

BULLETIN
OF
INDUSTRIAL COMMISSION OF WISCONSIN
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ELEVATORS
GENERAL ORDERS ON SAFETY
INTRODUCTION.

The orders on safety for elevators included in this bulletin were drafted by the committee on safety and sanitation, which also drafted the orders on safety published in Bulletin Vol. I, No. 1, under date of May 20, 1912. This committee is composed of the following persons:

Representing Wisconsin State Federation of Labor:

Geo. Mutter, machinist, Milwaukee.

Fred French, patternmaker, Milwaukee.

Representing Milwaukee Merchants and Manufacturers' association:

Charles P. Dessert, Plister. & Vogel Leather company.

Edward J. Kearney, Kearney & Trecker company (machinery), chairman.

Representing Milwaukee Health department:

Joseph Derfus, chief sanitary Inspector.

Representing Wisconsin Manufacturers' association:

Thomas McNeill, Sheboygan Chair company, Sheboygan.

H. W. Bolens, Gilson Manufacturing company (engines), Port Washington.

Representing Employers' Mutual Liability company of Wausau:

W. C. Landon, Wausau.

Representing Industrial Commission of Wisconsin:

John W. Mapel, Pfister & Vogel Leather company.

Fred W. McKee, Fairbanks-Morse company (engines), Debit.

C. W. Price, assistant to the Industrial commission and secretary of the committee.

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The following sub-committee assisted the main committee in drafting these orders;

C. F. Ringer, former Inspector of buildings, Milwaukee.

P. Jermaln, Otis Elevator company.

George Mueller, inspector of elevators, Milwaukee.

Otto Fischer, Inspector of elevators, Milwaukee.

U. N. Chapman, Inspector of safety, Travelers' Insurance company.

C. W. Price, assistant to Industrial commission.

In working out standards for elevator protection, the committees have made most careful inquiry

into the present practice of good elevator construction among the various elevator manufacturers who sell elevators in Wisconsin, and they have endeavored to draft orders in line with this practice. The investigations of the committee revealed the fact that there are a large number of points on elevators which are vital to safety and therefore, in drafting orders, it was necessary to include many details and to cover all of these points. Up to the present time there has been no standard which would serve as a guide to the purchaser of an elevator. The result has been the installation of many elevators which are not safe.

Manufacturers, generally, are alive to the importance of safeguarding elevators because this is considered one of the most dangerous machines in the factory. In issuing these orders the commission believes it is rendering the owner of elevators a real service, because it is placing in their hands standards which will enable them to secure safety in new elevators which are purchased, as well as in old elevators at present installed,

Copies of these rules as drafted by this committee were sent to manufacturers and to manufacturers' associations, and a public hearing was held in Madison on Jan. 7, 1913. The Industrial commission adopted the revised rules as general orders on Jan. 16, 1913. They became effective later, Feb. 20, 1913. A few elevator orders had been adopted eight months previously.

(c) Definition of Employment and Places of Employment

The phrase "place of employment" shall mean and include every place whether indoors or out or underground and the premises appurtenant thereto, where either temporary or

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permanently any industry, trade or business is carried on, or where any process or operation, directly or indirectly related to any industry, trade or business, is carried on, and where any person is directly or indirectly employed by another for direct or indirect gain or profit, but shall not include any place where persons are employed in private domestic service or agricultural pursuits which do not involve the use of mechanical power.

The term "employment" shall mean and include any trade occupation or process of manufacture, or any method of carrying on such trade, occupation, or process of manufacture, which any person may be engaged, except in such private domestic service or agricultural pursuits as do not involve the use of mechanical power. (Sec. 2394—41—Sub. 1—2.)

(d) Procedure for Hearing

If an employer considers any of the following orders issued by the Industrial commission as unreasonable, he may petition the Industrial commission for a hearing, and the commission if it finds the order unreasonable, is required by law to substitute such other order as may be just and reasonable. The procedure for such hearing is as follows:

1. Any employer or other person interested either because of ownership in or occupation of any property affected by an such order, or otherwise, may petition for a hearing on the reasonableness of any order of the commission in the manner provided in sections 2394 41 to 2394—70, inclusive.
2. Such petition for hearing shall be by verified petition filed with the commission, setting out specifically and in full detail the order upon which a hearing is desired and every reason why such order is unreasonable, and every issue to be considered by the commission on the hearing. The petitioner shall be deemed to have finally waived all objections to any irregularities and illegalities in the order upon which a hearing is sought other than those set forth in the petition. All hearings of the commission shall be open to the public.

