

## 524 CMR: BOARD OF ELEVATOR REGULATIONS

524 CMR 23.00: PRIVATE RESIDENCE ELEVATOR CODE (FOR INSTALLATIONS MADE PRIOR TO JUNE 7, 1991)

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#### 23.01: Scope

524 CMR 23.00 applies only to power passenger elevators serving only a single family, installed in a single residential building and having a contract load not in excess of 700 lbs. the contract speed not in excess of 50 fpm and a clear platform area not in excess of 12 sq. ft. and a rise not in excess of 50'. All installations shall comply with local laws and ordinances.

For requirements governing hand-elevators, refer to the appropriate sections of 524 CMR 15.00 through 33.00.

#### 23.02: Hoistways

- (1) Enclosure. The hoistway shall be solidly enclosed and be of one hour fire-rated construction throughout.
- (2) Contract Speed.
  - (a) If the contract speed is 30 fpm or less, the enclosure may be omitted in the lowest story served if there is no pit and if the car platform is equipped with a device which, when obstructed in its downward travel by a force not to exceed 4 lbs. applied anywhere at its lower surface, will open an electric contact in the control circuit and thus stop down travel of the car within the range of the free suspension of the device and not exceeding three inches.
  - (b) If the contract speed is 30 fpm or less, the hoistway landing door or doors at the lower landing may be omitted on elevators located in existing open stairway areas or other existing open areas if the car platform is equipped with a device which will meet the requirements of 524 CMR 23.02(2)(a), and stop the car when it is obstructed in its downward travel, and provided that the unused sides of the hoistway are protected.
- (3) Car Clearances.
  - (a) 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.
  - (b) The clearance between the car platform and the landing threshold shall be not less than  $\frac{1}{2}$ " nor more than one inch.
- (4) Pits and Overtravel.
  - (a) 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. (See 524 CMR 17.16.)
  - (b) A pit is not required at the bottom of the hoistway and the car may stop immediately on or above the bottom landing floor, or a pit may be provided to permit the car floor to stop flush with the landing floor, if equipped with a device that will meet the requirements of 524 CMR 23.02(2).
  - (c) A pit shall not be provided when there is no hoistway enclosure at the lowest story served.
  - (d) At the top landing, there shall be a top clearance of not less than four inches plus one inch for each 3 fpm of speed in excess of 30 fpm.

23.02: continued

(5) Overhead Support.

(a) All machinery and sheaves shall be so supported and secured as effectually to prevent any part becoming loose or displaced.

The supporting beams shall be steel, sound timber or reinforced concrete.

(b) 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.

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

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

Supporting members for sheaves and other elevator machinery hung underneath beams shall not depend solely on cast iron in tension.

(d) The factor of safety for overhead beams and their supports shall be:

For steel.....	5
For timber and reinforced concrete.....	6

(6) Pipes and Wiring.

(a) All electric wiring shall be in accordance with the rules and regulations made in accordance with the provisions of M.G.L. c. 143, § 3L, as most recently amended.

(b) No pipes, ducts, vessels, electrical conduits or cables shall be located within an elevator shaftway or hoistway or its pit other than those used to furnish or control light, heat, sprinklers, communications or signals for the elevator or hoistway, or for low voltage fire detection systems for the hoistway.

(c) No electric circuit having a nominal voltage in excess of 250 volts, shall be used for the operation, control or motor circuit.

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

23.03: Hoistway Guards

(1) Counterweight Runway.

(a) Where the counterweight runway comes down to a floor or passes a floor or stairs, it shall be enclosed at least seven feet above the floor or stairs by an enclosure which is either solid or with openings not exceeding 3/8" square.

(b) Access shall be provided for inspection, maintenance and repair of counterweight and ropes. The door to the counterweight runway enclosure shall be self-closing.

(2) Protection of Hoist Ropes.

(a) Where hoist ropes pass through a floor or stairs outside the hoistway enclosure, they shall be solidly enclosed to a height of not less than seven feet above the floor or the stair tread. The floor openings shall not be greater than necessary for free passage of the ropes.

(b) Hoist ropes immediately adjacent to stairs shall be guarded with solid or grille panel on the stair side to a height of not less than seven feet above the stair treads. Enclosures shall be solid, or open work with openings not exceeding 3/8" square.

23.04: Landings

(1) Hoistway Doors.

(a) Landing openings shall be protected by swing or horizontal sliding doors. Hoistway doors shall be of solid wood core or its equivalent and shall be not less than six feet six inches high.

(b) The clearance between the hoistway enclosure door and the hoistway edge of the landing sill shall not exceed three inches and the distance between the hoistway face of the landing door and

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the car door or gate shall not exceed four inches.

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23.04: continued

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

(d) Hoistway doors shall be provided with locking devices and electric contacts conforming to the following: "The locking device shall either be of a type which will prevent starting the car unless the door is locked in the closed position, or it may permit the car to start with the door in the closed position and not locked, provided the device will stop the car if the door fails to lock, before the car has moved more than 12" away from the landing. The device shall also prevent opening any hoistway door unless the car is within 12" of that landing."

(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 that it will not be necessary to reach 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 will be provided to prevent the hanger carriage from leaving either end of the track, or suitable stops shall be provided on the door.

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

Other Than: Elevators in unenclosed hoistways.

(3) Guide Rail Construction.

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

(b) Guide rails shall be securely fastened.

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

Joints of guide rails shall be well fitted and strongly secured.

Guide rails and their joints and fastenings shall withstand the application of the "SAFETY" when stopping the fully loaded car.

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

23.05: Counterweight

(1) (a) Counterweights, where used, shall run in guides.

(b) If a car counterweight is used, it shall not be of sufficient weight to cause undue slackening of any car hoist rope at 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.

