Chapter Ind 4

ELEVATOR CODE

History: Chapter Ind 4 as it existed on October 31, 1964 was repealed and a new chapter Ind 4 was created effective November 1, 1964.

Ind 4.001 Definitions. (1) ANNUNCIATOR, ELEVATOR CAR. An electrical device in the car which indicates visually the landing at which an elevator landing signal registering device has been actuated.

(2) APPROVED. Means approved by the industrial commission.

(3) BASEMENT. A story, the floor line of which is below the grade at any entrance or exit, and the ceiling of which is not more than 5 feet above such grade at any exit or entrance. The number of stories of a building includes all stories except the basement.

(4) BUFFER. A device designed to absorb the impact of the car or counterweight at the extreme lower limits of travel.

(5) CAPACITY. See contract Load, or Rated Load.

(6) CAR, ELEVATOR. An elevator car is the load carrying unit including the platform, car frame, and enclosure.

(7) CAR DOOR OR GATE. A door or gate in or on the elevator car ordinarily used for entrance and exit.

(8) CAR GATE, COLLAPSING. A collapsing gate is one that is distorted in opening and closing.

(9) CAR DOOR OR GATE ELECTRIC CONTACT. An electrical device, the function of which is to prevent operation of the driving machine by the normal operating device unless the car door or gate is in the closed position.

(10) CAR ENCLOSURE. The enclosure or cab of an elevator is the enclosure consisting of walls and the top or cover built up on the platform.

(11) CAR FRAME (SLING). The supporting frame to which the car platform, upper and lower sets of guide shoes, car safety and the hoisting ropes or hoisting-rope sheaves, or the plunger of a direct plunger elevator are attached.

(a) *Car frame, overslung.* A frame to which the hoisting-rope fastenings or hoisting-rope sheaves are attached to the crosshead or top member of the car frame.

(b) *Car frame, underslung.* A frame to which the hoisting-rope fastenings or hoisting-rope sheaves are attached at or below the car frame.

(c) *Car frame, sub-post.* A frame all of whose members are located below the car platform.

(12) CAR PLATFORM. A structure which forms the floor of the car and which directly supports the load.

(13) CLEARANCE, BOTTOM CAR. The clear vertical distance from the pit floor to the lowest structural or mechanical part, equipment or device installed beneath the car platform, except guide shoes or rollers, safety jaw assemblies and platform aprons or guards, when the car rests on its fully compressed buffers. (See *BOTTOM OVERTRAVEL.*)

(14) CLEARANCE. TOP CAR. Overhead or top clearance of the elevator car is the shortest vertical distance between the car crosshead and appurtenances and the nearest part of the overhead structure or any other obstruction when the car floor is level with the top landing.

(a) *Clearance. Top counterweight.* The shortest vertical distance between any part of the counterweight structure and the nearest part of the overhead structure or any other obstruction when the car floor is level with the bottom terminal landing.

(15) RUNBY. BOTTOM. Of an elevator car is the distance the car floor can travel below the level of the lower terminal landing until the car strikes its buffer.

(a) Bottom runby of an elevator counterweight is the distance the counterweight can travel below its position when the car floor is level with the upper terminal landing until the counterweight strikes its buffer.

(16) TOP. OVERTRAVEL. Of a traction elevator is the distance the car platform can travel above the level of the upper terminal landing until the counterweight buffer is fully compressed.

(a) Top overtravel, of an oil hydraulic elevator car is the distance provided for the car floor to travel above the level of the upper terminal landing until the car is stopped by the normal terminal stopping device.

(b) Top overtravel of the counterweight is the distance the counterweight can travel above its position when the car platform is level with the bottom terminal landing until the car buffer is fully compressed.

(17) COMPENSATING-ROPE SHEAVE SWITCH. A device which automatically causes the electric power to be removed from the elevator driving-machine motor and brake when the compensating sheave approaches its upper or lower limit of travel.

(18) CONTRACT LOAD, OR RATED LOAD, (CAPACITY). The approved safe live load specified in application and plans submitted for approval.

(19) RATED SPEED. The speed at which the elevator, power dumbwaiter, escalator or moving walk or moving ramp is designed to operate under the following conditions.

(a) *Elevator or power dumbwaiter.* The speed in the "up" direction with the rated load in the car.

(b) *Escalators, moving ramp.* The rate of travel of the steps, carriage or treadway, measured along the angle of inclination, with the rated load, on the steps, carriage or treadway. In case of a reversible escalator or moving ramp, the rated speed shall be the rate of travel of the steps or treadway in the "up" direction, measured along the angle of inclination, with the rated load on the steps or treadway.

(c) *Moving walk.* The rate of travel of the treadway measured along the line of travel or angle of inclination with the rated load on the treadway.

(20) CONTROL. The system governing the starting, direction of motion, stopping, acceleration, speed and retardation of the moving member.

(a) *Generator-field control.* A system of control which is accomplished by the use of an individual generator for each elevator or dumbwaiter wherein the voltage applied to the driving-machine motor is adjusted by varying the strength and direction of the generator field.

(b) *Multi-voltage control.* A system of control which is accomplished by impressing successively on the armature of the driving-machine motor a number of substantially fixed voltages such as may be obtained from multi-commutator generators common to a group of elevators.

(c) *Rheostatic control.* A system of control which is accomplished by varying resistance and/or reactance in the armature and/or field circuit of the driving-machine motor.

(d) *Two-speed alternating current control.* A 2-speed driving-machine induction motor which is arranged to run at 2 different synchronous speeds by connecting the motor windings so as to obtain a different number of poles.

(21) CABLE LOCK. A device installed and maintained so that the operating cable can be locked at any landing.

(22) CENTERING ROPE. Used in connection with hand cable control which, when pulled, will throw the operating device to the stop position.

(23) DOOR OR GATE DEVICE, POWER OPERATED. A device or assemblage of devices, the purpose of which is to open and/or close the hoistway door and/or car door or gate by power other than by hand, gravity, springs, or the movement of the car.

(a) *Doors.* See Hoistway Door or Gate, this section (Definition 37).

(24) DUMBWAITER. A hoisting and lowering mechanism, equipped with a car, which moves in guides in a substantially vertical direction, the floor area of which does not exceed 9 square feet, whose internal compartment height does not exceed 4 feet, the capacity of which does not exceed 500 pounds, and which is used exclusively for carrying freight.

(25) ELEVATOR. A hoisting and lowering mechanism equipped with a car or platform which moves in guides in a substantially vertical direction and the travel exceeds 56 inches.

(a) *Passenger elevator.* An elevator used primarily to carry persons.

(b) *Freight elevator.* An elevator used for carrying freight and on which only the attendant and/or the persons necessary for loading and unloading are permitted to ride.

(c) *Hand elevator.* An elevator utilizing manual energy to move the car.

(d) *Power elevator.* An elevator utilizing means other than gravity or manual energy to move the car.

(e) *Electric elevator.* A power elevator where the energy is applied by means of an electric motor.

(f) *Electro-hydraulic elevator.* A direct-plunger elevator where liquid is pumped under pressure directly into the cylinder by a pump driven by an electric motor.

(g) *Carriage elevator.* An elevator which is supported by cables attached to the platform at four or more points in such a manner that the supporting cables are relied upon to maintain the platform substantially level.

(h) *Sidewalk elevators.* A freight elevator, the hoistway being located partially outside the building and having no opening into the building at the upper terminal landing.

(j) *Hydraulic elevator.* A power elevator where the energy is applied, by means of a liquid under pressure, in a cylinder equipped with a plunger or piston.

(k) *Direct-plunger elevator.* A hydraulic elevator having a plunger or piston directly attached to the car frame or platform.

(m) *Grade level elevators.* A freight elevator, the hoistway being located partially outside the building located in an area not used by people or vehicles as a place of travel and having no opening into the building at the upper terminal landing.

(n) *Material-handling elevators.* A hoisting and lowering mechanism equipped with a car platform used in conjunction with manual or automatic loading and/or unloading devices and that moves in guides in a substantially vertical direction and the travel exceeds 56 inches.

(26) EXISTING INSTALLATIONS. Every installation installed before November 1, 1964.

(27) NEW INSTALLATIONS. Every installation for which the contract was let after November 1, 1964.

(a) Every elevator or power dumbwaiter, escalator which, after November 1, 1964, is moved to a new location.

(b) Any complete part of an existing installation which is materially altered or replaced with new after November 1, 1964.

(c) Every elevator that is changed from freight to passenger service, or from passenger to freight service, or from hand to power and every hand dumbwaiter changed to power, after November 1, 1964.

(d) Every elevator or power dumbwaiter which is enlarged or the travel extended.

(28) ESCALATOR. A power-driven, inclined, continuous arrangement of steps used for raising and lowering passengers.

(29) MOVING WALKS AND MOVING RAMPS.

(a) *Landing.* The stationary area at the entrance or exit from a moving walk or moving ramp.

(b) *Moving walk or moving ramp.* A type of passenger-carrying treadway on which passengers stand or walk and in which the passenger-carrying surface remains parallel to its direction of travel and its movement is uninterrupted.

(c) *Moving walk or moving ramp, belt type.* A power-driven continuous belt treadway.

(d) *Moving walk or moving ramp, belt pallet type.* A series of connected and power-driven pallets to which a continuous treadway is fastened.

(e) *Moving walk or moving ramp, pallet type.* A series of connected and power-driven pallets which together constitute the treadway.

(f) *Moving walk or moving ramp, roller type.* A belt supported by a succession of rollers with their axes at right angles to the direction of the treadway motion.

(g) *Moving walk or moving ramp, slider-bed type.* A treadway sliding upon the supporting surface.

(h) *Moving walk, system.* A series of moving walks on an end to end or side by side relationship.

(j) *Pallet.* One of a series of rigid platforms which together form an articulated treadway or the support for a continuous treadway.

(k) *Treadway.* The exposed passenger-carrying member of a moving walk or moving ramp.

(m) *Moving walk.* A moving walk having a slope or angle not exceeding 3 degrees with the horizontal.

(n) *Moving ramp.* A moving ramp having a slope or angle exceeding 3 degrees with the horizontal.

(o) *Threshold comb.* The toothed portion of a threshold plate designed to mesh with a grooved treadway surface.

(p) *Threshold plate.* That portion at the entrance or exit to the treadway consisting of one or more stationary or slightly movable plates.

(30) EMERGENCY STOP SWITCH. An emergency stop switch (safety switch) is a device in the car used manually to cut off the power from the elevator machine independently of the operating devices.

(31) FACIA PLATE. A metal plate not less than $\frac{1}{16}$ inch in thickness, securely fastened, and extending flush from the top of the hoistway landing door frame to the landing sill above and run the full width of the door opening.

(32) FIRE-RESISTIVE CONSTRUCTION.

Note: Refer to Building Code, Wis. Adm. Code, section Ind 51.05.

(33) FULL-AUTOMATIC DOOR OR GATE. A vertically moving door or gate which is opened directly by the motion of the elevator car approaching the terminal landings and closed by gravity as the car leaves the landing.

(34) HOISTWAY, ELEVATOR OR POWER DUMBWAITER. A shaftway for the travel of one or more elevators or power dumbwaiters. It includes the pit and terminates at the underside of the overhead machinery space floor or grating, or at the underside of the roof where the hoistway does not penetrate the roof.

(35) HOISTWAY ENCLOSURE. The fixed structure, consisting of vertical walls or partitions, which isolates the hoistway from all other parts of the building or from an adjacent hoistway and in which the hoistway doors and door assemblies are installed.

(36) HOISTWAY ACCESS SWITCH. Switches located at the lower and upper terminal landings to permit access to the pit and top of the car. The car travel limited to a zone sufficient for the full door opening.

(37) HOISTWAY DOOR OR GATE. (a) *Door.* A hoistway landing door is one which completely fills the door opening giving access to the elevator or dumbwaiter car at any landing and is of solid construction, with or without vision panels, regardless of design or method of operation.

(b) *Gate.* A hoistway landing gate is one which gives access to the elevator car at any landing and consists of slats, bars, spindles, wire screen or expanded metal regardless of the method of operation.

(c) *Hoistway door or gate electric contact.* An electrical device the function of which is to prevent operation of the driving machine by the normal operating device unless the hoistway door or gate is in the closed position.

(d) *Hoistway bi-parting door.* A vertical or horizontal sliding door consisting of 2 or more sections so arranged that the sections, or pairs of sections, open away from each other, and so interconnected that both sections operate simultaneously.

(e) *Hoistway full-automatic door or gate.* A vertically moving door or gate which is opened directly by the motion of the elevator car approaching the landing and closed by gravity as the car leaves the landing.

(f) *Hoistway semi-automatic door or gate.* A door or gate which is opened manually, and which closes automatically as the car leaves the landing.

(g) *Hoistway manually-operated door or gate.* A door or gate which is opened and closed by hand.

(h) *Hoistway power-operated door or gate.* A door or gate which is opened and closed by power other than by hand, gravity, springs, or the movement of the car.

(j) *Hoistway power-operated door or gate, automatically opened.* A door or gate which is opened by power, the opening of the door being initiated by the arrival of the car at or near the landing. The closing of such door or gate may be under the control of the elevator operator or may be automatic.

(k) *Hoistway power-operated door or gate, manually controlled.* A door or gate which is opened and closed by power, the door movement in each direction being controlled by the elevator operator.

(m) *Hoistway, telescoping gate.* A gate in which the sections slip together without distortion of the section.

(n) *Hoistway door, fire-resistive.* See Building Code, Wis. Adm. Code, section Ind 51.09.

(38) HOISTWAY LANDING DOOR INTERLOCKS. (a) *Existing installations.* 1. Mechanical interlocks. A mechanical hoistway landing door interlock is a device, limited to the following:

a. Elevators controlled from the car, and the hoistway provided with horizontally sliding doors equipped with a door locking device at each landing actuated by a related control unit in the car, thereby locking the car switch, lever, crank or wheel to prevent the operation of the driving machine by the normal operating device unless the hoistway landing door at that landing is locked within 4 inches of the fully closed position; and

b. To prevent the opening of a hoistway landing door from the landing side except by means of a special key.

2. Electro-mechanical interlock. A hoistway landing door interlock is a combination of electrical and mechanical devices which are:

a. To prevent the operation of the elevator driving machine by the normal operating device unless all hoistway landing doors are locked within 4 inches of the fully closed position; and:

b. To prevent the opening of the hoistway landing doors from the landing side except by means of a special key.

(b) *New installations.* 1. Hoistway door interlock. A device having 2 related and interdependent functions which are:

a. To lock the hoistway landing door in the closed position before the driving machine can be operated by the normal operating device.

b. To prevent the opening of the hoistway landing door from the landing side unless the car is within the leveling zone.

2. Hoistway unit system. A series of hoistway door interlocks, hoistway door electric contacts or hoistway door combination mechanical locks and electric contacts, or a combination thereof, the function of which is to prevent operation of the driving machine by the normal operating device unless all landing doors are locked in the closed position.

(39) LEVELING ZONE. The limited distance above or below an elevator landing, within which the leveling device may cause movement of the car toward the landing.

(40) LEVELING DEVICE, CAR. A leveling device is any mechanism or control which will move the car within a limited zone toward, and stop the car at the landing.

(41) OPERATING DEVICE. A car switch, push button, rope, wheel, lever, treadles, etc., employed to enable the operator to actuate the controller.

(42) BOTTOM OVERTRAVEL OF THE ELEVATOR CAR is the distance the car floor can travel below the level of the lower terminal landing until the weight of the fully loaded car rests on the buffers, and includes the resulting buffer compression.

(43) BOTTOM OVERTRAVEL OF THE COUNTERWEIGHT is the distance the counterweight can travel below its position when the car platform is level with the upper terminal landing until the full weight of the counterweight rests on the buffers, and includes the resulting buffer compression.

(44) AUTOMATIC OPERATION. An operation by means of buttons or switches at the landings, with or without buttons or switches in the car, the momentary pressing of which will cause the car to start and automatically stop at the landing corresponding to the button pressed.

(45) NON-SELECTIVE COLLECTIVE AUTOMATIC OPERATION.. An operation by means of one button in the car for each landing level served and one button at each landing, wherein all stops registered by the momentary pressure of landing or car buttons are made irrespective of the number of buttons pressed or of the sequence in which the buttons are pressed. With this type of operation the car stops at all landings for which buttons have been pressed, making the stops in the order in which the landings are reached after the buttons have been pressed but irrespective of its direction of travel.

(46) SELECTIVE COLLECTIVE AUTOMATIC OPERATION. An operation by means of one button in the car for each landing level served and by "Up" and "Down" button at the landings, wherein all stops registered by the momentary pressure of the car buttons are made as defined under non-selective collective automatic operation, but wherein the stops registered by the momentary pressure of the landing buttons are made in the order in which the landings are reached in each direc-

tion of travel after the buttons have been pressed. With this type of operation, all "Up" landing calls are answered when the car is traveling in the "Up" direction and all "Down" landing calls are answered when the car is traveling in the "Down" direction.

(47) SINGLE AUTOMATIC OPERATION. An operation by means of one button in the car for each landing level served and one button at each landing, so arranged that if any car or landing button has been pressed the pressure of any other car or landing operating button will have no effect on the operation of the car until the response to the first button has been completed.

(48) CAR-SWITCH OPERATION. An operation wherein the movement of the car is directly and solely under the control of the operator by means of a switch in the car.

(49) CAR-SWITCH AUTOMATIC FLOOR-STOP OPERATION. An operation in which the stop is initiated by the operator from within the car with a definite reference to the landing at which it is desired to stop, after which the slowing down and stopping of the elevator is automatically effected.

(50) CONTINUOUS-PRESSURE OPERATION. An operation by means of push buttons or switches in the car and at landings, any one of which may be used to control the movement of the car so long as the button or switch is manually held in the operating position.

(51) DUAL OPERATION. A system of operation whereby the elevator controller is arranged for either automatic operation by means of landing and car buttons or switches, or for manual operation by an operator in the car, who may either use a car switch or the buttons provided in the car. When operated by an operator, upon the throwing of a suitable switch or switches, the car can no longer be started by the landing buttons, buttons may, however, be used to signal the operator that the car is desired at certain landings.

(52) PRE-REGISTER OPERATION. An operation in which signals to stop are registered in advance by buttons in the car and at the landings. At the proper point in the car travel the operator in the car is notified by a signal, visual, audible, or otherwise, to initiate the stop, after which the landing stop is automatic.

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

(54) POTENTIAL SWITCH, ELEVATOR. An elevator potential switch is a switch which disconnects the power from the elevator apparatus

when the supply voltage fails or decreases below a definite value and which is usually opened by various electrical safety devices. These switches are of the magnetic type.

(55) RACEWAYS. Any channel for holding wires, or cables, which is designed expressly for, and used solely for, this purpose. Raceways shall be of metal and this term includes rigid metal conduit, flexible metal conduit or electrical metallic tubing.

(56) SAFETY, CAR OR COUNTERWEIGHT. A mechanical device attached to the car or frame to stop and hold the car or counterweight in case of predetermined overspeed, free fall, or slackening of the cables.

(57) SLACK-CABLE SWITCH, ELEVATOR. A slack-cable switch is a device for automatically cutting off the power in case the hoisting cables become slack.