3. Upon receipt of such petition, if the issues raised in such petition have therefore been adequately considered, the commission shall determine the same by confirming without hearing its previous determination, or if such hearing is

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necessary to determine the issues raised, the commission shall order a hearing thereon and consider and determine the matter or matters in question at such times as shall be prescribed. Notice of the time and place of such hearing shall be given to the petitioner and to such other persons as the commission may find directly interested in such decision.

4. Upon such investigation, if it shall be found that the order complained of is unjust or unreasonable the commission shall substitute therefor such other order as shall be just and reasonable.

5. Whenever at the time of the final determination upon such hearing it shall be found that further time is reasonably necessary for compliance with the order of the commission, the commission shall grant such time as may be reasonably necessary for such compliance. (Sec. 2394—57—Sub. 1—S.)

(e) Penalties

If any employer, employee or other person shall violate any provisions of section 2391-41 to 2394-55, inclusive, of the statutes, or shall do any act prohibited in sections 2394 -41 to 2394-71, inclusive, or shall fail or refuse to perform any duty lawfully enjoined, within the time prescribed by the commission, for which no penalty has been specifically provided, or shall fail, neglect or refuse to obey any lawful order given or made by the commission, or any judgment or decree made by any court in connection with the provisions of sections 2394— 41 to 2394—71, for each such violation, failure or refusal such employer or other person shall forfeit and pay into the state treasury a sum not less than ten dollars nor more than one hundred dollars for each such offense. (Sec. 2394-70.)

PROVISIONS OF INDUSTRIAL COMMISSION LAW

The Industrial commission law, Sections 2394 41 to 2394— 70, inclusive of the statutes, provides that “all places of employment shall be made safe,” and empowers the Industrial commission to make investigation as to what places are not safe, and to prescribe such safeguards, and issue such order as will make them safe.

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It is the duty of the Industrial commission to fix standards of safety and to formulate rules and regulations relative to the enforcement of such standards, which rules shall be published for the use of all citizens who may be interested. (Section 2394—52—Sub. 7.)

The law empowers the Industrial commission to appoint advisors, who shall serve without compensation, to assist the commission in the execution of its duties. (2394—52—Sub. 1.)

(a) Duties of Employers

Every employer shall furnish employment which shall be safe for the employees therein and shall furnish a place of employment which shall be safe for employees therein and for frequenters thereof, and shall furnish and use safety devices and safe guards, and shall adopt and use methods and processes reasonably adequate to render such employment and place of employment safe, and shall do every thing reasonably necessary to protect the life, health, safety and welfare of such employees and frequenters. (Sec. 2394—48.)

(b) Duties of Employees

No employee shall remove, displace, damage, destroy or carry off any safety device or safeguard furnished and provided for use in any employment or place of employment, nor interfere in any way with the use thereof by any other person nor shall any such employee interfere with the use of an method or process adopted for the protection of any employee in such employment or place of employment or frequenter employee of such place of employment, nor fail or neglect to do every other thing reasonably necessary to protect the life, health safety or welfare of such employees or frequenters. (Sec. 2394 —49—Sub. 2.)

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ELEVATOR ORDERS

Definition.—The term “elevator” when used in these orders, shall mean an elevating device provided with a platform and cage which is located in a permanent shaftway, and h used for the purpose of raising and lowering persons or materials.

Order 400. Elevators; Catching Device. All elevators except direct lift plunger elevators, must be equipped with an automatic device to catch the car in case it drops, and if the travel of the car of a power-driven elevator exceeds fifteen feet, a speed governor must be provided. Safety devices must be tested for efficiency at least once each month. *For elevators having a car speed of 100 feet or less per minute, the minimum speed at which the governor must act must be 150 feet per minute. For elevators having a car speed of over 100 feet and up to and including 250 feet per minute, the governor must be set to operate when the speed of the car exceeds by 50 per cent the regular speed. On elevators having a car speed of over 250 feet per minute the governor must be set to operate when the speed of the car exceeds by 40 per cent the regular speed. Such speed governors and safety devices must be put to a practical running test, with full load on platform, on every new installation and a report of such test must be made by the owner of the elevator to the industrial commission.*

On catching devices, to which speed governors are hereafter attached, the dogs or clamps of such catching devices must be attached to the under side of the car platform.

Every type of safety device for catching the car if it drops must be subjected to an actual drop test with load two-third of capacity, such test to be made under the direction of the Industrial commission.

Every such safety device hereafter installed must conform to the standard types approved by such tests.

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All power-driven elevators must be provided with automatic stops which shall stop them at the lowest and at the highest landings independent of the operating cable or other device. All hand power elevators must have such limit stops at the top.