(d) There shall be no gas lines under the car or counterweight runways.

(e) Counterweights requiring a safety shall operate by a speed governor and shall be of the instantaneous type at a maximum tripping speed of 75 feet per minute.

(2) Car Construction.

(a) Elevator cars shall have metal or combination metal and wood suspension frames and platforms with safety factor of not less than five based on the contract load.

(b) 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 shoe brackets.

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

(d) The car shall have but one compartment.

(e) No elevator shall have more than two openings.

(3) Car Enclosure.

(a) Other than 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 three eight inch diameter ball.

(b) The car enclosure shall be secured in such manner that it cannot work loose or become

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displaced in regular service.

## 23.05: continued

(4) Car Gate.

- (a) A car door or gate shall be provided at each entrance to the car. This door or gate shall, when closed, guard the opening to a height of at least six feet six inches and if on an electric or electrically controlled hydraulic elevator, shall be provided with an electric contact which will prevent operation of the elevator unless the car door or gate is within two inches of full closure.
- (b) The car door or gate may be manually operated, power operated, or may be closed by a weight or spring. Collapsible gates shall not be power-opened more than nine inch from full closure.
- (c) Car gates shall be of a design that when fully expanded will reject a three inch diameter ball.
- (d) When the hoistway enclosure is omitted at the bottom landing the car gate shall be provided with a mechanical lock which will lock it in the closed position when the car is more than six inches away from any landing. Car door release shall be provided to permit the door or gate to be opened at any point of car travel.
- (e) Car door or gate contacts shall be positively opened by a lever or other device attached to and operated by the door or gate.
- (f) 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.

23.06: Safeties(1) Safety Construction and Operation.

- (a) 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.
- (b) The car safety shall operate by a speed governor and be of the instantaneous type at a maximum tripping speed of 75 fpm.
- (c) If speed governor is used, it shall be located where it cannot be struck by the car or counterweight in case of over-travel and where there is sufficient space for full movement of the governor parts.
- (d) The motor-control circuit and the break control circuit shall be opened before or at the same time the safety applies.
- (e) The governor ropes shall be of iron, steel Monel metal or phosphor bronze not less than ¼" in diameter. Tiller rope construction shall not be used for governor ropes.
- (f) Elevators of the winding drum type with rope 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. Elevators with roller chain suspension shall be provided with a slack chain device which will cut off the power and stop the elevator machine if the car is obstructed in its descent and the hoist chains slacken. This device need not be of the manually reset type if the chain sprockets are guarded to prevent the chain from jumping off the sprockets.
- (g) 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.

(2) 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.

(3) Capacity Plate. 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 ¼" high.

(4) Limitations of Load, Speed and Platform Area. Where the contract load exceeds 700 lbs. or the contract speed exceeds 50 fpm, or the net inside car platform area exceeds 12 sq. ft., the elevator shall not be considered a "Private Residence Elevator" and shall conform to all requirements for "Power Elevators".

23.07: Machines(1) Machines.

(a) Winding drums, traction sheaves and overhead and deflecting sheaves shall be of cast iron, or steel, of diameter not less than 30 times the diameter of the wire hoist ropes. The rope grooves shall be machined.

Where 8 x 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 (the contract load plus the weight of car, ropes, counterweights, *etc.*) to be used in the design of residence elevator hoisting machines shall not be less than:

1. Eight for wrought iron and steel.
2. Ten for cast iron, cast steel and 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 that have 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, countervoltage or motor field discharge shall prevent the brake magnet from allowing the brake to set in the intended manner during normal operation.

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

(2) 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, set to operate if the car passes the terminal landings and stop the car before it strikes the overhead or pit bottom.

Where no hoistway enclosure is provided at the lower landing the final stopping device may be omitted at this landing.

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.

(3) Operation.

(a) The following methods of operation are permitted:

1. Continuous pressure operation.
2. Momentary pressure operation with up-down buttons or switches in the car and up-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".

(c) No control system shall be used which depends upon the completion or maintenance of an electric circuit for:

1. Interruption of the power and application of the electro-mechanical brake at the terminals.
2. Operation of the car safeties, or
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 contractor, or the occurrence of a single accidental ground, shall not permit the car to start if any hoistway or car door or gate is in the open position, and shall not permit the car to move more than 12" away from a floor with the hoistway door unlocked.

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### 23.08: Suspension Means

- (1) Suspension means shall be wire ropes or steel roller-type chains.
- (2) There shall not be less than two such ropes or chains.
- (3) Steel tapes as suspension means are prohibited.
- (4) On elevators having a contract load of less than 450 lbs. and operating at a contract speed of less than 30 fpm, ropes shall not be less than ¼" in diameter. Where the contract load exceeds 450 lbs. or the contract speed exceeds 30 fpm, ropes shall not be less than three-eighths inch in diameter.
- (5) The factor of safety of the suspension means shall not be less than seven.
- (6) When the car and counterweight are suspended by steel ropes and the driving means between the machine and the counterweight is an endless steel roller-type chain drive, the factor of safety of such chain with rated load on the car shall not be less than eight.
- (7) The arc of contact of a wire rope on attraction 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°.
- (8) 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 over-travel.
- (9) No car or counterweight wire rope shall be lengthened or repaired by splicing. Broken or worn suspension chains may be repaired but the entire chain shall comply with 524 CMR 23.08(6).
- (10) 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 524 CMR 23.08(11) below for fastening wire ropes to car or counterweight.
- (11) The car or counterweight ends of wire ropes shall be fastened by return loop, spliced eyes, or individual tapered babbitted sockets or by properly attached fittings.

### 23.09: 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.

## REGULATORY AUTHORITY

524 CMR 23.00: M.G.L. c. 143, § 69.