(58) TERMINAL LANDING. The highest and lowest landing served by the elevator.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

SCOPE

Ind 4.01 General scope. The requirements of this code shall apply to every elevator, power dumbwaiter, material handling elevator, moving walk or moving ramp, or escalator installed in public buildings and places of employment as defined by Wisconsin statutes. This requirement applies to both existing installations and those hereafter installed unless otherwise specified.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.02 Renewing of elevator, dumbwaiter, escalator, etc. Where part or parts of equipment of an elevator, power dumbwaiter, material handling elevator, moving walk or ramp or escalator are impaired through ordinary wear, damage or deterioration by fire or other causes, to 50% of the original condition, the equipment shall be repaired or rebuilt in conformance with the requirements for new installations.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.03 Exemptions. (1) This code does not apply to the following.

(a) Belt, bucket, scoop, roller or similar inclined or vertical freight conveyors, portable tiering or piling machines when not serving more than the floor on which the tiering or piling machine is located.

(b) Skip hoists, belt manlifts, mine hoists, wharf ramps or apparatus in kindred classes, amusement devices, stage curtain hoists or lift bridges, nor to elevators with a travel less than 56 inches.

(c) For regulations relative to the use of elevators, hoists, derricks and similar equipment during the period of construction of a building or any other structure, see Wis. Adm. Code section Ind 35.28 to 35.31, inclusive, of the Safety in Construction Code issued by the industrial commission.

(d) For belt manlift requirements, see Wis. Adm. Code, section Ind 1.69, Safety code.

(e) For the employment of minors under 18 years of age see Wis. Adm. Code, section Ind 70.09 (1), Wages and Hours code.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.04 Plans; new installations. (1) Before starting work on any new installation of an elevator, power dumbwaiter, material handling elevator, moving walk or moving ramp, or escalator, 3 copies of the plans shall be submitted to the industrial commission for approval with 2 copies of application for each unit, properly filled out on blank forms furnished by the commission.

(2) Every manufacturer who furnishes equipment as described in subsection (1) to be installed by the owner or an agent of the owner, shall submit plans and application.

(3) Plans shall include:

(a) Sectional plan of car and hoistway.

(b) Sectional elevation of hoistway, machine room (showing machinery) and pit.

(c) Plan of machine and supports showing details of materials, size of beams. If the hoistway has more than one entrance on any floor, all entrances shall be clearly shown.

(d) The guide rail bracket spacing.

(e) The size and weight per foot of any guide rail reinforcements where provided.

(4) The form referred to under subsection (1) is SB–22 "Application for Construction, Erection and Remodeling" and may be obtained from the Industrial Commission, Hill Farm State Office Building, 4802 Sheboygan Avenue, Madison, Wisconsin 53702.

(5) A plan examination fee in the amount established by Wis. Adm. Code section Ind 69.20 shall be paid for each installation requiring approval.

(6) Subsection (1) shall not apply in cities where permits are issued by the city in a manner approved by the industrial commission.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.05 Inspections. (1) INTERVAL. Every elevator, power dumbwaiter, material handling elevator, moving walk or moving ramp, or escalator operated in the state of Wisconsin shall be subjected to a regular inspection once every 12 months.

(2) INSPECTION BY INSURANCE COMPANIES. The industrial commission may accept inspections of elevators, power dumbwaiters, material handling elevators, moving walks or moving ramps, and escalators reported by certified inspectors subject to the following conditions:

(a) Each installation shall be inspected at least once every 12 months.

(b) A detailed report of each unit inspected shall be filed with the commission within 14 days after inspection on a printed form approved by the commission. Such report shall show all respects in which the installation fails to comply with the code requirements.

(c) A certificate of inspection on a form approved by the commission shall be posted by the insurance company in a conspicuous place in the elevator car, dumbwaiter cage, material handling elevator, moving walk or moving ramp, or escalator, as the case may be, and shall show the date of inspection, name of insurance company, name of inspector, and rated capacity.

(d) The insurance company shall use all reasonable diligence to secure compliance with the commission's rules. If unsuccessful, it shall

so report to the commission. If it then becomes necessary for the commission to make an inspection, the statutory fee for each unit inspected will be charged. (See Wis. Adm. Code section Ind 4.07.)

(e) The competency of each elevator inspector shall be certified by each insurance company to the commission in writing prior to making inspections. Insurance company inspectors will be approved by the commission only after the receipt of acceptable evidence of competency and a satisfactory examination has been passed consisting of written tests.

1. The form referred to under subsection (2) (e) is SB–12 "Insurance Company Elevator Inspector" and is furnished by the industrial commission to insurance company inspectors after their competency has been examined and approved.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.06 Inspection by cities. In any city which provides a competent inspector, the industrial commission will accept inspections by such city, provided the conditions of Wis. Adm. Code section Ind 4.05 (2) (a), (c), (d)), and (e) are complied with, substituting "city" for "insurance company".

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.07 Inspection fee. A charge in accordance with the fee schedule established by Wis. Adm. Code section Ind 69.25 will be made by the industrial commission of each inspection of each elevator, power dumbwaiter, material handling elevator, moving walk or moving ramp, or escalator.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.08 Tests and inspections; new installations. (1) Every elevator, power dumbwaiter, material handling elevator, moving walk or moving ramp, or escalator shall be tested and inspected in conformance with the code requirements by a representative of the industrial commission before the installation is placed in service.

(a) The party installing such an installation shall give notice to the industrial commission not less than 10 days prior to the time the installation is complete and ready for inspection.

(b) A representative of the elevator company shall be present during the final inspection of each installation.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.10 Hoistway enclosures. (1) EXISTING INSTALLATIONS. (a) The hoistway of every existing passenger or freight elevator or power dumbwaiter where the travel does not exceed 2 stories, and where a fire-resistive enclosure is not required, shall be solidly enclosed with wood or metal to not less than 6 feet in height, and shall withstand a horizontal force of 100 pounds with not more than 1 inch deflection at any point.

(2) NEW INSTALLATIONS. (a) The hoistway of every passenger elevator shall comply with the requirements as described in this subsection.

1. The hoistway enclosure in buildings of ordinary or frame construction shall be not less than 1-hour, fire-resistive construction. (See

subsection (2) (c) and (d) and Wis. Adm. Code section Ind 4.31 for hoistway landing doors.)

2. The hoistway, regardless of travel in buildings of fire-resistive or mill construction, shall be enclosed with not less than 2-hour, fire-resistive construction. (See Wis. Adm. Code section Ind 4.31 for hoistway landing doors.)

(b) The hoistway of every freight elevator or power dumbwaiter shall comply with the requirements as described in this subsection.

1. The hoistway in buildings of ordinary or frame construction, where the travel does not exceed 2 stories, shall be solidly enclosed with wood or metal and shall withstand a horizontal force of 100 pounds with not more than 1 inch deflection at any point. (See subsection (2) (d).)

2. The hoistway in buildings of ordinary or frame construction 3 stories or more in height, shall be enclosed with not less than 1-hour, fire-resistive construction. (See Wis. Adm. Code sections Ind 4.38 and 4.79 for hoistway landing doors.)

3. The hoistway regardless of travel in buildings of fire-resistive or mill construction shall be enclosed with not less than 2-hour, fire-resistive construction. (See Wis. Adm. Code sections Ind 4.38 and 4.79 for hoistway landing doors.)

a. *Exception.* 1. An elevator or power dumbwaiter hoistway which is placed in a fire-resistive stair enclosure, need not have an additional fire-resistive enclosure, but the hoistway shall be solidly guarded above each floor and every stairway with incombustible material and shall withstand a horizontal force of 100 pounds with not more than 1 inch deflection at any point.

b. *Exception.* 2. Elevators installed in power plants or similar buildings where landings consist of grille work, perforated metal or catwalks, the hoistway may be enclosed to a height of not less than 7 feet above each landing, provided the space in front of each car entrance opening shall be enclosed with a solid guard the full height of the hoistway. This guard shall be in a plane not more than 7 inches from the edge of the car.

(c) Where a passenger or freight elevator or power dumbwaiter is installed in a building which includes a *theatre or assembly* hall the hoistway enclosure shall be not less than 2-hour, fire-resistive construction. (See Wis. Adm. Code sections Ind 4.31, 4.38 and 4.79 for hoistway landing doors.)

(d) Where a passenger or freight elevator or power dumbwaiter is installed in an *apartment building, hotel, dormitory, convent, monastery, hospital, nursing home, or place of detention,* the hoistway shall comply with the requirements described in this subsection.

1. Where the building is of ordinary or frame construction and the travel does not exceed 2 stories, the hoistway shall be not less than 1-hour, fire-resistive construction. (See Wis. Adm. Code sections Ind 4.31, 4.38, and 4.79 for hoistway landing doors.)

2. Where the building is of ordinary or frame construction, 3 stories or more in height, the hoistway shall be not less than 2-hour, fire-resistive construction. (See Wis. Adm. Code sections Ind 4.31, 4.38, and 4.79 for hoistway landing doors.)

3. Where the building is of fire-resistive construction, regardless of travel, the hoistway enclosure shall be not less than 2-hour, fire-

resistive construction. (See Wis. Adm. Code sections Ind 4.31, 4.38, and 4.79 for hoistway landing doors.

(e) Windows shall be prohibited in an elevator hoistway.

(f) The hoistway for elevators located on the outside of a building shall be enclosed to conform with the requirements as follows:

1. Shall be solidly enclosed at ground floor to the height of not less than 7 feet.

2. The hoistway over the lower landing entrances shall be solidly enclosed the entire height of the hoistway; not more than 7 inches from the edge of the car.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.12 Guarding of hoistways; existing installations. (1) Where a hand cable is operated through the hoistway enclosure, a slot not more than 5 inches wide by not more than 3 feet long with the bottom 30 inches from the floor shall be cut in the enclosure.

Note: Hand elevators. On the side on which the pull rope is located, the enclosure may be arranged so as to permit free operation of the pull rope but not more than 15 inches in width.

(2) Where material is stored near a hoistway enclosure, the enclosure shall extend from floor to ceiling.

(3) In every elevator installation where the ceiling height is more than 12 feet, the space between the top of the entrance opening and the ceiling shall be enclosed with vertical wood or metal bars spaced not more than 2 inches apart. This enclosure shall be in a plane not more than 8 inches from the edge of the car.

(4) The hoistway for elevators located on the outside of a building shall be enclosed to conform with the requirements as follows:

(a) Shall be solidly enclosed at the ground floor to a height of not less than 7 feet.

(b) The hoistway over the lower landing entrances shall be solidly enclosed the entire height of the hoistway; not more than 7 inches from the edge of the car.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.14 Guards for outside windows in hoistways; existing installations. (1) Every outside window in an elevator hoistway shall be guarded on the outside as outlined in the following items:

(a) *Height.*

1. Up to and including the fourth floor.

2. Where a window sill is not more than 15 feet above an adjoining roof.

3. Up to and including the seventh floor on elevators hereafter installed in cities where the fire departments use aerial ladders.

(b) *Material.* Metal bars not less than ½ inch in diameter or equivalent and spaced not more than 10 inches center to center, or wire screen of wire not less than ¼ inch in diameter with mesh not greater than 3 inches, measured along the wire from center to center of wires at points where they cross. If any such screen is hinged, the fastening shall be on the inside.

1. *Exception.* Grain elevators.

Note: Flat bars not less than 1 inch wide by ¼ inch thick, with the ends securely anchored, will be considered the equivalent of ½ inch diameter rods.

(2) Where an open side of an elevator car passes a window in a wall of a hoistway and an approved car gate protection is not provided for such open side a guard consisting of vertical metal bars ½ inch in diameter or equivalent, spaced not more than 2 inches apart, or substantial grating, removable if desired, shall be provided over the inside of the window.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.15 Guards for projections in hoistways. (1) All projections and shearing edges in elevator hoistways such as floors, beams, sills, pipes, bolts and other stationary parts within 4 inches of the edge of the car, unless guarded by the permanent car enclosure, shall be provided with smooth metal guards not less than $\frac{1}{16}$ inch in thickness and beveled to make an angle of not less than 60 degrees with the horizontal.

(a) *Exception.* The requirements of subsection (1) shall not apply to door hangers and power driving devices; nor the projections of 1 inch or less on door lintels; nor to projections into the hoistway on interlocks or other door locking devices where the guarding of such devices would interfere with their proper operation.

(2) Passenger elevators hereafter installed equipped with car gates of the collapsing type shall have the hoistway provided with facia plates flush with the landing sill.

(3) Elevators equipped with a leveling device shall have the hoistway entrance sill provided with vertical guards extending down to a point not less than 2 inches beyond the leveling zone and beveled at the lower edge as required in subsection (1).

(4) Where a leveling device operates the car with the hoistway door or gate open, the under side of the car platform shall be equipped with a vertical guard at least 2 inches longer than the leveling zone.

(a) An inching device, controlled by means of up-and-down continuous pressure buttons or switches located in the car and when used with the hoistway door or gate, or car door or gate open; vertical guards shall be provided below the car platform to conform with subsection (4).

(5) For passenger elevators hereafter installed, the clearance between the edge of the car sill and the hoistway wall or facia plate shall not exceed 4 inches, and the width shall be not less than the full car door or gate opening.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.16 Car and landing clearances. (1) The clearances between the car entrance sill and any landing sill shall be not less than ½ inch, and not greater than 1½ inches, except for corner post construction the clearance shall be not less than ¾ inch.

(2) For every automatic-operation elevator the distance from the hoistway face of the door or gate to the edge of the hoistway sill, measured from the face of the door or gate nearest the car shall be not more than the following:

(a) Swinging doors, 1 inch.

(b) Vertical or horizontal sliding doors, 2¼ inches.

(c) Gates, 4 inches.

(d) For existing installations where the clearance exceeds that as outlined in the subsection (2) (a), the space between the hoistway side of the landing door and the edge of the landing sill shall be filled in by suitable means.

(e) The hoistway face of the hoistway landing door or gate shall not project into the hoistway beyond the edge of the landing sill.

(3) For freight elevators other than automatic-operation the distance from the hoistway face of the door or gate to the edge of the hoistway sill measured from the face of the door or gate nearest the car shall be not more than 4 inches.

(4) For freight elevators where hoistway landing gates are provided the clearance between the hoistway wall and the edge of any car entrance sill shall be not greater than 7 inches at any point.

(5) For freight elevators a clearance between the hoistway wall and the edge of any car entrance sill shall be not greater than outlined in this subsection.

(a) Four (4) inches for horizontal sliding hoistway landing doors.

(b) Seven (7) inches for vertical bi-parting counterbalanced hoistway landing doors.

(c) Eight (8) inches for vertical pass type counterbalanced hoistway landing doors.

(6) For every automatic operation elevator the car door or gate shall be so located that the distance from the face of the hoistway door or gate nearest to the landing sill to the face of the car door or gate nearest to the car sill shall be not more than 5½ inches.

(7) The clearance between any part of the elevator hoistway wall and the elevator car or counterweight and appurtenances shall have a clearance of not less than ¾ inch.

(8) The clearance between the car platform and the counterweight shall be not less than 1½ inches.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.17 Elevator pits. (1) A pit shall be provided for every power elevator.

(a) The pit shall be at least equal in area to the hoistway. The walls and floor shall be substantially constructed of incombustible material forming a tight enclosure. The construction of the pit floor and supports shall be adequate to resist the impact of the counterweight or the fully loaded car striking the buffer at governor tripping speed. The floor shall be approximately level.

(2) Where water cannot be kept out of a pit with ordinary construction, proper drains or sumps, with or without pumps, shall be provided with cover, or a pit tank shall be constructed of not less than ¼ inch steel plate.

(3) Where existing foundation footings are encountered in a new or altered installation and it is impractical to disturb the footings, the maximum permissible encroachment shall be not more than 15% of the cubic content of the pit.

(4) Where there is a difference in level of floors of adjacent pits greater than 8 inches, a solid guard of incombustible material shall be provided to separate such pits. Guards shall extend not less than 6 feet above the level of the higher pit floor.

(5) Access shall be provided to all pits to conform with Wis. Adm. Code sections Ind 4.31 (5) (a) and (6) (a) and Ind 4.38 (1) (a) 7. and Ind 4.38 (2) (b) 7. and 8., or by means of a separate pit entrance access door.

(a) Where separate access pit doors are provided the doors shall be at least 2 feet by 6 feet in size and equipped with self-acting locks, arranged to permit the doors to be opened from inside the pit without a key.

(6) A fixed ladder shall be provided in the pit of every elevator hereafter installed. This ladder shall be of incombustible material, located within reach of the access door and shall extend not less than 30 inches above the sill of the access door, or hand grips shall be provided to the same height.

(a) *Exception.* Where separate pit entrance access doors are provided.

(7) There shall be installed in the pit of every power elevator hereafter installed an enclosed stop switch of the approved type and shall be in addition to the directional and final limit switches. This switch shall be accessible from the pit access door adjacent to the ladder when ladders are used and approximately in line with the pit access door sill. Where access to the pits of elevators in a multiple hoistway is by means of a single access door, the stop switch for each elevator shall be located adjacent to the nearest point of access to its pit from the access door.

(8) No elevator machine or other machinery shall be located in the elevator pit except equipment used in connection with oil hydraulic or existing sidewalk elevators.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.18 Minimum pit depth and overhead clearance. (1) The pit depth for every power elevator hereafter installed shall be not less than the number of inches specified in the requirements outlined in Tables 2 and 3 of this section. The depth of trenches, depressions or foundation encroachments as of Wis. Adm. Code section Ind 4.17 (3) shall not be considered in determining the pit depth.

(a) For cable and hydraulic elevators the bottom runby for the car and counterweight shall be not less than shown in Table 1.

TABLE 1

Cable Elevators				Hydraulic Elevators		
Speed F.P.M.	Control	Buffers	Runby	Speed F.P.M.	Buffers	Runby
25 to 50	Rheostatic	Spring	6 inches	100 or less	Spring	3 inches
Between 51 and 100	Rheostatic	Spring	9 inches	100 to 300	Spring	6 inches
Over 100	Rheostatic	Spring	12 inches			
Up to 200	Generator Field Control	Spring	6 inches			
Over 200	Generator Field Control	Oil	6 inches			

1. Maximum bottom runby for car shall not exceed 12 inches.

2. The maximum bottom runby for counterweight shall not exceed 24 inches.

(b) The minimum pit depth for elevators hereafter installed requiring spring buffers shall be not less than shown in Table 2.

TABLE 2

MINIMUM PIT DEPTH—ELEVATORS HAVING SPRING BUFFERS

Contract Speed F.P.M.	Capacity 0 to 3000	Capacity 3001 to 6000	Capacity 6001 to 10,000	Capacity 10,001 to 16,000	Capacity 16,000 and over
25 to 50	42 inches	48 inches	54 inches	60 inches	66 inches
51 to 100	48 inches	54 inches	60 inches	66 inches	72 inches
101 to 200	54 inches	60 inches	66 inches	72 inches	76 inches

(c) The minimum pit depth for elevators requiring oil buffers shall be not less than shown in Table 3.

TABLE 3

MINIMUM PIT DEPTH—ELEVATORS HAVING OIL BUFFERS

Contract Speed F.P.M.	Capacities up to 10,000 pounds	Capacities 10,001 pounds and over
201 to 300	76 inches	82 inches
301 to 400	88 inches	94 inches
401 to 500	104 inches	110 inches
501 to 600	120 inches	126 inches
601 to 700	138 inches	144 inches
701 to 800	150 inches	156 inches

Note: Interpolation may be used for intermediate speeds.

1.*Exception.* When excessively long oil buffers are provided and where practical a pocket not over 30 inches deep may be provided below the normal pit floor to accommodate the lower portion of the oil buffer, provided the pocket is waterproofed and has a substantial removable cover or filled with sand to permit the buffer to be removed in case of repair. Such pocket shall not be included in the pit depth.