Note (a). The speed governor is the only equipment which will operate the safety device when the car attains an excessive speed from broken machinery or other cause. Safety devices without speed governors operate only when the cable breaks.

Note (b). Purchasers of safety devices should make sure that the type of the device has been properly tested and approved by the Industrial commission.

Order 401. Freight Elevators; Gates. All freight elevators must be equipped at each landing with self-closing gates not less than 5½ feet in height, except at top landing where such gates must be not less than 3½ feet in height. The bottom rail on all gates must be not more than 12 inches from the floor. The openings between the slats or bars on gates must be not more than 3 inches except on side of operating cable where the opening may be made sufficiently large to allow for the operation of the cable.

In case local conditions do not permit of a gate of 5½ feet in height a gate not less than 3½ feet in height may be used provided such gate is placed not less than 12 inches from the platform of the car, and provided that tell-tale chains not less than 5 feet long and not over 5 inches apart are suspended from the edge of the platform in front, of opening. On the top landing the gate may be placed less than 12 inches from the platform of the car.

Gates on freight elevators which are already installed which are less than 3½ feet in height, and which are placed close to the car, will be permitted if the bottom rail of such gates is not more than 12 inches from the floor, and if tell-tale chain as above specified, are provided.

Freight elevators already installed, if equipped with doors instead of gates, which doors are made of solid wood or metal or of wire-glass, grill work or screen as specified below for

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passenger elevators, will be permitted if such doors are equipped with self-closing locks which cannot be opened from the outside except by means of a key and provided such elevators are operated by an operator stationed on the car.

On hand power elevators where it is necessary in order to operate the car, the gate may be made not less than 3½ feet in height and placed not less than 2 inches from the car, providing tell-tale chains as specified above are attached to the car.

Gates swinging on vertical axes will not be permitted.

All gates or doors for entrances to freight elevators must be of sufficient strength to withstand a lateral pressure at the center of not less than 250 pounds.

Order 4.02. Passenger Elevator; Doors. All passenger elevators must be equipped at each landing with doors which must entirely fill the opening to the shaft. All such doors must be constructed of solid metal, wire-glass, or screen of not less than No. 10 wire with 1¾ inch mesh, or of grill work the openings in which must not be more than 1¾ inches square, or if oblong and over 1¾ inches long the openings must not be over 1 inch wide. All such doors must be equipped with self-closing locks or other appliances which cannot be opened from the outside except by means of a key, which key must be placed in charge of a responsible person.

Metal doors will not be required on passenger elevators already installed provided that if such doors have grill work or screen, the openings in such must be in accordance with the above requirements.

All doors for entrances to passenger elevator cars must be of sufficient strength to withstand a lateral pressure at the center of not less than 250 pounds.

Note. On doors of passenger elevators at present installed, where the openings in the grill work are larger than specified above, a wire screen may be stretched across the inner face of the door.

Order 403. Operation of Car of Passenger Elevator. All passenger elevators, except automatic push-button control elevators, must have a competent operator who is stationed on the car.

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The doors of passenger elevators must not be opened until the car reaches the landing and must be closed and locked before the car leaves the landing.

The operating lever, wheel or switch of a passenger elevator car must not be operated except by the operator stationed on the car. Hand rope controls of passenger elevators are not permitted on new installations or alterations.

Order 404. Elevator Lights. Ample light must be provided for all elevator cars and landings.

All passenger and freight elevators and power driven dumbwaiters must be equipped with a signal system, which is so arranged that it can be operated without reaching into the hatchway.

Note. On all passenger elevators the threshold of the car and the landings should be well lighted to prevent persons from stumbling when the car does not stop even with the floor.

Order 405. Elevator Shafts; Projecting Floors, etc. All projections in elevator shafts such as floors, beams, sills and bolts, unless guarded against by the car enclosures, must be provided with smooth beveled guards, fitted directly under such projections so as to push any projecting portion of the body back into the car instead of crushing it. This beveled guard must be set at an angle of not less than 60 degrees with the floor level. *On new installations, the toe guards must be made of smooth metal not less than 1/16 inch in thickness.*

Order 406. Freight Elevators; Enclosure of Car. All freight elevator cars must be enclosed solidly on all sides except on entrance side, to a height of not less than 6 feet. On side of the operating cable sufficient space should be allowed to operate the cable.

