

524 CMR: BOARD OF ELEVATOR REGULATIONS

524 CMR 27.00: SPECIAL INDUSTRIAL POWER OPERATED SERVICE ELEVATORS

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27.01: General

524 CMR 27.00 applies to elevators installed in broadcasting towers, cement storage towers, and similar structures which are not accessible to the general public, and for the exclusive use of special designated operating and maintenance employees only, where transportation of one and not more than three employees is required to attend or service machinery or other equipment requiring attention.

- (1) No persons other than employees as described above shall be permitted to operate or ride thereon. Such elevators shall be removed when the structure is no longer used for the purpose for which it was originally designed.
- (2) Elevators must comply with 524 CMR 27.00, and where reference is made to 524 CMR 15.00 through 35.00 inclusive.
- (3) In no case shall the following conditions be exceeded:
 - (a) Inside area of car nine square feet.
 - (b) Speed with load 100' feet per minute.
 - (c) Contract load 750 lbs.
 - (d) Operation only by means of push buttons.

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(4) Plans and specifications for such elevators shall be filed with the department where the elevators are to be installed and an erection permit secured in accordance with the requirements of M.G.L. c. 143, § 62, governing elevators before any work of installation is started. On completion of such elevators they shall be inspected and tested by the inspector having jurisdiction and shall not be placed in regular operation for the use of the persons for whom they are intended until the department has issued a Certificate of Operation. Such special elevators shall be subject to inspection at least once each year in accordance with M.G.L. c. 143, § 64, governing elevators, and, in addition, all safety devices shall be examined each six months.

27.02: Hoistway Enclosure

The hoistway shall be constructed and enclosed in accordance with the requirements of 524 CMR 17.00, except where building is of open construction throughout, and elevator does not travel through fireproof floors, grille or lattice work enclosure six feet high shall be provided around the hoistway at each floor. An enclosure shall be provided full height on open side or sides of the hoistway when hazards exist, such as stairways, passageways, and similar conditions.

27.03: Car Clearances

- (1) There shall be a clearance of not less than $\frac{3}{4}$ " between the car and the hoistway enclosure, and between the car and its counterweight.
- (2) The clearance between the car platform and the landing threshold shall be not less than $\frac{1}{2}$ ", nor more than $1\frac{1}{2}$ ".

27.04: Pits and Overtravel

- (1) The structure at bottom of hoistway shall be sufficiently strong to withstand without failure the impact of the car with contract load, also the impact of the counterweight, when either is descending at contract speed, or at governor tripping speed if governor-operated safety is used.
- (2) 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 therein set to strike steel safety plank of car. A minimum of one foot clearance shall be provided under the platform when the car rests on the fully compressed bumper.
- (3) At the top landings there shall be a clearance between top of 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. Where 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 not less than two feet six inches.

27.05: Machine and Machinery Supports

- (1) All machinery and sheaves shall be supported and secured so as to effectually prevent any part becoming loose or displaced. The supporting beams shall be steel.
- (2) Loads on overhead beams and their supports shall be computed as follows: the total load on overhead beams shall be assumed as equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams. The load resting on the beams shall include the complete weights of machine, sheaves, controller, etc. The load suspended from the beams shall include the sum of the tensions of all ropes suspended from the beams.

NOTE: The object in doubling the suspended load is to allow for impact, acceleration stresses, *etc.*

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(3) No elevator machinery or sheaves shall be fastened to the underside of the supporting beams at the top of the hoistway.

EXCEPTION: The idler or deflecting sheaves with their guards and frames.

Supporting members for sheaves and other elevator machinery underneath beams shall not be of cast iron in tension.

(4) The factor of safety for overhead beams and their supports shall for steel be five.

27.06: Pipes and Wiring

All wiring shall comply with requirements of 524 CMR 17.06.

(1) 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.

(2) Voltage of control circuits shall not be in excess of 250 volts.

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

27.07: Counterweight Runway

Sides of the counterweight runway exposed to the outside of the hoistway or structure shall be guarded, except where building is of open construction throughout, and elevator does not travel through fireproof floors, grille or lattice work enclosure six feet high shall be provided around the hoistway at each floor. An enclosure shall be provided full height on open sides of the hoistway when hazards exist such as stairways, passageways and similar conditions.

27.08: Protection of Hoist Ropes

All hoist and counterweight ropes shall be located inside the hoistway enclosure.

27.09: Hoistway Doors

(1) 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 doors and gates shall conform to 524 CMR 17.07.

EXCEPTION: Where the car operates in open steel towers without designated landing floors or levels.