(2) When the car rests on the fully compressed buffer, there shall be at least two feet clearance vertically between the lowest projection of the underside of the car platform, except guide shoes and aprons attached to the car sill, and any obstruction in the pit, exclusive of compensating device, buffer, and buffer supports. In no case shall the pit depth be less than shown in Tables 2 and 3 of this section.

(3) For every power cable and hydraulic elevator hereafter installed requiring spring buffers, the minimum overhead clearance for car and counterweight shall be not less than shown in Table 4.

TABLE 4

Cable Elevators			Hydraulic Elevators	
Contract Speed F.P.M.	Overhead Car Clearance	Overhead Counterweight Clearance	Contract Speed F.P.M.	Overhead Car Clearance
0 to 100	42 inches	30 inches	0 to 50	36 inches
101 to 200	48 inches	36 inches	51 to 100	42 inches
			Over 100	48 inches

(4) For every power elevator hereafter installed requiring oil buffers, the minimum top clearance for car and counterweight shall be not less than shown in Table 5.

TABLE 5

CABLE ELEVATORS

Contract Speed F.P.M.	Overhead Car Clearance	Overhead Counterweight Clearance
201 to 300	60 inches	42 inches
301 to 400	66 inches	48 inches
401 to 500	72 inches	54 inches
501 to 600	84 inches	66 inches
601 to 700	96 inches	78 inches
701 to 800	102 inches	84 inches

Note: Interpolation may be used for intermediate speeds.

(5) In no case shall the car strike any part of the overhead when the counterweight is fully compressed on the buffer at governor tripping speed.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.19 Buffers. (1) Spring or oil buffers shall be installed under the cars and counterweights of every power elevator as described in this subsection.

(a) Spring buffers may be used where the contract speed does not exceed 200 feet per minute.

(b) Spring buffers for cars and counterweights shall be capable of supporting a static load having a minimum of twice and a maximum of three times the total weight of the car plus the contract load or of the weight of the counterweight respectively without being compressed completely solid.

(c) The stroke of the buffer springs shall be equal to or greater than shown in Table 6 of this section.

TABLE 6

Contract Car Speed Feet Per Minute	Stroke in Inches
100 or less	1½
101 to 150	2½
151 to 200	4

(2) Approved type oil buffers shall be used for car and counterweight when the contract speed exceeds 200 feet per minute.

Exception. Where type C safeties are used, oil buffers are not required in the pit.

(a) Where type C safeties are used, switches shall be provided in connection with the oil buffers as outlined in this subsection.

1. A switch shall be provided which will automatically interrupt the power circuit in the event the buffer is compressed more than 10% of its stroke.

2. A switch shall be provided which will automatically interrupt the power circuit in the event the oil in buffer is below the minimum required level.

(3) Oil buffers shall develop an average retardation not in excess of 32.2 feet per second per second; and shall develop no peak retardation greater than 80.5 feet per second per second having a duration exceeding (1/25th) of a second with any load in the car from contract load to a minimum load of 150 pounds when the buffers are struck with an initial speed of not more than 115% of the rated speed.

(a) The minimum stroke for car and counterweight oil buffer shall be such that the car or counterweight on striking the buffers at 115% of the rated speed as shown in Table 7 of this section shall be brought to rest with an average retardation of not more than 32.2 feet per second per second.

TABLE 7

Rated Speed in Feet Per Minute	115% of Rated Speed in Feet Per Minute	Gravity Slowdown Distance in Inches at 115% of Rated Speed	Minimum Strokes of Oil Buffers Permitted in Inches
200	230	2¾	2¾
225	259	3½	3½
250	288	4¼	4¼
300	345	6¼	6¼
350	402	8¼	8¼
400	460	11	11
450	517	13¾	13¾
500	575	17	17
600	690	24¾	24¾
700	805	33¼	33¼
800	920	43¾	43¾

(4) When a new or altered elevator is installed in an existing hoistway and foundation footings are encountered as outlined in Wis. Adm. Code section Ind 4.17 (3), the minimum buffer stroke as speci-

fied in Table 7 of this section may be reduced provided an emergency terminal stopping device as described in this subsection is used and which will limit the speed at which the car or counterweight can strike its buffer. The reduced stroke shall be based on at least 115% of the reduced striking speed and shall be not less than 50% of the stroke required for rated speeds under 800 feet per minute, nor less than 33⅓% or 18 inches, whichever is greater.

(a) An emergency terminal stopping device when installed in connection with reduced-stroke oil buffers shall conform with the following requirement.

1. Shall operate independently of the normal terminal stopping switch should this switch fail to slow down the car at the terminal landing as intended.

2. Shall provide a retardation not in excess of 32.2 feet per second per second.

3. Shall not apply the car safety device.

4. Shall be so designed and installed that a single short circuit caused by a combination of grounds, or by other conditions, shall not prevent their functioning.

(5) Oil buffers shall be provided with means of determining that the oil level is within the maximum and minimum allowable limits. Glass sight gauges and pipe plugs shall not be used. Oils used in oil buffers shall have a pour point of zero (0) degrees Fahrenheit or lower and a viscosity index of 75 or higher.

Note: The range in viscosity of buffer oil to be used, as specified in Saybolt Seconds Universal will be considered as standard and approved by the industrial commission.

(6) Oil buffers shall have a metal plate securely attached thereto, marked by the manufacturer in a legible and permanent manner, as outlined in this subsection.

(a) The maximum and minimum loads and the maximum striking speeds for which the buffer may be used.

(b) The viscosity of the oil at 100 degrees Fahrenheit to be used.

(c) The viscosity index number of the oil to be used.

(d) The pour point in Fahrenheit of the oil to be used.

(7) Car buffers shall be tested in the field by running on to them with contract load at not less than ½ contract speed. Counterweight buffers shall be similarly tested with empty car. The final limit switch shall remain operative during these tests and temporarily relocated if necessary for full compression of the buffers. When the load is lifted the buffers shall return to the fully extended position within 90 seconds.

(8) Before field testing an oil buffer, the manufacturer, upon request, shall file for approval with the industrial commission complete information on the buffer design. Certified tests by a recognized testing laboratory may also be accepted as satisfactory evidence for approval.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.20 Hoistways, machine rooms and pits. Restrictions. New and existing installations. (1) No wires, cables, pipes or conductor enclosures shall be installed in any hoistway except those needed to serve the elevator or dumbwaiter equipment, including wiring for heating,

ventilating, lighting the car or hoistway and wiring for communication with the car.

(a) *Exception.* Other raceways or cables may in exceptional cases be installed in the hoistway only if approved in writing by the industrial commission provided that all openings, terminals, outlet or junction boxes are located outside the hoistway.

(b) *Exception.* In existing installations, pipes in hoistways may remain unless carrying noxious gases, or steam with a pressure exceeding 15 pounds.

(2) No elevator hoistway or pit shall be designed or used as a passageway, or for the storage of material.

(3) There shall be no thoroughfare, occupied or storage space under the hoistway of an elevator unless a structure is provided sufficiently strong to withstand without failure the impact of the car with contract load or the impact of the counterweight on their respective buffers when either is descending at governor tripping speed.

(4) There shall be no machinery, apparatus or material located in the machine room which is not a part of the elevator equipment, unless separated by a rigidly constructed partition not less than 3 feet away and extending not less than 6 feet in height.

(5) Access to the machine room or penthouse for elevators hereafter installed shall not be through any toilet room, sleeping room or private quarters.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.21 Machine rooms, penthouses, overhead sheaves and/or governors. New installations. (1) Where the machine and/or controller is located over the hoistway; a floor or grating shall be provided at the top of the hoistway of every power elevator to conform with Wis. Adm. Code section Ind 4.23 and the headroom or working space shall be not less than 7 feet in height.

(a) *Exception.* For new installations in existing machine rooms or penthouses the headroom or working space shall be not less than 6 feet in height.

(2) Where a secondary floor or metal grating is provided below the machine room or penthouse floor and the space contains sheaves and/or governor, a floor or metal grating shall be provided to cover the full area of the hoistway and the headroom or working space shall not be less than 4 feet in height.

(3) Where the elevator machine room is located below or at the side of the hoistway the headroom or working space shall be not less than 7 feet in height.

(4) A floor or metal grating shall be provided below all overhead sheaves and/or governors and shall cover the full area of the hoistway and shall conform with the requirements outlined in this subsection.

(a) The headroom or working space shall be not less than 4 feet in height.

(b) Access to the sheaves and/or governor from the roof shall be by means of a hinged door with latch; this door shall be not less than 20 inches by 24 inches.

1. Where the access door is 4 feet or more above the roof a stairway-type ladder shall be provided to the access door.

(c) Access to the roof shall be by means of a stairway in compliance with Wis. Adm. Code section Ind 4.22 (4).

(5) Where a new elevator terminates below an occupied floor and the headroom or working space in the machine room cannot be provided as required in subsection (1) the headroom or working space may be decreased if approved in writing.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.22 Construction of machine rooms and penthouses. (1) The construction of walls, ceilings or roofs and openings of all machine rooms and penthouses shall be of equivalent construction as required for hoistway enclosures. Where exposed walls and roofs are of non-fire-resistive construction, the penthouse shall in all cases be covered with incombustible material, or not less than 1-hour, fire-resistive construction.

(2) Machine rooms shall be provided with adequate heating and provided with natural or mechanical ventilation to insure safe and normal operation of elevators hereafter installed.

(3) For every existing elevator installation access to the machine room or penthouse shall be horizontal and shall be made safe and easy from outside the hoistway by means of a stairway (with handrail), or stairway type ladder (with handrail), inclined not more than 75 degrees with the horizontal.

(a) *Exception.* Scuttle openings through the roof on existing installations for access to the machine room or penthouse, will be accepted, provided the arrangement is reasonably safe and easy.

(4) For every elevator hereafter installed, access to the machine room or penthouse shall be made from outside the hoistway by means of an unobstructed stairway (with handrail), inclined not more than 60 degrees with the horizontal. Openings through the roof to serve the machine room or penthouse shall be completely protected from the weather. This protection shall be fitted with a door not less than 6 feet in height to permit horizontal entrance. Access to the machine room or penthouse may be under the same roof. One such stairway may serve a group of machine rooms or penthouses on the same roof.

(5) All stairways or stairway type ladders to the roof of the building, and all stairways or stairway type ladders having a rise of more than 6 feet above the roof, shall be protected from the weather or shall be of standard fire escape construction.

(a) Where access to the machine room or penthouse is from the roof and its entrance door opens outward a platform shall be provided not more than 8 inches below the entrance door sill. The platform shall be not less than 2 feet wide and shall project not less than 2 feet beyond the "lock" jamb of the door. A guard rail shall be provided at the edge of this platform, except where the stairs join the platform.

(6) Elevator penthouses shall not be used as public thoroughfares. Doors to elevator penthouse shall be fitted with locks which permit the door to be opened from the inside without a key.

(7) Where an elevator installation has a scuttle opening provided in the machine room floor, the opening shall be equipped with a sub-

stantial hinged cover so arranged that the opening cannot be conveniently used as an entrance to the machine room.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.23 Floor over hoistways of power elevators; new installations. (1) A floor shall be provided to conform with the requirements outlined in this subsection.

(a) Above or level with the top of the machine beams where the machine is located over the hoistway.

(b) Below the overhead sheaves where the machine is not located over the hoistway. (See Wis. Adm. Code section Ind 4.21.)

(2) The floor shall be capable of sustaining a concentrated load of 300 pounds on any 4 square inches, and where it constitutes the floor of a main or secondary-machinery space, it shall be designed for a live load of not less than 125 pounds per square foot in all open areas.

(a) Where the elevator machine is supported solely by the machine floor slab, the floor slab shall be designed in accordance with the requirements of the Wisconsin Building Code, Wis. Adm. Code sections Ind 51.001 and 51.01.

(3) Overhead beams, floors and their supports shall be of steel or reinforced concrete and shall be designed for not less than the sum of the following loads:

(a) The load resting on the beams and supports which shall include the complete weight of the machine, sheaves, controller, governor, and other elevator equipment together with that portion, if any, of the machine room floor supported thereon.

(b) Twice the sum of the tensions in all wire ropes passing over the sheaves or drums supported by the beams with the rated load in the car.

Note: Tensions are doubled to take care of impact, acceleration, stresses, etc.

(4) Floors may be of concrete, or of metal construction with or without perforations. Perforated metal floors shall conform with the following:

(a) If of bar-type grating, the openings between bars shall reject a ball ¾ of an inch in diameter.

(b) If of perforated sheet metal or of fabricated openwork construction, the openings shall reject a ball 1 inch in diameter.

(c) Wood floors not less than 2 inches thick may be used in buildings of ordinary or frame construction.

(d) The openings in floors, through which cables pass shall be fitted with suitable guards at least 2 inches high to prevent any loose material from coming in contact with such cables, and to prevent any loose parts from dropping through the openings.

(e) Where there is a difference in levels of machine room and machinery space floors exceeding 15 inches, a standard guard rail 42 inches in height with an intermediate guard rail shall be provided at the edge of the higher level. A stairway shall be provided for access between levels. Stairways having more than 3 risers shall be provided with handrails.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.24 Guards for counterweights. (1) Where a counterweight runway is located in the elevator hoistway the outside (the side

away from the elevator), if exposed to contact, shall be protected the full height with a solid guard.

(2) Solid metal guards shall be installed in the pit on the open side or sides of all counterweights of elevators hereafter installed. Guards shall extend from a point not more than 18 inches above the pit floor to not less than 90 inches in height above the floor, properly reinforced and braced in strength and stiffness to not less than $\frac{1}{16}$ inch sheet steel.

(a) *Exception.* Hand elevators.

(b) *Exception.* Existing power elevators where there is not room for such guards.

(c) *Exception.* Where compensating chains or cables are attached to the counterweight.

(3) On existing installation where the counterweight runway is located outside the elevator hoistway, the runway shall be solidly enclosed on all sides and a removable panel 12 inches longer than the counterweight stack shall be provided on the outside at the bottom.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.25 Counterweights; existing drum type installations. (1) The counterweight guide rails of every power drum type elevator shall be strongly fastened together every 4 feet from the top of the guide rails, to a point opposite the bottom of the counterweight stack when it is at the upper limit of normal travel.

(2) For every power drum type elevator, there shall be an I-beam or other obstruction, strongly secured at the upper limit of travel of the countereweights so that they cannot be drawn out of the runway. Such obstruction shall be so arranged that the counterweights will be stopped squarely, without distortion.

(3) For every hand type elevator which does not have a limit stop at the top, a solid footing shall be provided on which the counterweight will rest when the car is not more than 6 inches above the highest landing.

(4) Drum and car counterweights shall be made of metal, shall run in substantial guides, and shall be provided with not less than 4 guide shoes or slots.

(5) If 2 sets of counterweights run in the same guides, the car counterweight shall be above the machine counterweight, and there shall be a clearance of not less than 8 inches between them.

(6) Where an independent car counterweight is used, the weight shall not cause slack in the hoist cables at any time.

(7) Where the cables of one set of counterweights pass through, or by, another set of counterweights, the cables shall be so protected as to prevent chafing or wearing.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.26 Counterweights and compensating devices. New installations. (1) Counterweights shall be located only in the hoistway of the elevator which they serve.

(2) Counterweight weight sections for all elevators over 100 feet per minute shall be mounted and secured in structural metal frames so designed as to prevent shifting of the weight by an amount which will reduce the runing clearance to not less than ¾ inch.

(a) At least 2 tie rods shall be provided which shall pass through all weight sections. Tie rods shall be provided with lock nuts and cotter pins at each end.

(b) Counterweight frames shall be guided on each end by upper and lower guiding members attached to the frame.

(c) Frames and rods shall be of steel or other metals conforming to Wis. Adm. Code section Ind 4.54. Where metals other than steel are used, a factor of safety of not less than 5 shall be included in the design with the car at rest and the countereweight at the top of its travel.

(d) When a hoisting sheave is mounted in the frame, provisions shall be made to maintain the strength of the member supporting the shaft and the reduction in area shall not reduce the strength of the member below that required. The bearing pressure shall in no case exceed that for bolts in clearance holes as indicated in Wis. Adm. Code section Ind 4.54.

(3) Counterweight weight sections may be installed without frames for passenger and freight elevators up to 100 feet per minute providing the sections are securely fastened together with not less than 4 tie rods equipped with washers, lock nuts and cotter pins at each end. All rods shall pass through all weight sections. Suitable means shall be provided to limit the movement of the weight sections and to prevent the reduction in running clearance to not less than ¾ inch.

(a) The weight stacks shall be guided on each guide rail by upper and lower guide members.

(b) For every counterweight stack over 8 feet in height, there shall be a middle guide weight.

(4) Compensating chains or cables shall be fastened to or on brackets to the counterweight frame or bottom guide weight and shall not be fastened on individual tie rods.

(5) Compensating-cable sheaves shall be provided with a switch, mechanically opened to remove the electric power from the elevator driving-machine motor and brake before the sheave reaches its limits of travel.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.27 Car construction. New installations. (1) Every elevator shall have a car frame consisting of a crosshead, uprights (stiles), and a plank located approximately at the middle of the car platform and in no case further from the middle than ⅛ of the distance from front to back of the platform.

(2) Car frames shall be guided on each guide rail by upper and lower guide members attached to the frame.

(3) The frame and its guiding members shall be designed to withstand the forces resulting under the loading conditions for which the elevator is designed. (See Wis. Adm. Code section Ind 4.52 (1) and (2) for capacity and loading of elevators.)

(4) For freight type car frames which are located entirely below the car platform, the vertical distance between the top and bottom car guide shoes shall be not less than 40% of the distance measured between the guide rails.

(5) Where multiple sheaves are mounted on car frame members on separate sheave shafts, provisions shall be made to take the

compressive forces, developed by tension in the hoist ropes between the sheaves, on a strut or struts between the sheave-shaft supports, or by providing additional compressive strength in the car frame or car-frame members supporting the sheave shafts.

(a) Where the sheave shaft extends through the web of a car-frame member, the reduction in area of the member shall not reduce the strength of the member below that required, where necessary, reinforcing plates shall be welded or riveted to the member to provide the required strength. The bearing pressure shall in no case be more than that permitted in Wis. Adm. Code section Ind 4.54 for bolts in clearance holes.

(6) Where side bracing and similar members are attached to car-frame uprights, the reduction in area of the upright shall not reduce the strength of the upright due to the attachment and/or added forces imposed on the upright below that required in Wis. Adm. Code section Ind 4.54.

(7) Where cars are suspended by hoisting cables attached to the car frame by means of rope shackles, the shackles shall be attached to steel hitch plates or to structural steel shapes. Such plates or shapes shall be secured to the underside or to the webs of the car-frame member with bolts or rivets so located that the tensions in the hoisting ropes will not develop direct tension in the bolts or rivets.

(8) Every elevator car shall have a platform consisting of a solid floor attached to a platform frame supported by the car frame and extending over the entire area within the car enclosure. The platform frame members and the floor shall be designed to withstand the forces developed under the loading conditions for which the elevator is designed and installed.

(9) Materials used in the construction of car frames and platforms shall conform to the following:

(a) Car frames and outside members of platform frames shall be made of steel or other metals and shall conform with Wis. Adm. Code section Ind 4.54.

(b) Platform stringers for freight elevators designed for Class B or C loading shall be of steel or other metals. (See Wis. Adm. Code section Ind 4.52 (2).)

(c) Platform stringers for freight elevators designed for Class A loading shall be of steel or other metals or of wood.