All freight elevator cars must be equipped with a covering over the top either solid or made of wire screen not less than No. 10 wire and with mesh not over 1 inch. The part of such covering which faces the opening to the shaft, must be constructed with a section not less than 18 inches in width and extending the width of the opening to the shaft. Such section

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- must be so attached with hinges to the screen that it will rise when it meets with an obstruction as the car descends *On old installations of hand power elevators screens on top of car will not be required when the gates at the landings are brought down flush, with the floor.*

Where there is more than one entrance to a freight elevator car, if such entrances are not on contiguous sides of the car, or if the floor levels at each landing are not the same, or if there are more entrances to the shaft on one side than on the other, such other entrance to the car farthest from the place where the operator stands must have a gate not less than 6 feet in height, and reaching down flush with the floor

Note. The specification of 1 inch mesh in these orders means that the spacing between the wires when measured in either direction, must not be more than 1 inch from center to center of the wires at the points where they cross each other. This applies to the diamond mesh as well as the square mesh.

Order 407. Passenger Elevators; Enclosure of Car. All passenger cars must be fully enclosed on all sides except on entrance sides. Glass must not be used except to cover certificates, annunciators and lamps. Mirrors are strictly forbidden.

The sides of the car must be constructed of solid panels up to a height of not less than 3½ feet, and where counterweights run there must be a solid guard to the height of the car. The sides of the car above the panel may be made of grill work with open spaces not more than 1¾ inches

square or, if oblong and over 1¾ inches long, the openings must not be over 1 inch wide; or of screening of not less than No. 10 wire and with mesh not over 1¾ inches. The specification regarding height of panels on sides of car applies only to new installations or alterations. In all new installations or in alterations of cars the enclosure of cars must be made of incombustible material. The floors may be made of wood. The roof of the car must be constructed of solid material A portion of such roof measuring not less than 20 inches by

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30 inches must be so constructed that it can be readily re moved by a person on the inside of the car.

Where cars of passenger elevators have more than one en trance, the entrance other than the one facing the operator must be equipped with a gate or door entirely filling the opening, which must be kept closed when the ear is in motion.

In all passenger elevator cars there must be placed on all sides, not having door openings or seats, a metal handrail one inch in diameter and not less than three feet above the floor

No elevator shall have more than one compartment. (This applies to old and new installations.)

Note. On passenger cars where the openings in the grill work are larger than specified above, a screen may be stretched around the outside of the car.

Order 408. Sidewalk Elevators. All doors covering sidewalk elevator openings must open only sufficiently for proper service, and when open must form a suitable guard to the opening, or other guards must be provided. All power sidewall elevators must be equipped with a device to prevent the operation of such elevator until the doors are open. All sidewalk doors and frames must have a rough face or surface, and be so constructed and placed that no part of the door frame or hinges shall project above the level of the sidewalk. These doors must be of sufficient strength to carry a superimposed load of 250 pounds per square foot. These doors must be closet when the elevator is not in actual use.

Order 409. Cables, Factor of Safety. The maximum safe working load for all hoisting and counterweight cables must be not more than 1/7 of the breaking load, as given in the schedule of the cable manufacturer. *Wherever steel cables are installed a metal sign must be placed in a conspicuous position in the car to read as follows: This elevator is equipped with steel cables and when these cables are renewed steel cables must be used.*

Order 410. Drums and Sheaves, Minimum Size. The following shall be the schedule of cables with minimum size of sheaves and drums:

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Minimum size of sheaves and drums for power elevator other than dumbwaiters.

Size of Cable

3/8 inch -----	20 Inches
7/16 inch -----	20 inches
1/2 inch -----	20 Inches
9/16 inch -----	22 Inches
5/8 inch -----	24 Inches

3/4 inch -----30 Inches
7/8 inch -----36 Inches
1 inch -----40 Inches

Note. Attention is called to the fact that in the above schedule the minimum diameter of sheaves and drums is given, but it is recommended that wherever practicable, a larger diameter than the minimum should be used.

Order 411. Standard for Cable Inspection. Cables are considered unsafe and must be condemned when through broken wires, wear, rust, undue strain, or other conditions indicating deterioration, the strength of the cables has deteriorated 25%

Note. When broken wires, or other signs of deterioration are discovered, the cables should be carefully watched. Cables should be frequently lubricated; it adds much to their durability.

Order 412. Hoisting Cables, Number Required. All elevators requiring hoisting cables must be equipped with not less than two hoisting cables. *On old installations a single hoisting cable will be permitted if the factor of safety is 10.*

Order 413. Passenger Elevators, Defined. Elevators use chiefly for carrying passengers shall be considered passenger elevators.

Order 414. Hydraulic Elevators, Number of Cables Required. All hydraulic elevators traveling over 250 feet per minute, or having a carrying capacity of over 2000 pounds must be equipped with not less than 4 hoisting cables.

