch. The doors shall also comply with the following:

(i) Landing doors shall be mounted on the interior walls of the shaftway, except that they may be mounted on the exterior wall of the shaftway if the entrances to such shaftway are further protected by standard gates, as specified in § 7.278 (relating to landing gates). Vertical or horizontal sliding or rolling doors may be opened but shall not be closed by independent power, except when the mechanism employed is approved by the Board. When vertical doors are operated by independent power, they may be opened automatically but shall be closed manually or by constant-pressure pushbuttons. The speed of such doors shall not exceed one foot per second and the drive shall be of a type that permits easy arrest of the progress of the doors in the event of contact with any obstruction. In such cases means shall be provided to permit the manual operation of the landing doors and car doors or gates from within the car in the event of failure of power. Doors of the swinging type shall be so mounted that the inside surface of the door is not

more than four inches from the inside surface of the door sill. The width of the shaftway opening when the landing door is in a fully open position, shall not be greater than the width of the car opening.

(ii) Substantial stops shall be provided for both sections of a vertical biparting elevator door to prevent either door from dropping below the range of normal travel.

(iii) New installations of semiautomatic, counterbalanced, biparting and two-speed types of doors are prohibited. Existing semiautomatic, biparting shaftway doors shall be so changed as to be manually operated and all such doors shall be provided with approved locking devices.

(2) *Existing installations.* Landing doors, except those for automatic control and double-button control elevators, shall be equipped with latches arranged so that they may be unlocked only from the inside, except that the main or lowest landing door may be arranged to also open from outside the shaftway by means of a removable key.

(3) *New installations.* The main or parking floor door of all elevators, except double-button control, automatic control and dual control, shall be provided with a removable service key by which the door may be opened when the car is at that landing. Such service key shall be located where it is available to responsible authorized persons at all times. The landing doors at the lowest level and next floor above all elevators shall be equipped in such a manner that they may be opened, regardless of the location of the car, with a formed emergency key which is located under glass in the entry way or corridor on the lowest floor.

Source

The provisions of this § 7.275 amended through March 26, 1969.

Cross References

This section cited in 34 Pa. Code § 7.189 (relating to hoistway doors); 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); 34 Pa. Code § 7.297 (relating to hand elevators); and 34 Pa. Code § 7.298 (relating to gravity elevators).

§ 7.276. Latches.

Latches shall be provided on the shaftway side of all landing doors for power-driven freight elevators, except automatic control elevators, which effectively lock the doors when they are in a closed position. This requirement does not apply when the landing doors are on the outside of the shaftway and the entrance is further protected by a landing gate. Such latches shall operate to prevent the opening of the doors from the landing side, except when the car is at the landing.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); 34 Pa. Code § 7.297 (relating to hand elevators); and 34 Pa. Code § 7.298 (relating to gravity elevators).

§ 7.277. Locking devices.

(a) When the landing doors of power-driven freight elevators, except automatic control elevators, are of the manually operating type, an approved automatic locking device shall be placed on, or attached to, such doors. This requirement does not apply when the landing doors are on the outside of the shaftway and the entrance is further protected by a landing gate. The locking device shall prevent the normal operation of the car while the door on the landing at which the car may be standing is open or unsecured. Such locking device shall not be affected by ordinary deviation from true alignment of either the car or landing doors and shall not project into the shaftway to such an extent as to create a hazard.

(b) Each locking device installed shall be stamped or otherwise have irremovably placed on such device a type or model number which corresponds to the type or model number listed with the Department when such device was approved. No change shall be made in the design of approved locking devices unless the Board is notified and has acquiesced in such change. No locking device of any kind other than approved-type interlocks is permitted on any hoistway door.

(c) When springs are used in locking devices to create and maintain a condition of safety, they shall be of such strength as to insure against a hazardous condition through breakage or misplacement.

(d) The installation of emergency releases on freight elevators is prohibited.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); 34 Pa. Code § 7.297 (relating to hand elevators); and 34 Pa. Code § 7.298 (relating to gravity elevators).

§ 7.278. Landing gates.

(a) *Where required.* Landing gates shall be provided at the landings of all freight elevator shaftways not required to be constructed of fire-resistive materials. Gates shall also be provided at each landing of freight elevator shaftways constructed of fire-resistive materials when the fire doors are located on the exterior walls of the shaftway.

(b) *Construction.* Landing gates required under subsection (a) shall conform to the following:

(1) Gates shall be made of metal or of wood of at least as great a fibre strength as ash, and shall be rigid. When gates are made of slats or strips, the

distance between such slats or strips shall not exceed 2 inches. The joints of wood gate frames shall be reinforced with metal.

(2) When gates are of wire mesh they shall be of substantial construction and the mesh shall be of such dimensions that a ball 2 inches in diameter will not pass. In all instances they shall be so constructed as to be able to resist 150 pounds of pressure at the middle without permanent deformation.

(3) Gates shall not be less than 5 feet, 6 inches in height from the floor to the top of the upper horizontal member, and the clearance between the floor and the lowest horizontal member shall not be greater than 6 inches, provided that when the story heights are such that a gate 5 feet, 6 inches in height with a 6 inch underclearance is not practicable, the gates may be of the telescoping type, made in two or three sections.

(4) Gates and counterweights shall be properly balanced.

(c) *Types of gates permitted.* The following are the types of gates permitted:

(1) Gates of the manually-operated, vertical-raising balanced type, only when they conform to subsection (h).

(2) Gates of the semiautomatic vertical-raising type.

(3) Gates of the full automatic vertical-raising type, at terminal landings only.

(4) Gates of the manually-operated swinging or horizontal type, only when they conform to subsection (h).

(5) Gates of the power-operated horizontal type, if approved.

(6) Gates may be of standard railing when enclosures consist of standard railing and toeboard, if placed at least 12 inches from the line of the shaftway. Toeboards are not required in such cases.

(7) When local conditions prohibit full compliance with these requirements, other forms of gate construction may be used if satisfactory reasons are given with the application for a permit.

(d) *Protection of outside entrances.* When there are outside entrances to elevator shaftways from streets, alleys, or other thoroughfares, such gates shall not be less than 6 feet in height, and the clearance between the lowest horizontal member and the floor or landing shall not be more than 2 inches. When gates are of wire mesh they shall be of substantial construction and the mesh shall be of such dimensions that a ball 1 1/2 inches in diameter will not pass.

(e) *Tampering with gates.* The gates of shaftway entrances of freight elevators shall not be fastened in an open position or otherwise rendered inoperative.

(f) *Counterweight guards.* Counterweights shall be entirely enclosed with wood or metal or they may operate in open guides when otherwise effectively guarded.

(g) *Grate latches.* New landing gates shall be provided with a latch so arranged that the gate cannot be opened unless the car is at that landing. Existing landing gates shall be provided with a latch so arranged that the gate cannot be opened unless the car is at that landing.

(h) *Locking devices.* When landing gates are of the manually-operated type, which are only permitted when electric brakes are used, an approved automatic locking device shall be placed on, or attached to, such gates. Such locking devices shall prevent the normal operation of the car while the gate on the landing at which the car may be standing is open or unsecured. Such locking devices shall prevent opening of the gates when the car is away from the landing. When gates are of openwork construction a shield of sufficient size to prevent access to the lock from the outside of the shaftway shall be provided.

Cross References

This section cited in 34 Pa. Code § 7.111 (relating to shaftway construction); 34 Pa. Code § 7.189 (relating to hoistway doors); 34 Pa. Code § 7.275 (relating to landing doors); 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); 34 Pa. Code § 7.297 (relating to hand elevators); and 34 Pa. Code § 7.298 (relating to gravity elevators).

§ 7.279. Machinery.

(a) Overhead machinery for freight elevators in new installations shall be securely fastened or cleated to its supports to prevent movement. Cleats are not required where the ropes lead perpendicularly from both sides of the driving shaft. Overhead bearings, except for hand elevators, shall be placed on the tops of the beams or structural parts to which they may be secured, except that idler sheaves may be placed below the beams, provided the parts of the bearings in tension are of steel or wrought iron. Such supports shall possess a strength as specified in § 7.272 (relating to shaftway construction). When necessary in existing installations, the Department may require that overhead machinery be relocated or so changed as to conform to safe practices.

(b) No new machinery, except hydraulic plunger elevators, may be located directly under an elevator shaftway. Existing machinery may remain in place if there is sufficient pit depth, buffer support, and no other hazards involved, and subject to approval by the Board.

(c) Set screw fastenings shall not be used in lieu of keys in the construction or installation of hoisting and car safety mechanisms in existing installations. Set screws or pins shall not be used in lieu of keys in the construction of new hoisting and car safety mechanisms, except when the device has been approved by the Department.

(d) The operation of any elevator by friction gearing or clutch mechanism is prohibited where such mechanisms form the primary means for the transmission of the power required to operate the elevator at normal speed.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general) and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.280. Cables.

(a) *Number required.* At least two hoisting and two counterweight cables shall be provided on all new freight elevators raised and lowered by cables. At least three hoisting cables shall be used on new traction-type freight elevators. The operation of existing elevators having only one hoisting cable is prohibited unless the diameter and material of the cable is adequate to safely carry the maximum load with a factor of safety as designated in subsection (c), and if the elevator car is equipped with approved car safeties.

(b) *Material and diameter.* Hoisting and counterweight cables shall be made of iron or steel of good quality. The minimum diameter permitted for any type of cable is 1/2 inch. When different diameters of cables than those given in subsection (c) are necessary, they shall be computed on the same ratio as shown in that subsection. When the material of existing hoisting and counterweight cables is unknown, such cables shall be assumed to be of iron and the lifting capacity of the installation calculated accordingly.

(c) *Factors of safety.* No hoist or counterweight cable shall be stressed beyond a factor of safety as follows:

| <i>Cable Speed (in feet per minute)</i> | <i>Factor of Safty</i> |
|---|------------------------|
| 50 | 6.65 |
| 100 | 7.00 |
| 150 | 7.30 |
| 200 | 7.65 |
| 250 | 7.90 |
| 300 | 8.20 |
| 350 | 8.45 |
| 400 | 8.70 |
| 450 | 8.90 |
| 500 | 9.15 |
| 600 | 9.50 |
| 700 | 9.80 |
| 800 | 10.00 |
| 900 | 10.15 |
| 1000 | 10.30 |
| 1200 | 10.50 |
| 1400 | 10.55 |
| 1500 | 10.55 |

(d) *Cable fastenings.* Only approved types of cable fastenings shall be used.

(e) *Cables located outside of shaftways.* When the installation of an elevator requires cables to pass through the floors outside of the elevator shaftways, they shall be boxed on all sides with solid enclosures, or standard metal guards shall be provided to a height of at least 6 feet.

(f) *Diameters of sheaves and drums.* The diameters of drums and sheaves in new installations shall be at least 40 times the diameter of the cable used, except for sidewalk elevators. Drum and sheave diameters in existing installations may be accepted, except where changes are considered necessary by the Department.

(g) *Number of turns of cables.* There shall be at least 1 1/2 wraps of hoisting and counterweight cables on the drums of freight elevators of the winding drum type when either the car or counterweights are at the limits of travel. The ends of the cables shall be clamped on the inside of the drum.

(h) *Cable equalizers.* Cables shall be provided with a means of equalizing. Drum-type elevators shall be provided with eveners. On existing installations the requirements for cable equalizers need not be complied with until the next cable renewal. Such equalizers shall be fastened in position by thru-bolts, each bolt to be provided with a nut, locknut and cotterpin. Coil or helical springs, when used, shall be of a design which will not permit full compression under normal load.

(i) *Reshackling.* The car hoist and drum counterweights ropes of power-driven elevators having drum-type driving machines shall be reshackled every two years, except where auxiliary rope fastening devices are installed. Reshackling is required when the auxiliary rope fastener indicates failure of any rope fastening. Crosby clips and heart shackles shall be included. Two-to-one roped underslung drum elevators are exempted. A metal tag shall be placed on the rope to show the reshackling date and the person who performed the work.

(j) *Metal data tags.* A metal data tag shall be securely attached to one of the wire rope fastenings and a new tag shall be installed at each rope renewal. Data tag shall bear the following:

- (1) The diameter in inches.
- (2) The rated breaking strength, as rated by the manufacturer.
- (3) The grade of material used.
- (4) The month and year the ropes were installed.
- (5) Whether the ropes were nonpreformed or performed.
- (6) The construction classification.
- (7) The name of the person or firm who installed the ropes.
- (8) The name of the manufacturer of the rope.

Source

The provisions of this § 7.280 amended through June 28, 1967.

Cross References

This section cited in 34 Pa. Code § 7.36 (relating to data plates and numbering); 34 Pa. Code § 7.291 (relating to general); and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.281. Elevator cars.

(a) The cars of new power-driven freight elevators shall have all sides not used as a means of ingress or egress solidly enclosed. Grille, perforated or solid

metal may be used from a point 6 feet above the car floor to the underside of the car top. The tops of freight elevator cars shall be provided with a cover, solid or of grillework, capable of sustaining a concentrated load of 150 pounds at any point. If wire mesh is used it shall not be less than No. 10 standard steel wire gauge, 0.135 inch in diameter, and the mesh shall be such that a ball 1 1/2 inches in diameter will not pass. Such protecting tops or covers shall be set back not more than 6 inches from the landing threshold and be hinged to a depth of not less than 18 inches on the landing sides. Car slings, frames and girdles on all elevators installed after January 1, 1943, shall be constructed of steel. Elevators in existing fire-resistive shaftways are not required to have car tops. Such tops are also not required in connection with elevators when all gates above the bottom story have their underclearances eliminated and shaftway enclosures extend to the ceiling.

(b) When there is more than one opening to a car, all openings, except the one nearest the operator, shall be provided with a car gate of the horizontal collapsible type or of the semiautomatic vertical-raising type, except on existing one-story elevators when the clearance between the car and the shaftway is not greater than 2 inches and when the shaftway forms a smooth surface without projections throughout the travel of the car. When the horizontal collapsible type of gate is used, the construction shall be such that a 4 1/2 inch ball will not pass when the gate is fully extended, and the upright channels shall not be more than 18 inches apart.

(c) If gates of the horizontal collapsible type are used in installations provided with electric brakes they shall all be equipped with an electrical or mechanical device so constructed and installed that the car is held immovable when the gates are in an open position. If gates of the vertical-raising type are used, they shall be extended to the car floor and an electric contact shall be provided where practicable. This requirement does not apply to existing installations where automatic hatch covers are permitted.

(d) Car gates which are not provided with the locking devices required in subsection (c) shall be equipped with latches so arranged that the gates cannot be opened from the outside of the shaftway. Car gates shall have a minimum height of 5 feet, 6 inches.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general) and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); and 34 Pa. Code § 7.298 (relating to gravity elevators).

§ 7.282. Speed and capacity.

Belted and chain-driven freight elevators hereafter installed shall not have a rated speed of more than 75 feet per minute. When the car speed of electric and hydraulic freight elevators is in excess of 125 feet per minute, such installations

shall be made to conform to the requirements of this chapter for passenger elevators, except as to lifting capacity and shaftway doors.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general) and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.283. Safety requirements.

(a) *Slack cable device.* A slack cable device shall be used in connection with all power-driven freight elevator machinery of the winding drum type which will automatically shut off the power, apply the brake, and stop the machinery if the car is obstructed in its descent. The device shall be so designed and installed that, after functioning, the mere resetting of the device is not sufficient to move the elevator car unless the operator is in the car and starts it in the normal manner.

(b) *Shaftway limit switches.* Direct connected drum-type elevators shall be equipped with upper and lower final limit switches regardless of car travel or speed. All other electric freight elevators having magnetic brakes shall be provided with upper and lower final limit switches, except traction type with a speed of less than 125 feet per minute. Final limit switches shall automatically cut off the current, apply the brake and stop the machinery, and may be located in the shaftway with a cam on the car or on the car with cams in the shaftway. When necessary because of flood conditions, lower shaftway limit switches may be actuated by the counterweight at the top of the shaftway. All cams actuating limit switches shall be of metal. A stopping switch may also be mounted on the elevator car in addition to limit switches in the shaftway, and so arranged as to be actuated by stationary inclines placed in the shaftway at the upper and lower limits of travel. A sequence relay shall be installed in connection with final limit and direction switches of all electric rope control freight elevators, so connected as to require the centering of the controlling mechanism before the elevator car may be placed in operation. Friction-type governors without cable clamp dogs are not permitted.

(c) *Automatic terminal stops.* Automatic terminal stops shall be provided on the machines of all power-driven freight elevators of the winding drum type. Such devices shall operate independently of the car controlling mechanism.

(d) *Brakes.* Power-driven freight elevators, except hydraulic elevators, shall be equipped with an effective brake which automatically engages when the controlling mechanism of the elevator car is in a "stop" position. Electric brakes are required in all existing elevators where electric interlocks are installed. In such instances the requirements of subsection (b), and §§ 7.285(b) and 7.292(d) (relating to control apparatus; and electric freight elevators) shall be met. When a direct current elevator motor or motors derive current from an alternating current power source through a nonrotating rectifying unit, means shall be provided to absorb a sufficient amount of energy regenerated by the motor or motors under

overhauling load conditions to prevent any elevator from attaining at any time, or under any conditions of load, more than 120 % of the contract speed of the elevator. When a single rectifier is installed to supply power for a number of elevators, or elevators in conjunction with other electrical equipment in the building, separate means for absorbing the generated power shall be installed for each elevator and other equipment in the building shall not be depended upon for the absorption of this power.

(e) *Car safeties.* Car safeties are required in conformance with the following:

(1) *New installations.* New power-driven freight elevator cars suspended from cables shall be provided with car safeties located under the car floors. Such safeties shall be capable of stopping or holding the elevator car at any point of its travel. Freight elevators having a speed of 100 feet per minute or less shall be provided with car safeties actuated by a centrifugal speed governor, except when the car travel does not exceed 20 feet, in which case car safeties of the spring grip or broken rope type may be used. When the speed exceeds 100 feet per minute, regardless of car travel, the car shall be provided with car safeties of the friction clamp or other approved type, actuated by a centrifugal speed governor in such a manner as to bring the elevator car to a gradual stop within a distance of approximately 8 feet. A rack and pawl are not acceptable as a car safety device. Tiller rope construction shall not be used for governor cables except when used for the portion of the cable wound on the safety drum. Governor cables shall be of iron or steel, monel metal, phosphor bronze or equivalent, and shall not be less than 3/8 inch in diameter. The size, material and construction of the governor rope, and the proper tripping speed of the governor, shall be stamped on the governor stand or on a brass plate attached to it in letters not less than 1/4 inch in height.

(2) *Existing installations.* When no car safeties are provided, they shall be installed in accordance with the requirements for new installations. Existing car safeties may remain in their present position if they are, upon being tested, found to be reliable. Otherwise, they shall be replaced by new car safeties in accordance with the requirements for new installations. A rack and pawl is not acceptable as a car safety device. Whenever necessary to renew governor ropes or cables, such renewals shall conform to the requirements for new construction.

(f) *Signs—riders.* Power-driven freight elevators shall have signs posted at every landing and in the elevator car prohibiting all persons, except the operator and not more than three designated assistants from riding on such car. See also § 7.12(d) (relating to rules of operation).

(g) *Illumination.* The landings of all freight elevators shall be adequately illuminated at all times when the building is in use so that the entrance to the elevator car can be readily observed.

Cross References

This section cited in 34 Pa. Code § 7.285 (relating to control apparatus); 34 Pa. Code § 7.291 (relating to general); 34 Pa. Code § 7.295 (relating to hydraulic freight elevators); and 34 Pa. Code § 7.296 (relating to belted and silent chain drive elevators).

§ 7.284. Motive power.

The motive power of all freight elevators shall be one of the following:

- (1) Direct-connected electric (drum or traction).
- (2) Hydraulic plunger.
- (3) Horizontal or vertical cylinder.
- (4) Single belted.
- (5) Silent chain.
- (6) Hand.
- (7) Gravity.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general) and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

§ 7.285. Control apparatus.

(a) *Types.* Permissible types of control for freight elevators are as follows:

(1) *New installations.* The controlling mechanism of all new freight elevators shall be restricted to such types as car switch, automatic, double-button control, wheel or lever (hydraulic).

(2) *Existing installations.* Existing power-driven elevators operated by rope or cables shall have manually-operated landing doors or gates equipped with approved electric interlocks. In such instances, the requirements of subsection (b) of this section and §§ 7.283(b) and 7.296(d) (relating to safety requirements; belted and silent chain drive elevators). In hydraulic elevators that are operated by hand-cable control, the gates shall be made manually closeable and equipped with approved type interlocks.