(d) Platform stringers for passenger elevators shall be of steel or other metals, or of wood. Where wood is used the underside exposed wood surfaces shall be covered with not less than No. 26 U. S. gauge metal.

(e) Where wood is used for platform stringers or for platform floors and subfloors, it shall be properly cured clear structural quality lumber.

Note: Guards below the car platform, where elevators have leveling or inching devices. (See Wis. Adm. Code section Ind 4.15 (4).)

(f) Cast iron shall not be used for any part subject to tension, torsion or bending.

1. *Exception.* Guiding supports, guide shoes or compensating cable anchorage.

(10) Where there is a railroad track installed on an elevator car, the tops of the rails shall be flush with the car floor.

(11) The car frame members of every elevator car shall be securely welded, bolted and/or riveted and braced.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.28 Passenger elevator. Car enclosures. (1) Every existing passenger elevator car shall be solidly enclosed with wood or metal on all sides from floor to car top or ceiling, except for the entrance opening.

(2) For every elevator hereafter installed, the car enclosure shall be constructed of solid incombustible panels to the full height of the car top or ceiling, except for the entrance sides, and shall conform with the requirements outlined in this subsection.

(a) The enclosure shall be securely fastened to the car platform and so supported that it cannot loosen or become displaced in ordinary service or on application of the car safety or on buffer engagement.

(b) No passenger elevator car enclosure shall deflect more than 1 inch when subjected to a force of 75 pounds when applied horizontally at any point, nor with such deflection shall the actual running clearance be less than ¾ inch.

(3) The material for passenger car enclosures shall conform with the requirements outlined as follows:

(a) Metal shall be equal in strength and as fire-resistive as $\frac{1}{16}$ inch thick sheet steel.

(b) Fire-retardant-treated-wood, wood or wood materials of equivalent combustible characteristics provided all exterior surfaces of the enclosure are covered with sheet metal not less than 26 U. S. gauge.

(c) Any other construction which is approved by the industrial commission as equal in strength and fire-resistivity to conform with subsections (3) (a) and (b), based on tests submitted from a recognized testing laboratory.

(d) Slow-burning combustible materials for insulating, sound deadening or decorative purposes may be used for lining enclosures if firmly bonded to the enclosure. Such materials shall not be padded or tufted.

(4) Where vent openings are installed in the car enclosure they shall conform with the requirements outlined as follows:

(a) Lower vents shall not be extended more than 1 foot above the floor and shall reject a ball 1 inch in diameter.

(b) Upper vents shall not be located less than 6 feet above the floor and shall reject a ball 2 inches in diameter.

(c) All vent openings greater than ½ inch of the smallest dimension shall be properly guarded on the outside.

(5) Every passenger elevator car shall be provided with a car top or cover constructed of solid material, designed and installed as to be capable of sustaining a load of 300 pounds on any square area 2 feet on a side.

(6) An emergency exit with a cover shall be provided in the top of all elevator cars and shall conform with requirements outlined as follows:

(a) The exit opening on every elevator hereafter installed shall have an area of not less than 400 square inches, and shall measure not less than 16 inches on any one side.

1. The exit cover of every elevator hereafter installed shall open upward and shall be hinged or may be arranged to slide horizontally in guides, fastened to the car top, so that the cover may be opened from both inside and from on top of the car without the use of tools.

2. The exit opening of every existing elevator installation shall have an area of not less than 320 square inches, and shall measure not less than 16 inches on any one side.

(b) The exit openings shall be so located as to provide a clear passageway unobstructed by fixed elevator equipment located in or on top of the car.

(c) For elevators hereafter installed the car lighting shall in no case obstruct the clear top exit opening. False or drop ceilings located below the exit panel shall be designed for clear access to exit panel.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.29 Passenger elevator. Car furnishings; new and existing installations. (1) No glass shall be used in elevator cars except to cover certificates, lighting fixtures, and appliances necessary for the operation of the cars.

(a) No piece of glass, unless laminated, or otherwise shatterproof, shall exceed 1 square foot in area.

(b) Mirrors, other than hall view mirrors, will not be permitted.

(2) Handrails shall be provided at each side or sides of every passenger elevator car and shall be mounted approximately 3½ feet above the floor, except for the entrance openings.

(3) No seats, except one for the attendant shall be placed in the elevator.

(4) No signs or advertisements shall be posted in any elevator car, other than those required for the operation of the elevator.

(5) Ventilating fans or blowers, if used, shall be securely fastened in place and located above the car ceiling or outside the enclosure.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.30 Passenger elevator. Car door or gate. (1) For elevators hereafter installed car gates are prohibited where the car speed exceeds 100 feet per minute.

(2) A car door or gate of the horizontal sliding type shall be provided at each entrance to elevator cars hereafter installed in compliance with subsection (1). This door or gate when closed shall guard the full opening and each door or gate shall be provided with a door or gate electric contact.

Exception. The door or gate electric contact is not required to prevent the operation of the car when being moved within the leveling zone.

(a) Electric contacts shall be provided on all elevator car doors and gates installed after August 12, 1926 where the car speed is in excess of 150 feet per minute and the state registration is over 7,000.

1. Where new cabs are installed for existing installations, car doors or gates shall be provided and equipped with a car door or gate electric contact.

(3) Every existing automatic operation elevator shall be provided with a car door or gate at each entrance and equipped with a car door or gate electric contact.

(4) The distance between bars or slats on car gates shall not exceed 3 inches when the gate is fully expanded.

(a) Collapsible-type car gates hereafter installed shall have at least every fourth vertical member of the gate guided at the top and every second vertical member guided at the bottom.

(b) Collapsible-type car gates shall not be power opened to a distance exceeding one-third (⅓) of the clear gate opening, and in no case more than 10 inches.

(5) Vision panels when used in car doors shall not exceed 80 square inches in area and no single panel shall exceed 6 inches in width and shall be laminated or wire glass and the inside surface of the panel shall be substantially flush with the surface of the door.

(6) Door panels shall have a substantially flush surface without recessed or raised moldings.

(7) For automatic operation elevators the car door or gate shall be considered in the closed position when the clear open space between the edge of the door or gate and the nearest face of the closed jamb does not exceed 2 inches, or for center-parting doors or gates when the door panels or gates are within 2 inches of contact with each other.

(8) For car switch operation elevators an electric contact on the car door or gate may permit the starting of the car when the clear open space does not exceed 4 inches.

(9) Car door or gate electric contacts shall be positively opened by the movement of the door or gate and shall be maintained in the open position and shall be so located that they are not readily accessible from inside the car.

(10) For automatic operation passenger elevators having power-closed or automatically released self-closing car doors or gates and manually closed or self-closing hoistway doors, the closing of the car door or gate shall be prevented unless the hoistway door is in the closed position.

(11) For elevators hereafter installed when both the car and the hoistway doors are power operated, they shall be equipped with a re-open device which will function to stop and re-open both car and hoistway doors in the event the doors are obstructed while closing.

Note: It is permissible to close power operated car and hoistway doors at reduced speed and power when they have been delayed for prolonged periods through the use of the re-opening device.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.31 Passenger elevator hoistway landing doors. (1) Each landing of every passenger elevator hereafter installed shall be equipped with a door. These doors may be horizontally sliding of the single or multi-section type or single section horizontal swinging and shall fill the entire opening of the hoistway.

(a) Where a 1-hour fire-resistive constructed hoistway is required, all hoistway landing entrances shall have minimum fire-resistive rating of ¾ hour. Wood doors of solid flush type 1¾ inches thick are acceptable. (See Wis. Adm. Code section Ind 4.10.)

(b) Where a 2-hour fire-resistive constructed hoistway is required all hoistway landing entrances shall have a minimum fire-resistive rating of 1½ hours. The doors shall be marked or identified to indicate that the entrance construction meets the fire rating requirements

of this subsection. These identifying marks may be labels or certifications based on tests submitted from a recognized testing laboratory. (See Wis. Adm. Code section Ind 4.10.)

(c) The section of each hoistway door shall be so constructed as to withstand a constant force of 250 pounds applied at right angles to and at approximately the center of the door, without causing the door to break or to be permanently deformed.

1. Horizontally sliding doors shall be so hung and guided that the doors will not be displaced from their guides or tracks when in normal service. Bottom guide shoes shall be made of or reinforced with metal so that in case of fire the guide shoe will prevent the door from being displaced from its guides.

2. Hangers for horizontally sliding doors shall be provided with means to prevent the doors from jumping the tracks. Stops shall be provided to prevent the hanger from leaving the ends of the track. Hangers and tracks shall be so designed and installed as to support the door in case of fire.

3. The hangers, tracks and their supporting brackets and fastenings for horizontally sliding power operated doors shall be constructed to withstand without damage of appreciable deflection, an imposed load equal to 4 times the weight of the door as applied successively downward and upward at the vertical center line of the assembled door or of each door section.

4. The leading edge of all horizontally sliding doors shall be smooth and free of sharp projections. The meeting edges of center-opening doors may be provided with a fire-resistive member on one or both doors to form a shallow overlap. Single and two-speed doors shall lap the strike jambs but shall not close into pockets in the strike jambs. The clearance between the corridor face of the doors and the bucks and header, and the clearance between overlapping faces of two-speed doors shall not exceed ⅜ inch.

(2) Horizontally sliding or swinging doors of automatic operation elevators hereafter installed shall be provided with door closers.

(3) Vertically sliding or doors of the vertically bi-parting type shall not be used to protect landing openings, except doors used exclusively for freight.

(4) For existing installations, the upper sections of such doors may be solid metal or of wire glass provided the glass pane is not less than ¼ inch thick nor greater than 720 square inches and not more than 54 inches vertical and 48 inches horizontal dimension.

(5) Existing installations:

(a) Every elevator controlled from the car only, shall be provided with an emergency key, not easily duplicated, to open the lowest terminal landing door from the landing side regardless of the car position.

1. The emergency key opening shall be provided with a cover fastened securely with Phillips head-type screws.

(b) For every automatic operation elevator where an emergency key opening, or any similar means has been provided for opening a hoistway landing door, the key opening or similar means shall be provided with a cover fastened securely with Phillips head-type screws.

(c) Emergency keys shall be kept in a receptacle having a transparent breakable cover. This receptacle shall be located at the lowest landing and shall be clearly marked "Elevator Door Key for Fire Department and Emergency Use Only".

(d) Emergency keys shall be provided to conform with subsection (6) for elevators installed after May 1, 1957 where the state registration number is 10959 or over.

(6) New installations:

(a) Emergency keys, not easily duplicated, shall be provided for elevators hereafter installed, to open certain hoistway landing doors from the landing side regardless of car position, in the manner and subject to the conditions described in this subsection.

(b) Emergency key openings shall be provided for landing doors for every automatic push button controlled elevator outlined as follows:

1. Single hoistway—at each floor.

2. Multiple hoistway—at the lowest terminal landing and the landing door immediately above it.

(c) Emergency key openings shall be provided at the lowest terminal landing for elevators controlled from the car only.

(d) All emergency key openings shall be provided with a cover fastened securely to the landing door with Phillips head-type screws.

1. *Exception.* Emergency key openings not greater than ½ inch in diameter which require the use of keys of the jointed design and the hinged action cause the release of the door interlocks.

(e) Emergency keys shall be kept in a receptacle having a transparent breakable cover. This receptacle shall be located immediately adjacent to the lowest landing and shall be clearly marked "Elevator Door Key for Fire Department and Emergency Use Only".

(7) Hoistway access switches are not required, but, where installed shall conform with the requirements and operation outlined as follows:

(a) Hoistway access switches shall be installed at the top and/or bottom terminal landings. The top terminal landing car travel shall be limited to the full door opening to permit access to the top of the car; and the bottom terminal landing car travel shall be limited to the full door opening to permit access to the pit. These switches shall be located immediately adjacent to the hoistway doorways at these landings and shall not be installed at any other landings or in the car.

(b) The hoistway access switch shall be of the continuous-pressure spring-return type and shall be operated by a cylinder type lock having not less than a 5 pin or 5 disk combination with the key removable only when the switch is in the "off" position. The lock shall not be operable by any key which will operate any other lock or device which is used for any other purpose in the building. The key shall be available to and used only by inspectors, maintenance men, and repairmen.

(c) The operation of the hoistway access switch at either terminal landing shall permit movement of the car with the hoistway door at

this landing unlocked or open and with the car door or gate open, subject to the following:

1. The operation of the access switch shall not render ineffective the hoistway door interlock or electric contact at any other landing.

2. The car shall not operate at a speed greater than 100 feet per minute.

3. For automatic operation elevators the normal operation shall first be made inoperative by means other than the access switch and the power operation of the hoistway door and/or car door or gate shall be inoperative.

4. Automatic operation by a car-leveling device shall be inoperative.

5. The operating device on top of the car as of Wis. Adm. Code section Ind 4.70 (3) shall be inoperative.

(8) Vision panels shall be provided in all hoistway landing doors of every automatic operated elevator except at landings where a hall position indicator is provided or where car and landing doors are power operated. All swing type hoistway doors shall be provided with vision panels. Where required or used, vision panels shall comply with the requirements as described in this subsection.

(a) The total area of any single panel shall not be less than 25 square inches or more than 80 square inches, and no single glass panel shall have a width exceeding 6 inches.

(b) Where mullions or division strips are used between panels, they shall be of fire-resistant material and of substantial construction.

(c) Panel openings shall be of glazed clear wire glass not less than ¼ inch thick, and shall be substantially flush with the surface of the landing side of the door.

(d) The center of a panel shall be not less than 54 inches nor more than 66 inches, above the elevator landing.

(9) On existing installations where the glass vision panel is in excess of 80 square inches, mullion or division strips shall be provided and no single glass panel shall have a width exceeding 6 inches.

(10) Where an elevator is installed in a single blind hoistway there shall be installed in the blind portion of the hoistway an emergency door at every third floor but not more than 36 feet apart and shall comply with the requirements outlined in this subsection.

(a) It shall be not less than 30 inches wide and 6 feet 6 inches in height and easily accessible and free from fixed obstructions.

(b) It shall be either of the horizontally sliding or swinging type irrespective of the type of door installed at the other landings.

(c) It shall be self-closing and self-locking and shall be marked in letters not less than 2 inches high, "DANGER ELEVATOR HOISTWAY".

(d) It shall be provided with a hoistway door electric contact. It shall be unlocked only from the landing side through the use of a cylinder type lock having not less than a 5 pin or 5 disk combination. The cylinder lock shall:

1. Be located not less than 5 feet above the floor.

2. Not be unlocked by any key which will open any other lock or device used for any other purpose in the building.

3. Be so designed that the key shall be removable only in the locked position and shall be kept where it is accessible only to authorized persons.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.32 Passenger elevator, (hoistway landing door interlocks). (1) EXISTING INSTALLATIONS. (a) Interlocks, either mechanical or electro-mechanical shall be provided on the door of every passenger elevator installation as described in this subsection.

1. A mechanical interlock when provided shall prevent the operation of the driving machine by the normal operating device unless the hoistway landing door at that landing is locked within 4 inches of the fully closed position; and prevent the opening of a hoistway landing door from the landing side, except by means of a special key.

2. An electro-mechanical interlock (a combination of electrical and mechanical devices) when provided shall prevent the operation of the driving machine by the normal operating device unless the hoistway landing door at that landing is locked within 4 inches of the nearest face of the jamb and, provided that the door will eventually be closed and locked within ⅝ inch of the nearest face of the jamb; and prevent the opening of a hoistway landing door from the landing side, except by means of a special key.

3. The functioning of the landing door interlock shall prevent the movement of the car and shall not be dependent solely on the action of a spring or springs in tension, nor solely upon gravity, nor shall it be dependent on the closing of an electric circuit.

(2) NEW INSTALLATIONS. (a) *Interlock.* A hoistway door interlock shall be provided on the door of every passenger elevator installation as described in this subsection.

1. Interlock contacts shall be positively opened by the locking member or by a member connected to and mechanically operated by the locking member, and the contacts shall be maintained in the open position by the action of gravity or by a restrained compression spring, or by both, or by means of the opening member.

2. The interlock latching mechanism shall hold the door in the closed and locked position by means of gravity or by a restrained compression spring or by both, or by means of a positive linkage.

3. The interlock shall lock the door in the closed position before the driving machine can be operated by the normal operating device.

4. The interlocks shall prevent the operation of the driving machine by the normal operating device unless all hoistway doors are closed and locked within ⅝ inch of the fully closed position.

a. *Exception.* The interlock is not required to prevent the operation of the car when being moved within the leveling zone or by means of the access switch as described in Wis. Adm. Code in section Ind 4.31 (7).

(b) Interlocks, used with multi-section doors, shall conform with the requirements outlined as follows:

1. They shall lock all sections of the door, but may be applied to only one section of the door provided the device used to interconnect the door sections is so arranged that lockng one section will prevent the opening of all sections.

(c) Interlock systems employing a single master switch for more than one door is prohibited.

(d) Retiring cams used to actuate an interlock shall exert a force at least double the average force required to operate the interlock

and shall have a movement at least ½ inch more than the average movement required to operate the interlock.

(e) Interlocks shall be so located that they are not accessible from the landing side when the hoistway doors are closed .

Note: Hoistway door interlocks to be accepted as satisfactory, are subject to evidence that they meet requirements based on tests outlined by the Safety Code for Elevators approved by American Standards Association and by tests made by a recognized testing laboratory.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.33 Landing sills and hinged or movable trucking sills. (1) Metal sills shall be provided of sufficient strength to support the load to be carried by the sill when loading and unloading the car and shall be permanently secured in place at each hoistway door opening. Sills shall be substantially level with the floor surface of the elevator landing or shall be beveled to meet the floor surface and for passenger elevators shall be so designed and maintained as to provide secure foothold for the entire width of the door opening.

(a) Landing sills of elevators used to carry freight shall be designed and installed to withstand the maximum concentrated sill loads for which the elevator is rated.

(b) The tops of railroad tracks located on elevator landings shall be substantially flush with the floor surface for a distance of at least 6 feet from the sill.

(2) Hinged or movable trucking sills where provided shall conform with the requirements as outlined in this subsection.

(a) Where a hinged or movable trucking sill is provided on the hoistway landing, the hinged or movable section shall be securely fastened to the building floor or landing sill at each hoistway door opening. Each sill may function automatically with the operation of a vertical moving hoistway door or counterbalanced gate.

(b) Where a hinged or movable trucking sill is provided on the car platform, the trucking sill shall be provided with an electric contact to prevent the operation of the elevator by the normal operating device unless the hinged or movable sill is locked within 2 inches of its fully retracted position; provided that when in this position the sill shall not reduce the clearance as outlined in Wis. Adm. Code section Ind 4.16 (1). The elevator may be operated by a releveling device with the sill in any position.

(c) Each sill shall bridge across the entire width of the door opening from the building floor landing to the elevator car platform, or from the car platform to the building landing sill. Each sill shall be properly counterbalanced and the long edges of each sill shall be beveled for smooth trucking surface. Each sill shall be designed to withstand the maximum concentrated loads for which the elevator is rated.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.34 Freight elevator. Car enclosure. (1) EXISTING INSTALLATIONS. (a) Every freight elevator car shall be solidly enclosed on all sides, except the entrance side. The height of every such enclosure shall be at least 6 feet, except as follows:

1. On every elevator the enclosure shall be at least 7 feet in height in front of the counterweight runway, and shall extend from floor to cover on every car where a cover is required or provided.

2. On every hand carriage type elevator traveling not more than 2 stories the enclosure shall be at least 3½ feet in height, except in front of the counterweight runway, where it shall be 7 feet high.