Order 415. Sheaves on Hydraulic Elevators, Guarded. All sheaves at the cylinder of hydraulic elevators must be provided with a cable guard to prevent the cable from leaving the sheaves in case it becomes slack.

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Order 416. Cables on Drums, Turns Required. The hoisting and counterweight cables on drum types of elevators, shall have at least one and one-half turns of the cable on the drum when the car or counterweight has reached the limit of travel

Order 417. Traction Elevators, Cables Required. Traction types of elevators must have not less than 4 hoisting cables All traction types of elevators running over 250 feet per minute, or having a carrying capacity of over 2,500 pounds, must be equipped with not less than 6 cables.

Order 418. Cables, Fastenings at Terminals. *Where practicable, on elevators hereafter installed, each hoisting and counterweight cable shall be independently fastened at its terminal to the crosshead of the car frame or counterweight frame, respectively.*

Where adjustable draw bars or equalizers are required, the manufacturer's standard construction of such draw bars and equalizers for the given condition of installation and type of apparatus shall be submitted to the Industrial commission for approval and only such approved construction shall be used in similar cases.

In no case, however, on elevators hereafter installed shall more than one cable be fastened into the same device or secured to a single threaded draw bar.

Order 419. Drum and Car Counterweights. All passenger elevators hereafter installed, must be equipped with car counterweights. All drum types of passenger elevators hereafter installed, must also be equipped with drum counterweights.

Note. The equipment of elevators with proper counterweights is very essential to safety and it is recommended that on elevators already installed, the above standards be followed where possible.

Order 420. Counterweights, Cables Required. Each set of counterweights on freight elevators hereafter installed, the weight of which exceeds 1,000 pounds, or the travel of which exceeds 25 feet, or the speed of which exceeds 60 feet per minute,

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must be equipped with not less than 2 cables. Each set of counterweights on all passenger elevators hereafter installed must be equipped with not less than 2 cables.

Order 421. Cables Protected. Where cables of one set of counterweights pass through or by another set of counterweights, they must be provided with a suitable covering to prevent them from chafing or wearing on the counterweights.

Order 422. Counterweights Bolted. Each set of counterweights on all power driven elevators hereafter installed, unless contained in a steel frame, must have the separate weights bolted together with not less than 4 bolts with lock nuts and cotter pins at each end, at least 2 of which bolts shall pass through all of the weights, tightly bolting them together. Counterweights on hand power elevators must be bolted together with not less than 2 bolts. On all sub-counterweights the bolts must pass through holes and not slots. *Counterweights of elevators at present installed must be bolted or strapped together to keep the individual weights in position.*

Order 423. Fireproof Shaftways on Passenger Elevators, All passenger elevators hereafter installed or where shaftway are altered, must have their shaftways enclosed entirely with fireproof enclosures.

A fireproof enclosure for a passenger or freight elevator must be made either of wire glass in metal frame, or of solid plaster not less than 2 inches thick on metal lath and metal frame, or of brick, concrete or tile of sufficient thickness to give rigidity. The windows in a fireproof enclosure must have metal frames, metal sash and wire glass. The doors and their frames must be of solid metal, or the doors may be made of not less than two thicknesses of matched lumber, enclosed with tin. These doors must be self-closing in case of fire. Fire doors must not swing on a vertical axis except in basements where the restricted space will not permit the use of a sliding or rolling door.

Note. The term. "enclosure" when used in these orders, shall mean the enclosure of the shaftway on all sides. Where fireproof shaftways are required, the entrance

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openings to the shaftway must be equipped with fireproof doors constructed in accordance with the above order.

Order 424. Fireproof Shaftways in Basement. All elevators hereafter installed, must have their shaftways in the basement enclosed with fireproof enclosures, except sidewalk elevators, and freight elevators in buildings not over one story in height above the basement and where automatic lift fire doors on such elevators close the openings in the first floor. All automatic lift fire doors must be made sufficiently strong to safely sustain a center load of 300 pounds, and

must be covered on the under side with fireproof material. Guide rails must not be attached to the fire doors.

Note. The automatic fire door may consist of a solid cover which is automatically raised and lowered with the movement of the elevator car, or of hinged doors which automatically open and close with the movement of the car.

Order 425. Fireproof Shaftways on New Freight Elevators. All freight elevators hereafter installed in buildings more than two stories in height above the basement, or in building & where the travel of the elevator car exceeds 35 feet, must have the shaftways entirely enclosed with fireproof enclosures as specified in order 423.