(b) *Electric control switches.* Electric car control switches shall be so designed and installed in new cars that, upon removal of the hand of the operator, the switch will automatically return to the "off" position. Low voltage and no voltage protection shall be provided on all new electric elevators so that the elevator car will not restart upon the restoration of voltage or service until the operator has first moved the controller to the "off" position. Low voltage and no voltage protection shall be provided for existing hand rope control elevators having electric brakes, so that the elevator car will not restart upon the restoration of voltage or service until the operator has first moved the control to the "off" position.

Cross References

This section cited in 34 Pa. Code § 7.283 (relating to safety requirements); 34 Pa. Code § 7.291 (relating to general); and 34 Pa. Code § 7.295 (relating to hydraulic freight elevators).

SPECIAL REQUIREMENTS**§ 7.291. General.**

In addition to the special requirements of this section and §§ 7.291—7.300 for various types of freight elevators, the general requirements contained in §§ 7.271—7.285 and 7.31—7.37 shall also be complied with, except in cases of direct conflict, where these special requirements shall govern.

§ 7.292. Electric freight elevators.

(a) All electric freight elevators operated by polyphase alternating current motors shall be provided with relays of the potential type, or other approved devices, which will prevent the starting of the motor if the phase rotation is in the wrong direction, or if there is a failure in any phase.

(b) No potential differences in excess of 250 volts shall be used in connection with the car switch or automatic control circuits of new electric freight elevators. When direct current is the only available source of power and it is impracticable to keep within this requirement, application may be made to the Department for special permission to use a higher voltage. Full information shall be given with each application for a special permit. When step-down transformers are used in connection with an alternating current car switch and automatic control circuits, they shall be of the two-winding type.

(c) When the operating apparatus of an existing electric freight elevator has a potential difference in excess of 250 volts, the hand control ropes or cables shall be provided with insulating balls, placed to prevent elevator operators from receiving electric shocks.

(d) An emergency stop switch shall be installed in every new electric elevator car when the hoisting machine is equipped with an electric brake. Such a switch shall operate to open a main line switch independent of the car-controlling circuit wiring. An emergency switch shall be installed in each existing electric elevator car when the hoisting machine is equipped with an electric brake and shall operate to open a main line switch independent of the car-controlling circuit wiring.

(e) In all installations where the power for elevator control switches is dependent upon main line circuit breakers, potential switches or other similar electric apparatus, connections shall be made so that the operation of any fire alarm system connected to such main line circuit breakers, potential switches or other similar electric apparatus, will not cut off the power to the elevator control circuit.

(f) The machine controllers of all electric freight elevators shall be equipped with a potential switch of either the manual or power-closing type, so designed that when the current is interrupted from any cause whatever it will automatically apply the brake and stop the elevator car.

(g) Switches shall be provided in connection with new electric freight elevators so that the motor control circuit and the brake control circuit are opened before or at the time the governor trips. Switches shall be provided in existing electric freight elevators so that the motor control circuit and the brake control circuit are opened before or at the time the governor trips or when the safety operates.

Cross References

This section cited in 34 Pa. Code § 7.283 (relating to safety requirements); 34 Pa. Code § 7.291 (relating to general); and 34 Pa. Code § 7.296 (relating to belted and silent chain drive elevators).

§ 7.293. Automatic and dual control freight elevators.

(a) *Automatic control freight elevators.* Automatic control freight elevators shall not be constructed and installed unless a special permit has been obtained from the Department. Their use shall at all times be subject to special regulations applied to them for the protection of the public and employees. Such elevators are subject to the provisions covering automatic control passenger elevators, as set forth in § 7.73 (relating to automatic control passenger elevators), except as to capacity or side exits. Shaftway gates or doors may be of the same type as permitted for freight elevators of car switch control.

(b) *Dual control freight elevators.* Dual control freight elevators are subject to the provisions covering dual control passenger elevators, as set forth in § 7.74 (relating to dual control passenger elevators), except that capacity is included in the list of exemptions, and shaftway gates or doors may be of the same type as permitted for freight elevators of car switch control.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.294. Double-button control freight elevators.

(a) *Permit.* Double-button control freight elevators shall not be constructed and installed unless a special permit is obtained from the Department. Their use is at all times subject to special regulations applied to them by the Department for the protection of the public employees.

(b) *Wiring.* Means shall be provided to prevent any interference from hall buttons or switches. When an elevator is being operated from within the car, such means shall be automatic, or provision shall be made to enable the person operating the elevator from within the car to prevent interference from landing buttons or switches, and to maintain complete control of the car.

(c) *Emergency stop switches.* In addition to the directional buttons in the cars of double-button control elevators, an emergency stop switch shall be provided in the car to enable the person operating the elevator from within the car to stop the car at any point of its travel.

(d) *Speed.* Double-button control freight elevators shall be limited to a speed not exceeding 100 feet per minute.

(e) *Landing doors.* Landing doors shall be provided as follows:

(1) *All installations.* The shaftways of double-button control freight elevators, when required to be of fire-resistive construction, shall be equipped at floor landings with approved manually-operated, fire-resistive landing doors. Such doors shall be mounted on the interior walls of the shaftway, except that they may be mounted on the exterior walls of the shaftway if entrances to such shaftway are further protected by standard gates, as specified for use with double-button control freight elevators. The width of the shaftway opening, when the landing door is in the fully open position, shall not be greater than the width of the car opening.

(2) *New installations.* When vertical or horizontal-sliding landing doors are located on the inside of the shaftway, shaftway gates may be omitted, and such shaftway landing doors shall be provided with an approved interlock and retiring cam so that the door may not be opened unless the car is at that landing and shall prevent the operation of the car while any door is open.

(3) *Existing installations.* Landing doors on existing installations shall be equipped with approved automatic locking devices.

(4) *Locking devices.* When springs are used in locking devices to create and maintain a condition of safety, they shall be of such strength as to insure against a hazardous condition through breakage or misplacement.

(f) *Landing gates.* Landing gates shall conform to the following:

(1) *Location.* Gates shall be provided at each landing of all freight elevator shaftways where the shaftways are not required to be constructed of fire-resistive materials. Gates shall also be provided at each landing of freight elevator shaftways constructed of fire-resistive materials when the fire doors are located on the exterior walls of the shaftway.

(2) *Specifications.* Gates shall be made of metal or of wood of at least as great a fiber strength as ash, and shall be rigid. When gates are made of slats or strips, the distance between such slats or strips shall not exceed 2 inches and the joints of wood gate frames shall be reinforced with metal. When gates are made of wire mesh construction, the mesh shall be of such dimensions that a ball 2 inches in diameter will not pass. In all instances they shall be so constructed as to be able to resist 150 pounds pressure at the middle without permanent deformation. Gates shall be not less than 5 feet, 6 inches in height from the floor to the top of the upper horizontal member, and the clearance between the floor and the lowest horizontal member shall not be greater than 6 inches. When the story heights are such that a gate 5 feet, 6 inches in height with 6

inches underclearance is not practicable, the gates may be of the telescoping type made in two or three sections. Gates and counterweights shall be properly balanced.

(3) *Permissible types.* The following types of gates are permitted with double-button control freight elevators:

- (i) Manually-operated, vertical-raising balanced type.
- (ii) Manually-operated horizontal type.
- (iii) Manually-operated swing type.

(4) *Locking devices.* All new landing gates shall be provided with an approved interlock and retiring cam, so arranged that the gate cannot be opened unless the car is at the landing. All existing landing gates shall be equipped with an approved automatic locking device.

(g) *Gates at outside entrances.* When there are outside entrances to elevator shaftways from streets, alleys or other thoroughfares, all such gates shall be not less than 6 feet in height, and the clearance between the lowest horizontal member and the floor or landing shall not exceed 2 inches. When such gates are of wood, metal, or other open construction, they shall be covered with a wire mesh such that a ball 1 1/2 inches in diameter will not pass. The gates of shaftway entrances of freight elevators shall not be fastened in an open position, or otherwise rendered inoperative. Counterweights for such gates shall be entirely closed with wood or metal, or they may operate in open guides otherwise effectively guarded.

(h) *Car gates.* Openings on double-button control freight elevators shall be provided with car gates equipped with electric contacts so constructed and installed that the car is held immovable when the gate is in an open position.

(i) *Pushbuttons—prohibition.* Pushbuttons shall not be permitted to control the operation of elevators in school buildings, sanitariums for the weak-minded, and similar classes of building where there is danger of the abuse of the purpose of such buttons, unless the pushbuttons are made inaccessible to the occupants or are key operated. A decision on this point should be made at the time of the approval of the plans for the elevators.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.295. Hydraulic freight elevators.

Plunger and cylinder freight elevators, when possible, shall be constructed, installed, and operated in accordance with the requirements of §§ 7.271—7.285 and 7.76, except that the requirement governing capacity does not apply to freight elevators coming under this subchapter.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.296. Belted and silent chain drive elevators.

(a) *Worm gear.* Newly installed single belted or chain drive elevators shall be of the worm gear type and be overbalanced by at least one third.

(b) *Counterweights.* All cars shall be properly counterweighted, except that if existing installations are not counterweighted they may be permitted to operate, provided the absence of such counterweights does not constitute a menace, as determined by the Department.

(c) *Speed control.* Safety mechanisms shall be provided so that in the event of a broken belt or chain the car does not attain a dangerous speed, with or without a load. In lieu of installing cut-out switches, the installation of at least three V-belt drives will be accepted.

(d) *Electric brakes.* Elevators covered by this section shall be equipped with an electric brake. Electric brakes are required in all cases where electric interlocks are installed in existing structures. In such instances, the requirements of §§ 7.283(b) and 7.292(d) (relating to safety requirements; and electric freight elevators) shall also be met.

Cross References

This section cited in 34 Pa. Code § 7.285 (relating to control apparatus); and 34 Pa. Code § 7.291 (relating to general).

§ 7.297. Hand elevators.

(a) *Car travel.* New hand elevators shall not have a car travel in excess of four stories, or 60 feet.

(b) *Conversion to power drive elevators.* No hand elevator shall be equipped with any attachments or equipment for applying power, unless the hoisting machinery is permanently and completely converted into power-driven machinery. In such cases, all requirements of this chapter for power-driven freight elevators shall be complied with.

(c) *Clearances.* New hand freight elevators shall be so installed that the minimum clearance between the highest point of the elevator car and the underside of the protecting platform or grating under the overhead machinery shall not be less than 2 feet. There shall be a minimum clearance of two feet between the lowest point of the car, when at the lower limit of travel, and the bottom of the pit. Existing clearances and over travel may be accepted, except when changes are considered necessary by the Department for the safety of repairmen, oilers and inspectors.

(d) *Counterweights.* The counterweights of all hand elevators shall operate in guides, or in substantial boxing, the interior surfaces of which shall be flush and free from all projections. They shall be so arranged that they will land on a sol-

idly constructed bottom of the counterweight runway when the car platform is not more than 6 inches above the upper terminal landing.

(e) *Mounting of overhead machinery.* New overhead machinery shall be supported by a substantial frame. When it is necessary to suspend bearings for sheaves or pull wheels, such bearings shall be secured to their supports by steel or wrought iron straps. When considered necessary by the Department, existing overhead machinery shall be relocated or changed to conform to safe practices.

(f) *Latches.* Latches shall be provided which function in the manner prescribed by §§ 7.275—7.278 (relating to landing doors; latches; locking devices; and landing gates).

(g) *Car enclosures.* The cars of all hand elevators shall be solidly enclosed on at least two sides to a height of 6 feet or to the upper car beam.

(h) *Brakes.* The cars of each hand elevator shall be equipped with a substantial brake. The weight which balances the brake band shall be secured by an auxiliary chain or rope to prevent the weight from falling down the shaftway.

(i) *Speed governors.* When the car travel of new hand elevators is over two stories, or 30 feet, a centrifugal speed governor shall be provided to control the speed of the car in its descent.

(j) *Car safeties.* The cars of new hand elevators shall be fitted with substantial car safeties. When hand-operated elevators installed prior to December 15, 1924, carry only light loads and travel less than 15 feet, the installation of car safeties may be waived upon application to the Board, provided that all other requirements of this Chapter are complied with.

(k) *Location of pull ropes.* New hand elevators shall be so designed and installed that the pull rope is located on the landing side of the shaftway enclosure.

(l) *Cable or rope locks.* Hand elevators shall be provided with a cable or rope lock which, when locked, will prevent the car from being operated from any other floor or landing.

(m) *Gates.* The gates for new hand elevators shall be of the semiautomatic type, except that at terminal landings they may be of the full automatic type. Existing gates shall be replaced by other equipment if the Department so requires.

(n) *Signs required.* Hand elevators shall have signs posted at every landing and in the elevator car prohibiting all persons from riding on such elevator, except when special permission is granted by the Department.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.298. Gravity elevators.

(a) *Car travel.* New gravity elevators shall not have a car travel in excess of four stories, or 60 feet.

(b) *Bumpers.* Gravity elevators shall be installed with bumpers which absorb the energy of the elevator car when descending at full speed under full load.

(c) *Shaftway clearances.* Shaftway clearances shall be in accordance with the requirements of § 7.274 (relating to shaftway clearances).

(d) *Counterweights.* Counterweights shall be so installed that they will land on a solidly constructed bottom of the counterweight runway when the car platform is not more than 6 inches above the upper terminal landing.

(e) *Counterbalancing.* When two cars of gravity elevators are so arranged as to counterbalance each other, the hoisting cables shall be properly secured to the car beams. The use of mechanisms on the car beams of such elevators for car adjustment to various floor levels is prohibited.

(f) *Latches.* Latches shall be provided which function in the manner prescribed by §§ 7.275—7.278 (relating to landing doors; latches; locking devices; and landing gates).

(g) *Car enclosures.* The cars of new gravity elevators shall be solidly enclosed on at least two sides, to a height of 6 feet or to the upper car beam, except when the shaftway enclosures extend to the ceiling on all but the top floor. Protecting tops for cars of gravity elevators shall be provided as required by § 7.281 (relating to elevator cars).

(h) *Brakes.* Gravity elevators shall be provided with dependable brakes which effectively control the speed of the car during ascent or descent. Such brakes shall also function to automatically hold the car immovable and secure at any landing at which it is standing.

(i) *Speed governors.* When the car travel of gravity elevators is over two stories, or 30 feet, a centrifugal speed governor shall be provided which will control the speed of the car in its descent.

(j) *Car safeties.* The cars of gravity elevators shall be fitted with substantial car safeties.

(k) *Cable or rope locks.* Gravity elevators shall be provided with a cable or rope lock which, when locked, will prevent the car from being operated from any other floor or landing.

(l) *Gates.* The gates for new gravity elevators shall be of the semi-automatic type, except that at terminal landings they may be of the full automatic type. Existing gates shall be replaced by new equipment if the Department so requires.

(m) *Signs required.* Gravity elevators shall have signs posted at every landing and in the elevator car prohibiting all persons from riding on such elevator, except when special permission is granted by the Department.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.299. Automobile elevators.

(a) New freight elevators for automobile service shall have a car platform of sufficient strength to support a load equal to 70% of the live load when concentrated equally at any two points, 4 feet, 8 1/2 inches apart on a line parallel with the entrance sill to the car. Existing automobile elevators shall comply with the provisions of this chapter for existing freight elevators.

(b) Construction of automobile elevators of the multiple or four point suspension type is prohibited.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

§ 7.300. Electric or oil-electric platform elevators.

Special requirements for electric or oil-electric platform elevators are the following:

- (1) The rise shall not exceed 20 feet.
- (2) The capacity shall not exceed 2,500 pounds.
- (3) The speed shall not exceed 30 feet per minute.
- (4) The platform shall not exceed 36 square feet in area.
- (5) The winding drums and sheaves shall not be less than 14 inches in diameter.
- (6) The machine, motor and controller shall not be placed in the pit, but drums may be placed in the pit under the elevator car.
- (7) Guide rails shall extend from the pit to the top of the shaft and be constructed of steel or iron.
- (8) An elevator shall have at least two cables of not less than 1/2 inch diameter.
- (9) Platform elevators may be used from the basement to the first floor only.
- (10) Spring buffers shall be provided and so placed that the car cannot rest on the drums or drum shaft.
- (11) A pit shall be not less than four feet deep, but is exempt from application of § 7.274 (relating to shaftway clearances).
- (12) Elevators may be of the two-point suspension type, but not of the four-point suspension type.
- (13) Cars shall be provided with a safety device of the broken rope or governor type.
- (14) Machines shall be provided with automatic terminal stops and shall have shaftway limit switches at the top and bottom.
- (15) Shaftway enclosure gates or doors and locking devices shall comply with the requirements for freight elevators, except that shaftway enclosures shall be flush from top to bottom.

(16) Control shall be of the car switch, double-button constant pressure or full automatic pushbutton type. Hand rope control is prohibited.

Cross References

This section cited in 34 Pa. Code § 7.291 (relating to general).

Subchapter J. ESCALATORS

| | |
|--------|-------------------------------|
| Sec. | |
| 7.321. | Construction. |
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| 7.324. | Safety equipment. |
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§ 7.321. Construction.

(a) *Angle of inclination.* The angle of inclination of new escalators shall not exceed 30° from the horizontal. The Department may, in its discretion, require that the angle of inclination of existing escalators be lessened if such change is considered necessary for the safety of the public or employees.

(b) *Width.* The width of all new escalators shall be measured between balustrading at a vertical height of 24 inches above the nose line of treads. No escalator shall have a width less than 22 inches or more than 29 inches unless a horizontal tread formation is utilized, in which case the width shall not be greater than 48 inches.

(c) *Enclosures.* Each new escalator shall be enclosed on each side from the handrail to the escalator treads. These enclosures shall, on the escalator side, be smooth without depressed or raised paneling or moulding. There shall be no jogs or abrupt changes in width between the enclosing sides. If a change in width is necessary, it shall not be more than 8.0% of the greatest width and the enclosing sides shall then be moulded to such change at an angle not greater than 15 degrees from the line of escalator travel. The use of glass panels in connection with balustrading is prohibited except when special, approved types of glass are used.

(d) *Strength of truss or girder.* The strength of escalator trusses or girders shall conform to the following:

(1) *Generally.* Escalator trusses and all supporting structure, including tracks, shall conform to the AISC Specification for design, fabrication and erection of structural steel for buildings, 1969.

(2) *New installations.* The escalator truss or girder shall be of sufficient strength to safely retain the escalator treads in their runs, with the maximum

passenger load, should the tread chain break. Escalator trusses or girders shall be designed and constructed with a factor of safety of at least five, based on the static loads.

(3) *Existing installations.* Existing escalators shall be carefully examined under load. The truss or girder shall be able to carry the weight of the treads with the maximum passenger load should the tread chain break.

(e) *Track arrangement.* On new installations the track for guiding an escalator tread shall be so constructed as to prevent the displacement of the upper line of treads if the tread chain breaks.

(f) *Treads and landings.* Escalator treads and landings shall be constructed of material which affords a secure foothold such as wood or material used for safety treads. If the landing is of concrete it shall have edge insertions of metal, wood, or other antislip material.

(g) *Handrails.* New escalators shall be equipped on both sides with moving handrails operating at the speed of the escalator and in the same direction of travel. Existing handrails shall conform to the requirements for new installations if, in the judgment of the Department, such changes are practicable and necessary.

(h) *Reconstruction.* When an existing escalator is removed or reerected in a new location, such reconstruction shall be in conformity with the requirements for new installations.

Source

The provisions of this § 7.321 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial pages (13395) to (13396).

§ 7.322. Drive.

(a) *Motive power arrangement—all installations.* Each escalator shall preferably be driven by an independent electric motor but under no circumstances shall more than two escalators be driven by one motor. The latter arrangement is permissible only when the two are placed so closely together as to be practically one unit.

(b) *Chains.* The strength of chain drives shall conform to the following:

(1) *New installations.* Chains used for driving escalator treads shall have a factor of safety of not less than ten when operating with the full capacity at maximum speed, except when the chains are composed of cast steel links, which shall be thoroughly annealed, in which case the factor of safety shall be not less than 20.

(2) *Existing installations.* Chains used for driving escalator treads shall be of sufficient strength to carry the load without breakage or misplacement. When such chains are in need of renewal, the new chains shall possess a safety factor of not less than ten when the escalator is operating with full capacity at maximum speed.

§ 7.323. Capacity.

The maximum capacity of newly installed escalators shall be determined as follows:

- (1) For escalators 24 inches or less in width, the maximum load shall equal 110 times the horizontally projected length of exposed treads in feet.
- (2) For escalators over 24 inches in width, the maximum load shall equal 4.6 times the width of the escalator in inches times the horizontally projected length of exposed treads in feet.