3. On the side of the operating cable, a sufficient open space to operate the cable shall be allowed, but in no case shall the opening be more than 15 inches wide.

4. On hand elevators, the enclosure may be arranged on the pull rope side so as to permit free operation of the pull rope.

5. Every power elevator shall be equipped with a solid or openwork top cover. Openwork top covers shall reject a ball 1½ inches in diameter. The car top or cover shall be sufficiently strong to sustain a load of 300 pounds applied on any square area 2 feet on a side.

a. *Exception.* A car cover is required over only that half of the car next to the entrance opening; on cars 10 feet or more in length with one entrance opening only (except at the lowest landing) and where the travel does not exceed 2 stories; nor more than 30 feet.

b. *Exception.* No cover is required where an elevator travels one story and the bottom rail of the landing gate above the lowest landing extends to the floor.

6. No cover is required over an existing hand elevator car where the bottom rail of every landing gate above the lowest landing rests on the floor. Where a hand elevator is not provided with a cover, a floor or screen shall be provided under the overhead drum and gears.

7. Where any entrance opening in an elevator hoistway is not equipped with a hoistway door, provided with a hoistway door interlock or electric contact and lock or where the entrance side of the car is not equipped with an approved car gate, the cover of the car shall be equipped with a hinged section facing each entrance, unless such entrance occurs only at the lowest landing. This hinged section shall be at least 12 inches wide, shall extend the full width of the entrance to within 5 inches of the landing sill, and shall be constructed so it will rise easily if it meets an obstruction as the car descends.

(2) NEW INSTALLATIONS. (a) Every power freight elevator car shall be solidly enclosed on all sides, except the sides used for entrance and shall conform with the requirements outlined in this subsection.

(b) The enclosure shall be of metal without perforations to a height of not less than 6 feet above the car platform. The enclosure above the 6 foot level shall be of metal with or without perforations. Perforated portions of the enclosure shall reject a ball 1½ inches in diameter.

1. The enclosure in front of the counterweight runway shall be of metal without perforations.

(c) The enclosure shall be of such strength and so designed and supported that when subjected to a force of 75 pounds applied horizontally at any point on the enclosure, the deflection shall not exceed one inch, nor the running clearance be less than ¾ inch.

1. The enclosure shall be securely fastened and supported so that it cannot loosen or become displaced in ordinary service or on the application of the car safety device or on buffer engagement.

(d) Every elevator shall be equipped with a solid or openwork top cover. Openwork top covers shall reject a ball 1½ inches in diameter. The car top or cover shall be so designed and installed as to be capable of sustaining a load of 300 pounds on any square area 2 feet on a side.

(e) An emergency exit with a cover shall be provided in the top of all elevator cars and shall conform with the requirements outlined as follows:

1. The exit opening shall have an area of not less than 400 square inches and shall measure not less than 16 inches nor more than 25 inches on any one side.

2. The exit shall be so located as to provide a clear passageway unobstructed by fixed elevator equipment located in or on top of the car.

3. The exit cover shall open upward and shall be hinged to the car top so that the cover can be opened from both inside and from on top of the car without the use of tools.

(f) Hinged or removable panels shall not be provided in car tops except for emergency exits.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.35 Freight elevator. Car door or gate. (1) EXISTING INSTALLATIONS. (a) A door or gate shall be provided at the car entrance to conform with the requirements outlined in this subsection.

(b) At each entrance of every automatic operation elevator.

(c) At each entrance of every continuous pressure or car switch operation elevator where the contract speed is in excess of 50 feet per minute.

(d) At the secondary entrance of every continuous pressure or car switch operation elevator not in excess of 50 feet per minute.

1. *Exception.* This requirement is not applicable to an elevator having but one entrance at the lower landing and the secondary entrance at the upper limit of travel, provided the distance between the edge of the car and the hoistway enclosure at the secondary entrance does not exceed 1½ inches with no projections and the speed does not exceed 50 feet per minute.

(e) At the secondary entrance of every power elevator having more than one entrance and having a difference in the floor levels in excess of 30 inches.

(f) At the secondary entrance of every elevator where the distance between the edge of the car and the hoistway enclosure on the side of the secondary entrance is more than 7 inches at any point or the hoistway enclosure on that side shall be altered so that it will come within the required limit.

(g) Every door or gate shall be not less than 6 feet in height; shall extend to within 1 inch of the car floor and when closed shall guard the full width of the opening; and the distance between bars or slats shall not exceed 3 inches, and each door or gate shall be provided with a door or gate electric contact to prevent movement of the car unless the door or gate is within 2 inches of being in the fully closed position.

1. *Exception.* This door or gate electric contact is not required to prevent the operation of the car when being moved within the leveling zone.

(2) NEW INSTALLATIONS: (a) A door or gate shall be provided at each car entrance.

1. *Exception.* Car doors or gates are not required on elevators of the continuous pressure operating type having but one entrance at the lower landing provided the travel does not exceed 14 feet or

more than one story; the speed does not exceed 35 feet per minute; and the distance between the edge of the car and the hoistway enclosure at the secondary entrance does not exceed 1½ inches with no projections; and the car operating buttons located not less than 24 inches from the edge of the car sill.

(b) Doors and gates, when in the closed position, shall guard the full width of the car opening and shall extend from a point not more than 1 inch above the car floor and to a height of not less than 6 feet. Each door or gate shall be provided with a door or gate electriic contact to prevent the movement of the car unless the door or gate is within 2 inches of being in the fully closed position.

Exception. The door or gate electric contact is not required to prevent the operation of the car when being moved within the leveling zone.

1. Gates shall be of the horizontal sliding collapsing type or vertical sliding type. Collapsible type gates when fully closed shall reject a ball 3 inches in diameter; and at least every fourth vertical member shall be guided at the top and every second vertical member guided at the bottom. Vertical sliding gates shall be of hardwood or metal and shall reject a ball 3 inches in diameter, and shall be designed to withstand a lateral force of 100 pounds concentrated at the center of the gate without deflecting the gate past the line of the threshold, and a force of 250 pounds, without forcing the gate from the guides.

2. Collapsible type gates shall not be power opened.

3. Doors shall be of the horizontal or vertically sliding type. There shall be no openings in doors, except for vision panels.

4. Vision panels in car doors shall not exceed 80 square inches in area and no single panel shall exceed 6 inches in width and shall be laminated or wire glass.

(c) Vertically sliding car doors or gates shall be counterbalanced from two sides. Balance (counterweight) weights for vertical operating doors or gates shall be located outside the car enclosure and shall run in guides or boxed in. Guides shall be of metal, and the bottom of the guides or boxes shall be so constructed as to retain the weight if the suspension member fails.

(d) Car door or gate electric contacts shall be positively opened by the movement of the door or gate and shall be maintained in the open position and shall be so located that they are not readily accessible from inside the car.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.36 Freight elevator hoistway landing entrance openings. Every freight elevator entrance opening in the hoistway enclosure shall be protected with a door or gate and when closed shall guard the opening as outlined in Wis. Adm. Code section Ind 4.37 and Ind 4.38.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.37 Freight elevator hoistway landing gates.

(1) EXISTING INSTALLATIONS. (a) Hoistway landing gates where provided shall conform with the requirements outlined in this subsection. (See Wis. Adm. Code section Ind 4.38 for hoistway landing doors.)

1. Where the car speed does not exceed 75 feet per minute, gates shall be not less than 3½ feet in height; and semi-automatic operation at each landing or full-automatic at terminal landings or balanced

type gates with electric contacts and locks. For elevators equipped with an electric brake (See subsection (1) (a) 6.).

2. Every semi-automatic gate for power elevators shall be equipped with an approved gate lock so arranged that the gate cannot be opened unless the car is at the landing. This lock shall be so constructed and located that it cannot be easily reached from the floor when the gate is closed.

Note: Balanced gates with electric contacts are prohibited on elevators with mechanical brake. (See Wis. Adm. Code section Ind 4.60 (1) (f).)

3. Where the car speed exceeds 75 feet per minute, gates shall be not less than 5½ feet in height; and shall be semi-automatic at each landing or balanced type with electric contacts and locks or interlocks.

4. Where electric contacts are provided on the hoistway landing gates, the lock or latch and contact shall be so arranged as to insure the gate being in a position to be locked or latched before the contact is closed.

5. Hoistway landing gate electric contacts shall be opened by the movement of the gate and shall be maintained in the open position and shall be so located that they are not readily accessible from the landing.

6. Every hoistway landing gate shall be provided with electric contacts and locks or interlocks on all elevators having an electric brake.

7. Hoistway landing gates are prohibited on elevators where the car speed exceeds 100 feet per minute.

8. Hoistway landing gates for hand-operated elevators shall be semi-automatic at each landing or full automatic at terminal landings.

a. *Exception.* On hand elevators where doors are used, the doors shall be equipped with self-acting locks designed to prevent opening the doors from the landing except by means of a key.

9. Every full-automatic gate shall be fully closed when the car has traveled a distance of not more than 8 feet from the landing.

10. No collapsible type gate shall be installed at any hoistway landing.

(2) GATE CONSTRUCTION. EXISTING INSTALLATIONS. (a) Every hoistway landing gate shall be so constructed and guided as to withstand a lateral force of 100 pounds concentrated at the center of the gate without being deflected beyond the line of the landing sill and a force of 250 pounds without separating the gate from its guides or without causing it to break or be permanently deformed.

1. Slats or bars when used shall be spaced not more than 3 inches apart.

a. *Exception.* A 5-inch gate opening will be permitted on existing cable controlled elevators to permit operation of the cable.

2. The main horizontal cross members shall extend into the guides or against the vertical members at the gate post, or the gate shall be provided with guide shoes fastened to the gate frame, so that the pressure on the gate from the landing side will not cause the gate to move into the hoistway in case the fastenings become loose.

Note: Where overhead rails are used on cars, center slots or openings in the hoistway gates will be permitted to allow passage of the trolley.

3. The bottom cross member of each landing gate shall extend to within 12 inches of the sill when the gate is closed.

a. *Exception 1.* At landings where conditions require more space to secure sufficient headroom, a clearance of not more than 20 inches

between the bottom cross member and the sill when the gate is closed will be permitted.

b. *Exception 2.* At basement landings where conditions will not permit a standard gate a clearance of not more than 30 inches between the bottom cross member and the sill when the gate is closed will be permitted provided the speed does not exceed 50 feet per minute. Self-closing or balanced type gates with electric contact and locks will be acceptable.

4. The bottom cross members of each landing gate at an opening in an outside wall shall be not more than 1 inch above the sill when closed.

5. Every gate guide post or track shall be securely fastened to the supporting wall or structure in such a manner to withstand the lateral pressure applied to the gate as specified in subsection (2) (a). The use of wood plugs and/or metal expansion bolts in brick, tile or plaster walls for fastening guide posts or track is prohibited.

6. Every gate shall be properly balanced and hung with substantial sash cord, flexible cable or chain over pulleys and not less than 3 inches in diameter.

7. Gate counterweights shall be boxed in, or shall run in metal guides which cannot be dislodged. The bottom of the boxes or guides shall be of such construction that the counterweight will be retained if the sash cord, cable or chain breaks.

(3) GATES. NEW INSTALLATIONS. (a) Hoistway landing gates shall conform with the requirements outlined in this subsection.

Note: For fire-resistive constructed hoistways see Wis. Adm. Code section Ind 4.10 (2) (b), (c) and (d) and section Ind 4.38 (2) (a) 3.

1. Where the car speed does not exceed 50 feet per minute; gates shall be not less than 3½ feet in height and shall be of the balanced type equipped with electric contacts and locks or interlocks.

2. Where the car speed exceeds 50 feet per minute; gates shall be not less than 5½ feet in height and shall be of the balanced type equipped with electric contacts and locks or interlocks.

3. Hoistway landing gates are prohibited on elevators where the car speed exceeds 100 feet per minute.

4. Hoistway landing gates shall be equipped with electric contacts and locks or interlocks as outlined in this subsection.

a. Electric contacts and locks or interlocks where the car speed does not exceed 100 feet per minute.

b. Hoistway landing gate electric contacts shall be positively opened by the movement of the gate and shall be maintained in the open position and shall be so located that they are not readily accessible from the landing.

c. Where electric contacts are provided on hoistway landing gates; the lock or latch and contact shall be so arranged as to insure the gate being in a position to be locked or latched before the contact is closed.

5. Hoistway landing gates located at an opening in an outside wall shall be not less than 6 feet in height.

6. No collapsible type gate shall be installed at any landing.

7. Hoistway landing gates shall be provided for hand-operated elevators and shall be of the vertically sliding type, semi-automatic operation at each landing and full-automatic at terminal landings.

(4) GATE CONSTRUCTION. NEW INSTALLATIONS. (a) Hoistway landing gates where provided shall be constructed to conform with all requirements in this subsection, as outlined.

1. Hoistway landing gates shall be so constructed and guided as to withstand a lateral force of 100 pounds concentrated at the center of the gate without being deflected beyond the line of the landing sill and a force of 250 pounds without forcing the gate from its guides or without causing it to break or be permanently deformed.

2. The net width of an opening between wood slats or bars shall not exceed 2 inches.

a. The bottom cross member of each landing gate shall extend to within 1 inch of the sill when closed.

3. Panels of metal constructed gates shall be equal in strength to No. 10 U. S. Standard gauge, with mesh not greater than 2 inches.

a. Each gate panel shall be provided with guide shoes secured to the gate frame in such a manner that pressure on the gate from the landing side will not cause the gate panel to move into the hoistway if the guide shoes become loose.

4. Every gate guide post or track shall be securely fastened to withstand the lateral pressure as applied to the gate as specified in subsection (4) (a) 1. The use of wood plugs and/or metal expansion bolts in brick, tile or plaster walls for fastening guide posts or tracks is prohibited.

5. Every gate shall be properly counterbalanced from 2 sides and hung with substantial sash cord, flexible cable or chain over pulleys not less than 3 inches in diameter.

6. The gate counterweights shall be boxed in or shall run in metal guides to prevent being dislodged. The bottom of the boxes or guides shall be of such construction that the counterweights will be retained if the suspension means break.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.38 Freight elevator hoistway landing doors. (1) EXISTING INSTALLATIONS. (a) Hoistway landing doors where provided shall conform with the requirements outlined in this subsection.

1. Every semi-automatic door for power elevators shall be equipped with an approved lock so arranged that the door cannot be opened unless the car is at the landing. This lock shall be so constructed and located that it cannot be easily reached from the floor when the door is closed. For elevators equipped with an electric brake see subsection (1) (a) 5.

2. Where electric contacts are provided on hoistway landing doors, the lock or latch and contact shall be so arranged as to insure the door being in a position to be locked or latched before the contact is closed.

3. Hoistway landing door electric contacts shall be positively opened by the movement of the door and shall be maintained in the open position and shall be so located that they are not readily accessible from the landing.

4. On hoistway landing doors, where the glass vision panel is in excess of 80 square inches, mullion or division strips shall be provided and no single glass panel shall have a width exceeding 6 inches.

5. Every hoistway landing door shall be provided with electric contacts and approved locks or interlocks on all elevators having electric brakes.

6. Full automatic doors at terminal landings are prohibited where the car speed exceeds 100 feet per minute.

7. Every existing freight elevator with counterbalanced doors and every car switch controlled elevator equipped with horizontal sliding doors, shall be equipped with an emergency key which cannot be easily duplicated, which will, irrespective of the position of the car, unlock the lowest terminal landing door. This emergency key shall be placed in a receptacle having a transparent breakable cover, clearly marked, "Elevator Door Key for Fire Department and Emergency Use Only", and shall be located at the lowest landing. Where an emergency key opening has been provided for opening a hoistway landing door, the key opening shall be provided with a cover fastened with Phillips head-type screws.

8. Single or multi-section vertically sliding doors shall be so counterweighted and vertically sliding, bi-parting counterbalanced doors shall be so counterbalanced that they will not open or close by gravity.

9. Suspension means and their connections for vertically sliding bi-parting counterbalanced doors and for the counterweights of vertically sliding counterweighted doors, shall have a factor of safety of not less than 5. Fastenings shall be provided to prevent the detachment or dislodgment of counterbalancing weights of doors.

10. Each door panel shall be so constructed as to withstand a constant force of 250 pounds applied at right angles to and at approximately the center of the panel, without causing the panel to break or to be permanently deformed.

(2) DOORS. NEW ELEVATOR INSTALLATIONS. (a) Hoistway landing doors where provided shall conform with the requirements outlined in this subsection.

1. Where a 1-hour, fire-resistive constructed hoistway is required all hoistway landing doors or fire shutters shall have a minimum fire-resistive rating of ¾ hour. Wood doors of solid flush type 1¾ inches thick are acceptable.

2. Where a 2-hour, fire-resistive constructed hoistway is required all hoistway landing doors or fire shutters shall have a minimum fire-resistive rating of 1½ hours. The doors shall be marked or identified to indicate that the entrance construction meets the fire rating requirements. These identifying marks may be labels or certifications based on tests submitted from a recognized testing laboratory.

3. Where a fire-resistive constructed hoistway is required and hoistway landing gates are provided, each entrance opening shall be provided with an approved fire door or shutter which shall be equipped to close automatically in case of fire (see Wis. Adm. Code section Ind 4.10).

4. Hoistway doors shall be provided for elevators where the car speed exceeds 100 feet per minute.

5. Hoistway landing doors shall be equipped with electric contacts and locks or interlocks as outlined in this subsection.

a. Electric contacts and locks or interlocks where the car speed does not exceed 100 feet per minute.

b. Interlocks for all elevators where the car speed is in excess of 100 feet per minute.

c. Where interlocks are provided they shall conform with all requirements outlined in Wis. Adm. Code section Ind 4.32 (2) (a).

6. Hoistway landing door electric contacts shall be positively opened by the movement of the door and shall be maintained in the open position and shall be so located that they are not readily accessible from the landing.

7. Where electric contacts are provided on hoistway landing doors, the lock or latch and contact shall be so arranged as to insure the door being in a position to be locked or latched before the contact is closed.

(b) Each door panel shall be so constructed as to withstand a constant force of 250 pounds applied at right angles to and at approximately the center of the panel, without causing the panel to break or be permanently deformed.

1. Single or multi-section vertically sliding doors shall be so counterweighted and vertically sliding, bi-parting counterbalanced doors shall be so counterbalanced that they will not open or close by gravity.

2. Suspension means and their connections, for vertically sliding bi-parting counterbalanced doors and for the counterweights of vertically sliding counterweighted doors, shall have a factor of safety of not less than 5. Fastenings shall be provided to prevent the detachment or dislodgment of counterbalancing weights of doors.

3. Bi-parting counterbalanced hoistway doors shall have the lower edge of the upper door section provided with a fire-resistive, non-shearing, non-crushing member to provide a space of not less than ¾ inch between the rigid members of the door sections when closed. Any rigid astragal overlapping the meeting edge and/or any fire-resistive astragal overlapping the door sections when closed is prohibited. Center latches are prohibited.

4. Manually operated vertically sliding bi-parting counterbalanced hoistway doors on elevators which can be operated from the landings shall be provided with pull straps on the inside and outside of the doors.