Order 426. New Freight Elevators, Shaftways Guarded. All freight elevators hereafter installed in buildings not over two stories in height above the basement, and where the car travel does not exceed 35 feet, must have the shaftways above the basement enclosed with guards not less than 6 feet in height above each floor, unless a continuous fireproof enclosure is provided. Where not enclosed continuously with a fire proof enclosure, the shaftway opening in the top floor must be provided with a fire door which is operated by the movement of the car. If the guards are made of wood, they must be made solid with the top at least 2 feet below the ceiling. If the guards are made of wire screen, the wire must not be less than No. 10 gauge, and the mesh not more than 1 inch, wire guards may extend to the ceiling.

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Order 427. Fireproof Shaftways for Hotels, Hospitals, etc. All elevators in hotels, lodging houses, hospitals and institutions for housing insane or infirm persons, or children, must have hatchways entirely enclosed with fireproof enclosures.

Order 428. Old Freight Elevators, Shaftways Guarded. With the exception of the elevators mentioned in Order 427: all elevators at present installed, the shaftways of which are not continuously enclosed, must be guarded at each floor with an enclosure not less than 6 feet high, if such enclosure guards are made of wood, they must be made solid and the top must be at least 2 feet below the ceiling. If the enclosure guards are made of wire screen, the wire must be not less than No 10 gauge, and the mesh not more than 1 inch; wire guard may extend to the ceiling. Shaftway enclosures at present installed, which are not of sufficient height or sufficient strength must be changed to conform to the above order.

Order 429. Elevators on Outside of Buildings, Guarded. All elevators located on the outside of a building must have an enclosure at each landing of not less than 6 feet in height or the sides where the floor adjoins such shaftway.

Order 430. Counterweight Runways Guarded. Where counterweight runways are located in the elevator shaftway the outside must be entirely enclosed with a solid guard. The runways must be entirely enclosed on the inside with a solid guard to a height of eight feet from the bottom of the pit, *and where the travel of the car exceeds thirty-five feet, the runway: must also be enclosed* ten feet down from the top limit of travel of the car. Where counterweight runways are located outside of the elevator shaftway, they must be entirely enclosed on all sides with a solid guard. On hand power elevators the guards will not be required on the inside of counterweight runways at top and bottom.

Order 431. Pent House Construction. Where fireproof shaftway enclosures are required, the enclosures must include the pent house or enclosure of sheaves or machinery above the shaftway.

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The above provisions will not be required where there are sheaves only and where they are separated from the hatchway by a fireproof floor. Where a fireproof shaftway enclosure is not required, a pent house or enclosure of machinery and sheaves may be made of frame construction if the outside is covered with incombustible material.

Order 432. Pent House Entrance. The entrance to the pent house or the floors under the sheaves on new installations, must be located outside of the hatchway, and the access to same must be made safe and easy.

Order 433. Pits and Overhead Clearance. All elevator hereafter installed with a speed up to and including 50 feet per minute, must have a pit not less than 2 feet in depth below the lowest landing, and an overhead clearance of not less than 2 feet above the highest landing. All elevators with a speed over 50 feet and up to and including 150 feet per minute, must have a pit not less than 3 feet deep, and an overhead clearance of not less than 4 feet. All elevators having a speed over 150 feet and up to and including 350 feet per minute, must have a pit of not less than 4 feet in depth, and an overhead clearance of not less than 5 feet. All elevators having a speed greater than 350 feet per minute, must have a pit not less than 4 feet deep and an overhead clearance not less than 6 feet. The overhead clearance for counterweight shall be not less than the above mentioned clearance for car at the various speeds. The pit and overhead clearance must be equal in area to that of the shaftway.

Order 434. Buffers. All passenger and power driven freight elevators hereafter installed must be provided with spring rubber or oil buffers or other improved type of buffers, which must rest on a substantial foundation in the pit. The car must be so constructed as to withstand the impact of the buffers.

Exception. Oil buffers may be attached to the bottom of the car *if securely fastened, but it is preferable to install them in the pit.*

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Order 435. Pits Fireproof. The walls and floor of elevator pits hereafter installed must be constructed of incombustible material forming a tight enclosure of sufficient strength to stop the descent of the car in case it drops.

Order 436. Pits Kept Clean. Elevator machines or other machinery shall not be located in the pit; only sheaves necessary for the operation of the elevator shall be located in the shaftway or pit under the car. Elevator shaftways or pit shall not be used for the storage of any material or the running of any rope, wire or pipe, except such as is needed for the operation of the elevator. Branch pipes with sprinkle heads will be allowed in the shaftway. Elevator hatchway shall not be used as passageways.

Order 437. Elevators Kept Clean. All elevators and other mechanical devices used for similar purposes must be kept *in good repair*, and clean and free from excessive grease and dirt.