§ 7.324. Safety equipment.

(a) *Brakes.* Each escalator drive shall be provided with an electrically-released, mechanically-applied brake which automatically stops the escalator if the circuit is opened.

(b) *Emergency stops.* There shall be a button or other type of switch located in a conspicuous position at the top and bottom landings of every escalator and accessible to the public. The operation of such buttons or switches shall cause interruption of the power supply, application of the brake, and stoppage of the escalator. Under no circumstances shall the arrangement be such that these buttons or switches may be used to start the escalator. Such buttons or switches shall be plainly marked "Escalator Stop Button," or "Escalator Stop Switch," as the case may be.

(c) *Starting switches.* When starting buttons or switches are located in such a position as to be of possible access to the public, they shall be either of the key operated type or be enclosed in a box provided with a lock and key.

(d) *Protection against reversal of direction.* Each new escalator operated in the ascending direction shall be equipped with a safety mechanism so that in case of accidental reversal of the motion of the escalator, the power is cut off, the brake applied and the escalator stopped. On a reversible escalator, the safety mechanism shall be so arranged as to be made inoperative when the escalator is descending and operative when the escalator is ascending.

(e) *Protection against broken chains.* New escalators shall be provided with a safety device which will open the power circuit, apply the machine brake, and bring the escalator to a gradual stop if the tread chain or chains break.

(f) *Tension weights.* When new escalators are equipped with tightening devices operating by means of tension weights, provision shall be made to retain such weights in the escalator truss in case the weights should fall.

(g) *Machine room.* There shall be a suitable and permanent lighting fixture in every machine room, the lighting of which may be accomplished without passing or reaching over any part of the machinery. The minimum intensity of illumination shall be 1 foot-candle. In installations constructed after January 1, 1951, the machine room or platform shall also have a minimum clear cross sectional area of 6 square feet to enable inspection and repair of machine and control device

without exposure to electric shock or to operating machinery. This minimum area may include a space made available by providing a removable control cabinet arranged with the trail cables for maintenance or inspection procedures outside the machinery space.

(h) *Access to interior of escalators.* Reasonable access to the interior of all escalators shall be provided for inspection and repair.

Source

The provisions of this § 7.324 amended through September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial pages (15210) to (15211).

Cross References

This section cited in 34 Pa. Code § 7.14 (relating to tests); and 34 Pa. Code § 7.325 (relating to tests).

§ 7.325. Tests.

The following tests shall be run on all new or rebuilt escalator installations:

(1) *Speed test.* The application of the overspeed safety device where so equipped 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.

(2) *Reversal test.* The application of the reversal safety device as prescribed in § 7.324(d) (relating to safety equipment) shall be made by releasing the machine brake and operating the escalator by hand in the reverse direction or by some approved alternate procedure.

(3) *Broken chain test.* The application of the broken chain safety device as specified in § 7.324(e), shall be obtained by operating the safety by hand.

(4) *Miscellaneous tests.* A suitable test of the machine brake, emergency stopping buttons or switches, and other safety features required on escalators shall be made to determine whether they function properly.

Source

The provisions of this § 7.325 amended through September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (15211).

§ 7.326. Prohibition—wheeled vehicles.

Wheeled vehicles are not permitted on escalators.

Subchapter K. DUMBWAITERS

| | |
|--------|--------------------------|
| Sec. | |
| 7.341. | Applicability. |
| 7.342. | Shaftway construction. |
| 7.343. | Landing doors and gates. |
| 7.344. | Machines and bearings. |
| 7.345. | Cars. |
| 7.346. | Cables. |
| 7.347. | Safety requirements. |

§ 7.341. Applicability.

(a) *New installations.* This subchapter applies to all dumbwaiters except handpower dumbwaiters, the car floor of which is less than three square feet in area with a travel not over 12 feet and a rated capacity of not over 75 pounds.

(b) *Existing installations.* This subchapter applies to all dumbwaiters except handpower dumbwaiters, the car floor of which is less than three square feet in area.

Source

The provisions of this § 7.341 amended through February 26, 1969.

§ 7.342. Shaftway construction.

(a) Fire-resistive enclosures shall be provided as follows:

(1) *New installations.* The shaftways of dumbwaiters installed subsequent to December 15, 1924, with car travel of over two stories shall be of fire-resistive construction.

(2) *Existing installations.* The shaftways of dumbwaiters erected after July 1, 1916, and prior to December 15, 1924, shall be constructed of fire-resistive material as follows:

(i) In buildings of frame construction where car travel is over two stories.

(ii) In buildings of ordinary construction where car travel is over three stories.

(iii) In buildings of fire-resistive construction where car travel is over four stories.

(b) In each case where fire-resistive construction is not required in both existing and new installations, shaftways shall be enclosed on all sides not used for loading or unloading from the floor to a height of at least 6 feet. On sides used for loading or unloading, the enclosure shall extend from the floor to the ceiling, except the space required for doors or gates. If, in the judgment of the Department, such shaftways present a fire hazard they shall be entirely enclosed with fire-resistive material.

(c) Ordinary enclosures for dumbwaiter shaftways may be of wire mesh, not less than No. 10 standard steel wire gauge (0.135 inch) or expanded metal, not less than No. 13 U.S. gauge (0.09375 inch). Openings in the mesh shall not exceed 1 1/2 inches. The open spaces in grillework shall not be in excess of 1 1/2 inches between any two members. When straight bars are used which are not filled in with scroll work, there shall not be more than 1 inch space between bars. When wood slats are used they shall not be less than 1 1/2 inches in width by 3/8 inch thick, with a 1 inch space between slats. Such enclosures shall be properly and securely braced and fastened.

Source

The provisions of this § 7.342 amended September 23, 1977, 7 Pa.B. 2696. Immediately preceding text appears at serial page (8165).

§ 7.343. Landing doors and gates.

(a) *All installations.* Shaftway entrances shall be provided with approved gates or doors, which may be of the vertical-sliding or rolling semiautomatic type or of the swinging hinged type. When shaftways are required to be of fire-resistive construction, fire doors shall be provided at all landings. Landing doors and gates shall be equipped with an effective lock or latch. The openings at shaftway entrances shall in no instance be greater than the width and height of the car. Larger openings are permitted, if they are limited to the car size by bolted transoms or side panels.

(b) *New installations.* The shaftway landing doors of power-driven dumbwaiters shall be provided with a locking device which prevents the normal operation of the car so long as any door or doors are in an opened position. Such locking device shall also lock the door or doors on the shaftway side while the car is not at the landing.

(c) *Existing installations.* The shaftway landing doors of power-driven dumbwaiters, except of the automatic control type, shall be self-closing.

§ 7.344. Machines and bearings.

In all new installations, all overhead machinery for dumbwaiters shall be securely fastened to its supports. Overhead bearings, except for handpower dumbwaiters, shall be placed on the tops of the beams or structural parts to which they are secured, except that idler sheaves may be placed below the beams, provided the parts of the bearings in tension are made of steel or wrought iron. When the dumbwaiter machinery is overhead, a substantial fireproof working platform or metal grating capable of sustaining a live load of at least 50 pounds to the square foot, shall be securely fastened underneath the machine. When machines are installed in the pit they shall be accessible through a door opening at the

machine level, and not through any landing door. A substantial platform shall be provided over all such machinery. In such instances, controllers shall not be located in the shaftway.

§ 7.345. Cars.

(a) The cars of newly installed dumbwaiters shall be of substantial construction. The horizontal cross sectional area shall not exceed 9 square feet and the compartment height shall not exceed 4 feet. The carrying capacity of dumbwaiter cars shall not exceed 500 pounds. All cars of dimensions and carrying capacities greater than those specified will be considered as freight elevators and shall comply with freight requirements in every respect. The stated dimensions and capacity also apply to existing installations, except that if local conditions necessitate modification, the Department may, upon request, grant relief according to the existing exigencies.

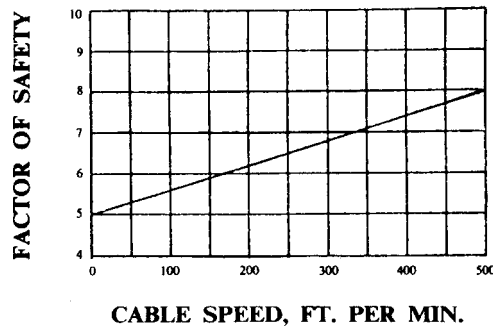
(b) New dumbwaiter cars shall be enclosed to the full height on all sides not used for loading or unloading. When considered necessary by the Department, the cars of existing dumbwaiters shall also be enclosed to the full height under beam, except on the sides used for loading and unloading.

(c) No person shall be permitted to ride upon any dumbwaiter.

§ 7.346. Cables.

(a) Power-driven dumbwaiters shall be provided with one or more iron or steel hoisting cables, equivalent tapes, or chains. If cables are exposed to corrosion, they shall be covered with marline or other equivalent protective covering.

(b) The loads on hoisting cables shall be determined by the factors of safety as given in the following curve, in accordance with the rated speed of the car:



(c) The hoisting and counterweight cables of all power-driven dumbwaiters shall not be lengthened or repaired by splicing.

(d) The drum ends of new hoisting and counterweight cables shall be secured by clamps placed on the inside of the drums.

(e) Cables secured to winding drums shall have not less than one complete wrap of the cable around the winding drum when the car or counterweight has reached the extreme limit of its travel.

§ 7.347. Safety requirements.

(a) No single-belted or chain-driven dumbwaiter shall have a car speed in excess of 50 feet per minute. No new power-driven dumbwaiter shall be operated by hand rope control.

(b) New power-driven dumbwaiter machines of the winding drum type shall be equipped with an automatic terminal stop which automatically cuts off the source of power and applies the brake. Limit switches may be used in lieu of machine automatics.

(c) Dependable brakes shall be provided for all dumbwaiters.

(d) A slack cable device shall be provided on newly installed dumbwaiters of the winding drum type above a car travel of 30 feet and a capacity of 100 pounds. Such device shall automatically stop the machine and apply the brake in the event of broken or slack hoisting cables.

(e) The removal and reerection of any dumbwaiter in a new location shall be in conformity with the requirements for new installations.

(f) When the space below the hoistway of new installations is used for a passageway or is occupied by persons, or if unoccupied is not secured against unauthorized access, cars and counterweights shall be provided with safeties which operate on the breaking of the suspension means.

(g) Pushbuttons shall not be permitted to control the operation of any dumbwaiter in school buildings, sanitariums for the weak-minded, and similar classes of buildings if there is danger of abuse of the purpose of such buttons, unless the pushbuttons may be made inaccessible to the occupants or are key operated. A decision on this point will be made at the time of the approval of the plans for the dumbwaiters.

Subchapter L. HOISTS

MATERIAL HOISTS

| | |
|--------|-----------------------|
| Sec. | |
| 7.361. | General requirements. |
| 7.362. | Operating rules. |
| 7.363. | Hoistway entrances. |
| 7.364. | Hoist towers. |
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PERSONNEL HOISTS

- 7.371. Hoist towers.
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- 7.373. Cars.
- 7.374. Ropes.
- 7.375. Safety.
- 7.376. Noninclosed towers.
- 7.377. Removal of ropes.
- 7.378. Permanent elevators.
- 7.379. Drum hoists.
- 7.380. Use of freight elevators as hoists.
- 7.381. Use of passenger elevators as hoists.
- 7.382. Change of certificate.
- 7.383. Signal system.
- 7.384. Special personnel hoists used in chimney construction.

MATERIAL HOISTS**§ 7.361. General requirements.**

(a) The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. If manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determination of an approved Certified State Commissioned Inspector competent in the field.

(b) Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

(c) Wire rope shall be removed from service when any of the following conditions exists:

(1) In hoisting ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay.

(2) Abrasion, scrubbing, flattening, or peening, causing loss of more than 1/3 of the original diameter of the outside wires.

(3) Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires.

(4) Reduction from nominal diameter of more than 3/64 inch for diameters up to and including 3/4 inch; 1/16 inch for diameters 7/8 to 1 1/8 inches; and 3/32 inch for diameters 1 1/4 to 1 1/2 inches.

(d) Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.

(e) The installation of live booms on hoists is prohibited.

(f) The use of endless belt-type man lifts on construction shall be prohibited.

§ 7.362. Operating rules.

(a) Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or cross-head in a conspicuous location, including the statement "No Riders Allowed."

(b) No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.

§ 7.363. Hoistway entrances.

(a) All entrances of the hoistways shall be protected by substantial gates or bars which shall guard the full width of the landing entrance.

(b) All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow stripes. Bars shall be not less than 2 by 4 inch wooden bars or the equivalent, located 2 feet from the hoistway line. Bars shall be located not less than 36 inches nor more than 42 inches above the floor.

(c) Gates or bars protecting the entrances to hoistway shall be equipped with a latching device. Where landing platforms connect the shaftway to the building such platforms shall be constructed of materials of ascertained soundness and capability to safely sustain the maximum load to be imposed on them and they shall be provided with standard guard rails and toe boards. If the floors or platforms are covered with metal they shall have a nonslip surface. Where any platform entrance to a shaftway, and the top of the shaftway is exposed to falling objects, a substantially large and strong overhead catch platform shall be provided. It is understood that the floor of each landing shall be considered the roof of the platform immediately below. The landing platform is to be kept free and clear of building material and debris at all times.

(d) Overhead protective covering of two-inch planking, 3 1/4 inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material hoist cage or platform.

(e) The operator's station of a hoisting machine shall be provided with overhead protection equivalent to tight planking not less than 2 inches thick. The support for the overhead protection shall be of equal strength.

§ 7.364. Hoist towers.

(a) Hoist towers may be used with or without an enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met.

(b) When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of 1/2-inch mesh, No. 18 U.S. gauge wire or equivalent, except for landing access.

(c) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed, that is, caged, on all sides for the full height between the floor

and the overhead protective covering with 1/2-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A 6-foot high enclosure shall be provided on the unused side of the hoist tower at ground level.

§ 7.365. Safety.

(a) Approved car safety devices shall be installed to function in case of wire rope failure. Safety devices shall be tested by certified inspector at each and every erection.

(b) All material hoist towers shall be designed by a licensed professional engineer.

(c) All material hoists shall conform to the requirements of ANSI A10.5-1969, Safety Requirements for Material Hoists.

PERSONNEL HOISTS

§ 7.371. Hoist towers.

(a) Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least 10 feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of 10 feet above the level of such floors or scaffolds.

(b) For towers located outside a building, the enclosures, except those at the lowest landing, may be omitted on the sides where there is no floor or scaffold adjacent to the hoistway. Enclosures on the entrance and exit side of the hoistway shall be full height. Other enclosures, where required, shall be not less than 10 feet high.

(c) Towers inside of structures shall be enclosed on all four sides throughout the full height.

(d) Towers shall be anchored to the structure at intervals not exceeding 25 feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical the tower shall be anchored by means of guys made of wire rope at least 1/2 inch in diameter, securely fastened to anchorages to ensure stability.

§ 7.372. Doors

Hoistway doors or gates shall be not less than 6 feet 6 inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to persons on the car. Inside face of hoistway doors to be within 4 inches of face of seal line.

§ 7.373. Cars.

(a) Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit, which have car gates or doors. Where landing platforms connect the shaftway to the building such platforms shall be constructed of material of ascertained soundness and capability to safely sustain the maximum load to be imposed on them and they shall be provided with standard guard rails and toe boards. If the floors or platforms are covered with metal they shall have a nonslip surface. Where any platform entrance to a shaftway, and the top of the shaftway is exposed to falling objects, a substantially large and strong overhead catch platform shall be provided. It is understood that the floor of each landing shall be considered the roof of the platform immediately below. The loading platform is to be kept free and clear of building material and debris at all times.

(b) A door or gate shall be provided at each entrance on the car which shall protect the full width and height of the car entrance opening.

(c) Overhead protective covering of two-inch planking, 3/4-inch plywood or other solid material of equivalent strength shall be provided on the top of every personnel hoist.

(d) Car doors or gates shall be provided with electric contacts which do not allow movement of the hoist when door or gate is open.

(e) Approved car safeties shall be capable of stopping and holding the car and rated load when traveling at governor tripping speed.

(f) Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car of crosshead.

(g) Internal combustion engines shall not be permitted for direct drive.

(h) Normal and final terminal stopping devices shall be provided.

(i) An emergency stop switch shall be provided in the car and marked "Stop."

§ 7.374. Ropes.

(a) The minimum number of hoisting ropes used shall be three for traction hoists and two for drum-type hoists.

(b) The minimum diameter of hoisting and counterweight wire ropes shall be 1/2-inch.

(c) Minimum factors of safety for suspension shall conform with the following

WIRE ROPES

| <i>Rope speed in feet per minute:</i> | <i>Minimum factor of safety</i> |
|---|---|
| 50 | 7.60 |
| 75 | 7.75 |
| 100 | 7.95 |

| <i>Rope speed in feet per minute:</i> | <i>Minimum factor of safety</i> |
|---|---|
| 125 | 8.10 |
| 150 | 8.25 |
| 175 | 8.40 |
| 200 | 8.60 |
| 225 | 8.75 |
| 250 | 8.90 |
| 300 | 9.20 |
| 350 | 9.50 |
| 400 | 9.75 |
| 450 | 10.00 |
| 500 | 10.25 |
| 550 | 10.45 |
| 600 | 10.70 |

§ 7.375. Safety.

(a) Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices shall be made under the supervision of a Certified Commissioned Inspector. A similar inspection and full load test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than 3-month intervals or each time erected. Records shall be maintained and kept on file for the duration of the job.

(b) All personnel elevators used by employes shall be constructed of materials and components which meet the specifications for materials, construction, safety devices, assembly, and structural integrity as stated in the American National Standard A104-1972, Safety Requirements for Personnel Hoists and all subsequent additions as heretofore amended from time to time by the Industrial Board.

(c) Personnel hoists used in bridge tower construction shall be approved by a registered professional engineer and erected under the supervision of a qualified engineer competent in this field.

Source

The provision of this § 7.375 amended through August 17, 1973, 3 Pa.B 1722.

§ 7.376. Nonenclosed towers.

(a) When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed, that is, caged, on all sides for the full height between the floor

and the overhead protective covering with 3/4-inch mesh of No. 14 U.S. gauge wire or equivalent. The hoist platform enclosure shall include the required gate for loading and unloading.

(b) These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding 35 miles per hour it shall be inspected and put in operable condition before reuse.

§ 7.377. Removal of ropes.

Wire rope shall be taken out of service when any of the following conditions exist:

- (1) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.
- (2) Wear of 1/3 original diameter of outside individual wires. Kinking, curshing, bird caging or any other damage resulting in distortion of the rope structure.
- (3) Evidence of any heat damage from any cause.
- (4) Reduction from nominal diameter of more than 3/64 inch for diameters to and including 3/4 inch, 1/16 inch for diameter 2/8 inch to 1 1/8 inches inclusive, 3/32 inch for diameters 1 1/4 to 1 1/2 inches inclusive.
- (5) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

§ 7.378. Permanent elevators.

Under the care and custody of the employer and used by employes for work covered by the act shall comply with the requirements of the Pennsylvania Regulations for Elevators, Escalators, Dumbwaiters, and Hoists, 1967, as amended.

§ 7.379. Drum hoists.

(a) Exposed moving parts such as gears, projecting screws, setscrews, chain, cables, chain sprockets and reciprocating or rotating parts, which constitute a hazard, shall be guarded.

(b) All controls used during the normal operation cycle shall be located within easy reach of the operator's station.

(c) Electric motor operated hoists shall be provided with the following:

- (1) A device to disconnect all motors from the line upon power failure and not permit any motor to be restarted until the controller handle is brought to the "off" position.
- (2) Where applicable, an overspeed preventive device.
- (3) A means whereby remotely operated hoists stop when any control is ineffective. The driving machine drum or sheave is equipped with an electrically released, spring-applied brake, operating on a brake drum directly con-

nected to the drum or drum shaft, and having a capacity sufficient to stop and hold the car at not less than 125% of its rated load when applied at a speed of 125% of rated speed.

A speed control device is provided and operated by the drum, which will cause the application of the drum brake and removal of power from the driving machine motor if the speed of the drum exceeds that corresponding to 125% of a rated car speed. Where the speed control device is chain driven from the drum, a broken chain switch shall be provided.

§ 7.380. Use of freight elevators as hoists.