(2) Where 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. Where sliding type doors with door closures are used, the clearances specified may be increased to two inches and five inches respectively.

(3) 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.

(4) Hoistway doors shall be provided with approved interlocks conforming to 524 CMR 17.10.

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

(6) Hoistway doors shall be so arranged that it will not be necessary to reach back of any panel, jamb

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or sash to operate them.

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

27.10: Light in Car

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.

27.11: Guide Rail Construction

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

(2) Guide rails shall be securely fastened in position with brackets, through bolts, ties, clips or backing of such strength, design and spacing that the guide rails and their fastenings shall not deflect between supports more than 1/4" under normal operation. Joints of guide rails shall be accurately machined with tongue and groove if tee rails are used, or doweled if other solid shape rails are used, and fastened with splice plates to prevent movement in any direction.

(3) The guide rail 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.

27.12: Counterweight

Counterweights, where used, shall run in guides located within the elevator hoistway and shall comply with 524 CMR 17.30.

27.13: Car Construction

(1) 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.

(2) 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.

(3) No glass shall be used in an elevator car except for car light and appliances necessary for the operation of the car.

(4) The car shall have but one compartment.

(5) The car shall be so constructed and weighted that it will descend upon failure of the suspension means.

27.14: Car Enclosure

(1) Except at the entrance, the car shall be enclosed at sides and top. The enclosure at the sides shall be solid or of open work which will reject a 1/2" diameter ball.

EXCEPTION: An aperture not in excess of 30 square inches shall be permissible in the inside of car enclosures of elevators operating in open steel towers. Such apertures shall be located not less than 54" nor more than 60" above the car floor and shall be equipped with a horizontal sliding cover to close the opening when not in use.

(2) The car enclosure shall be secured in such manner that it cannot work loose or become displaced in regular service.

27.15: Car Gate

- (1) A car door or gate shall be provided at each entrance to the car. This door or gate shall, when closed, guard the full height of the opening, and if on an electric or electrically controlled hydraulic elevator shall be provided with an electric contact or interlock which will prevent 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 door or gate shall be manually operated.
- (3) Car gates shall be of a design that when fully expanded 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 contacts 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.

27.16: Car Safety Construction and Operation

- (1) Elevator cars suspended by wire ropes shall be provided with a car safety located beneath the car platform and capable of stopping and sustaining the car with contract load.
- (2) 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 must operate to set the safety at a maximum speed of 175 feet per minute, except that on the breaking of the hoist ropes, the safety shall operate without appreciable delay and independently of the governor speed action.
- (3) If a speed governor is used, it shall be located where it cannot be struck by the car or counterweight in case of overtravel and where there is sufficient space for full movement of the governor parts.
- (4) The motor-control circuit and the brake-control circuit shall be opened before or at the same time the safety applies.
- (5) The governor rope shall be iron, steel, Monel metal or phosphor bronze not less than $\frac{3}{8}$ inch in diameter. Tiller rope construction shall not be used for governor ropes.
- (6) Elevators of the winding drum type with wire ropes suspension shall be provided with a slack rope device of the manually reset type which will cut off the power and stop the elevator machine if the car is obstructed in its descent and the hoist ropes slacken.
- (7) 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 where its breakage might result in the failure of the safety to function to sustain the car.

27.17: Tests

Test of the car safety 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.

27.18: 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 $\frac{1}{4}$ " high.

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27.19: Limitations of Load, Speed and Platform Area

Where conditions do not conform in all respects with the requirements of 524 CMR 27.00, the elevator installation shall conform to all requirements of 524 CMR 35.00.

27.20: Machines and Sheaves

- (1) Winding drums, traction sheaves and overhead and deflecting sheaves shall be of cast iron or steel, of diameter not less than 40 times the diameter of the wire hoist ropes. The rope grooves shall be machined.
- (2) The factor of safety based on the static load (the contract load plus the weight of car, ropes, counterweights, *etc.*) to be used in the design of these elevator hoisting machines shall not be less than
 - (a) Eight for wrought iron and steel.
 - (b) Ten for cast iron, cast steel and other material.
- (3) Set-screw fastenings shall not be used in lieu of keys or pins at a connection subject to torque or tension.
- (4) No friction gearing or clutch mechanism shall be used for connecting the hoist drum or sheaves to the main driving gear.
- (5) Gearing having cast iron teeth shall not be used.
- (6) Electric elevator machines shall be equipped with electrically released spring applied brakes which will apply automatically when the operating device or stopping contacts are in the stop position.
- (7) No single ground, short-circuit, counter-voltage or motor-field discharge shall prevent the brake magnet from allowing the brake to set when the operating device or stopping contacts are in the stop position.
- (8) Electric elevator machines may be arranged for manual operation by crank in case of power failure and a suitable crank should be provided and kept near the machine.