5. Horizontal sliding doors shall conform with the requirements of Wis. Adm. Code Ind 4.31 (1) (c) to (c) 4., inclusive.

6. Vision panels shall be provided in all hoistway landing doors; except where car position indicators are installed at each floor, or where car and landing doors are power operated. Where required or used, vision panels shall conform with the requirements as described in this subsection.

a. The total area of any single panel shall not be less than 25 square inches or more than 80 square inches, and no single glass panel shall have a width exceeding 6 inches.

b. Where mullions or division strips are used between panels, they shall be of fire-resistive material and of substantial construction.

c. Panel openings shall be glazed clear wire glass not less than ¼ inch thick and shall be substantially flush with the surface of the landing side of the door.

d. The center of a panel shall be not less than 54 inches nor more than 66 inches above the elevator landing.

7. Every new freight elevator with counterbalanced doors and every car switch controlled elevator equipped with horizontally sliding doors, shall be equipped with an emergency key which cannot be easily dupli-

cated, which will, irrespective of the position of the car, unlock the lowest terminal landing door. This emergency key shall be placed in a receptacle having a transparent breakable cover, clearly marked, "Elevator Door Key for Fire Department and Emergency Use Only", and shall be located at the lowest landing. Where an emergency key opening has been provided for opening a hoistway landing door, the key opening shall be provided with a cover fastened with Phillips head-type screws.

8. Emergency keys not easily duplicated, shall be provided to open certain hoistway landing doors from the landing side regardless of the car position. Emergency key opening shall be provided for landing doors for every automatic or continuous pressure push button controlled elevator installed with horizontally sliding or swinging doors outlined as follows:

a. Single hoistway—at each floor.

b. Multiple hoistway—the lowest terminal and the landing door immediately above it.

c. All emergency key openings shall be provided with a cover fastened securely with Phillips head-type screws.

a. *Exception.* Emergency key openings not greater than ½ inch in diameter which require the use of keys of the jointed design and the hinged action cause the release of the door interlocks.

d. Emergency keys shall be kept in a receptacle having a transparent breakable cover. This receptacle shall be located at the lowest landing and shall be clearly marked "Elevator Door Key for Fire Department and Emergency Use Only".

9. An elevator installed in a single blind hoistway shall conform with Wis. Adm. Code section Ind 4.31 (10).

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.39 Power door operation. New installations.

(1) (a) Power operation of horizontally sliding car and hoistway landing doors shall conform with the requirements as outlined in this subsection.

1. Both the car and hoistway door shall be of the horizontally sliding type.

2. Power opening the car door shall occur only when the car is stopping, or is leveling, or is at rest.

3. Power opening of the hoistway landing door shall occur only at the landing where the car is stopping within the leveling zone or is at rest.

4. Where power hoistway doors are automatically opened as the car is leveling, the car shall be at rest or substantially level with the landing before the hoistway door is fully opened.

(b) Where a car door or gate of an automatic operation elevator is closed by power, or is of the automatically self-closing type, and faces a manually operated or self-closing hoistway door, the closing of the car door or gate shall not be initiated unless the hoistway door is in the closed position; and the closing mechanism shall be so designed that the forces necessary to prevent closing of a car door or gate from rest shall be not more than 30 pounds.

(c) A re-opening device shall be provided for every power-operated car door which will function to stop and re-open a car door and the adjacent hoistway door in the event that the car door is obstructed

while closing. Where the hoistway door and the car door are closed in such a manner that stopping either one manually will stop both.

(2) Power operation of vertically rising or vertically bi-parting hoistway doors or gates shall conform with the requirements outlined in this subsection.

(a) Both hoistway door or gate and car door or gate shall be of the vertically sliding type and:

1. Power opening of the car door or gate shall occur only when the car is stopping or is leveling, or is at rest.

2. Power opening of the hoistway landing door or gate shall occur at the landing where the car is stopping within the leveling zone.

3. Where power hoistway doors are automatically opened as the car is leveling, the car shall be at rest or substantially level with the landing before the hoistway door is fully opened.

4. Where a car door or gate of an automatic operation elevator is closed by power, or is of the automatically self-closing type, and faces a manually operated or self-closing hoistway door, the closing of the car door or gate shall not be initiated unless the hoistway door is in the closed position.

(b) Power closing of vertically sliding hoistway doors or gates shall be by means of continuous pressure operation from the car and/or at the landing where the car is stationed.

(c) The operation of the closing means shall not close the hoistway door or gate or car door or gate when the elevator is at any other landing.

(d) For elevators having more than one hoistway opening at any landing level, a separate closing means shall be provided in the car for each car door or gate and its adjacent hoistway door or gate. Any closing means at a landing shall close only that hoistway door or gate and the car door or gate at the side where such means is located.

(e) Power-operated hoistway landing gates shall be not less than 5½ feet in height.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.41 Factors of safety for cables. New and existing installations. (1) The factor of safety based on static loads for cables for passenger and freight elevators shall be not less than the values given in Table 8 corresponding to the contract speed of the car.

TABLE 8

FACTORS OF SAFETY FOR HOISTING CABLES

Car Speed in Feet Per Minute	Elevators
50 or less	7.60
100	7.95
200	8.60
300	9.20
400	9.75
500	10.25
600	10.70
700	11.00
800	11.25
900	11.45

Note: Intermediate car speeds and factors of safety can be obtained by interpolation.

(a) Unless the ultimate strength and material of a cable are known, the load shall be limited to the load allowed for an iron cable of the same diameter.

(b) No car or counterweight cable shall be repaired or lengthened by splicing.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.42 Cable data. (1) There shall be posted for permanent record in a conspicuous place on the car beam of every elevator hereafter installed a metal sign bearing the following original data:

CABLE SPECIFICATIONS

Kind of Cable	Number of Cables	Diameter in Inches	Rated Ultimate Strength	Date of Installation
Hoisting				

(2) On elevators hereafter installed and thereafter whenever cables are renewed on elevators, there shall be attached to the cable fastening or car beam a tag or plate bearing the following data:

CABLE INSTALLATION DATA

Diameter of Cables _____
Material and Type of Cable _____
Rated Ultimate Strength _____
Date Installed _____

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.43 Renewing of cables. Cables are considered unsafe and shall be renewed when through broken wires, wear, rust, undue strain, or other deterioration, the strength has decreased more than 25% of the manufacturers rated strength of the cable. When for any reason it becomes necessary to renew one or more cables of a group supporting a common load, all cables in that group shall be renewed.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.44 Number and size of cables required. (1) Every elevator which requires hoisting cables shall have not less than 2 hoisting cables.

(a) *Exception.* On existing installations a single hoisting cable will be permitted providing the factor of safety is not less than 10.

(2) Every traction elevator hereafter installed shall have not less than 4 cables.

(a) *Exception.* For 2 to 1 roping where the capacity does not exceed 2500 pounds and the speed does not exceed 100 feet per minute 3 cables may be used.

(b) *Exception.* When the capacity does not exceed 1200 pounds 3 cables may be used.

(3) Hoisting cables less than ½ inch in diameter shall not be used for power elevators.

(4) The number of hoisting cables shall be determined by using the factor of safety in Wis. Adm. Code section Ind 4.41 (1) Table 8. The computed load on the car-hoisting cables shall be the weight of the elevator car, plus the contract load, plus the weight of the car-hoisting cables and the compensation minus the weight of the independent car counterweight, if any.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.45 Cable guards for sheaves and idlers. Every sheave or idler under which is led any hoisting, counterweight, or governor cable, shall be provided with a guard that will keep the cable on the sheave of idler if the cable becomees slack.

Note: See Wis. Adm. Code section Ind 1.18 in the "General Orders on Safety" for guarding of pinch points.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.46 Cable (wire rope) terminal fastenings, and turns required on drums. (1) The car and counterweight ends of car and counterweight cable, or the stationary hitch-ends where multiple roping is used, shall be fastened in such a manner that all portions of the cable except the portion inside the cable socket shall be readily visible.

(a) Cable fastenings shall be individual tapered babbitted sockets.

(b) The car ends, or the car or counterweight dead ends where multiple roping is used, of all suspension cable traction type elevators shall be provided with shackle rods of a design which will permit individual adjustment of the cable lengths. Similar shackle rods shall be provided on the car or counterweight ends of compensating cables.

(c) The cable socket shall be either cast or forged steel providing that where the rope socket and the shackle rod are in one piece (unit constructed), the entire fastening shall be of forged steel.

(d) Where the shackle rod is separate from the rope socket, the shackle rod shall be forged or rolled steel and the fastening between the two parts shall be positive and such as to prevent their separation under all conditions of operation of the elevator. Where the connection of the two parts is threaded, the length of the threaded engagement of the rod in the socket shall be not less than 1½ times the root diameter of the thread on the rod, and a cotter pin shall in addition be provided to restrict the turning of the rod in the socket and prevent unscrewing of the connection in normal operation.

(e) Cast or forged steel cable sockets, shackle rods and their connection shall be made of unwelded steel, having an elongation of not less than 20% in a length of 2 inches.

(f) The threaded length of each shackle rod shall be provided with lock nuts and cotter pinned.

(g) Cable sockets shall be of such strength that the cable will break before the socket is perceptibly deformed.

(h) The shackle rod or eye bolt used to connect the cable socket to the car or counterweight, shall have a strength at least equal to the manufacturer's rated strength of the cable.

(j) Where a cable is fastened in a socket, the strand ends of the cable shall be separated and turned in toward the center. The portion

turned in shall have a length of not less than 2½ times the diameter of the cable. The knot thus formed shall be drawn tightly into the socket. The loop of the wire strands shall be visible above the surface of the babbitt after the socket is poured.

1. Only babbitt-metal free from dross shall be used to secure cable ends in tapered babbitted sockets.

2. Seizing of cable ends shall be made with annealed iron wire, and the length of each seizing shall be not less than the diameter of the cable.

(k) The cables of every drum type elevator hereafter installed shall have at least one and one-half turns on the drum when the car is at either the bottom or top landing. This requirement shall also apply, in recabling of existing installations. The winding drum end of every car or counterweight cable shall be secured on the inside of the drum by clamps or by tapered babbitted sockets.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.48 Warning chains; new and existing installations. Warning chains shall be hung within 2 inches from the edge of the car platform entrance side or sides of every power freight elevator. Such chains to be of No. 10 U. S. Standard gauge wire; to extend at least 5 feet below the platform and spaced not more than 5 inches apart.

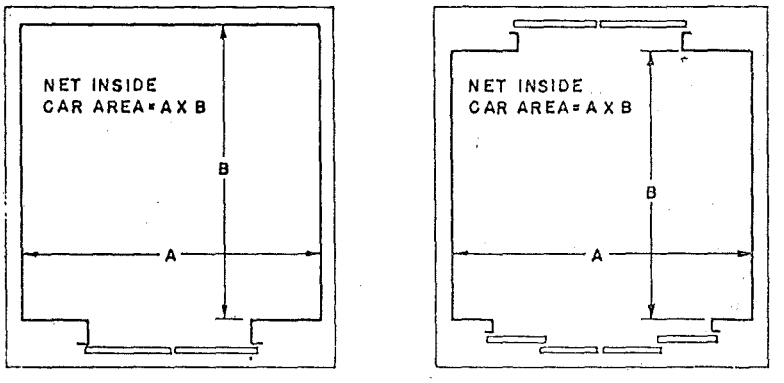
(1) *Exception.* Where hoistway landing doors with electric contacts or interlocks are provided.

Ind 4.52 Capacity and loading of elevators. (1) Every passenger elevator hereafter installed shall have a minimum rated load in pounds based on net inside platform area, and the contract load shall not be less than that given in Table 9. The net inside platform area shall be the product of the inside distance between the inside walls and the inside distance from the front return wall to the rear wall, or the rear return wall where a rear opening is provided.

TABLE 9

MAXIMUM INSIDE NET PLATFORM AREAS FOR THE VARIOUS RATED LOADS

Effective Platform Area Square Feet	Rated Capacity	Loading of Car Per Square Foot in Pounds
10	700	70
13.5	1000	74
15.6	1200	76
19	1500	79
24	2000	83
29	2500	87
33	3000	90
37.6	3500	93
42	4000	95
46.2	4500	97
50	5000	98
58	6000	103
74	8000	108
87.5	10000	114



INSIDE NET PLATFORM AREAS FOR PASSENGER ELEVATORS

(2) Every power freight elevator platform hereafter installed shall have a metal outside frame and shall be designed and constructed for one of the following classes of loading:

(a) *Class A. General freight loading.* Where the load is distributed, the weight of any single piece of freight or of any single hand truck and its load is not more than ¼ the rated load of the elevator, and the load is handled on and off the car platform manually or by means of hand trucks. For this class of loading, the rated load shall be based on not less than 50 pounds per square foot of inside net platform area.

(b) *Class B. Motor-vehicle loading.* Where the elevator is used solely to carry automobile trucks or passenger automobiles up to the rated capacity of the elevator. For this class of loading, the rated load shall be based on not less than 50 pounds per square foot of inside net platform area.

(c) *Class C. Industrial truck loading.* Where the load is carried in transit by, or is handled on and off the car platform by means of industrial power trucks or by hand trucks having a loaded weight more than ¼ the rated load of the elevator. For this class of loading the following requirements shall apply:

1. The rated load shall be based on not less than 50 pounds per square foot of inside net platform area.

2. The weight of the loaded industrial truck shall not exceed the rated load of the elevator.

3. The weight of the industrial truck plus any other material carried on the elevator shall not exceed the rated load when the industrial truck is also carried.

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

(4) If there is a railroad track on an elevator car, the tops of the rails shall be flush with the car floor.

(5) The car frame members of every elevator car shall be securely welded, bolted and/or riveted and braced. Welding, where used, shall meet the requirements of the industrial commission.

Note: See Wis. Adm. Code section Ind 4.56 for Guide Rails and Supports; Stresses and Deflections.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.53 Capacity and data plates. New and existing installations. (1) PASSENGER ELEVATORS. There shall be a metal plate which shall be located in a conspicuous place in each passenger elevator car, the letters and figures in each plate to be not less than ¼ inch in height and to be stamped in, etched or raised on the surface of the plate and shall bear the following information:

(a) The contract load of the elevator in pounds.

(b) The number of persons allowed on the car.

Note: The estimated number of persons allowed on the car is based on the contract load divided by 150.

(2) FREIGHT ELEVATORS. A metal plate with stamped or raised letters not less than ½ inch in height, stating the contract load of the elevator, shall be located in a conspicuous place in each freight elevator car.

(3) PLATE ON CROSSHEAD. A metal plate or plates shall be placed upon the car crosshead of each power elevator hereafter installed bearing the information outlined as follows:

(a) The total weight of the complete car, including the safeties and all auxiliary equipment attached to the car.

(b) The contract load and speed.

(c) Cable data, as required in Wis. Adm. Code section Ind 4.42 (1).

(d) Manufacturer's name, and date of installation.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.54 Structural connections and stresses allowed in design. New installations. (1) Connections between members of car frames and platforms shall be riveted, bolted or welded and shall conform with the requirements outlined in this subsection. (See Wis. Adm. Code section Ind 4.27.)

(a) Bolts, where used through sloping flanges of structural members, shall have bolt heads of the tipped-head type or shall be fitted with beveled washers.

(b) Nuts, used on sloping flanges of structural members, shall seat on beveled washers.

(2) The design stresses in the car-frame and platform members and their connections based on the static load imposed upon them shall not exceed the stresses permitted by the Wisconsin Building code,

Wis. Adm. Code sections Ind 53.22 and Ind 53.24. Structural members stresses shall not exceed the unit values as described in Wis. Adm. Code section Ind 4.54, Table 10.

TABLE 10

MAXIMUM ALLOWABLE STRESS IN CAR-FRAME AND PLATFORM MEMBERS AND CONNECTIONS FOR STEELS

Member	Type of Stress	Max. Stress Lbs. Per Sq. Inch	Area Basis
Car Crosshead	Bending	12,500	Gross Section
Car-Frame Plank Normal Loading	Bending	12,500	Gross Section
Car-Frame Plank Buffer Reaction	Bending	25,000	Gross Section
Car-Frame Uprights (Stiles)	Bending plus Tension	15,000	Gross Section
		18,000	Net Section
Hoisting-Rope Hitch Shapes	Bending plus Tension	8,000	Net Section
Platform Framing	Bending	12,500	Gross Section
Platform Stringers	Bending	15,000	Gross Section
Threaded Brace Rods and Other Tension Members except Bolts	Tension	8,000	Net Section
Bolts	Tension	7,000	Net Section
Bolts in Clearance Holes	Shear	7,000	Actual Area in Shear Plane
Bolts in Clearance Holes	Bearing	16,000	Gross Section
Rivets or Tight Body-fit Bolts	Shear	10,000	Actual Area in Shear Plan
Rivets or Tight Body-fit Bolts	Bearing	18,000	Gross Section
Any Framing Member, Normal Loading	Compression	$14{,}000 - \frac{59L}{R}$	Gross Section

(3) The deflection allowed in design of car-frame and platform members shall be based on the static load imposed upon them and shall be not more than permitted by this subsection.

(a) For crosshead—1/960th of the span.

(b) For safety or car frame plank—1/960th of the span.

(c) For platform frame members—1/960th of the span.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.55 Guide rails. New installations. (1) Every passenger and freight elevator shall have T section steel guide rails for car and counterweight.

(a) Guide rails, brackets, clips, fish plates and their fastenings shall be of steel to conform with the requirement as follows:

1. Rails, brackets, fish plates and rail clips shall be made of open-hearth steel or its equivalent having a tensile strength of not less than 55,000 pounds per square inch and having an elongation of not less than 22% in a length of 2 inches.

(2) Guide rails shall conform to the nominal weights and dimensions shown in Figure 4.55 and Table 11.

FIGURE 4.55

ELEVATOR GUIDE RAILS

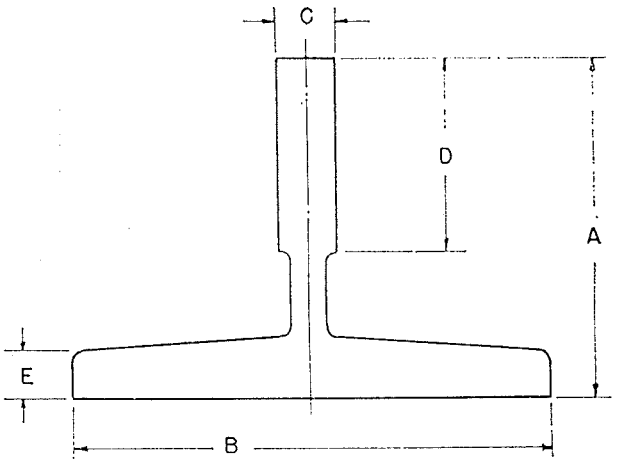


TABLE 11

T SECTION RAIL

Nominal Weight Per Foot in Lb.	Nominal Dimension in Inches				
	A	B	C	D	E
8	2 7/16	3 1/2	5/8	1 1/4	5/16
15	3 1/2	5	5/8	1 11/32	1/2
18 1/2	4 1/4	5 1/2	3/4	1 11/32	1/2
22 1/2	4	5 1/2	1 1/8	2	9/16
30	5	5 1/2	1 1/4	2 1/4	11/16

(3) The joints of metal guide rail shall conform to the requirements as outlined in this subsection.

(a) The ends of the rails shall be accurately machined with a tongue and matching groove centrally located in the center of the web.

(b) The ends of each rail shall be joined together with fish plate and with not less than 4 bolts.

(c) The width of the fish plate shall be not less than the width of the back of the rail.

(d) The thickness of the fish plates and the diameter of the bolt for each size of guide rail shall be not less than specified in Table 12.