(a) A new installation of a freight elevator, in a new building or one undergoing alterations, where the hatchways, enclosures and gates have not been completed, may be used as a builders' hoist, provided the car is enclosed, the hatchway protected and the entrances guarded as required for builders' hoists erected on the inside of buildings. Such an elevator shall be in charge of an experienced elevator erector or helper or hoisting engineer and may be used for carrying freight or building materials. Only the operator and assistants necessary for handling the load, not to exceed three are permitted to ride, except that workmen may be hauled, provided all entrances are protected by temporary doors or gates not less than 6 feet high and set within 4 inches of the edge of the shaftway. Such gates or doors shall be locked from the inside only.

(b) The number of workmen permitted to ride on an uncompleted freight elevator at any one time shall be based on the ratio of one workman to 2 square feet of floor area.

(c) A freight elevator used as a builders' hoist shall be properly tested and approved by an authorized inspector employed by the Department and a certificate issued as a builders' hoist before being put in service as a hoist.

§ 7.381. Use of passenger elevators as hoists.

(a) A new installation of a passenger elevator in a new building or one undergoing alterations where the hatchways, enclosures and gates have not been completed, may be used as a builders' hoist provided the car is enclosed on three sides, and the hatchway protected as required for builders' hoists erected inside of buildings. Such an elevator shall be in charge of an experienced elevator erector or helper or hoisting engineer and may be used for carrying freight or building materials. Only the operator and assistants necessary for handling the load, not to exceed three, are permitted to ride, except that workmen and passengers may be hauled, provided all entrances are protected by temporary doors or gates not less than 6 feet high and set within 4 inches of the edge of the shaftway. Such gates or doors shall be locked from the inside only.

(b) The number of workmen or passengers permitted to ride on any uncompleted passenger elevator at any one time shall be based on the ratio of one workman to 2 square feet of floor area.

(c) A passenger elevator used as a builders' hoist shall be properly tested and approved by an authorized inspector employed by the Department and a certificate issued as a builders' hoist before being put in service as a hoist.

§ 7.382. Change of certificate.

When a building is completed, the certificate under which any freight or passenger elevator has been operated as a builders' hoist shall become void and a new certificate shall be taken out to operate the installation as a freight or passenger elevator.

§ 7.383. Signal system.

Either an electric or manual signal system shall be used on a builders' hoist installed inside or outside a building. Electric signal systems shall be provided and used on all converted elevators and they shall be so installed and connected to shaftway gates or doors as to be inoperative when any gate or door is in an open position.

§ 7.384. Special personnel hoists used in chimney construction.

(a) *General.* The provisions of this chapter shall apply generally. The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of these special hoists. Where the manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determination of the Elevator Inspection Division and a certified State Commissioned Inspector competent in the field.

(b) *Hoisting machines.* Hoisting machines shall conform with the following:

(1) A base mounted drum hoist designed for man hoisting and complying with these requirements shall be used.

(2) The hoist machine may be powered by internal combustion engine, electric motor or other prime mover with positive controls to provide proper speeds and direction. The machine shall be such design that it must be powered in the up and down directions. Friction gearing, clutch mechanisms and belt drives shall be prohibited.

(3) The hoist machine shall be designed to effect proper spooling on the hoist drum.

(4) The winding drum shall be not less than 30 times the diameter of wire rope used. The winding drum shall have flanges not less than 1 1/2 times the drum diameter. Wire rope shall not be spooled closer than two inches to edge of flange.

(5) The winding drum shall have not less than three turns of wire rope when the hoist cage or car is at the lowest point of travel. A line-speed indicator shall be installed to control various speeds.

(6) The hoist machine shall be equipped with two independently operated brakes, each capable of holding 150% of the rated load. A manually controlled

brake applied to hoist drum or drive shaft. An electro-magnetic brake or automatic braking device which shall be automatically applied when power is cut off.

(7) The hoist machine shall be equipped with a deadman control switch which shall stop the machine immediately when released.

(8) The hoist machine shall be securely anchored in position to prevent movement, shifting or dislodgement due to pressure from the hoisting operation.

(9) Hoist machine shall be equipped with final limit switches to prevent over travel at top and bottom terminals.

(10) All electric equipment shall be weather proof.

(c) *Operation of hoists.* Operation of hoists shall conform with the following:

(1) The operator of the hoist shall be a qualified or licensed operator.

(2) Operating signal systems shall be installed to have constant communications between the operator and the riders in the car or cage. The operator and machine shall be protected by a suitable and safe enclosure.

(d) *Hoisting cables.* Hoisting cables shall conform with the following:

(1) All hoisting cables shall be iron or steel of accepted quality. Cable tags shall be attached showing manufacturer's name, size and safety factor. All hoisting ropes shall be installed in accordance with the manufacturer's instructions of approved methods.

(2) A deflector sheave shall be installed at base to provide proper alignment of hoist cable to cat head or overhead structure.

(3) The overhead structure shall be secured by a sufficient number of bolts to prevent spreading or movement, sheaves of proper diameter shall be installed to provide correct rotation of hoisting cable. Sheaves shall be not less than 24 times the diameter of hoist cables.

(4) The cage or car suspended guide ropes shall be securely anchored to the cat head or overhead structure.

(5) The suspended car or cage guide ropes shall be of approved material and sufficient strength to accept the impact imposed upon the rope in the event the approved safety device actuates. The manufacturer's cable tag shall be attached to the guide ropes with approved data showing factors of safety for speed, rated loads and impact.

(6) Wire rope shall be removed from service when any of the following conditions exists:

(i) In hoisting ropes, six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay.

(ii) Abrasion, scrubbing, flattening or peening, causing loss of more than one-third of the original diameter of the outside wires.

(iii) Evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires.

(iv) Reduction from nominal diameter of more than 3/64 inch for diameters up to and including 3/4 inch; 1/16 inch for diameters 7/8 to 1 1/8 inches; and 3/32 inch for diameters to 1 1/4 to 1 1/2 inches.

(7) Car or cage shall be constructed of approved material as required by ANSI A10.4 1973 regulations. The car frame must be designed to withstand the force resulting from loading conditions or impact of car safeties actuating.

(8) All welding must meet the National Standard requirements. All bolts, rivets or rods must meet National Standards requirements. The maximum load shall be eight employees or 1,200 pounds.

(9) Cars or cage shall be permanently enclosed on all sides and tops, except sides used for entrances or exit, which shall have car gates or doors. The car gate or door shall be the entire height and width of the opening.

(10) Each car gate or door shall have a mechanical lock which may be opened only when cars are at the terminal landings.

(11) Each car shall be provided with an approved device that shall stop the car in the event of a wire rope failure or other emergencies.

(12) Each car shall be provided with an emergency exit panel that may be removed from the inside or outside of the car.

(13) Each car shall be provided with an emergency descent control device. This device must be approved by the Inspection Bureau at each erection of the hoist.

(14) The car or cage shall be guided by approved wire rope of approved size that meets all factors of safety. The suspended wire rope shall be securely anchored to the overhead structure and properly weighted and secured at the bottom landing.

(15) The bottom landing shall have adequate protection and controlled access during personnel hoisting operations. The top terminal landing shall be protected by drop bars or other adequate protection around the opening.

(16) When the erection of the hoist is completed and before they are put in service, a complete inspection will be made by an approved State Elevator Inspector. Upon the approval of the hoist and the equipment, a current certificate of operation shall be issued by the Department, upon payment of the current inspection fee.

(17) Upon re-erection of the hoist, a complete inspection and safety test will be required and a new operating certificate will be issued.

(18) A visual check shall be conducted daily and a full inspection will be made weekly. Records shall be kept on file for the duration of each job.

(19) The hoist shall be inspected every three months during use by a certified State Elevator Inspector.

Source

The provisions of this § 7.384 adopted November 22, 1974, 4 Pa.B. 2419.

Subchapter M. AERIAL PASSENGER TRAMWAYS**GENERAL**

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GENERAL**§ 7.411. Scope.**

The provisions of this subchapter outline safety standards for the transportation of passengers for recreational purposes on devices usually referred to as aerial tramways, chair lifts, gondola lifts, skimobiles, T-bar lifts, J-bar lifts, platter lifts, fiber rope tows and similar devices. This subchapter does not cover equipment such as cog railways, cable cars running on rails and equipment which handles materials.

§ 7.412. Stipulations.

In addition to detailed requirements provided for the principal categories of this Subchapter, the following stipulations apply to each category of this subchapter:

- (1) For purposes of design, the average passenger shall be considered as having a weight of 170 pounds.
- (2) If a designer or manufacturer of equipment wishes to use materials not covered by the code or which may be developed in the future, it is intended that

full information be submitted to the committee. The design details, materials and construction features shall provide safety factors equivalent to those specified in this Subchapter.

(3) It is assumed in all cases that tramways will run in a straight line, in plan, between the terminals. Proposals involving lines with angles require special consideration by the authority having jurisdiction unless this subchapter is amended to include such designs.

(4) Provision shall be made to render first aid in the event persons are injured on the tramway. This shall include provision for transporting an injured person off the mountain.

(5) Good housekeeping shall prevail at all times.

(6) During lightning storms in the immediate vicinity, all passengers shall be unloaded and the tramway shut down immediately.

§ 7.413. Inspections and tests.

(a) Before any tramway is placed in operation it shall be subjected to thorough inspection and tests to confirm that it meets the requirements of the approved plans and specifications in every respect. This shall include but not necessarily be limited to all of the following:

(1) A final check for tightness of all structural connections.

(2) A final check of the lubrication of all moving parts.

(3) Open gearing shall be checked for alignment and clearances.

(4) All bearings, couplings, and shafting shall be checked for alignment and fit.

(5) Belting shall be checked for proper tightness.

(6) A final check of position of counterweights and bull wheel carriages, and for freedom of movement of such carriages.

(7) Under the most adverse static loadings, track cables and hauling ropes shall be checked for sag.

(8) Track cable saddles and hauling rope line sheave units shall be checked for alignment in the planes of their respective cables or ropes.

(9) Hauling rope shall be checked for alignment at entrance to the bull wheels.

(10) Thorough operating tests shall be made under full loading and partial loadings which provide the most unfavorable conditions, and include an operational check of motive power, acceleration, deceleration, all brakes, all push-button stops, all automatic stops and limit switches, all communication devices, and the like.

(b) The tests shall include at least one full day of continuous operation for the purpose of checking for the overheating of moving parts, excessive vibration or deflection of any mechanical or structural components, free movement of counterweights, and the like.

Cross References

This section cited in 34 Pa. Code § 7.449 (relating to line equipment); and 34 Pa. Code § 7.469 (relating to line equipment).

§ 7.414. Maintenance.

(a) *Routine.* A schedule for systematic maintenance shall be developed and set down in writing for all installations subject to the provisions of this Subchapter. Such schedule should be based on a maintenance manual which shall be provided by the designer of the tramway. The manual shall include the type of lubricant and frequency of lubrication of each element involving moving parts. It shall stipulate that parts showing excessive wear shall be replaced immediately and, if possible, establish yardsticks to define excessive wear. It shall include a schedule for checking and tightening all bolts especially on rope attachments. The maintenance schedule shall establish a specific period of time which will represent one complete cycle of maintenance operations, including all component parts, assigning a time within such cycle for the maintenance work on each component. The schedule shall include a daily check of all normal operating brakes, all communications, and all stopping devices, both manual and automatic. A daily check shall also be made to assure that the counterweight sheaves are free to turn. Also included shall be periodic checks of all emergency brakes. A signed complete log or diary shall be kept of the actual execution of maintenance work recorded daily. Such log shall not only state that the component is given attention on that day, but also the condition of the component if it shows any signs of deterioration, and also the replacement of any components. It shall also contain a daily record of the position of all counterweights and bull wheel carriages.

(b) *Special inspections.* Each tramway shall be inspected at least once each year by a specialist acceptable to the authority having jurisdiction.

(c) *Special requirements for cables.* Ropes and cables in all installations subject to the provisions of this Subchapter shall conform to the following:

(1) *Track cables.* All end connections and areas near saddles shall be inspected at established intervals of time for broken wires and worn spots. At longer intervals, the whole length shall be inspected. Such intervals shall not be longer than those recommended by the track cable manufacturer.

(2) *Hauling ropes.* The general condition of hauling ropes, including those of cable links for monorail lifts, and also including splices, shall be noted each day by the observation of one complete cycle under normal operating conditions. At established intervals, the whole length of rope shall be examined for conditions such as broken wires, worn spots, pitting, lubrication, and the like. Fixed grips shall be moved and the rope inspected at least once every 2 years, but not at longer periods than recommended by the tramway designer. For purposes of maintaining orderly and useful records, it is suggested that they be moved uniform distances and always in the same direction. Each time a fixed grip is moved, the rope which has been under and near the grip shall be exam-

ined for deterioration, and records should be made which will make it possible at any time during the life of the rope to locate the spots where grips have previously been located. On the link-type hauling ropes of monorail lifts with swaged button-end fittings, links should be removed at random and proof-tested for safety factor and signs of corrosion annually or more often as required.

(3) *Counterweight and other ropes and cables.* Counterweight and other ropes and cables are subject, when applicable, to the provisions specified for track cables and hauling ropes in paragraphs (1) and (2).

(4) *All ropes and cables.* Lubrication shall be carried out in accordance with the recommendations of the designer of the tramway. Retirement of rope from service shall occur on the basis of the general condition and history of the rope and its predecessors as indicated by the inspection reports. Consideration shall be given to the condition of the splices, the deterioration or corrosion, the surface wear and the number of broken wires in the worst rope lay.

Cross References

This section cited in 34 Pa. Code § 7.449 (relating to line equipment); and 34 Pa. Code § 7.469 (relating to line equipment).

§ 7.415. Operation.

(a) Requirements regarding the marshalling of passengers for smooth and safe loading and unloading without interference are subject to a clear plan of operations. Once such a plan is established by management, succeeding steps shall include the training of attendants and the formulation of a layout of gates and fences.

(b) When wind conditions reach such a point as to make continued operation hazardous to passengers or equipment, the tramway shall be shut down.

Cross References

This section cited in 34 Pa. Code § 7.453 (relating to operation).

SINGLE AND DOUBLE REVERSIBLE AERIAL TRAMWAYS

§ 7.421. Definitions.

The following words and terms, when used in this section and §§ 7.422—7.432 (relating to single and double reversible aerial tramways), shall have the following meanings, unless the context clearly indicates otherwise:

Bicable tramway—A tramway which incorporates standing tracks, usually made of wire cable on which the carriers ride.

Double reversible tramway—A tramway in which two cars or two lines of cars oscillate back and forth between the terminals on two separate paths of travel.

Monocable tramway—A tramway which does not incorporate standing tracks on which the carriers ride. The carriers are instead supported as well as propelled by the hauling or traction wire rope.

Single reversible tramway—A tramway in which a single car or line of cars moves back and forth between the terminals on a single path of travel.

Cross References

This section cited in 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.441 (relating to definitions); and 34 Pa. Code § 7.461 (relating to definitions).

§ 7.422. Applicability.

The provisions of §§ 7.421—7.432 (relating to single and double reversible aerial tramways) apply to that class of aerial tramways in which the carriers reciprocate between the terminals, particularly those referred to as single reversible (“to and fro”) tramways and double reversible (“jigback”) tramways. Such tramways may be either monocable or bicable.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); and 34 Pa. Code § 7.431 (relating to signs).

§ 7.423. Location.

(a) In selecting the location and alignment of tramways, consideration shall be given to the following:

- (1) Electric power lines.
- (2) Railways.
- (3) Highways.
- (4) Structures.
- (5) Rock and earth slides, cave-ins, washouts, and the like.
- (6) Avalanches of snow.
- (7) Wind action.
- (8) Icing.
- (9) Ski slopes and trails.
- (10) Rivers and gullies.
- (11) Buried installations, including pipelines.

(b) Location with respect to such conditions shall meet the requirements of the authority having jurisdiction. Generally, tramways shall not be in the immediate proximity of, nor cross over or under the items described in paragraphs (1)—(4), except when permitted and approved by the authority having jurisdiction.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.443 (relating to location); and 34 Pa. Code § 7.463 (relating to location).

§ 7.424. Width of clearing.

The clearing shall be wide enough to prevent interference with the tramway by the adjacent vegetation. Such clearings shall be protected, if necessary, to avoid washouts which might endanger the tramway or its foundations. Dead trees shall be cleared out far enough back from the line to avoid their falling on the tramway.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.444 (relating to width of clearing); and 34 Pa. Code § 7.464 (relating to width of clearing).

§ 7.425. Towers.

(a) Towers shall be located to conform to the profile of the terrain and designed to provide clearance of the cabins and ropes from all obstructions and ski or hiking trails. Under the most adverse loading conditions, a minimum space of 5 feet shall exist between the lower edge of the cabin or ropes and the terrain or other possible obstacles, including snow pack. Whenever the space is less than 15 feet, a protective fence shall be erected to divert all surface transportation or persons from possible collision.

(b) On monicable tramways, the tower arrangement shall be such that the hauling rope may not depart from a group of tower rollers should the tension in the hauling rope become twice its most unfavorable design value at that point. If a factor of less than two is used, adequate retaining rollers, properly placed, shall be provided. Where the rope load is normally upward, that is, where "hold-down" or "depression" rollers are used for normal operating conditions, the rope shall not leave the group of rollers under a condition in which twice the normal concentrated design load passes the tower while the rope is under normal design tension.

(c) On bicable tramways, the tower arrangement shall be such that the track cable under the most adverse operating conditions has a positive break over angle at the saddle. If angles of less than one degree are unavoidable, provision shall be made to keep the track cable in the saddle. Such provisions shall not interfere with any track cable in the saddle nor with any track cable brake operation.

(d) Towers shall be so located as to minimize the surge of the line under operating conditions. Local wind conditions shall be taken into consideration. Towers and ropes shall be so arranged as to prevent the collision of passing cabins in the event of lateral swinging due to winds.

(e) At passing places, the distances between the two cabins swung ten degrees inward from the vertical should be at least 2 feet, 6 inches. In no case shall this distance be less than 0.5% of the span length.

(f) Towers containing provision for change in height of rope and cable supports shall not be used.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.428 (relating to line structures); and 34 Pa. Code § 7.431 (relating to signs).

§ 7.426. Capacity and speed.

(a) *Capacity.* The design capacity of each cabin shall be posted in a conspicuous place in that cabin and at each loading platform.

(b) *Speed.* Maximum car speeds shall be as follows:

(1) Bicable tramways using track cable brakes on the carriage shall not exceed 1,500 feet per minute.

(2) Bicable tramways using two or more traction ropes and not using track cable brakes shall not exceed 2,000 feet per minute.

(3) Monocable tramways shall not exceed 800 feet per minute across tower rollers, and 2,000 feet per minute in clear spans.

(4) On bicable or monocable tramways, cabins entering terminals shall not exceed 300 feet per minute.

(5) On bicable tramways, when there is no conductor in a cabin, the maximum speeds specified in paragraphs (1) and (2) shall be reduced by 25%, and speeds when passing over tower saddles shall be reduced to $\frac{2}{3}$ of the speeds permitted elsewhere. It is also assumed that track cable saddles are so designed that the carriage wheels ride directly on the track cables over the saddles as well as in the spans and do not come in contact with or ride on any part of the saddles, or retaining clips if used. Where such a condition does not exist, speed over the saddles shall be reduced to a maximum of 800 feet per minute.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); and 34 Pa. Code § 7.431 (relating to signs).

§ 7.427. Terminals and stations.

(a) *Power source.* Electrical and internal combustion energy may be utilized as a power source, as follows:

(1) *Electrical.* Exposed electrical transmission wiring shall be so located that in case of collapse or breakage of the power line it will not come in contact with cars, cables or passengers. All electrical work shall comply with the American Standard National Electrical Code, C1-1959 and the American Standard National Electrical Safety Code, C2 (R 1947). Transformer stations and

other electrical equipment shall be so protected as to prevent unauthorized persons from entering the area or coming in contact with any portion of the equipment or wiring. Power equipment shall be protected against overloads by proper circuit breakers or fuses.

(2) *Internal combustion.* Fuel tanks shall be of adequate capacity to permit uninterrupted operation during normal operating hours. In any event, the tank shall be refilled while there is still enough fuel in such tank to bring the fuel to the stations. Fuel tanks shall be buried or so located as to be free of fire hazard. The engine shall always be shut down during refueling. The fuel entry opening shall be capped and located to avoid toxic fumes and fire hazard during refueling. Liquid fuels shall be stored and handled in accordance with the standards of the National Board of Fire Underwriters as outlined in Pamphlet No. 30, Flammable Liquids, June 1959. Also, liquefied petroleum gas installations shall be made in accordance with the standards of the National Board of Fire Underwriters, as outlined in Pamphlet No. 58, Liquefied Petroleum Gases, as amended through 1959.