27.21: Limit Switches

Upper and lower normal stopping devices shall be provided, set to stop the car at the upper and lower terminal landings operated by switches and cams attached to the car and hoistway. Final stopping devices shall be provided, set to operate if the car passes the terminal landings and 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. Drum type machines shall also be provided with automatic machine terminal stop switches.

27.22: Operation and Operating Devices

- (1) The following methods of operation are permitted:
 - (a) Double button control.
 - (b) 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.
 - (c) Single automatic operation.
 - (d) Operation may be by remote control.
- (2) 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.

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- (3) The control systems shall be designed so that the direction of travel of the elevator can be reversed at any point in the hoistway after stopping the elevator from the stop switch or any other method. No control systems shall be used which depend upon completion of maintenance of an electric circuit for:
 - (a) Interruption of the power and application of the electro-mechanical brake at the terminals.
 - (b) Operation of the car safeties, or
 - (c) Stopping in response to the opening of the emergency stop switch.
- (4) Hand-rope operation shall not be used.
- (5) The sticking or freezing of any single electrically operated switch, relay, or contractor 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.
- (6) Each electric power elevator driven by a polyphase alternating current motor shall be provided with a device which will prevent starting the motor if:
 - (a) the phase rotation is in the wrong direction, or,
 - (b) there is a failure in any phase.524 CMR 27.00 does not apply to AC motor used to drive motor-generator sets.

27.23: Suspension Means

- (1) Suspension means shall be wire ropes. Tiller rope is not permissible.
- (2) There shall be not less than two such ropes.
- (3) Steel tapes as suspension means are prohibited.
- (4) Ropes shall not be less than 1/2" in diameter.
- (5) The factor of safety of the suspension means shall not be less than 7.
- (6) The arc of contact of a wire rope on a traction sheave shall be sufficient to produce adequate traction under all load conditions.
- (7) All 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.
- (8) No car or counterweight wire rope shall be lengthened or repaired by splicing.
- (9) The winding drum end 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 524 CMR 27.23(10) for fastening wire ropes to car or counterweight.
- (10) The car or counterweight ends of wire ropes shall be fastened by return loop, by properly made individual tapered babbitted sockets or by spliced eye.
- (11) A metal tag shall be placed on all wire rope fastenings, or be permanently fixed on the car frame, upon which shall be stamped the size, material and manufacturer's rated ultimate strength of the rope and the name of person or company installing the ropes and the date of installation or renewal.

27.24: Emergency Signal

An emergency signal shall be provided operative from the car. This signal shall be audible outside the hoistway and may be a telephone connected to a central exchange.

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27.25: Maintenance of Elevators

In order to insure the safe operation of elevators installed in broadcasting towers and cement towers subject to extreme weather conditions, and before being placed in service, they shall conform to the following requirements:

Lubrication. All parts of the machinery and equipment requiring lubrication shall be lubricated at regular intervals with lubricants of a grade as recommended by the manufacturer.

27.26: Guide Rails

Except those of elevators equipped with roller or other type guiding members not requiring lubrication, guide rails should be kept well lubricated.

- (1) Rails on which a lubricant is used shall be cleaned down at least once a year.
- (2) Rust-preventive compounds such as paint mixtures or other anti-rust coatings shall not be used as they may interfere with the proper operation of the car safety.

27.27: Car Safety Mechanisms

All moving parts of car safety mechanisms shall be kept clean and free of rust and dirt and shall be lubricated at frequent intervals. This is especially important where the safety mechanism is exposed to water, corrosive vapors, or freezing conditions, as corrosion or rusting of the parts may prevent operation of the safety.

27.28: Machine and Brake

Machine lubricant subject to freezing conditions shall be specified by the manufacturer. Transformer oil with low pour point and low viscosity shall be used in all brake pots where brake coils and magnets are submerged.

- (1) All fulcrum pins operating in brake levers shall be of non-ferrous metal or the liners bushed with non-ferrous bushings.
- (2) The heads of all rivets fastening brake linings and all metal in contact shall be sealed to avoid freezing to brake pulley.

27.29: Instructions

Elevator subject to extreme weather conditions should make a trial trip without personnel on the car to make sure the operating mechanism is in good order.

REGULATORY AUTHORITY

524 CMR 27.00: M.G.L. c. 143, § 69.