Order 438. Overhead Sheaves, Screens Under. Where the overhead machinery consists only of sheaves, a metal grating, metal screen, or wooden floor must be placed under such sheaves, provided it extends over the entire shaftway and gives safe access to the sheaves from the floor or roof of the building. The grating or screen must be of sufficient strength to sustain a load at center of span of not less than 300 pound with a factor of safety of 4. The openings in such grating or screen must not be wider than 1 inch.

On traction types of elevators, the screen under the secondary sheaves which are located below the floor of the pent house, must extend under the entire sheaves and must no cover more than one-half of the area of the shaftway, unless there is sufficient room for a man to stand between the screen and the pent house floor.

On hand power elevators hereafter installed when the top of the car is not equipped with a screen, a screen or floor must be placed under the overhead machinery, and cover the entire areca under the frame. The floor or screen must be so constructed as to provide safe access for inspection and must be of sufficient.

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strength to sustain a center load of 200 pounds. If a screen is used the mesh of same must not be greeter than one inch. On old installations of hand power elevators, when the car is not equipped with a screen over the top, a floor or screen as above specified under the overhead machinery must be provided whet there is room.

Order 439. Floors Under Overhead Machinery. On new installations where the elevator machine is placed over a shaftway there must be a floor provided to separate the machine from the shaftway. This floor must be made of fireproof construction, or it may be made of mill construction if covered on the top and bottom with asbestos board or other fireproof material, which shall closely adjoin the wood and leave no air spaces. No metal covering will be permitted where electric current is used.

Order 440. Beams Supporting Machines, Strength. All beams for the support of overhead machinery of power driven elevators hereafter installed must consist of iron or steel, and these beams must rest on supports of steel, concrete, masonry or wood of sufficient strength to sustain the required load The factor of safety for all supports must be not less than 6. If vertical wood supports are used they must be not less than 8 inches by 8 inches in size. All vertical supports must rest on foundations of concrete or masonry.

Order 441. Guide Rails. All power driven elevators which require fireproof shaftways, and all power driven freight elevators whose speed exceeds 100 feet per minute, and all passenger elevators, hereafter installed, must have the guide rail for car and counterweights made of wrought iron or steel. Where wrought iron or steel guide rails are not required guide rails made of wood, or a combination of wood and steel securely bolted together, may be used. All guide rails must be made of sufficient strength and must be so braced between the floors that they will not spread.

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Order 442. Hoisting Machinery, Lifting Capacity. All passenger elevators hereafter installed, must have hoisting machinery capable of lifting a load carried in the car of not less than 75

pounds per square foot of car floor area. *Chain o belt drives will not be permitted on passenger elevators here after installed.*

Order 443. Entrance to Car. All sills to entrances of elevator cars and shaftways must be made with a nonslippery surface.

Order 444. Plates in Car Giving Capacity. A metal plat with raised letters not less than 1 inch long, stating the number of pounds such elevator will safely carry, must be placed in a conspicuous position on the car of all freight and passenger elevator hereinafter installed.

Order 445. Old Elevators, Capacity Tested. Within two years from the date of the issue of these orders, all existing elevators must be inspected and tested for safe capacity by the owner or lessee in the presence of an inspector authorized by the Industrial commission, and a metal plate as specified above must be placed in the car.

Order 446. Hand Rope Locks. All freight elevators equipped with a hand rope operating device must be provided with a lock on the car to prevent the operation of the car by persons on other floors than the one at which the car is stationed. The operating cable must be equipped with a guard at the point where the sheaves lead the cable from the shaftway to the machine. *Where operating cables are not in tension around any sheave, a proper guard must be installed to prevent cable from leaving the sheave.*

Order 447. Centering Rope. All hand rope controlled elevators, except hydraulic elevators, must be provided with centering rope.

Order 448. Electric Brake and Circuit Breaker. All electric passenger elevators and all electric freight elevators here *All changes from former rules are printed in Italics*

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after installed, whose speed exceeds 75 feet per minute, must be equipped with an electric brake and an overload and no voltage circuit breaker, and must be provided with an emergency switch in the car.

Such elevators must also be equipped with limit switches placed in the hatchway and so constructed that should the car travel beyond the normal limits at top or bottom, of the shaft, the current will be automatically cut off from the motor, the brake will be applied and the car will be brought to a gradual stop.

Switches and fuses connected with electric elevators must be placed in metal cabinets and near the machine.

When wires carrying current for light or power for the operation of the elevator are run inside the hatchway, they must be in conduit.

Order 449. Mechanically Controlled Brakes on Electric Elevators. Mechanically controlled brakes will be permitted on electric freight elevators whose speed does not exceed 75 feet per minute.