(b) *Prime movers.* Prime movers shall have the capacity to handle the most unfavorable design loading conditions. An auxiliary power unit with an independent power source shall be provided which may readily be used to move the cabins to the terminals in the event of power failure, unless other means are provided to return the cabin to the terminal. Internal combustion engine exhaust shall be discharged into the atmosphere.

(c) *Speed reducers and gears.* Speed reducers and gears shall comply with accepted standard practices, and have the capacity for starting the tramway under the most unfavorable design load conditions.

(d) *Bearings, couplings and shafting.* Shafting shall be designed in accordance with accepted standard practices. Provision shall be made for the adjustment and lubrication of all bearings and couplings when required. Bearings and couplings shall be selected on the basis of the published recommendations of the manufacturer for the particular use in question. If published data are not available to cover the use, the approval of the manufacturer shall be obtained for the intended use. Bearings and couplings of special design, when used, shall have the approval of a competent mechanical engineer.

(e) *Clutches.* Any clutch device used between the prime mover and the drive sheave shall meet the requirements for bearings and couplings specified in subsection (d).

(f) *Acceleration and speed control.* Acceleration and speed controls are required to avoid discomfort to passengers caused by undue longitudinal swinging of the cabin or by excessive acceleration or deceleration and in order to start and stop the cabins smoothly and safely. The following points shall be considered in the design:

- (1) Provision shall be made for smooth deceleration of the tramway prior to the actuation of one of the automatic motor brakes specified in subsection (g).
 - (2) Cabins shall be brought to a stop for loading and unloading, and provision made to make the tramway immobile during loading and unloading periods. The control room shall contain, in full view of the operator, indicators which show the location of the cars at all times.
 - (3) Provision shall be made for an overhauling load so that the system always operates at a controlled speed not exceeding the rated speed by more than 10%. The power developed by the overhauling load shall be automatically dissipated electrically, hydraulically or pneumatically.
- (g) *Brakes and stops.* Each tramway system shall have brakes and manual stops as follows:
- (1) *Brakes.* Each tramway system shall include the following brakes:
 - (i) An automatic brake to stop and hold the tramway system under maximum load when power is shut off or the tramway is stopped for any reason. Such brake shall be applied to a drive shaft such that there is no clutch, V-belt, chain drive or similar device between the brake and the drive wheel. The brake shall be electrically released and applied by springs or gravity, except in cases where another type of brake is specifically approved by the authority having jurisdiction. In all cases the brake shall normally be in the applied position. It shall be held open for operation of the tramway by a device which is automatically cut out if power is shut off or the tramway stopped. Such device shall, without exception, be placed in operation before the tramway is started.
 - (ii) An automatic overspeed device which actuates the brake specified in subparagraph (i) or a similar independent brake when the speed of the prime mover exceeds its rated value by more than 10%.
 - (iii) A manually-operated brake on the main drive sheave with controls located near the operator.
 - (iv) On bicable tramways, an automatic track cable brake. Reference should be made to § 7.429(b)(3)(ii) (relating to line equipment).
 - (2) *Stops.* Electric switches to stop tramways shall be installed on both terminal platforms. One shall also be installed on the control board of the conductor in each cabin, unless no conductor is required. The stopping system shall be so arranged that the tramway cannot be started until the device that stopped the tramway is reset and the operator obtains clearance from the point at which the device is actuated. It is desirable that a wind gage be installed on the most exposed point along the tramway line. In such case, a conspicuous warning device shall function to alert the operator when wind velocity reaches the established maximum. When wind conditions make operations dangerous, as determined by such a device or by observation of an attendant or the operator, the tramway shall be unloaded and stopped. The tramway shall never be started

except by the operator. Reference should also be made to subsections (f) and (t) and § 7.428(d) (relating to line structures).

(h) *Machine rooms.* Motive power shall be housed in a well-ventilated machine room in a manner which permits proper maintenance and keeps the public away from the machinery. Adequate lighting and protection against lightning and static electricity shall be provided. A minimum of 18 inches clearance shall be provided between machinery and machine room enclosures, and passageways between units of machinery shall have the same minimum width. A fireproof room is preferable, but in any event, fire prevention measures and fire fighting devices shall be installed. A door with a suitable lock shall be installed on all machine rooms.

(i) *Protection against moving parts.* Moving machine parts which may normally be within reach of personnel shall be fitted with safety guards conforming to American Standard B15.1-1953.

(j) *Bull wheels.* Bull wheel frames shall be so designed that they will retain the wheel in the event of shaft breakage. The minimum diameter for bull wheels shall be 72 times the diameter of the rope, provided that no gripping device passes around the bull wheel. The minimum diameter for bull wheels shall be 96 times the diameter of the rope if gripping devices travel around the bull wheel. In the latter instance, the angle formed by the cable as it enters and leaves the grip body when passing around the bull wheel shall not exceed seven degrees. The mounting that travels under the action of the counterweight shall be supported on rigid straight rails by means of wheels. The available travel shall be such that the frame does not reach either limit of motion during normal operation and until the hauling rope needs to be resocketed or respliced for other reasons, or replaced.

(k) *Sheaves and bearings in terminals.* Sheaves and bearings in terminals shall conform to the following:

(1) *All drive sheaves.* All drive sheaves shall meet the requirements of this subsection.

(2) *Hauling rope deflecting sheaves.* Hauling rope deflecting sheaves in terminals shall be designed to withstand static and dynamic loads. The tread diameter shall be not less than that recommended by the manufacturer of the hauling rope for the intended use. Standard recommendations are as follows:

| <i>Rope Construction Category</i> | <i>Sheave Diameters</i> | |
|---------------------------------------|-------------------------|--------------------|
| | <i>Condition A</i> | <i>Condition B</i> |
| 6 × 7 | 72d | 42d |
| 6 × 19 | 45d | 30d |
| 6 × 37 | 27d | 18d |

(i) For the purposes of this section, the following words and terms shall have the following meanings:

Condition A—Where bending over sheaves is of major importance.

Condition B—Where bending over sheaves is important but some sacrifice in rope life is acceptable to achieve reduction in weight, economy of design, and the like.

d—Nominal diameter of rope.

(ii) When unlined grooves are used they shall be V-shaped with rounded bottoms having a radius equal to 55% of the rope diameter. Sheave mountings and bearings shall satisfy the recommendations of the manufacturers of the bearings.

(iii) Provision shall be made for grounding the wire rope. When such rope is used as a conductor in the communication system, lightning protection shall be provided and the rope grounded when the tramway is not in operation.

(3) *Counterweight rope sheaves.* Counterweight rope sheaves are subject to the requirements set forth in paragraph (1), except that antifriction bearings shall be selected to avoid a tendency for flat spots to develop on the rollers or balls.

(4) *Track cable deflecting sheaves.* Track cable deflecting sheaves in terminals shall be designed to withstand static and dynamic loads. Their tread diameter shall be not less than that recommended by the manufacturer of the track cable for the particular installation and shall also satisfy the allowable bearing load limits of the material with which their grooves are lined. When unlined grooves are used they should be V-shaped with rounded bottoms having a radius equal to 55% of the cable diameter. Sheave mountings and bearings shall satisfy the recommendations of the manufacturers of the bearings. Provision shall be made for grounding the cable. When the cable is used as a conductor in the communication system, lightning protection shall be provided, and the cable shall be grounded when the tramway is not in operation.

(l) *Track cable saddles.* The requirements for track cable saddles are the same as those set forth in § 7.428(e), except that if saddles in the terminals are located so that the carriage wheels do not pass over them, § 7.428(e)(1)(ii) and (iv) need not apply.

(m) *Anchor connections for hauling ropes, track cables, counterweight ropes, tower or station anchor cables or guys, and the like.* Rope and cable sockets shall be designed so that they will not be stressed beyond the yield point of the material used when the ropes or cables which they anchor are under tensions equal to their catalog breaking strength. Anchor connections shall be above ground. Any part of the anchorage below ground shall be protected against loss of strength due to corrosion.

(n) *Counterweight ropes.* Counterweight ropes shall have a minimum factor of safety of six, when new, based on their catalog strength. A copy of the specifications of the wire rope manufacture shall be available to the authority having jurisdiction. Such specifications shall include size, grade rope, construction, type of core, and breaking strength, based on values as published in United States

Department of Commerce, National Bureau of Standards Simplified Practice Recommendations 198-50. Before installation the manufacturer shall test to destruction a sample of the rope furnished, and submit a certified report of the results. In the case of ropes of foreign origin, a test shall be made by a reputable testing agency approved by the authority having jurisdiction in order to obtain adequate proof. No splices are permitted in counterweight ropes. Counterweight ropes should be lubricated regularly with a lubricant specifically recommended for this type of service to avoid corrosion. They shall be adjusted so that the counterweight will reach the end of its travel when the corresponding bull wheel carriage comes within not less than 6 inches of the end of its travel.

(o) *Counterweights.* Counterweights shall be provided for all hauling ropes and be so arranged as to move freely up and down. Enclosures for counterweights shall be provided when necessary to prevent snow or ice from accumulating under and around such counterweights and interfering with their free movement. When snow enclosures are not required, guard rails or enclosures shall be provided to prevent unauthorized persons from coming in contact with or passing under the counterweights. Counterweights shall have sufficient travel to take care of all normal operating changes in loading and temperature. Furthermore, it should preferably have a travel equal to that of the bull wheel carriage, as described in subsection (j), which moves in response to it. If this amount of travel is not available, means shall be provided to shorten the counterweight ropes so that the counterweight will be in full suspension at all times. When counterweights are used for track cables, the same provisions shall apply.

(p) *Structures.* With respect to static loads, terminal structures shall be designed on the basis of the following:

(1) *Steel.* American Standard A57.1-1952; American Welding Society Standard Code for Arc and Gas Welding for Building Construction; American Standard for Testing and Materials (ASTM) A6-57T; American Standard for Testing and Materials (ASTM) A7-58T.

(2) *Timber.* National Lumber Manufacturers Association Wood Structural Design Data.

(3) *Concrete.* American Standard A89.1-1957 (ACI 318-56).

(4) *All structures.* The following apply to all terminal structures subject to this subsection:

(i) Applied design loads include dead, live, snow and wind loads, plus impact, and earthquake loadings. They shall satisfy the requirements of American Standard A58.1-1955.

(ii) Attention shall be paid to those portions of the structure which are subject to vibration from moving parts. In such cases, the governing criterion may be deflection or natural period of vibration. The design shall be made or reviewed by an engineer competent to handle such problems.

(iii) Terminals located in snow creep areas shall be designed for such loads or be protected by snow breakers or shears.

(iv) Pressure due to snow creep may be approximated by use of the following:

(A) *Formula.*

$$P_s = 4 WBD^2 \cos \varphi \sin \varphi$$

(B) For the purposes of this section, the following symbols shall have the following meanings:

P_s —Total pressure on the object in pounds.

W —Width of snow in pounds per cubic foot.

B —Width of object in feet.

D —Vertical depth of snow in feet.

φ —Angle between horizontal and slope of ground surface.

(v) All terminals should be grounded so as to satisfy all national and local codes. The local electric power company is normally a good source of information regarding such code requirements.

(q) *Foundations.* Foundations for vertical loads shall satisfy the design requirements of subsection (p). For foundations for inclined or horizontal loads the structure of the anchorage shall satisfy the design requirements of subsection (p). In determining the resistance of the earth to motion of the anchorage, the subsoil conditions at the site shall be considered, including any buoyancy due to ground water which may be present. If the resistance of the soil is not practically determinable, the anchorage should be designed as a gravity anchor, using a coefficient of friction appropriate to the general character of the soil. Reference should also be made to § 7.428(b).

(r) *Loading and unloading platforms.* Steps should be avoided in all loading and unloading areas if possible. Platforms should be as level as practical and there shall be sufficient space for passengers waiting to ascend and descend. Railings shall be provided to guide passengers safely to and from cabins. Dead-man controls shall be provided to stop the tramway in case the operator suddenly becomes incapacitated. Guide rails with curved ends shall be provided so that entrance and exit of cabins to and from platforms may be accomplished smoothly and without impact when the cabins are deflected from the vertical by ten degrees.

(s) *Attendants.* At least one trained platform attendant shall be present each time a cabin enters or leaves a terminal. The car conductor may serve as such an attendant if no loading passengers are permitted on the platform until it is cleared of all unloading passengers. There shall be a conductor who has knowledge of normal and emergency duties in each car having a capacity of more than six passengers during each trip. Reference should be made to § 7.429(b)(4) (relating to line equipment). The tramway operator shall be located where he has the best possible view of the tramway. His controls and communicating devices shall be within his reach without leaving his position.

(t) *Safety stops.* Limit switches or equivalent devices shall be installed to take over the operation of the drive automatically if the operator fails to decelerate the tramway when the cabin enters the terminal area. A further limiting device shall be installed to cut power and stop the tramway before the cabin reaches its limit of travel. An adequate bumper system shall also be installed. Limit switches may be installed to stop the tramway before any counterweight or bull wheel carriage reaches either end of its travel. Electrical stop circuits shall be closed circuits so that, in the event of power failure or of malfunction of a stop switch, the system will fail safe. Circuits shall be all metallic and ungrounded, unless otherwise approved by the authority having jurisdiction. After any actuation of a safety stop, the cause shall be determined and removed. The safety stop shall be reset. Safety stop circuits shall not be bypassed during passenger operation. The tramway shall never be started except by an experienced operator. Reference should be made to subsections (f) and (g) of this section and § 7.428(d).

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.428 (relating to line structures); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.447 (relating to terminals and stations); 34 Pa. Code § 7.448 (relating to line structures); 34 Pa. Code § 7.453 (relating to operation); 34 Pa. Code § 7.467 (relating to terminals and stations); and 34 Pa. Code § 7.468 (relating to line structures).

§ 7.428. Line structures.

(a) *Towers.* The design of towers shall satisfy the requirements of § 7.427(p) (relating to terminals and stations) and all of the following:

(1) If clearance is not adequate, towers shall be equipped with guards designed to prevent the cabins from swinging into the towers. Reference should also be made to subsection (c).

(2) If guyed towers are used and guys intersect the ground within or near ski runs, the guys shall be marked for visibility, preferably with boards painted with black and yellow stripes.

(3) All towers shall be equipped with access ladders located in such a manner as to prevent any moving parts from becoming engaged in the rungs.

(4) All towers should be grounded by individual grounds, by buried ground wires connecting all towers, or by tying all towers into a suspended ground wire, which may also be used as a ground for the signal system, and is itself grounded. The ground shall satisfy all national and local codes. The local electric power company is a good source of information regarding such requirements.

(5) Towers shall be clearly identified with successive numbers.

(b) *Foundations.* The structure of foundations shall be designed to satisfy the requirements of § 7.427(p) and (q). Foundations shall be designed to resist overturning or sliding with a factor of safety of two with respect to dead load and live load, and 1 1/2 with respect to such loadings and wind acting simultaneously.

Under the action of all loads, pressure on the underlying earth shall not exceed allowable values for the subsurface material encountered. Bottoms of foundations shall be below the normal frost line unless they rest on solid rock, and tops shall be a minimum of 6 inches above finish grade. Foundations on rock shall be firmly anchored to the rock.

(c) *Guards.* The clearance between fixed objects, such as intermediate towers, rocks, and the like, and the cabin shall be sufficient to allow the latter to swing ten degrees laterally from the vertical. If this cannot be done without reducing the clearance to less than 18 inches, suitable guards shall be provided.

(d) *Hauling rope sheaves (or rollers) and mounts.* Hauling rope sheaves (or rollers) and mounts shall conform to § 7.427(k)(1), except that this application is that of a tower roller, not a large-angle deflection sheave. The following shall also apply:

(1) The recommended diameter should not be less than 10 times the diameter of the rope. Grounding of the hauling rope is not necessary at each tower. The allowable load on each sheave should be determined after consultation with the manufacturers of the material, if any, with which the sheave groove is lined.

(2) Sheave grooves shall be designed with deep flanges to discourage the rope from leaving the sheaves. In addition, suitable guards shall be installed to prevent the rope from falling into dangerous positions either within or outside of the tower structure in case it does leave the sheaves, and suitable devices should be installed to stop the tramway in such event.

(3) Rope grips should be designed in relation to the sheave groove so as not to contact sheave flanges during normal operations, taking into consideration the anticipated amount of wear on the grooves. Furthermore, rope grips, sheave flanges, and hanger guides shall be designed so that hangers may not be caught behind guides, and ropes and grips may not be derailed from sheaves, if the carrier is swinging as it approaches or passes the tower.

(4) If the gage of the tramway is varied at any point along the line, the horizontal departure at any one tower shall be kept to a minimum so that the rope cannot become derailed from the sheaves due to such departure.

(5) Sheave mounts or mounting frames should be designed to be adjustable laterally and rotationally, so that sheave units may be lined up and held in the plane of the rope.

(6) On monocable tramways, single sheave units shall not be used except for bull wheel guide sheaves. Sheave units shall be completely articulated to provide uniform distribution of pressure.

(7) The effect of tower height and location on sheave units shall be governed by § 7.425 (relating to towers).

(e) *Track cable saddles and mounts.* Track cable saddles and mounts shall comply with the following:

- (1) The radius of a track cable saddle shall be determined by whichever one of the following criteria requires the largest radius:
 - (i) That it be large enough to minimize bending stresses in the cable and thus prolong cable life. Wire rope manufacturers are a good source of recommendations on this point.
 - (ii) That it be large enough to provide smooth transition of the carriage from span to span.
 - (iii) That it be large enough to reduce the bearing pressure to a value that permits the cable to slide in the saddle groove.
 - (iv) That it be large enough so that if the carriage were to travel over the saddle at three times normal speed the centrifugal force would not produce enough uplift to make the carriage wheels lose contact.
- (2) The saddle shall be long enough to ensure that under maximum loading conditions the cable will not come into contact with the end of the saddle groove.
- (3) Saddles shall be so designed so that the track cable brake, if any, may function at the time the cabin is passing the saddle without derailment of the tracks.
- (4) Saddles shall permit free passage of the carriage even when the cabin is swinging laterally as it approaches or passes the tower.
- (5) If the gage of the tramway is varied at any point along the line, horizontal departure at any one tower shall be kept to a minimum to avoid derailment of the carriage as it passes over the saddle.
- (6) The effect of tower height and location on saddles shall be governed by § 7.425.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.427 (relating to terminals and stations); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.447 (relating to terminals and stations); 34 Pa. Code § 7.448 (relating to line structures); and 34 Pa. Code § 7.468 (relating to line structures).

§ 7.429. Line equipment.

- (a) *Hauling ropes.* Hauling ropes shall conform to the following:
 - (1) *Specifications and tests.* A copy of the wire rope specifications of the manufacturer shall be available to the authority having jurisdiction. Such specifications shall include size, grade of rope, construction, type of core, and breaking strength based on values as published in United States Department of Commerce, National Bureau of Standards Simplified Practice Recommendations 198-50. Before installation, the manufacturer shall test to destruction a sample of the rope furnished and submit a certified report of the results. In the

case of ropes of foreign origin, a test shall be made by a reputable testing agency approved by the authority having jurisdiction in order to obtain adequate proof.

(2) *Tension limitation.* Hauling ropes shall have a minimum static factor of safety of five when new, in that section in which the highest tension is encountered. Operating tension shall be controlled by the use of a freely moving counterweight.

(3) *End fittings or splices.* Splicing of hauling ropes on bicable tramways is not permitted, unless this rule would result in a shipping package that is too large to handle by existing means of transportation. In such a case, attention should be paid to the selection and splicing of the rope, based on the recommendations of the wire rope manufacturer. When splices are required on monocable tramways, they shall satisfy the requirements of § 7.446(3) (relating to capacity, speed and loading interval).

(4) *Sockets.* Sockets shall be so designed that no part is stressed in excess of the yield point of the materials used when the ropes are stressed to their catalog strength.

(5) *End attachments other than current standard types.* If types of end attachments are proposed which are other than the current standard types used in this country, their suitability shall be established by tests. The authority having jurisdiction may approve or disapprove the use of such proposed connection even though such tests are made.