TABLE 12

MINIMUM THICKNESS OF FISH PLATES AND MINIMUM DIAMETER OF FASTENING BOLTS

Nominal Weight of Guide Rail in Pounds Per Foot	Minimum Thickness of Fish Plates in Inches	Minimum Diameter of Bolts in Inches
8	9/16	1/2
15	11/16	5/8
18½	11/16	3/4
22½	13/16	3/4
30	15/16	3/4

(e) Guide rails shall have finished guiding surfaces.

(4) The top and bottom ends of each run of guide rail shall be so located in relation to the extreme positions of travel of the car and counterweight that the car and counterweight guiding members cannot travel beyond the ends of the guide rails.

(5) Steel plates or other structural shapes shall be mounted under and fastened to the bottom ends of car guide rails where safeties are used.

(6) The guide rails of power elevators shall not be used to support the overhead machinery.

(a) *Exception.* Governors.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.56 Guide rails and supports; stresses and deflections; new installations. (1) The stresses in a guide rail or in the rail and its reinforcements, due to the horizontal forces imposed on the rail during loading, unloading or running, calculated without impact, shall not exceed 15,000 pounds per square inch based upon the class of loading; and the total deflection shall not exceed ¼ inch.

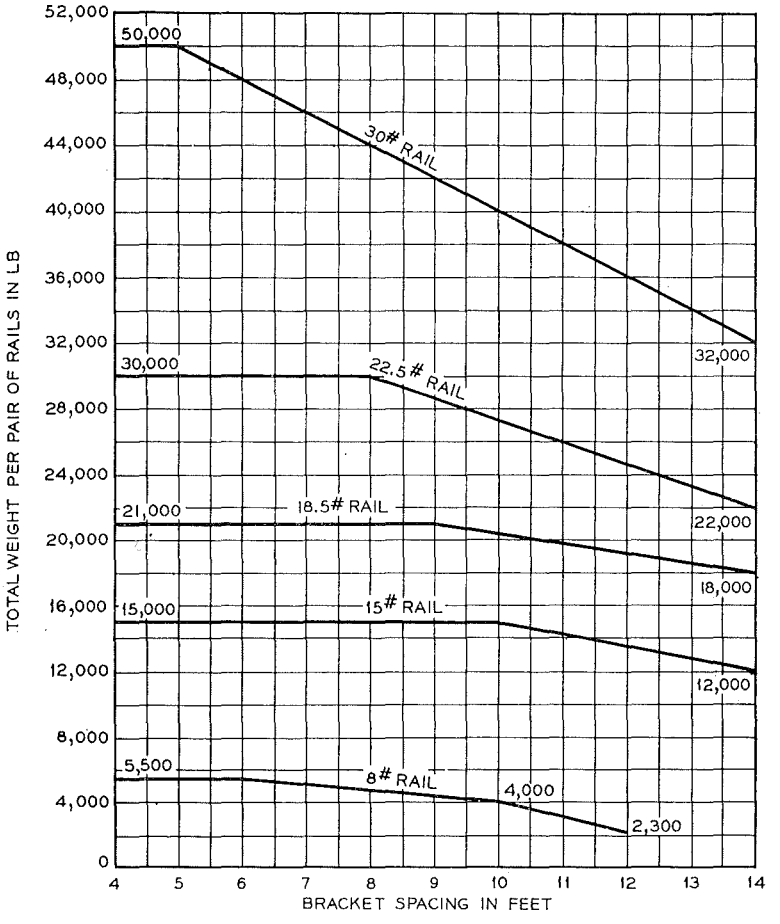
(2) The guide rail brackets, their fastenings and supports, such as building beams and walls, shall be capable of resisting horizontal forces imposed by the class of loading; the total deflection shall not exceed ⅛ inch at the point of support.

(3) Where a car with safety or counterweight with safety is used, the maximum suspended weight of the car and its rated load per pair of guide rails, or maximum suspended weight of the counterweight per pair of guide rails, including the weight of any compensating ropes or chains and of any traveling cables suspended therefrom, shall not exceed the maximum specified in Figure 4.56 for the size of rails and the bracket spacing used. Where conditions require greater bracket spacing the guide rails shall be reinforced or a larger size

rail used providing the reinforced or larger rail is of equal strength per pair of guide rails to conform with the requirements of Figure 4.56.

FIGURE 4.56

MAXIMUM WEIGHT OF CAR WITH RATED LOAD OR OF COUNTERWEIGHT WITH SAFETY FOR A PAIR OF GUIDE RAILS



(4) The weight of the counterweight per pair of guide rails and the bracket spacings where no safety is used shall not exceed that specified in Table 13.

TABLE 13

GUIDE RAILS FOR COUNTERWEIGHTS WITHOUT SAFETIES

Weight of Counterweight in Pounds	Nominal Weight of Guide Rail in Pounds Per Foot	Maximum Bracket Spacing Without Reinforement in Feet
15,000	8	16
40,000	15	16
56,000	18½	16
80,000	22½	16

(a) Intermediate tie brackets, equally spaced shall be provided between counterweight guide rails at intervals as specified in Table 14.

TABLE 14

INTERMEDIATE TIE BRACKETS

Nominal Distance Between Fastenings to Building Structure in Feet	Number of Intermediate Tie Brackets
0 to 12	0
12 to 14	1
14 to 16	2

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.57 Fastening of guide rails. New installations. (1) Guide rails shall be secured to their brackets by clips or by bolts which shall conform with Wis. Adm. Code section Ind 4.54 (1) (a) and (b) or by welding which shall conform with section Ind 4.54 (1) (c).

(2) The size of bolts used for fastening the guide rails or clips to the brackets shall be not less than specified in Table 15 outlined as follows:

TABLE 15

MINIMUM SIZE OF RAIL-FASTENING BOLTS

Nominal Weight of Guide Rail in Pounds Per Foot	Minimum Diameter of Bolts in Inches
8	½
15	⅝
18½	⅝
22½	¾
30	¾

(3) Material used for shimming steel rails shall be metal so secured as not to drop from its position if the fastenings become loose.

(4) The building construction shall be adequate to support the guide rails and their brackets in accordance with the requirements outlined in this subsection.

(a) Safely withstand the application of the car safety when stopping the car at governor tripping speed with its rated load or application of the counterweight safety at governor tripping speed.

(b) Withstand the forces specified in Wis. Adm. Code section Ind 4.56 (2) within deflection limits.

(5) Guide rails shall be located in essentially a vertical plane and the distance between the plane of the rails shall not vary more than ¼ inch.

(6) Fastenings shall be by means of metal inserts, expansion bolts, or by through bolts in the beams or walls and shall conform with the requirements of Wis. Adm. Code section Ind 4.56 (2).

(a) Expansion bolts shall not be used unless the wall or beam construction is such as to rigidly and permanently hold the fastenings in place.

(b) Through bolts shall be backed on the outside of the wall or beam with a metal plate to adequately distribute the load.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.58 Minimum size of drums and sheaves. (1) The minimum diameter of drums and sheaves for hoist and counterweight cables for every power elevator shall be not less than 40 times the diameter of the cable as outlined in Table 16.

Exception. Existing sidewalk elevators and existing elevators of a sidewalk type installed within a building.

TABLE 16

Diameter in Inches of Cables	Minimum Diameter in Inches of Drums and Sheaves
½	20
9/16	22
⅝	24
¾	30
⅞	36
1	40

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.59 Machinery. General requirements. (1) The factor of safety to be used in the design of driving machines and in design of sheaves used with hoisting and compensating cables (ropes) shall conform with the requirements as outlined in this subsection.

(a) Eight (8) for steel, bronze, or for other metals having an elongation of at least 14% in a length of 2 inches.

(b) Ten (10) for cast iron, or for other metals having an elongation of less than 14% in a length of 2 inches.

Note: The load to be used in determining the factor of safety shall be the resultant of the maximum tensions in the cables (ropes) leading from the sheave or drum with elevator at rest and with rated load in the car.

(2) Bolts or other means used to transmit torque between the driving sheave and the gearing, and their supports, shall be tightly fitted without play. Set screws or threaded portions of bolts or screws shall not be used to transmit torque.

(3) A fillet shall be provided at any point of change in the diameter of driving-machine shafts and sheave shafts to prevent excessive stress concentrations in the shaft.

(a) Shafts which support drums, sheaves, couplings and other members, and which transmit torque, shall be provided with tight-fitting keys.

(4) Gear housings for elevator machines shall have openings so located as to permit proper inspection of the gears, and gear spider fastenings.

(a) *Exception.* A gear housing cover that is not integral with the bearing cap, does not require gaskets to prevent oil leakage, and is not to exceed 30 pounds in weight, will be acceptable in lieu of subsection (4).

(5) The motor drive on geared traction elevators shall be directly connected to the gearing provided and mounted on continuous steel or cast iron bed plates.

(a) *Exception.* Existing drum type machines, hydraulic elevators and new installations of winding drum machines installed in compliance with the requirements of Wis. Adm. Code section Ind 4.61.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.60 Prohibited installations. (1) NEW AND EXISTING INSTALLATIONS. (a) Freight elevators shall not be used for transporting passengers.

(b) Belt or chain driven machines shall not be used for any passenger elevator installation.

1. *Exception.* Oil hydraulic elevators.

(c) Friction gearing or a clutch mechanism shall not be used to connect a driving-machine drum or sheave to the main driving gear of any elevator.

(d) Continuous pressure button operation from the landings shall not be used for passenger elevators.

(e) An emergency hoistway landing door and/or car gate by-pass switches are prohibited.

(f) Drum type freight elevator installations equipped with a mechanical brake shall not have hoistway limit switches, car door or gate electric contacts, hoistway landing door or gate electric contacts or any combination thereof.

(g) No power attachment, such as worm reduction units, rope clutch or rope grip devices, belts to improvised rope wheels, or any similar device, shall be installed on any hand elevator unless all requirements for power elevators are complied with.

(2) NEW INSTALLATIONS. (a) There shall be not more than 2 entrances to any passenger or freight elevator car.

(b) Chains shall not be used for hoisting in connection with a power elevator.

1. *Exception.* See Wis. Adm. Code section Ind 4.82 special requirements.

(c) Sidewalk elevator installations are prohibited. (See Wis. Adm. Code section Ind 4.81 for grade level elevators.)

(d) Winding drum machines are prohibited, except as indicated in Wis. Adm. Code section Ind 4.61.

(e) Cast iron worm gears shall not be used in the hoisting mechanism of any elevator.

(f) No elevator of any type shall have more than one compartment, nor shall elevator cars counterbalance each other.

(g) Continuous pressure push button operation elevators shall not have a contract speed in excess of 100 feet per minute.

(h) Sheaves or idlers shall not be suspended in cast iron stirrups from the supporting beams.

(j) Hand power operated elevators shall be limited to one floor travel.

(k) Hand cable power operated elevators and dumbwaiters are prohibited.

(m) Carriage type elevators supported by cables attached at 4 or more points are prohibited.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.61 Winding drum machines. Winding drum machines shall be used for freight elevators only; shall not have counterweights, and shall be limited to a capacity not to exceed 2500 pounds. The speed shall not exceed 50 feet per minute and the travel not to exceed 35 feet.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.62 Slack cable devices. Slack cable switches. (1) Every drum type power elevator with a mechanical brake shall be provided with a mechanical slack cable device which will automatically stop the machine in the event the hoist cables loosen or break.

(2) A slack cable switch shall be provided for every drum type power elevator equipped with an electric brake which will automatically shut off the power and stop the machine in the event the hoist cables loosen or break. This switch shall not reset automatically when the slack in the cable is removed.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.63 Limit stops. New and existing installations. (1) Every elevator hereafter installed shall be equipped with final limit switches. These switches shall automatically interrupt the power circuit and stop the car in case of overtravel at each terminal of travel.

Exception. Electric oil hydraulic elevators.

(a) The operation of final limit switches shall prevent movement of the car by normal operating controls in both directions of travel. (See Wis. Adm. Code section Ind 4.72 (2).)

(b) Final limit switches shall be located in relation to oil buffers so that the engagement of the buffer and the opening of the final limit switches will occur as near simultaneously as possible; to cause the electric power to be removed automatically from the elevator driving-machine motor and brake after the car has passed the terminal landing. For spring buffers, the final limit switches shall be opened before the buffer is engaged.

(c) Final limit switches shall be mounted to the guide rails and directly operated by a cam attached to the car. The cam shall be of

sufficient length to maintain the switches in the open position to the extreme car travel.

(2) Every power elevator hereafter installed shall be equipped with directional limit switches at each terminal of travel. These switches shall function independently of the operation of the floor selector stopping devices; and operated by the movement of the car and shall stop the car approximately level at each terminal landing.

(a) Where final limit switches are not required, directional limit switches shall be mounted to the guide rails and directly operated by a cam attached to the car.

(3) Limit switches, directional and/or final shall be located at the "Bottom" approximately in line with the lower terminal landing sill and at the "Top" approximately in line with the car top or cover when the car is at the upper terminal landing.

(4) Every drum type elevator machine shall be equipped with an approved machine automatic terminal stopping device which will automatcially stop the machine in the event the car over-travels either of the terminal landings.

(a) For alternating current drum type elevator machines hereafter installed, the terminal stopping device as outlined in Wis. Adm. Code section (4) shall also open the electric circuit to the motor and brake. This device shall be in addition to the final limit switches required in Wis. Adm. Code section Ind 4.63 (1).

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.64 Car safety devices. (1) An approved car safety device capable of stopping and sustaining the car with contract load in the down direction shall be attached to every elevator except:

(a) Freight elevators which travel not more than 10 feet.

(b) Direct lift plunger elevators.

(c) Existing carriage type elevators which travel not more than 18 feet.

(2) For speeds greater than 125 feet per minute Type B (sliding type) or Type C (combination instantaneous and oil-buffer) car safety device shall be required.

(3) Every car safety device shall be attached to and located within or below the lower members of the car frame (safety plank). The gripping surfaces of a car or counterweight safety device shall not be used to guide the car or counterweight. Safeties shall be applied mechanically and shall be so designed that on their application the forces which provide the stopping action shall be compressive forces on each side of the guide rail section.

(4) Multiple car safeties may be used subject to the approval of the industrial commission providing the lower safety shall be capable of developing not less than ½ of the force required to stop the entire car with rated load and the duplex safeties shall function simultaneously; these safeties shall be of the "B" type.

(5) Counterweight safeties, where required, shall meet the requirements of car safeties. (See Wis. Adm. Code section Ind 4.20 (3).)

(6) Every drum or idler sheave which is underneath the car and is used to actuate the car safety device shall be so guarded to prevent

the cable leaving the drum or sheave and shall be securely fastened directly to the car frame or by means of metal brackets.

(7) A cutout switch shall be provided on the car safety device of every elevator hereafter installed, which shall remove the power from the driving-machine-motor and brake; at the initial movement of the safety device before or at the time of application of the governor.

(8) Car safety devices shall be identified and classified on the basis of performance characteristics after the safety begins to apply pressure on the guide rails as outlined in this subsection.

(a) *Type A Safeties.* Instantaneous type safeties shall be limited to elevators where the contract speed does not exceed 125 feet per minute.

Note: Type A safeties develop a rapidly increasing pressure on the guide rails during the stopping interval, the stopping distance being instantaneous to the inherent design of the safety. The operating force is derived entirely from the mass and the motion of the car or the counterweight being stopped. These safeties apply pressure on the guide rails through eccentric dogs or rollers without any flexible medium purposely introduced to limit the retarding force and increase the stopping distance.

(b) *Type B Safeties.* Shall be provided where the contract speed exceeds 125 feet per minute. The safeties shall when operated, stop the fully loaded car within the maximum stopping distances as specified in Table 17 of this section on the basis of the governor tripping speed.

TABLE 17

MAXIMUM STOPPING DISTANCES—TYPE B CAR SAFETIES WITH RATED LOAD

Rated Speed in Ft. Per Minute	Maximum Governor Tripping Speed in Ft. Per Min.	Stopping Distance in Feet—Inches	
		Wedge-Clamp Safety* / Gradual-Wedge-Clamp Safety**	Flexible Guide-Clamp Safety***
0 to 125	175	6– 0	1– 3
150	210	6– 1	1– 4
175	250	6– 2	1– 7
200	280	6– 3	1–10
225	308	6– 5	2– 0
250	337	6– 8	2– 3
300	395	6–11	2– 9
350	452	7– 3	3– 4
400	510	7–10	4– 0
450	568	8– 3	4–10
500	625	8–10	5– 8
600	740	9–11	7– 7
700	855	11– 1	9–10
800	970	12– 4	12– 6

Note: B safeties of the sliding type are divided into 3 classes outlined as follows:

* Wedge-clamp is one where the wedges are applied against the rails through the unwinding of a cable-operated drum, and threaded screws, and the connections between the safety drum and the safety wedges are rigid and no elastic member is provided in the jaw assembly. Travel of the wedges increases the pressure on the jaws.

** Gradual-wedge-clamp is similar in design and construction as the wedge-clamp safety except that an elastic member such as spring or springs are provided on the safety device to obtain a predetermined constant retarding force.

*** Flexible-guide-clamp. Safeties of this type have vertical sliding wedge-type jaws, in which the retarding force is derived from the proportional to the pressure exerted by the compression of spring or springs, directly applying the jaws to the rails. The retarding forces are reasonably uniform after the safety is fully applied.

(c) *Type C Safeties.* (Combination instantaneous and oil-buffer safety) shall, when provided and where the contract speed exceeds 125 feet per minute, be subject to the requirements as outlined in this subsection.

1. The rated car speed shall not exceed 500 feet per minute.

2. The oil buffers shall conform to all requirements specified in section Ind 4.19 for oil buffers, except that the stroke shall be based on governor tripping speed and on an average retardation not exceeding 32.2 feet per second per second.

3. After the buffer has been compressed, as applied in subsection (8) (c) 2. there shall be at least 10% of the buffer stroke remaining to prevent excessive impact on the buffer parts and the auxiliary safety.

4. Where the distance between guide rails exceeds 8 feet, the safety shall be provided with two oil buffers of substantially identical calibration, and the buffers shall be so located as to develop minimum stresses in the auxiliary safety plank during safety operation.

5. Buffers shall be located in line with and symmetrically between the guide rails.

6. The auxiliary safety plank shall be so supported and guided below the car frame that the proper clearances for the safety parts shall be maintained during normal operation.

7. The auxiliary safety plank shall be so designed that the maximum stresses in the plank shall not exceed those specified for similar car frame members.

8. An electric switch shall be provided and so arranged and connected that the elevator cannot be operated by means of the normal operating device if any buffer is compressed more than 10% of its stroke.

9. Means shall be provided to prevent operation of the elevator by means of the normal operating device if the oil level in any buffer is below the minimum allowable level.

Note: Type C safeties develop retarding forces during the compression stroke of one or more oil buffers interposed between the lower members of the car frame and a governor-operated Type A auxiliary safety plank applied on the guide rails. The stopping distance is equal to the effective stroke of the buffers.

(9) Safeties shall be so arranged that they can be released inside the car, or on top of the car, or by operating the machine in the "up" direction.

(10) Each safety shall be marked for identification by the manufacturer by a plate that shall be placed in a conspicuous location on the safety plank. This plate shall show the type and the manufacturer, the maximum weight and the maximum governor tripping speed for which the safety is approved.

(11) Every type of car safety device and speed governor hereafter installed shall be subjected to a drop test as outlined in this subsection.

(a) The test shall be made with the total load on the car safety device. The total load shall include the weight of the car structure, the safety device, the live load, and all appurtenances and devices attached to the car.