Order 450; Elevators Altered Classed as New Installations. Where the machinery of the elevator is moved to a different location or materially altered, or where the shaftway or pent house is materially altered or extended, or where the capacity of the elevator is materially increased, such alterations shall be considered the same as a new installation and shall bring the moved or altered parts under the orders for new installations. *Before proceeding with such installation or alteration notice must be sent to the Industrial Commission.*

Order 451. Factor of Safety for Elevator Parts. In the construction of all parts of elevators hereafter installed, the factor of safety for parts sustaining immovable loads must be not less than 4 for wrought iron or steel, and not less than 9 for cast iron. For moving loads the factor of safety must be not less than 50 percent more than the above standard, except in the case of cables, which must be not less than 7.

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Order 452. Slack Cable Device. *All Power driven elevators, where the cables wind around a drum (except sidewalk lifts), must be equipped with an efficient device which will automatically shut off the power in case the cables become slack.*

Order 453. Wire Cables for Governors. Wire governor cables must be used on all elevators the travel of which exceeds 75 feet, and the speed of which exceeds 150 feet per minute

Note. On elevators equipped with wire in governor cables, the governor should be specially constructed so as to grip the cable, and throw in the safety clutch.

Order 454 Windows in Elevator Shaftways. *All outside windows in elevator shafts shall be protected by guards of metal, covering the entire area of such, windows. Such guards shall consist of metal bars not less than ½ inch in diameter, and spaced not more than 3 inches on centers, or may be made of wire screen of wire not less than ¼ inch in diameter, with mesh not more than 3 inches in diameter.*

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RULES FOR ELEVATOR OPERATORS

Note. Below are given nineteen suggestions for operators of elevators. The commission wishes to urge owners of elevators to have these suggestions printed in large type and posted in the elevator.

- (a) Read the Rules. Read these rules carefully and be sure you understand them. If you do not understand a rule ask your foreman to explain. Remember you are required to thoroughly understand these rules and to obey them.
- (b) Carelessness. Always keep in mind that a large number of serious accidents are caused by carelessness. No matter how perfect the elevator may be, you can cause accidents and the loss of life if you are not always careful.
- (c) Creeping After Car is Stopped. In stopping a steam elevator be careful to center the hand rope, and if the elevator creeps after it is stopped, report at once to your foreman. The brake requires adjusting.
- (d) Fooling on the Elevator. Never allow anyone to scuffle or fool on your elevator. It is always dangerous.
- (e) Close Gate Before Starting Elevator. Never start at elevator until the door or gate at the landing is closed and latched, and do not open the door at a landing until you have brought the elevator to a full stop.
- (f) Holding a Load. If an elevator, when it is stopped does not hold the load properly, report at once to your foreman. The brake needs adjusting.
- (g) Lever or Wheel, Operation of. When running an elevator, which is operated by a wheel or lever, you should never

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reverse the wheel or lever suddenly, but should bring the cat to a full stop, and then move your wheel, or lever in the direction you wish to go.

(h) Report to Engineer, Rope Loose or Tight. If the hand rope is too tight or too loose, report it at once to the engineer, who will adjust it properly. The tension of the ropes changes with the condition of the atmosphere.

(i) Belt Elevators. If you are running a belt driven elevator, be sure to pull the hand rope or hand chain as far as possible on either motion; by doing so you throw the belt full on the tight pulley and thus prevent it from slipping; in stopping, use the check rope.

(j) Everything in Place Before Starting. Before starting elevator, make sure that everything is in place and that the passengers standing nearest the door or opening of the car are well within the car and that all passengers stand facing the door.

(k) Safe Capacity of Elevator. Always keep in mind the safe capacity of your elevator and under no circumstances allow it to be overloaded. When the car is comfortably full request the remaining persons to ride on the next elevator and close your door. If you have a large amount of material to take upstairs, it is safer to make two loads of it than to attempt to carry it all in one load.

(l) Report When Out of Order. If your elevator or gate is out of order, or if you hear an unusual sound in or about the machinery, report at once to your foreman. If the gate is tied up do not operate the elevator until it is in place.

(m) Centering Lever or Rope, Electric Elevators. If you are running an electric elevator, always center your hand rope, lever, or wheel, when stopping, for if you fail to do so you are liable to burn out parts of the starting box and motor. Electric elevators should never be overloaded, for the moment the load exceeds the lifting capacity, the fuse burns out and the elevator cannot be operated until a new fuse has been put in. Never use a piece of wire as a substitute for a safety fuse, for by doing so you will burn out the entire machine sooner or later.

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