(b) *Cars.* All parts of cars, including cabins, frames, and carriage trucks, shall be designed in accordance with accepted practices of design. The adequacy of designs is considered primarily on the basis of prior successful use, if any, and the competency of the designing engineers. The following specifics shall also apply:

(1) *Cabin body.* Passenger cabins shall be enclosed and ventilated and be equipped with doors that fill the entire entrance opening. Each door shall be locked during every trip in such a manner that it cannot be unlocked except by the conductor or other authorized personnel. The key shall be kept where it is not accessible to the public or passengers. A key shall also be placed under glass and posted to prohibit use except under specified emergency conditions. The capacity of each cabin shall be posted in a conspicuous place in the cabin. Means of emergency evacuation of passengers, acceptable to the authority having jurisdiction, shall be provided. All windows shall be of shatterproof material.

(2) *Frame.* The frame shall be securely fastened to the carriage trucks and the cabin in such a manner that it cannot work loose. The frame hanger shall be of sufficient length vertically so that under the worst condition of longitudinal sway the top of the cabin will not strike the hauling rope or the bottom of

a tower saddle and thus expose the trucks to danger of derailment. The hanger may be shorter in length if effective sway dampers are used. See also paragraph (3)(iii).

(3) *Trucks.* Trucks shall comply with the following:

(i) *Wheels.* On bicable tramways, the weight of the cabin, frame and carriage shall be so distributed over all wheels that the load per wheel does not exceed that recommended by the track cable manufacturer. Wheels shall be designed to prevent them from leaving the track cable under all operating conditions. The diameter of wheels should be selected on the basis of whichever of the following criteria requires the greatest diameter:

(A) The recommendation of the track cable manufacturer.

(B) The allowable bearing pressure on the material, if any, with which the wheels are lined.

(ii) *Track cable brakes.* Each carriage on a bicable tramway shall be equipped with a brake that will grip the track cable. Such brake shall be capable of holding a fully loaded car at the point of maximum slope, and shall function automatically in case of a hauling rope failure and be capable of being manually applied by the cabin conductor. The authority having jurisdiction may permit the brake to be omitted if two or more hauling ropes are used, or if the profile of the tramway will not permit an uncontrolled cabin to gain abnormal speed or crash into a terminal.

(iii) *Sway dampers.* Sway dampers to reduce the longitudinal sway of cars shall be used if recommended by the tramway designer or the authority having jurisdiction. When used, they shall be designed to operate smoothly and without danger of derailment of the carriage trucks.

(4) *Attendants.* Each tramcar having a capacity of more than six passengers shall be served by a conductor trained in tramcar operation, emergency control and evacuation.

(c) *Track cables.* Track cables shall conform to the following:

(1) *Specifications and tests.* A copy of the specifications of the track cable manufacturer shall be available to the authority having jurisdiction. Such specifications shall include size, grade of track cable, construction and breaking strength. Before installation, the manufacturer shall test to destruction a sample of the cable furnished and submit a certified report of the results. In the case of cables of foreign origin, a test shall be made by a reputable testing agency approved by the authority having jurisdiction in order to obtain adequate proof.

(2) *Tension limitations.* Track cables shall be designed to have a minimum static factor of safety of three when new. Provisions shall be made to properly maintain track cable tension. Under the dynamic load applied by the track cable brake, this factor shall not be reduced below 2-1/2.

(3) *Sockets.* Sockets shall be so designed that no part is stressed in excess of the yield strength of the materials used when the cables are stressed to their

catalog strength. Rules applying to unusual or special types of fittings are provided in subsection (a).

(4) *Couplings.* Track cable couplings shall not be used without the consent of the authority having jurisdiction. In the case of long track cables, couplings may be necessary, but such a situation should not preclude the use of a carriage brake designed accordingly. Track cable couplings shall not be reused.

(d) *Grounding.* Hauling ropes and track cables shall be connected metallically to one or both terminal structures so as to be grounded through such structures. When hauling ropes are used as conductors in the communication system, lightning protection should be provided while the tramway is in operation. At all other times, the ropes should be grounded.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); 34 Pa. Code § 7.427 (relating to terminals and stations); 34 Pa. Code § 7.431 (relating to signs); 34 Pa. Code § 7.449 (relating to line equipment); and 34 Pa. Code § 7.469 (relating to line equipment).

§ 7.430. Communications.

(a) A communication system shall be provided. The following types of communication are recommended for major installations:

(1) Terminal-to-terminal two-way telephone or radiophone communication independent of all other forms of communication.

(2) Two-way telephone communication or radiophone communication from operating room to all attended tramcars and to the opposite terminal platform.

(3) Two-way pushbutton signal (buzzer system) communication from the operating room to all attended tramcars and to the opposite terminal.

(b) A reduction of the system of communication for less important installations may be approved by the authority having jurisdiction.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); and 34 Pa. Code § 7.431 (relating to signs).

§ 7.431. Signs.

No signs are required other than those specified elsewhere in §§ 7.421—7.432 if attendants and conductors are placed as specified. Signs, if used, should be short, simple, bold in design, and to the point.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions) and 34 Pa. Code § 7.422 (relating to applicability).

§ 7.432. Evacuation.

Tram cabins shall be equipped with a trap door and either a rope ladder or boatswain's chair capable of reaching the ground from the highest point. Consideration should be given to the provision of auxiliary emergency cars for the evacuation of unusually timid or invalid or physically handicapped passengers, or in cases of extreme heights. An auxiliary hauling rope or emergency car system shall be provided in cases of extreme height or hazardous terrain.

Cross References

This section cited in 34 Pa. Code § 7.421 (relating to definitions); 34 Pa. Code § 7.422 (relating to applicability); and 34 Pa. Code § 7.431 (relating to signs).

CHAIR LIFTS, GONDOLA LIFTS AND SKIMOBILES**§ 7.441. Definitions.**

(a) The following words and terms, when used in this section and §§ 7.442—7.453, have the following meanings, unless the context clearly indicates otherwise:

Carriers—Open chairs, cars, or gondolas, which may be permanently attached to the hauling rope, or detached at the terminals.

Monorail life—A tramway in which the carriers are supported on a rigid overhead rail of I-beam or similar construction.

Tramways—Those of the bicable, monocable, or monorail type.

(b) The definitions specified in § 7.421 (relating to definitions) shall also apply.

Cross References

This section cited in 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.442. Applicability.

The provisions of §§ 7.441—7.453 apply to that class of aerial tramways in which the carriers circulate around the system, traveling from one terminal to the other along one path of travel and returning along another path of travel, making U-turns in both terminals. Such provisions do not apply to tramways in which passengers are in contact with the ground or snow during the trip. Skimobiles and similar devices, though they might not be denoted as aerial tramways, are subject to such provisions.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.443. Location.

The location of chair lifts, gondola lifts, and skimobiles is subject to the requirements specified for single and double reversible aerial tramways in § 7.423 (relating to location).

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.444. Width of clearing.

Clearings for chair lifts, gondola lifts, and skimobiles are subject to the requirements specified for single and double reversible aerial tramways in § 7.424 (relating to width of clearing).

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.445. Towers.

(a) Towers shall be located to conform to the profile of the terrain and to provide for the proper deflection of the hauling rope so that passengers will not be higher above the ground than necessary, nor so close as to encourage them to disembark at locations other than established stations.

(b) The adjustment of tower sheave heights, if made, shall be done in a manner to avoid overloading or underloading tower sheave units. In the furthering of this purpose, there shall be made available to the designer not only the profile of the natural terrain along the line but also profiles, approved by the owner, of the various anticipated snow depths for which the tramway is to be designed. The designer shall select one set of tower locations which will be suitable for all of such profiles. For each profile he shall determine the proper number and height of sheaves for each tower. The sheave units furnished for each tower shall be suitable for all of the profiles. Each tower shall be marked with the location of the assigned height for the sheave units for each profile, giving each profile a serial number or letter, such as A,B,C,D or the like. The operating instructions shall clearly state that when the sheaves on one tower are at location A, for example, then the sheaves on all towers shall also be at location A, and similarly for all other serial letters. The instructions shall also include a standard procedure for determining which serial designation to use to suit the snow conditions existing at any time. The owner shall make sure that these instructions are followed. After any such change the lift shall not be started until the horizontal alignment of the sheave units is checked.

(c) The interrelation between the location and height of towers, and design of sheave units and track cable saddles, shall be subject to the provisions of § 7.448 (d) and (e) (relating to line structures).

(d) Towers and ropes shall be so arranged as to prevent the collision of passing carriers in the event of lateral swinging due to wind.

(e) The distance between two carriers, if swung ten degrees inward from the vertical, shall be at least two feet six inches. The distance between cables, for purposes of this check shall be considered as equal to the gage of the line.

(f) Since the skimobile line is supported by a trestle closely following the profile of the ground, most of the provisions of this section are irrelevant, except that the trestle shall be bridged over ski trails with an opening wide enough and high enough to permit the passage of skiers. The same is true of the monorail type, except that subsections dealing with wind action and lateral swing are relevant.

(g) When ski runs cross under the line, the tower shall be high enough to assure clearance for the skiers under the chairs or cars.

(h) Local wind conditions shall be taken into consideration in every instance.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.465 (relating to towers).

§ 7.446. Capacity, speed and loading interval.

No chair lift, gondola lift or skimobile shall be operated beyond their design capacity and speed. The following specifics shall also apply:

(1) *Single chair lifts.* Lifts shall never be operated beyond their design capacity and speed. Single chair lifts shall not operate for the use of skiers at speeds in excess of 600 feet per minute, nor with chair spacings less than would produce a loading interval of 6 seconds. Outside of the skiing season, or if there is no skiing, such lifts shall operate at lower speed, preferably 350 feet per minute. Such speeds may be increased if a lift is slowed or stopped for loading and unloading. Variations in speed and loading intervals may be approved by the authority having jurisdiction.

(2) *Double chair lifts (including monorail lifts).* Double chairs lifts should not generally be operated for the use of skiers at speeds in excess of 550 feet per minute, nor with chair spacing less than would produce a loading interval of eight seconds. Outside of the skiing season, or if there is no skiing, such lifts shall be operated at a lower speed, preferably 350 feet per minute. These speeds may be increased if a lift is slowed or stopped for loading and unloading. Variations in speed and loading intervals may be approved by the authority having jurisdiction.

(3) *Detachable chair lifts and gondola lifts.* The design capacity of each carrier shall be posted in a conspicuous place on the carrier. Permissible speed of travel is dependent on the facilities provided at the terminals for detaching, attaching, decelerating, and accelerating carriers. The hauling rope is to be continuously moving at a constant speed. Smooth and relatively slow acceleration of the carrier shall be accomplished at full rope speed. Rope speed shall not exceed 600 feet per minute, unless approved by the authority having jurisdiction. Means shall be provided to space the carriers at prescribed intervals, never less than those contemplated in the design.

(4) *Skimobiles.* Skimobiles shall not generally be operated at speeds in excess of 550 feet per minute. Loading intervals for single passenger cars shall not be less than four seconds. The speed may be increased if a lift is stopped and started for loading and unloading. Higher speeds and shorter intervals may be approved by the authority having jurisdiction if a proposed scheme is satisfactorily shown to represent a safe operation.

Cross References

This section cited in 34 Pa. Code § 7.429 (relating to line equipment); 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.447. Terminals and stations.

(a) *Power source.* Electrical and internal combustion energy may be utilized as a power source, under the requirements set forth in § 7.427(a) (relating to terminals and stations).

(b) *Prime movers.* Prime movers shall have the capacity to handle the most unfavorable design loading conditions. An auxiliary power unit with an independent power source shall be provided which may readily be used to unload the line in the event of power failure unless an exception is granted by the authority having jurisdiction. Internal combustion engine exhaust shall be discharged in the atmosphere.

(c) *Speed reducers and gears.* Speed reducers and gears shall comply with accepted standard practices, and have the capacity for starting the tramway under the most unfavorable design load conditions.

(d) *Bearings, couplings, and shafting.* All bearings, couplings, and shafting shall conform to the provisions of § 7.427(d).

(e) *Clutches.* Any clutch device used between the prime mover and the drive sheave shall meet the requirements for bearings and couplings specified in subsection (d).

(f) *Acceleration and speed control.* The primary requirement is to have means of preventing runaway speeds particularly when overhauling loads are being carried. Specific provision other than brakes shall be made for maintaining normal speed under overhauling loads. The power developed by such overhaul-

ing load may be dissipated electrically, hydraulically, or pneumatically. Provision shall also be made for slowing and stopping the tramway drive automatically if the line velocity exceeds design values by more than 15%. Drive equipment shall be designed to accelerate the line smoothly and to avoid discomfort to passengers under any loading condition. When carriers are detachable, they shall be accelerated and decelerated to and from the rope speed at such rates as not to cause discomfort to passengers. When carriers are fixed to the rope, there shall be an attendant to assist the passengers mounting and dismounting. The drive shall be capable of rotating the unloaded system at reduced speed for rope inspection. In the case of systems involving detachable carriers, unbalanced loading shall be controlled by automatic car counters or other suitable devices.

(g) *Brakes and stops.* Every chair lift, gondola lift and skimobile shall be provided with at least the following:

(1) *Brakes.* Every such lift shall include the following brakes:

(i) An automatic brake to stop and hold the system under maximum load when power is shut off or the lift is stopped for any reason. Such brake shall be electrically released and applied by springs of gravity, except in cases where another type of brake is specifically approved by the authority having jurisdiction. In all cases the brake shall normally be in the applied position. It shall be held open for operation of the tramway by a device which is automatically cut out if power is shut off or the tramway stopped. Such device shall, without exception, be placed in operation before the tramway is started. The brake shall be applied to a drive shaft so that there is no clutch, V-belt or chain drive, or similar device between the brake and the drive wheel. This restriction on the location of the brake is not required in cases where the gear pitch or gear reduction is such that the lift cannot overhaul with a capacity load plus 10% after the interruption of power.

(ii) A manually-operated brake on the main drive sheave with controls located near the operator.

(iii) A backstop to prevent reverse rotation of the tramway, unless the gearing will prevent gravity reversal.

(2) *Stops.* Electric switches affecting all power shall be installed at all loading and unloading points and be so located as to be immediately available to the attendants. The stop system shall be so arranged that the lift cannot be started until the device that stopped the lift is reset and the operator obtains clearance from the point at which the device is actuated. It is desirable that a wind gage be installed on the most exposed point along the tramway line. In such case, a conspicuous warning device shall function to alert the operator when the wind velocity reaches the established maximum. When wind conditions, as determined by such a device or by observation of an attendant or the operator, make operations dangerous, the tramway shall be unloaded and stopped. The tramway shall be started only by the operator or with his approval, unless the plan of operations set by the management of the tramway

permits other attendants to start the lift under certain specified conditions. Reference should be made to subsections (f) and (t) of this section and § 7.448(d) (relating to line structures).

(h) *Machine rooms.* Machine rooms shall conform to the requirements specified in § 7.427(h), except that a door with a suitable lock is not required for a cabinet type unit. In all cases, all safety devices, such as backstops, brakes, relays, and the like, shall be protected from the weather.

(i) *Protection against moving parts.* Moving machine parts which may normally be within reach of personnel shall be fitted with safety guards conforming to American Standard B15.1-1953.

(j) *Bull wheel.* Bull wheel frames shall be so designed that they will retain the wheel in the event of shaft breakage. If this is not feasible, shaft design working stresses shall be not more than 60% of those otherwise allowable. The minimum diameter for bull wheels shall be 72 times the diameter of the rope, if no gripping device passes around the bull wheel. The minimum diameter for bull wheels shall be 96 times the diameter of the rope in cases where the gripping devices travel around the bull wheel. In such instances, the angle formed by the cable as it enters and leaves the grip body when passing around the bull wheel shall not exceed seven degrees. The bull wheel mounting at all terminals shall be supported from the ground by rigid structures. The mounting that travels under the action of the counterweight shall be supported on rigid straight rails by means of wheels. The available travel should be such that the frame does reach either limit of motion during normal operation and until the hauling rope needs to be resocketed or respliced for other reasons, or replaced. On fixed-grip lifts, guides shall be provided to prevent the carriers from excessive swinging while passing around the bull wheel. On skimobiles, provision shall be made in the design of the turntable to prevent the car from leaving the track.

(k) *Sheaves and bearings in terminals.* All sheaves and bearings in terminals shall conform to the following:

(1) *Drive sheaves.* Drive sheaves shall be designed to withstand static and dynamic loads. Sheave mountings and bearings shall satisfy the recommendations of the manufacturers of the bearings. When sheaves are mounted on vertical shafts, such shafts shall be equipped with bearings which adequately resist the vertical thrust. Drive sheaves shall be so designed that the hauling rope will not slip in the sheave groove which involves the friction between the bull wheel or its groove liner and the rope, as well as the relative levels of tensions of the rope entering and leaving the bull wheel.

(2) *Hauling rope sheaves.* Guide sheaves shall be placed to prevent misalignment of the rope entering and leaving the bull wheels. Sheaves shall meet the specifications of § 7.448(d), and carry no figured load from the rope. When necessary to prevent the rope from leaving the sheaves, counter sheaves shall be installed adjacent to them. Provision shall be made for grounding the wire rope to offset the effects of static electricity and electrical storms. When

deflecting sheaves are required they shall also satisfy the requirements of § 7.427(k)(2).

(3) *Counterweight rope sheaves.* Counterweight rope sheaves are subject to the specifications prescribed in paragraph (2) of this subsection, except that if antifriction bearings are considered, they shall be selected to avoid a tendency for flat spots to develop on the rollers or balls since counterweight sheaves are subject to very little motion and often stand without moving for long periods of time.

(4) *Track cable deflecting sheaves (bicable lifts only).* Track cable deflecting sheaves in the terminals shall be designed to withstand static and dynamic loads. Their tread diameter shall be not less than that recommended by the manufacturer of the track cable for the particular installation and shall also satisfy the allowable bearing load limits of the material with which their grooves are lined. When unlined grooves are used they should be V-shaped with rounded bottoms having a radius equal to 55% of the cable diameter. Sheave mountings and bearings shall satisfy the recommendations of the manufacturers of the bearings. Provision shall be made for grounding the cable. If the cable is used as a conductor in the communication system, lightning protection shall be provided, and the cable shall be grounded when the tramway is not in operation.

(l) *Track cable saddles.* The requirements for track cable saddles are the same as those set forth in § 7.428(e)(1)—(5) of this Title (relating to line structures), except that if saddles in the terminals are so located that the carrier wheels do not pass over them, subparagraphs (ii) and (iv) of paragraph (1) of that subsection need not apply.

(m) *Anchor connections for track cables, counterweight ropes, tower or station anchor cables or guys, and the like.* Rope and cable sockets shall be designed so that they will not be stressed beyond the yield point of the material used when the ropes or cables which they anchor are under tensions equal to their catalog breaking strength. Anchor connections shall be above ground. Any part of the anchorage below ground shall be protected against loss of strength due to corrosion.

(n) *Counterweight ropes.* Counterweight ropes shall conform to the specifications prescribed in § 7.427(n).

(o) *Counterweights.* Counterweights shall conform to the specifications prescribed in § 7.427(o), except that reference shall be made to subsection (j) in regard to bull wheels.

(p) *Structures.* The structures of chair lifts, gondola lifts, and skimobiles shall conform to the specifications prescribed in § 7.427(p).

(q) *Foundations.* The foundations of chair lifts, gondola lifts, and skimobiles shall conform to the specifications prescribed in § 7.427(q).

(r) *Loading and unloading areas.* All loading and unloading areas shall conform to the following:

(1) *Chair and monorail lifts.* Loading and unloading areas shall have sufficient level length to load and unload passengers safely and, in the case of unloading, to clear them from the platform. The minimum length shall be 16 feet, which shall be level except for unloading areas for skiers, which may be inclined so that passengers may ski away from the lift. Handrails, safety nets, or ramps shall be provided on all sides of each platform for the protection of passengers. Attention should be given to intermediate and upper unloading areas for double chair lifts. Since there may be a hazard involved in attempting to disembark both passengers from a carrier to the same side of the lift, this should be overcome either in the design or operation of the lift. Towers adjacent to loading points shall be covered with guards to prevent ski tips of starting passengers from becoming entangled in the towers. The outer ends of unloading platforms shall be fitted with inclined guards to prevent the ski tips of unwary passengers from being caught under the edges of such platforms. The distance between hauling rope supports on either side of each loading area shall be such that the distance between chair and ground does not diminish excessively under the impact of loading passengers. The same distance shall be used between hauling rope supports at unloading areas.

(2) *Detachable chair and gondola lifts.* Sufficient terminal floor space shall be provided so that passengers may board and leave the carriers without being crowded. Carriers shall be secured or controlled to prevent excessive swinging during loading and unloading. Provision shall be made at all stations for the separation of incoming and outgoing passengers. Stations shall be so arranged that the carriers can enter and leave safely even when swinging laterally. Beyond the points of attachment and detachment of the grips, devices shall be installed to avoid damage to equipment or injury to persons in the event of faulty detachment or attachment. Such devices shall support the grip and carrier safely as it travels the distance necessary to stop the lift after the operation of a safety stop, to which 50% should be added as a safety margin. The devices shall include bumpers wherever the carriage or carrier could become free-wheeling on an openend or deadend track. Switches in the track system shall be provided with safety devices to prevent malfunction. Reference shall also be made to § 7.449(b)(2)(i) (relating to line equipment).

(3) *Skimobiles.* Loading and unloading terminal platforms shall have a minimum level length of 30 feet and the surface shall be maintained in a non-slippery condition. There shall be a guardrail between incoming and outgoing tracks. At intermediate stations used for unloading only, the slope of the platform shall be the same grade as the track.

(s) *Attendants.* Attendants shall be provided as follows:

(1) *Chair lifts and skimobiles.* There shall be a minimum of one attendant at each station when it is being used for loading and unloading. One attendant shall also be placed in charge of the operating crew. Primary tramway controls and communication systems shall be immediately available to him. He shall

have enough time from other duties to discharge this responsibility and keep the operation under observation at all times. At least one attendant shall be available to service each carrier to be loaded or unloaded. At times of peak load on double chair lifts with minimum interval between chairs, it may be necessary for safe operation to have two attendants available for each chair.

(2) *Detachable chair and gondola lifts.* The requirements for detachable chair and gondola lifts are the same as those prescribed in paragraph (1), except that additional attendants may be required to handle the carriers in the stations. When carriers are not mechanically controlled in the stations, one or more additional attendants may be required, one to handle incoming cars and the other to handle outgoing cars during peak periods of operation.

(3) *All installations.* All personnel subject to the provisions of this subsection shall be carefully instructed in tramway operation, including the acquisition of a knowledge of possible emergency situations and methods of handling them.

(t) *Safety stops.* Safety stops shall be provided as follows:

(1) *Chair lifts and monorail lifts.* When danger to passengers or equipment may result if a passenger remains on the carrier while it travels around a bull wheel, a safety stop shall be provided at each such terminal to stop the lift before exposure to such danger. The distance from such stop to the first obstruction shall not be less than the distance travelled by the unloaded lift operating at maximum speed after application of such a stop, to which should be added a safety margin of 50%.

(2) *Detachable chair and gondola lifts.* Automatic safety stops shall be provided in each terminal to stop the lift in the event a carrier does not properly disengage from, or reattach to, the hauling rope. The provisions of subsection (r)(2) shall also be complied with.

(3) *All installations.* Limit switches shall be installed to stop the tramway before any counterweight or bull wheel carriage reaches either end of its travel. Electrical stop circuits shall be closed circuits so that, in case of power failure or of malfunction of the stop switch, the system will fail safe. The circuit shall be all metallic and ungrounded, unless otherwise approved by the authority having jurisdiction. After any actuation of a safety stop, the cause shall be determined and removed, and the safety stop reset. Safety stop circuits shall not be bypassed during passenger operation. In the case of such stops, the tramway shall never be started except by the operator. Reference should also be made to subsections (f) and (g) and § 7.448(d).

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); 34 Pa. Code § 7.449 (relating to line equipment); 34 Pa. Code § 7.453 (relating to operation); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.448. Line structures.

(a) *Towers, trestles, and monorails.* Towers, trestles and monorails shall conform to the following:

(1) *Towers.* The design of towers shall satisfy the requirements of § 7.427(p) (relating to terminals and stations) and all of the following:

(i) When clearance is not adequate, towers shall be equipped with guards designed to prevent the carriers from swinging into the towers. The provisions of subsection (c) shall also apply.

(ii) When guyed towers are used and guys intersect the ground within or near ski runs, the guys shall be marked for visibility, preferably with boards painted with black and yellow stripes.

(iii) Means shall be provided for ready access from the ground to all tower tops. This requirement is fulfilled if the tower structure is such that it is safe to climb. Otherwise, means such as permanent or light portable ladders shall be provided. The latter shall be in at least sufficient quantity to be available at each point where attendants are stationed.

(iv) Towers shall be grounded by individual grounds, by buried ground wires connecting all towers, or by tying all towers into a suspended ground wire, which may also be used as a ground for the signal system, and is itself grounded. The ground shall satisfy all National and local codes. The local electric power company is a good source of information regarding such requirements.

(v) Towers shall be clearly identified with successive numbers.

(vi) When towers are designed to permit variations in rope height, sheave unit supports shall be guided and attached so as to prevent misalignment by rotation during raising or lowering, as well as during normal operation.

(2) *Trestles and monorails.* The design of trestles and monorails shall satisfy the requirements of § 7.427(p) (relating to terminals and stations) and any further portions of paragraph (1) relevant to the particular design. Provision shall be made for the expansion and contraction of the actual track or rail. Facilities shall be provided for maintenance and emergency access to the trestle track deck from the ground at intervals not exceeding 800 feet, and to the monorail at any point. Bents shall be clearly identified with successive numbers.

(b) *Foundations.* Foundations shall comply with the provisions of § 7.428(b) (relating to line structures).

(c) *Guards.* Towers shall be equipped with devices to prevent the carriages from swinging into the towers. The clearance shall be sufficient to allow the car to swing 10° laterally from the vertical. When this cannot be done without reducing the clearance to less than 18 inches, suitable guards shall be provided. When, on chair lifts, clearance between the chair in normal position and the tower is less

than 30 inches, guards shall be provided to keep skis from being caught in the tower structure. Such guards should be at least 48 inches in height, extending 24 inches above and 24 inches below foot level. Clearance shall not be less than 24 inches.

(d) *Hauling rope sheaves (or rollers) and mounts.* Hauling rope sheaves (or rollers) and mounts shall conform to § 7.428(d)(1)(6). If, under the most adverse loading conditions, the load on a group of support sheaves at a tower may become less than 1/2 the permissible load on one sheave, depression sheaves shall be installed to ascertain that the rope will not lift out of the support sheaves. The reverse requirement shall be applied to depress towers.

(e) *Track cable saddles and mounts.* Track cable saddles and mounts shall conform to the requirements of § 7.428(e)(1)—(5), except that the rules there relating to cabins shall here apply to carriages. In addition, tower heights and locations shall be so arranged that the track cables will never lift out of their saddles under any operating conditions, including surge.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); 34 Pa. Code § 7.445 (relating to towers); 34 Pa. Code § 7.447 (relating to terminals and stations); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.449. Line equipment.

(a) *Hauling ropes.* Hauling ropes shall conform to the following:

(1) *Specifications and tests.* Specifications and tests shall comply with the provisions of § 7.429(a)(1) (relating to line equipment).

(2) *Tension limitation.* The tension of ropes shall comply with the provisions of § 7.429(a)(2).

(3) *Splices and other connections.* Splicing of the main hauling rope shall be done only by an experienced splicer acceptable to the authority having jurisdiction. If a breakdown occurs during operations and it is impossible to obtain an acceptable splicer without delaying the resumption of operation, the splice shall be made by an experienced splicer following the standard printed instructions of the wire rope manufacturer for the splice. Such splice shall be inspected by an acceptable splicer at the first opportunity. When cable links with swaged end fittings are used, as in monorail lifts, the end fittings shall be so designed and applied that, in a test of a complete link, the rope will break without slippage of the fitting. When good performance has been shown by previous experience, or when permitted by the authority having jurisdiction, if cable links with swaged end fittings are used, as in the case of monorail lifts, the rope shall be all metallic, with an independent wire rope cord or a strand core rather than a fiber core. An adequate safety wire rope shall also be installed to safeguard the carriers, to the satisfaction of the authority having jurisdiction, in the event of failure or disengagement of cable links, the parts

which connect them, or other parts of the hauling system. When the above requirements are met, in a test of a complete link, there shall be no slippage of the fittings at a tension equal to five times the working tension in the link when that tension is held for 15 minutes, and the rope shall not break at any tension below five times the same working tension.

(b) *Carriers*. All carriers shall be clearly identified with numbers and also conform to the following:

(1) *Safety and seating requirements*. Carriers shall comply with the following:

(i) *Chairs and hangars*. Chairs and hangers shall be designed with a minimum factor of safety of six based on the ultimate load. For this purpose, ultimate load is defined as that load at which the whole assembly, supported at the location of the rope and loaded in the normal manner will be distorted beyond a usable condition, regardless of whether any component parts actually rupture. Each chair may be equipped with an approved safety bar and foot rest, or safety belt if deemed desirable.

(ii) *Gondolas*. Gondolas are subject to the provisions of § 7.429(b)(1), except that equipment for emergency evacuation is not required for each gondola. The number of passengers in a gondola is limited to a maximum of six persons unless a conductor rides in each gondola.

(iii) *Skimobile cars*. Skimobile cars shall comply with relevant requirements of subparagraph (i), except that in determining the ultimate load the car shall be considered as being supported at the maximum grade existing on the line, and as being supported by its wheels on the tracks as well as by the hauling rope. There shall be a shield or dashboard on the front of the car, an adequate step, and a handrail to facilitate embarking and disembarking. If operated for skiers, ski racks shall also be provided.

(2) *Rope grips*. A rope grip, whether detachable or fixed, shall be of a type which has proved to give satisfactory service or has been specifically approved by the authority having jurisdiction. Unless so exempted, a rope grip shall be designed so as to resist a force tending to slide it along the cable, which is at least three times as great as the force required to drag the loaded carrier along the steepest incline of the lift under such unfavorable conditions as ice or excessive lubrication on the cable. A factor of safety of at least six shall exist in the component parts of all grips. By inspection, using methods approved by the authority having jurisdiction, confirmation shall be obtained that the grip and its parts meet these requirements. The following shall also apply:

(i) *Detachable rope grips*. Detachable grips shall be designed to pass smoothly over and under line sheaves which have flanges of adequate depth to discourage the rope from leaving the sheave, and grip the rope positively without damaging the rope and so that it cannot become accidentally uncoupled, even by rope vibrations. Each terminal shall be equipped with devices designed to prevent the start of grips that are incorrectly coupled to

the rope. Reference should also be made to § 7.447(r) and (t) (relating to terminals and stations). The maximum total vertical load on a single detachable grip shall not exceed 1/14 of the least tension in the rope. A single spring arrangement for holding grip jaws closed about the rope is not permissible. If two springs are used, each spring shall be sufficiently strong to hold the grip safely closed against the design loads.

(ii) *Fixed rope grips.* Fixed grips shall be designed to pass smoothly over and under line sheaves and bull wheels which have flanges of adequate depth to discourage the rope from leaving the sheave. Grips shall be moved at least once in every 24-calendar months. They shall be moved a uniform distance each time, in the same direction. The instructions of the designer or of the authority having jurisdiction shall be followed if they are more restrictive than the provisions of this subparagraph. Reference shall also be made to §§ 7.413 and 7.414 (relating to inspections and tests; and maintenance). As each grip is moved, the rope shall be examined for deterioration at or near the grip location, and the rope shall be thoroughly inspected at least once each year.

(3) *Carriage wheels.* The provisions of § 7.429(b)(3)(i) shall apply to carriage wheels, which ride on trestles or monorails with appropriate modifications where necessary.

(4) *Track brakes.* Track brakes shall conform to the provisions specified in § 7.447(g).

(c) *Track cables.* Track cables (bicable lifts only) shall conform to the following:

(1) *Specifications and tests.* Specifications and tests shall be in compliance with § 7.429(c)(1).

(2) *Tension limitations.* Tension limitations shall be in compliance with § 7.429(c)(2).

(3) *Sockets.* Sockets shall be so designed that no part is stressed in excess of the yield strength of the materials used when the cables are stressed to their catalog strength. If types of end attachments are proposed that are other than the current standard types used in this country, their suitability shall be established by tests. The authority having jurisdiction reserves the right to approve or disapprove the use of the proposed connection even when such tests have been made.

(4) *Couplings.* Track cable couplings shall not be used without the consent of the authority having jurisdiction, nor where track cable brakes are used. Track cable couplings shall not be reused.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); 34 Pa. Code § 7.447 (relating to terminals and stations); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.450. Communications.

A two-way voice communication system shall be provided between the motor control point and all loading and unloading stations. A public address system reaching all points along the line is recommended.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.451. Signs.

(a) The following signs, if relevant to the type of lift, shall be posted where they may be read by all persons using the tramway:

- (1) If not familiar with use of lift, ask attendant for instructions.
 - (2) Prepare to unload (at a distance of not less than 50 feet ahead of unloading area).
 - (3) Keep ski tips up.
- (b) Additional signs may be advisable at some installations.
- (c) Signs should be bold in design and easily readable.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.452. Evacuation.

A system of planned evacuation of passengers from the lift, in the event of power failure or breakdown, shall be established to the satisfaction of the authority having jurisdiction. Adequate equipment for such evacuation shall be available at all times for immediate use.

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.453. Operation.

In addition to the requirements provided in § 7.415 (relating to operation), reference shall be made to § 7.427(g) (relating to terminals and stations) or § 7.447(g) (relating to terminals and stations).

Cross References

This section cited in 34 Pa. Code § 7.441 (relating to definitions); 34 Pa. Code § 7.442 (relating to applicability); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.472 (relating to operation).

**T-BAR LIFTS, J-BAR LIFTS, PLATTER LIFTS AND
SIMILAR DEVICES****§ 7.461. Definitions.**

The definitions specified in § 7.421 (relating to definitions) shall apply to this section and §§ 7.462—7.472.

Cross References

This section cited in 34 Pa. Code § 7.462 (relating to applicability).

§ 7.462. Applicability.

The provisions of §§ 7.461—7.472 apply to that class of aerial tramways subject to the provisions of §§ 7.441—7.453, but is limited to those devices in which the passengers are in contact with the ground or snow during the trip. Such devices are normally of the monocable type.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions).

§ 7.463. Location.

The location of T-bar lifts, J-bar lifts, platter lifts, and similar devices is subject to the requirements specified for single and double reversible aerial tramways in § 7.423 (relating to location). In addition, the location shall be selected so that the ski track will always have, or may be made to have, a level or an upward slope. No reverse slopes are permitted except for very mild inclines at loading and unloading points. Selection of the site shall also involve consideration of the maximum permissible slope of the ski track. In no case shall it be steeper than a grade of 100% for single towing outfits, or 80% for double towing outfits. Surface water which might make icy tracks shall be avoided. The site selected shall avoid the intersection of the lift line with possible ski trails.

Cross References

This sections cited in 34 Pa. Code § 7.461 (relating to definition); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.464. Width of clearing.

Clearings for T-bar lifts, J-bar lifts, platter lifts, and similar devices are subject to the requirements specified for single and double reversible aerial tramways in § 7.424 (relating to width of clearing).

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.465. Towers.

(a) Towers shall be located to conform to the profile of the terrain and be so located that, under the most adverse loading conditions, the towing device is unable to lift any passenger off the snow. Also, under the most adverse conditions, the hauling rope shall be high enough to clear the passenger's head by at least 2 feet. Towers shall also be so arranged that descending empty towing outfits are clear of the snow.

(b) Towers shall be of a height and so located that, if the rope comes off the supporting sheaves of a tower, the towers on either side will support the rope clear of grade by at least 2 feet.

(c) In areas of deep snow, it may be imperative to use variable tower heights. In such cases, changes in tower height shall be made in a manner to avoid overloading or underloading of tower sheave units. This control, when necessary, shall be provided in the manner prescribed in § 7.445(b) (relating to towers).

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.469 (relating to line equipment).

§ 7.466. Capacity, speed, and loading interval.

The combination of rope speed and action of the towing outfit shall be such that the skiers are accelerated at a safe rate as they are mounting the lift. When the average level of ability of the skiers to mount the lift is relatively low, acceleration shall be reduced by changing the traveling speed of the rope. The minimum loading interval for T-bars shall be 5 seconds plus the time required to extend the towing outfit to such a point that the skiers begin to move. The minimum loading interval for single passenger outfits shall be three seconds plus the time required to extend the towing outfit to such a point that the skier begins to move. These figures represent capacities of something less than 1,400 and 1,200 passengers per hour, respectively.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.467 (relating to terminals and stations).

§ 7.467. Terminals and stations.

(a) *Power source.* Electrical and internal combustion energy may be utilized as a power source, as follows:

(1) *Electrical.* The utilization of electrical energy shall conform to the provisions of § 7.427(a)(1) (relating to terminals and stations).

(2) *Internal combustion.* Fuel tanks shall be buried or so located as to be free of fire hazard. The engine shall always be shut down during refueling. The fuel entry opening shall be capped and located to avoid toxic fumes and fire

hazard during refueling. Liquid fuels shall be stored and handled in accordance with the standards of the National Board of Fire Underwriters as outlined in Pamphlet No. 30, Flammable Liquids, June 1959. Also liquefied petroleum gas installations shall be made in accordance with the standards of the National Board of Fire Underwriters, as outlined in Pamphlet No. 58, Liquefied Petroleum Gases, as amended through 1959.

(b) *Prime movers.* Prime movers shall have the capacity to handle the most unfavorable design loading conditions. Internal combustion engine exhausts shall be discharged into the atmosphere.

(c) *Speed reducers and gears.* Speed reducers and gears shall comply with accepted standard practices, and have the capacity for starting the tramway under the most unfavorable design load conditions.

(d) *Bearings, couplings, and shafting.* Bearings, couplings, and shafting shall conform to the provisions of § 7.427(d).

(e) *Clutches.* Any clutch device used between the prime mover and the drive sheave shall meet the requirements for bearings and couplings specified in subsection (d) of this section.

(f) *Acceleration and speed control.* When necessary to satisfy the requirements of § 7.466 (relating to capacity, speed and loading interval), a variable speed drive shall be used, so that the speed of the rope may be changed to suit variations in snow conditions and the ability of skiers to mount the lift. The drive equipment shall be able to accelerate the line safely under all conditions of loading.

(g) *Brakes and stops.* Every system shall be provided with the following:

(1) *Brakes.* The lift shall have a backstop to prevent reverse rotation of the lift under full load.

(2) *Stops.* Electric switches affecting all power shall be installed at all loading and unloading points, and be so located as to be immediately available to the attendants. The tramway shall be started only by the operator or other designated attendant. Reference should also be made to subsection (s) and § 7.468(d) (relating to line structures).

(h) *Machine rooms.* Motive power shall be housed in a well-ventilated machine room in a manner which permits proper maintenance. Adequate lighting and protection against lightning and static electricity shall be provided. A minimum of 18 inches clearance shall be provided between machinery and machine room enclosures, and passageways between units of machinery should have the same minimum width. A fireproof room is preferable but in any event, adequate fire-prevention measures and fire fighting devices shall be installed, except for a cabinet type unit. In all cases, all safety devices, such as backstops, brakes, relays, and the like, shall be protected from the weather.

(i) *Protection against moving parts.* Moving machine parts which may normally be within reach of personnel shall be fitted with safety guards conforming to American Standard B15.1-1953.

(j) *Bull wheels.* Bull wheel frames should be so designed that they will retain the wheel in the event of shaft breakage. Where this is not feasible, the shaft design working stresses shall be not more than 60% of those otherwise allowable. The minimum diameter for bull wheels shall be 72 times the diameter of the rope, if no gripping device passes around the bull wheel. The minimum diameter for bull wheels shall be 80 times the diameter of the rope in cases where the gripping devices travel around the bull wheel. In such instances, the angle formed by the cable as it enters and leaves the grip body when passing around the bull wheel shall not exceed seven degrees. The bull wheel mounting at all terminals shall be supported from the ground by rigid structures. The mounting that travels under the action of the counterweight shall be supported on rigid straight rails by means of wheels. The available travel should be such that the frame does not reach either limit of motion during normal operation and until the hauling rope needs to be resocketed or respliced for other reasons, or replaced. Guides shall be installed to lead the towing outfits in and out of terminals and around the bull wheel without danger to themselves, terminal structures or equipment, or personnel.

(k) *Sheaves and bearings in terminals.* Sheaves and bearings in terminals shall conform to the following:

(1) *Drive sheaves.* Drive sheaves shall meet the requirements of § 7.427(k)(1).

(2) *Hauling rope sheaves.* Guide sheaves shall be placed to prevent misalignment of the rope entering and leaving the bull wheels. Sheaves shall meet the specifications of § 7.468(d). When necessary to prevent the rope from leaving the sheaves, counter sheaves shall be installed adjacent to them. Provision shall be made for grounding the wire rope to offset the effects of static electricity and electrical storms. When deflecting sheaves are required, they shall satisfy the requirements of § 7.427(k)(2).

(3) *Counterweight rope sheaves.* Counterweight rope sheaves shall conform to the provisions of § 7.427(k)(3).

(l) *Anchor connections for counterweight ropes, tower or station anchor cables or guys, and the like.* Rope and cable sockets shall be so designed that they will not be stressed beyond the yield point of the material used when the ropes or cables which they anchor are under tensions equal to their catalog breaking strength. Anchor connections should be above ground. Any part of the anchorage below ground shall be protected against loss of strength due to corrosion.

(m) *Counterweight ropes.* Counterweight ropes shall conform to the specifications prescribed in § 7.427(n).

(n) *Counterweights.* Counterweights shall conform to the specifications prescribed in § 7.427(o), except that reference shall be made to subsection (j) in regard to bull wheels.

(o) *Structures.* The structures of chair lifts, gondola lifts and skimobiles shall conform to the specifications prescribed in § 7.427(p).

(p) *Foundations.* The foundations of chair lifts, gondola lifts, and skimobiles shall conform to the specifications prescribed in § 7.427(q).

(q) *Loading and unloading areas.* All loading areas shall be of sufficient length and grade to permit starting of skiers with maximum ease and comfort and to permit them to become adjusted to the towing outfit before they start uphill. All unloading areas shall be at least 16 feet long and approximately level, but may be inclined slightly to aid the passengers to ski away from the towing device. The distance between the unloading area and upper terminal guides shall be sufficient to allow the towing outfits to become retracted and to permit their oscillation to diminish adequately before they enter the terminal. This requirement will result in a different distance for each type of towing outfit and each line velocity.

(r) *Attendants.* There shall be at least one attendant at each station, one of whom shall be in charge of all operations.

(s) *Safety stops.* A safety stop actuated by contact with a passenger or towing device shall be provided at the unloading terminal to stop the lift before a passenger or unretracted towing device comes in contact with any mechanism or obstruction. The distance from such stop to the first obstruction shall be not less than the distance traveled by the unloaded lift operating at maximum speed after application of the stop, to which shall be added a safety margin of 50%. The safety stop shall be marked by a red flag or other attention-arresting device. Limit switches shall be installed to stop the tramway before any counterweight or bull wheel carriage reaches either end of its travel. All electrical stop circuits shall be closed circuits so that, in case of power failure or malfunction of the stop switch, the system will fail safe; it shall also be all metallic and ungrounded, unless otherwise approved by the authority having jurisdiction. After any actuation of a safety stop, the cause shall be determined and removed, and the safety stop reset. Safety stop circuits shall not be bypassed during passenger operation. In the case of such stops, the lift shall never be started except by the operator. Reference should also be made to subsection (g) and § 7.468(d) (relating to line structures).

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.468 (relating to line structures).

§ 7.468. Line structures.

(a) *Towers.* The design of towers shall satisfy the requirements of § 7.427(p) (relating to terminals and stations) and all of the following:

- (1) A minimum clearance of 36 inches shall be maintained between the base of a tower and the vertical plane of the upward traveling cable. With

respect to the downward traveling cable a minimum clearance of 24 inches shall be provided between the towing outfit in its normal position and the tower.

(2) If guyed towers are used and the guys intersect the ground within or near ski runs, the guys shall be marked for visibility, preferably with boards painted with black and yellow strips.

(3) Means shall be provided for ready access from the ground to all tower tops. This requirement is fulfilled if the tower structure is such that it is safe to climb. Otherwise, means such as permanent or light, portable ladders shall be provided. The latter, if used shall be in at least sufficient quantity to be available at each point where attendants are stationed.

(4) All towers should be grounded by individual grounds, by buried ground wires connecting all towers, or by tying all towers into a suspended ground wire, which may also be used as a ground for the signal system, and is itself grounded. The ground shall satisfy all national and local codes. The local electric power company is a good source of information regarding such code requirements.

(5) Towers shall be clearly identified with successive numbers.

(6) When towers are designed to permit variations in rope height, sheave unit supports shall be attached so as to prevent misalignment by rotation during normal operation.

(b) *Foundations.* Foundations shall comply with the provisions of § 7.428(b) (relating to line structures).

(c) *Guards.* Guards shall comply with the provisions of § 7.428(c).

(d) *Sheaves and mounts.* Sheaves and mounts shall conform to § 7.427(k)(1), except that this application is that of a tower roller, not a large-angle deflection sheave. The following shall also apply:

(1) The provisions of § 7.428(d)(1),(3)—(6).

(2) Sheave grooves shall be designed with deep flanges to discourage the rope from leaving the sheaves. In addition, suitable guards shall be installed to prevent the rope from falling into dangerous positions within the tower structure in case it does leave the sheaves, and suitable devices shall be installed to stop the tramway in the event the cable leaves the sheave on either side.

(3) When, under the most adverse loading conditions, the load on a group of support sheaves at a tower may become less than 1/2 the permissible load on the sheave, depression sheaves shall be installed to ensure that the rope will not lift out of the support sheaves. The reverse requirement shall apply to depress towers.

(4) The sheaves for return ropes shall be installed in a manner which will prevent a passenger from contacting the rope or being hit by one of the returning towing outfits.

(5) Line sheaves shall be so guarded that towing devices or attachments cannot become entangled in sheaves or sheave supports. If unloading is permit-

ted ahead of any intermediate tower, the layout of the unloading area shall satisfy the requirements of § 7.467(q) (relating to terminals and stations), and the tower shall be so guarded as to prevent the released towing devices from becoming entangled with it.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); 34 Pa. Code § 7.462 (relating to applicability); and 34 Pa. Code § 7.467 (relating to terminals and stations).

§ 7.469. Line equipment.

(a) *Hauling ropes.* Hauling ropes shall conform to the following:

(1) *Specifications and tests.* Specifications and tests shall comply with the provisions of § 7.429(a)(1) (relating to line equipment).

(2) *Tension limitations.* The tension of ropes shall comply with the provisions of § 7.429(a)(2).

(3) *Splices.* Splicing of the main hauling rope shall be done only by an experienced splicer acceptable to the authority having jurisdiction. If a breakdown occurs during operations and it is impossible to obtain an acceptable splicer without delaying the assumption of operation, the splice shall be made by an experienced splicer following the standard printed instructions of the wire rope manufacturer for the “long” splice. Such splice shall be inspected by an acceptable splicer at the first opportunity.

(b) *Towing outfits.* As regards towing outfits, the following shall apply:

(1) *Bar or platter in contact with skier.* The bar or platter in contact with the skier shall be so designed as to minimize potential injury to the skier by the member during starting, unloading, or in the event that the skier falls during progress along the line. Any proposed device which envelopes the skier, such as a strap is prohibited.

(2) *Towing members and hangers.* Each type of towing outfit requires a different technique for successful loading on the part of both the attendant and the skier. Training of the former and instructions to the latter are important. Retractable towing outfits shall be removed immediately from the line for repair when they fail to retract normally. The following shall also apply:

(i) *Fixed-length type.* The towing member or hanger shall be designed with a factor of safety of six between the ultimate strength of the weakest part and the load imposed on the part while towing a 200 pound skier alone or on either a single or double towing outfit, or while towing two 200 pound skiers, on a double towing outfit up the maximum grade under any snow conditions. The length shall be such as to permit the skis of the shortest user to remain in firm contact with the snow and to satisfy the requirements of § 7.465 (relating to towers).

(ii) *Telescoping type.* Towing members and hangers of this type shall meet the requirements of subparagraph (i). Retraction of such devices shall

be so controlled that it may be released from a fully extended position without causing injury to itself or the passengers or causing such violent oscillations as to expose any part of the towing outfit to entanglement with the hauling rope, sheaves or other structures or equipment.

(iii) *Spring-box type.* The provisions of subparagraph (ii) also apply to towing members and hangers of the spring-box type, except that the requirements regarding controlled retraction are here much more critical, as improperly controlled T-bars have a tendency to fly into parts of structures and equipment. Acceleration of the skier during extension is also more important in this case, because the skier is more likely to expect it and is therefore less likely to be braced for the lack of it.

(iv) *Other types.* Proposals for types of towing members and hangers other than those covered by subparagraphs (i)—(iii) will be scrutinized carefully before approval by the authority having jurisdiction, since successful experience elsewhere is no guarantee of success and safety in this country, due to differences in terrain, snow conditions and the habits and abilities of the skiing public.

(3) *Rope grips.* A rope grip, whether detachable or fixed, shall be of a type which has proved to give satisfactory service or has been specifically approved by the authority having jurisdiction. Unless exempted, a rope grip shall be designed so as to resist a force tending to slide it along the cable which is at least three times as great as the force required to drag the loaded carrier along the steepest incline of the lift under such unfavorable conditions as ice or excessive lubrication on the cable. A factor of safety of at least six shall exist in the component parts of all grips. By inspection, using methods approved by the authority having jurisdiction, confirmation shall be obtained that the grip and its parts meet these requirements. The following shall also apply:

(i) *Detachable rope grips.* Detachable grips shall be designed to pass smoothly over and under line sheaves which have flanges of adequate depth to discourage the rope from leaving the sheaves and shall grip the cable without damaging it and so that it cannot become accidentally uncoupled, even by rope vibrations.

(ii) *Fixed rope grips.* Fixed grips shall be designed to pass smoothly over and under line sheaves and bull wheels which have flanges of adequate depth to discourage the rope from leaving the sheave. All grips shall be moved at least once in every 24-calendar months. They shall be moved a uniform distance each time, in the same direction. The instructions of the designer or of the authority having jurisdiction shall be followed if they are more restrictive than the provisions of this subparagraph. Reference shall also be made to §§ 7.413 and 7.414 (relating to inspections and tests; and maintenance). As each grip is moved, the rope shall be examined for deterioration at or near the grip location.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.470. Communications.

A two-way communication system shall be provided between all stations except where the lift is so short that direct communication is possible. A public address system reaching all points along the line is recommended.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.471. Signs.

(a) The following signs shall be posted where they may be read by all persons using the lift:

- (1) "If not familiar with use of lift, ask attendant for instructions."
 - (2) "Prepare to unload" (at a distance of not less than 50 feet ahead of unloading area).
 - (3) "Safety gate" (a red flag shall be attached to the safety gate or cord).
- (b) Additional signs may be advisable at some installations.
- (c) Signs should be bold in design and easily readable.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

§ 7.472. Operation.

Operation shall conform to § 7.453 (relating to operation). In addition, the ski path shall be centered under the ascending rope. It shall be kept reasonably smooth and there shall be no obstruction within three feet of the center line of the path. The side slope of the ground shall be reasonably level; where this is not the case, it should be shelved. Where there are cuts or fills, the path width for single towering outfits shall not be less than 6 feet; for double outfits it should be at least ten feet. The path shall be broken out after every snowfall of eight inches or more, before passenger operation begins.

Cross References

This section cited in 34 Pa. Code § 7.461 (relating to definitions); and 34 Pa. Code § 7.462 (relating to applicability).

FIBER ROPE TOWS**§ 7.481. Location.**

All fiber rope tows shall be located far enough from terrain features, such as overhanging ledges, electric power lines and other structures so as not to endanger skiers.

§ 7.482. Width of clearing.

The tow path shall be cleared of all obstructions for a distance of 3 feet on both sides of the normal uphill rope path. Dead trees or dead limbs of living trees near enough to fall within the tow path shall be removed.

§ 7.483. Path of rope.

There shall be a minimum distance of 5 feet between the uphill rope and the return rope poles at the loading point, and a minimum distance of 3 feet between the uphill rope and any pole located between the loading and unloading points.

Cross References

This section cited in 34 Pa. Code § 7.486 (relating to line structures).

§ 7.484. Speed.

Rope speed shall not exceed 1,500 feet per minute, except that the tow may be capable of higher speed for ski patrol emergency only.

§ 7.485. Terminals and stations.

(a) *Power source.* Fiber rope tows shall conform to the following:

(1) *Electrical.* Power supply equipment shall be installed in accordance with American Standard National Electrical Safety Code, C2 (R 1947). Wiring shall be done in accordance with American Standard National Electrical Code, C1-1959.

(2) *Liquid fuels.* Liquid fuels, such as gasoline and diesel fuel, shall be stored and handled in accordance with the standards of the National Board of Fire Underwriters as outlined in Pamphlet No. 30, Flammable Liquids, June 1959.

(3) *Liquified petroleum fuels.* Liquified petroleum gas installation shall be made in accordance with standards of the National Board of Fire Underwriters as outlined in Pamphlet No. 58, Liquefied Petroleum Gases, 1958, as amended 1959.

(b) *Prime movers.* All prime movers should have sufficient power output to start the tow fully loaded.

(c) *Speed reducers.* All speed reducers shall have ample capacity to withstand starting the tow when fully loaded.

(d) *Bearings and couplings.* All bearings and couplings shall be of a size and type suitable for the function to be performed. If the bearings are inaccessible, the lubricant shall be piped to the bearings if lubricant is required while the equipment is in operation. Couplings shall be guarded in the same manner as speed reducers.

(e) *Clutches.* Where used, clutches shall be of ample size to carry the load and permit controlled slipping for smooth acceleration during starting without overheating.

(f) *Acceleration and speed control.* A satisfactory method of obtaining gradual acceleration of the rope shall be provided. Such method shall be effective when starting with any load from one skier to full load. If the prime mover is an internal combustion engine, the speed shall be controlled by a mechanical governor or by the operator.

(g) *Brakes and stops.* Brakes and stops shall comply with the following:

(1) On installations where coasting, after an emergency stop, renders the operation dangerous, some method of braking shall be provided.

(2) On installations where rollback may occur, a brake or anti-rollback device shall be provided. If the prime mover is an internal combustion engine, the compression of the engine may suffice as a brake but not as an anti-rollback device because the motor is declutched in order to start it again and, at that point, the rollback, if any, will occur.

(3) Tows driven by electric motors shall be equipped with automatic brakes or manually-operated brakes under the control of the operator.

(4) Electrical stop circuits shall be closed circuits so that, in case of power failure or malfunction of a stop switch, the system will fail safe.

(h) *Machine rooms.* Driving units except stationary self-enclosed units and portable tows shall be housed in a manner which prevents the public from coming in contact with the machinery. If an internal combustion engine is used as a prime mover, the machine room shall be ventilated to prevent any products of combustion or fuel fumes from contaminating the atmosphere in the enclosure. Engine exhaust pipes shall not pass within two inches of any wooden member or other flammable material. The engine room should be sign-posted to the effect that unauthorized persons are not permitted inside. Openings over 10 inches square shall be provided with suitable doors with locks to prevent entrance and operation by unauthorized persons. Adequate lighting shall be provided to permit proper maintenance of the machinery. The position of the engine man in the machine room shall afford an unobstructed view of the tow path, and all operating controls shall be so arranged that he may operate them from this position while viewing the tow path. Approved fire extinguishers shall be installed. An exit should be near enough to the station of the generator to permit him to leave rapidly in case a flash fire occurs.

(i) *Protection against moving parts.* Moving parts shall be so guarded as to prevent the possibility of injury to persons and to prevent clothing from being

caught. If such moving parts are located in areas where only authorized maintenance personnel have access, such arrangements of frames or guards are not required if provision is made to stop and lock out the power before work is performed on the tow. Moving parts adjacent to the operating position shall be guarded to prevent accidental contact by the operator. All required guards shall conform to American Standard B15.1-1953.

(j) *Sheaves.* Sheaves shall conform to the following:

(1) *Rope drive and idler sheaves.* Sheaves shall be of such design and so arranged as to prevent unnecessary stressing, wear or disfiguration of the hauling rope. They shall be of sufficient strength and be properly balanced to prevent excessive vibration at operating speeds.

(2) *Offset sheaves and mountings.* Offset sheaves shall be mounted on mountings designed to withstand the load imposed by normal operation.

(3) *Loading sheaves.* A grooved sheave or sheaves may be installed to hold the uphill rope between 2 feet and 3 feet above the snow at the loading position. When used, they shall be so arranged as to prevent the rope from being pulled out of the groove by the skier.

(4) *Intermediate sheaves.* There shall be no immediate sheaves on the uphill rope between the loading and unloading area.

(5) *Counterweight sheaves.* If a counterweight sheave is used, it shall be grooved and shall be so arranged that the rope cannot jump off the sheave.

(6) *Head sheaves.* The sheaves used on the end opposite the driving mechanism shall be grooved and so arranged that the rope cannot jump off the sheave, and be mounted or installed in such a manner as to prevent their falling to the ground in case the hauling rope breaks, or any area in which they may fall shall be suitably fenced or guarded to prevent public use. They shall be of such design and construction as to withstand the load imposed without undue stress.

(k) *Counterweight ropes.* The connection between the counterweight sheave and the counterweight shall be made with wire rope with a minimum size and strength equivalent to 1/4 inch, 6 by 19, with a fiber core. Such rope shall be coated with a lubricant or other approved coating to prevent rusting.

(l) *Counterweights.* Counterweights shall be heavy enough to prevent slipping of the hauling rope on the drive sheaves, but not so heavy as to impose an excessive load on the hauling rope.

(m) *Foundations.* Foundations or anchors used to restrain the driving mechanism and the head sheave shall be of sufficient size and type to prevent movement under full load.

(n) *Loading and unloading areas.* Loading areas shall be as nearly level as possible, be free of obstructions, and fenced in such a way as to guide skiers to the loading point. Unloading areas shall be so arranged as to permit the skier to unload from and leave the rope with as little effort as the terrain will permit.

(o) *Attendants.* Attendants and engine operators shall be trained for duty. The full length of the tow shall be under the continuous visual surveillance of one or more trained attendants who have easy access to a device for stopping the tow. A system of communication between designated points for the use of attendants shall be provided when required. When only the minimum of required attendants are on duty, such attendants shall not have other duties that prevent them from being in a position to view the tow when skiers are in motion on it.

(p) *Inspection.* The operator or a trained person shall inspect the tow the first thing each day of operation to assure that it is operating properly and that all safety features are functioning.

(q) *Safety stops.* On the uphill side of the unloading area there shall be a safety gate or other device installed across the tow path so that any skier in contact with and being pulled by the hauling rope will contact and actuate it in such a manner as to stop the tow. Such safety gate shall be so located and so actuated that it will stop the tow before the skier contacting the safety gate has traveled more than $\frac{2}{3}$ the distance between the safety gate and the first sheave, or other obstruction. The stopping distance shall not be exceeded even though the skier contacting the safety gate is the only skier on the tow at the time and the tow is operated at maximum speed. Safety gates and other safety stops shall be so arranged that they will fail safe, that is, if they are improperly adjusted or for any reason malfunction, the tow shall stop and remain inoperative.

§ 7.486. Line structures.

(a) *Towers.* The intermediate supports for return rope sheaves shall be of sufficient size to prevent failure under the most adverse design loading plus winds of 40 miles per hour from any direction. If guide wires or braces are used, they shall be clearly marked and be so located as to provide a minimum clearance as required in § 7.483 (relating to path of rope). There shall be no spikes, hooks or other projections on the hauling rope side, or on the downhill side, of the tower, lower than 7 feet above the surface of the tow path.

(b) *Foundations.* Foundations for intermediate towers shall be below the frost line or anchored to a ledge. If utility-type poles are used for intermediate towers, they shall be set into the ground a minimum of 4 feet with the backfill well tamped. If the soil has insufficient bearing capacity to prevent overturning with the most adverse design load condition plus winds of 40 miles per hour then guys or braces shall be used.

(c) *Guards.* Wherever moving parts are less than seven feet above the maximum snow depth, they shall be guarded in such a manner as to prevent accidental contact by the public or skiers using the tow. All persons shall be prevented from passing under the counterweight or contacting any attachments thereto by fences or guards.

(d) *Sheaves and mounts.* Return rope sheaves shall be mounted high enough on intermediate towers to hold the rope at least seven feet above maximum snow

conditions. The sheave mountings shall be sufficiently strong to prevent failure under the most adverse design load conditions plus winds of 40 miles per hour. If the vertical component of the rope tension is not sufficient to hold the rope in the sheave groove at all times, then a proved device shall be used to prevent the jumping of the rope off the sheave. This applies to sheaves supporting the rope as well as those holding it down.

§ 7.487. Line equipment.

Hauling ropes shall be rope manufactured for ski tow use with a special lay to minimize twist. All splices shall be long or transmission splices. Normal operating tensions shall not exceed 1,000 pounds per inch of diameter. Towing outfits and rope grippers are not permitted unless allowed by the authority having jurisdiction.

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