(b) The free fall shall be such that the safety under test shall have attained the maximum governor tripping speed before the safety actuating device starts to function, except that where approval is desired for speeds greater than 280 feet per minute the governor tripping speed need not exceed 280 feet per minute.

(c) The total drop from the starting point to rest for type B safeties shall not exceed 15 feet.

(d) The application of the car safety device shall not cause the car platform to become out of level in excess of ½ inch per foot.

(e) A drop test made on a car safety device that is designed and constructed to trip by inertia, when set within the drop test requirements, shall be considered as satisfactory. The governor in connection with the above car safety device shall be tested separately to determine the tripping speed as required in subsection (8) (b), Table 17.

(f) Complete plans and specifications for every car safety device and speed governor to be tested shall be submitted to the commission.

(g) Such tests shall be made at the risk and expense of the elevator manufacturer and witnessed by the industrial commission.

(12) Tests of car safety device and speed governor combination shall be made before the elevator is placed in regular service. Such tests shall be made with cables attached and all electric apparatus operative, except for the cutout switch required by subsection (7) and shall comply with the following:

(a) Elevators provided with *type A safeties* shall be tested with the contract load in the car and from contract speed shall stop and hold the car by tripping the governor by hand.

(b) An overspeed test shall be made on elevators provided *with type B and C safeties* equipped with "generator field control". The test shall be made with the contract load in the car, by increasing the speed of the car until the governor causes application of the safety.

1. The stopping distance for *type B safeties* and the governor tripping speed shall conform with requirements of subsection (8) (b), Table 17.

2. The stopping distance for *type C safeties* shall be equal to the stroke of the buffer located between the lower member of the car frame and auxiliary safety plank, and shall conform to the requirements of subsection (8) (c) 2.

(c) No person shall be permitted to ride on the elevator car during an overspeed test or drop test.

(d) For type B safeties the pull-out of the governor cable from its normal running position until the safety jaws begin to apply pressure to the guide rails shall not exceed 30 inches.

(e) Stopping distance is the actual slide as indicated by the marks on the rails.

(f) All winding drum-operated safeties, requiring continual unwinding of the safety drum cable (rope) to fully apply the safety shall be so designed that not less than 3 turns of the cable will remain on the safety drum after the overspeed test of the safety has been made with the rated load in the car.

(g) Tests of counterweight safeties shall be made with no load in the car.

(13) Every car safety device and speed governor shall be maintained in proper working condition and shall be subjected to a running test at intervals as outlined in this subsection.

(a) Safety tests for *type A, B and C safeties* shall be made with the contract load in the car, and at contract speed in the "down" direction, shall, by tripping the governor by hand stop and hold the car.

1. The governor tripping speed shall conform with requirements as specified in subsection (8) (b), Table 17.

(b) The test shall be made with all electric apparatus operative, except for the cutout switch as specified in subsection (7).

(c) Type B safeties shall stop the car with the contract load within the maximum stopping distances as specified in subsection (8) (b), Table 17.

(d) Tests as outlined in subsection (13) shall be made at every 5 year period thereafter.

(e) In the event the safety device or the governor fails to function as required, the owner or agent shall renew or replace any part or parts of the equipment and make a test or tests necessary to insure satisfactory operation of the safety device and governor.

(f) A tag shall be fastened to the governor releasing carrier, upon completion of a satisfactory test of the car safety device and speed governor. Reports of tests as specified in subsection (13) shall be submitted to the industrial commission with complete information on Form SB–2E "Test Report of Safety Devices" and "Tags" furnished by the Industrial Commission, Hill Farms State Office Building, 4802 Sheboygan Avenue, Madison, Wisconsin 53702.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.65 Speed governors. (1) An approved speed governor shall be installed in connection with the required car safety for every power elevator as outlined in Wis. Adm. Code section Ind 4.64 (8) (a), (b), and (c).

(2) Every speed governor hereafter installed shall be of a type equipped with cable-grip jaws which will grip the governor cable. Governor jaws shall be of such shape and minimum length to prevent serious cutting, damage or deformation of the cable from the stopping action of the jaws in operating the safety device. The governor shall be located where it cannot be struck by the car or counterweight in case of overtravel. There shall be sufficient space for full movement of the governor parts.

(a) Governors for elevators with a contract speed in excess of 200 feet per minute and with type B safeties shall be equipped with spring loaded cable grip jaws. The maximum tension in the governor cable shall not exceed ⅛th of the rated ultimate strength of the cable.

Note: For counterweight safeties see Wis. Adm. Code section Ind 4.20 (3).

(3) Speed governors for car safeties shall be set to trip at overspeeds as follows:

(a) At not less than 115% of the contract speed.

(b) At not more than the tripping speed listed opposite the applicable speed specified in Table 18, this subsection.

TABLE 18

MAXIMUM SPEEDS AT WHICH SPEED GOVERNOR TRIPS AND GOVERNOR OVERSPEED SWITCH OPERATES

Rated Speed in Ft. per Minute	Maximum Governor Trip Speed in Ft. per Minute	Maximum Speed at Which Governor Overspeed Switch Operates Down Ft. per Minute
0–125	175	175
150	210	190
175	250	225
200	280	252
225	308	277
250	337	303
300	395	355
350	452	407
400	510	459
450	568	512
500	625	563
600	740	703
700	855	812
800	970	921

(4) Governors for elevators having a contract speed greater than 200 feet per minute shall be equipped with an overspeed switch. This switch shall be set to open in the "down" direction at a speed not greater than specified in Table 18, this subsection. This switch shall also be set to open in the "up" direction at not more than 100% of the speed at which the governor is set to trip in the "down" direction and shall, when operated in either direction, remove the power from the driving machine motor and brake and shall remain in the open position until manually reset.

(5) Speed governors, when 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.

(6) Governor ropes (cable) shall be of iron, steel, monel metal, phosphor bronze, or stainless steel, of regular-lay construction and shall be not less than ⅜ inch in diameter. Tiller rope construction shall not be used. The factor of safety of governor cable shall be not less than 5.

(a) Governor sheaves shall be not less than 12 inches in diameter.

(b) The governor shall be marked for identification by a plate, which shall give the information outlined as follows:

1. Type _____
2. Tripping Speed _____
3. Cable Construction and Size _____
4. Cable Material _____
5. Manufacturer _____

(7) In replacing existing governor cable or rope they shall be of the same size, material and construction as the cable or rope originally furnished by the manufacturer.

(8) Every friction type rope governor shall be replaced with an approved type governor to conform with subsection (6) (a) and (b) as outlined in this subsection.

Note: A friction type rope governor is dependent upon the pinch of the rope in the sheave groove.

(a) A safety test shall be made in accordance with subsection (13).

(b) A report shall be submitted to the industrial commission giving the information as follows:

1. Type, number and design of governor.
2. Governor tripping speed.
3. Type, number and design of car safety device.
4. Type and size of guide rails.
5. Car speed.
6. Car capacity.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.66 Brakes. (1) Every electric elevator hereafter installed shall be equipped with an electrically released and spring applied brake so designed, installed and maintained so as to stop and hold the car with contract load when applied.

(a) No brake shall be arranged to be released until power has been applied to the machine-driving motor.

(b) No single ground, short-circuit, motor field discharge or countervoltage shall prevent the action of the holding brake magnet or motor from allowing the brake to set in the intended manner during normal operation or during emergency stops.

(2) Every power elevator shall be equipped with a brake so designed, installed and maintained to be released when the control mechanism is shifted to the starting position and shall be applied when the control device is shifted to the stopping position.

(3) Every hand-power elevator shall be equipped with a brake to operate in either direction of motion of the elevator. When the brake has been applied it shall remain locked in position until manually released.

(4) Every hand-power elevator which does not have a limit stop at the top terminal landing, shall be provided with a solid footing for the counterweight to rest when the car is not more than 6 inches above the top landing.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.70 Control mechanism. (1) An externally operated circuit-breaker or disconnecting fused switch opening all lines shall be installed separately in the supply circuit of every elevator, escalator or moving walk or moving ramp. This breaker or switch shall be of the enclosed type, and shall be provided with proper over-current protection, and shall not be made to close from any other part of the building, and shall be located to be visible from the elevator machine in the machine room at the lock-jamb side of the entrance door. The switch shall be a horsepower rated motor circuit switch for motors up to and including 50 H. P.

(2) An externally operated circuit-breaker or disconnecting fused switch opening all lines, shall be installed separately in the supply circuit of every *power dumbwaiter* hereafter installed. This breaker or switch shall be of the enclosed type and shall be provided with

proper overcurrent protection and shall conform with the requirements as outlined in this subsection.

(a) Where the hoisting machine is located in the hoistway, directly above or below the dumbwaiter, the controller and circuit breaker or switch shall be mounted on the outside of the hoistway, on the adjacent hoistway wall at the machine location.

(b) Where a machine room is provided and isolated from the hoistway enclosure, the circuit breaker or fused disconnect switch shall be mounted adjacent to the controller to conform with subsection (1).

(3) Elevators hereafter installed where the travel exceeds 14 feet shall be provided with car top operating switches of the enclosed type, externally operable and permanently mounted vertically on the car crosshead and shall conform with the following:

(a) An operating switch to render all landing buttons and car switches or car buttons inoperative.

(b) An "Up" and "Down" button or switch which will enable the car to be operated in either direction as long as the button or switch is held in contact.

(c) The car speed shall not exceed 100 feet per minute.

(d) It shall operate the car only when all car doors and gates and all hoistway landing doors and gates are in the closed position.

(e) The operating switch shall be so arranged and connected that when operative, the movement of the car shall solely be under control of this device.

(4) Every elevator equipped with hand cable control shall be provided with adjustable stop balls, to center the control mechanism and stop the car at each terminal landing.

(5) Every hand cable controlled elevator shall be equipped with a properly adjusted centering rope which shall be accessible from the car and so arranged to be easily and safely used at any point of the car travel.

(a) *Exception.* Hydraulic elevators.

(6) The car of every power freight elevator with hand cable control shall be equipped with a cable lock so designed, installed and maintained that the hand cable can be locked at any landing to prevent the operation of the car by persons on other floors.

(a) *Exception.* Existing sidewalk elevators.

(b) *Exception.* Elevators equipped with an emergency stop switch in the car or electric contacted gates, provided they comply with subsection (4). (See Wis. Adm. Code section Ind 4.72 (5).)

(7) The car of every electrically driven elevator shall be provided with an emergency stop switch located in or adjacent to the car operating panel. When opened, this switch shall cause the electric power to be removed from the elevator-machine-motor, brake or solenoid valve and shall conform with the following:

(a) Be of the manually opened and closed type.

(b) Have red operating handles or buttons.

(c) Be conspicuously and permanently marked "stop".

(d) Be positively opened mechanically and the opening shall not be solely dependent on springs.

1. *Exception.* Existing hand cable controller elevators.

(8) The car switch or hand lever on every power elevator shall be so arranged that the movement of the switch handle or lever toward

the opening (which operator usually faces) will cause the car to descend and the movement of the switch handle or lever away from the opening will cause the car to ascend. The switch handle or lever shall return to the neutral position and automatically latch when released.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.71 Control and operating circuits. (1) The design and installation of the control and operating circuits, shall conform with the requirements outlined in this subsection.

(a) If springs are used to actuate switches, contactors or relays to break the circuit to stop an elevator at terminal landings, they shall be of the compression type.

(b) The completion or maintenance of an electric circuit shall not be used to interrupt the power to the elevator driving-machine motor or brake at the terminal landings nor to stop the car when the emergency stop switch is opened or any of the electrical protective devices operate.

1. *Exception.* Dynamic braking, nor to speed control switches.

(c) The failure of any single magnetically operated switch, contactor or relay to release in the intended manner, or the occurrence of a single accidental ground, shall not permit the car to start to run if any hoistway-door interlock is unlocked or if any hoistway-door or car-door or gate contact is in the open position.

(d) Where generator-field control is used, means shall be provided to prevent the generator from building up and applying sufficient current to the elevator driving-machine motor to move the car when the elevator-motor control switches are in the "off" position. The means used shall not interfere with maintenance of an effective dynamic-braking circuit during stopping and standstill conditions.

(e) Motor-generators driven by direct current motors used to supply direct current for the operation of elevator machine motors shall be provided with an overspeed switch which will automatically remove the power from the elevator machine-motor and brake should the motor-generator overspeed more than 125% of its rated speed.

(f) The installation of condensers, the operation or failure of which will cause an unsafe operation of the elevator, is prohibited. No permanent device shall be installed, except as provided in this code, which will make any required safety device inoperative.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.72 Electrical protection. (1) Every automatic operation elevator hereafter installed having polyphase alternating current power supply shall be provided with means to prevent the starting of the elevator motor if:

(a) The phase rotation is in the wrong direction, or

(b) There is a failure of any phase.

1. *Exception.* Additional protection shall not be required in the case of generator-field control having alternating current motor-generator driving motors, providing a reversal of phase will not cause the elevator driving-machine motor to operate in the wrong direction, nor in the case of controllers whose switches are operated by polyphase torque motors providing inherent protection against phase failure or reversal.

(2) Every existing elevator driven by a polyphase alternating current motor shall be protected against damage due to phase reversal by either:

(a) Limit switches as specified in Wis. Adm. Code section Ind 4.63 (1), or

(b) A reverse phase relay which will prevent starting the motor if the phase rotation is in the wrong direction, or there is failure in any phase.

(3) If an overload circuit breaker is used for a direct-current elevator, the wiring shall be arranged so that the circuit of the brake magnet coil is opened at the same time that the line circuit is opened.

(4) Every electrically driven cable type elevator hereafter installed shall be provided with an elevator potential switch which will cause and maintain interruption of power to the main circuit during failure of supply voltage, and the operation of any of the emergency stopping switches.

(5) Every electrically driven elevator with an emergency stop switch or electric contacted gates, which is controlled by a hand cable, lever or wheel, shall be equipped with a sequence device requiring the centering of the operating device after the power has been cut off the motor before the car can again be started.

(6) Every elevator which is changed from hand cable control to car switch, automatic or continuous pressure operation shall comply with the requirements of new installations.

(7) When any material change in electrical equipment is hereafter made on any power elevator or dumbwaiter, the wiring and equipment which is an integral part of that which is replaced or renewed shall comply with the requirements of new installations.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

Ind 4.73 Wiring and electrical protection. (1) VOLTAGE LIMITATIONS. The nominal voltage used for elevators, power dumbwaiters, escalators and moving walks or moving ramps for operating control and signal circuits, operating equipment, driving-machine motors, machine brakes, and motor-generator sets shall not exceed the requirements as outlined in this subsection.

(a) For operating control and signal circuits and related equipment including door operator motors: 300 volts, except that higher potentials may be used for frequencies of 25 through 60 cycles alternating current or for direct current, provided the current in the system cannot, under any conditions, exceed 8 milli-amperes for alternating current or 30 mill-amperes for direct current.

(b) Driving-machine motors, machine brakes, and motor-generator sets: 600 volts, except that higher potential may be used for driving motors of motor-generator sets.

(2) LIVE PARTS. All live parts of electrical apparatus in the hoistways, at the landings, or in or on the cars of elevators and power dumbwaiters or in the well-ways or the landings of escalators, moving walks or moving ramps shall be enclosed to protect against accidental contact.

(3) CONDUCTORS. The insulation of conductors installed in connection with elevators, power dumbwaiters, escalators, moving walks or moving ramps, shall comply with the following:

(a) Conductors from panels to main circuit resisters shall be flame-retardant and suitable for a temperature of not less than 90° C. (194° F.). All other wiring on control panels shall be flame-retardant, moisture-resistant.

(b) Traveling cables used as flexible connections between the elevator or dumbwaiter car and the hoistway shall be Type E, E0, or ET elevator cable or other approved types and shall have a flame-retardant, moisture-resistant outer covering.

(c) All other conductors in the raceways and in or on the cars of elevators and dumbwaiters and in the wellways of escalators and moving walks or moving ramps and in the machine room of elevators, dumbwaiters, escalators and moving walks or moving ramps shall have flame-retardant and moisture-resistant insulation.

(d) The thickness of the insulation of all conductors shall be suitable for the voltage to which the conductors are subjected.

(4) SIZE. The minimum size of conductors used for elevators, dumbwaiters, escalators, and moving walks or moving ramps wiring except for conductors which form an integral part of control equipment shall conform with the following:

(a) *Traveling cables.*

1. For lighting: No. 14, except that No. 18 or larger conductors may be used in parallel provided the carrying capacity is equivalent to at least that of No. 14 wire.

2. Operating, control and signal circuits: No. 18.

(b) *Other wiring.* All operating control and signal circuits: No. 18.

(5) LOCATION. Conductors and cables located in elevator and dumbwaiter hoistways and escalator and moving walks or moving ramp wellways, in or on elevator and dumbwaiter machine and control rooms, not including the traveling cable connecting the car and hoistway wiring and all wiring through floors and walls shall be installed in rigid conduit, electrical metallic tubing or raceways.

(a) *Exception* 1. Flexible metal conduit not over 3 feet in length may be used in hoistways and in escalator and moving walk or moving ramp wellways, between risers and limit switches, interlocks, operating buttons, and similar devices if securely fastened in place.

(b) *Exception* 2. Flexible metal conduit not over 3 feet in length may be used on cars where so located as to be free from oil and if securely fastened in place.

(c) *Exception* 3. Approved types, S, SO and ST cords may be used as flexible connections between the fixed wiring on the car and the switches in connection with the safety devices on the car doors.

(d) *Exception* 4. Where motor-generators and machine motors are located adjacent to or underneath control equipment, and are provided with extra length terminal leads not exceeding 6 feet in length, may be grouped together and taped or corded without being installed in raceways. Such leads may be extended to connect directly to controller terminal studs. Auxiliary gutters may be used in machine rooms between controllers, starters and similar apparatus.

(6) WIRING. The wiring of elevators in hazardous locations shall comply with the requirements of the Wisconsin Electrical Code, Wis. Adm. Code, Chs. E 500 to E 503, inclusive.

(7) RACEWAYS. Metal raceways, rigid metal conduit, flexible metal conduit or electrical metallic tubing shall be installed to conform with the requirements outlined in this subsection.

(a) Only rigid conduit or electrical metallic tubing shall be permitted for wiring runs totally enclosed within a concrete floor slab.

(b) Conduit, metallic tubing and metal raceways shall be securely fastened to guide rails, walls or beams at least once in every ten (10) foot length of installation.

(c) All changes enroute of runs shall be completed through fittings or boxes which will permit pulling of wiring without injury to the wire covering.

1. Where boxes or metal raceways are used, proper raceway fittings shall be installed and a radius of not less than two (2) inches included to provide a smooth bending surface for the conductors.

(d) Where auxiliary runs of conduit, metallic tubing or flexible metallic conduit are connected into metal raceways, the connection shall be securely fastened to the metal raceway and the entrance of conductors from the raceway into the auxiliary run shall be through smooth surfaced bushings.

(e) Where conductors or cables leave conduit, electrical metallic tubing or metal raceways for connections to or routing through controller, signal panels or switchboards, the exit shall be through an insulated bushing.

1. Where conduits or tubing terminate upward through the floor, the end of the conduit or tubing shall terminate not less than 2 inches above the floor.

2. Where conductors or a cable leave the conduit or tubing, an insulating bushing shall be placed on the end of the conduit and the conductors or cables shall be grouped together and taped or corded from the conduit or tubing end to the controller, signal panel, or swithboard connections.

(f) A run of conduit between outlet to outlet, between fitting and fitting, or between outlet to fitting shall not contain more than the equivalent of 4 quarter bends (360 degrees, total), including those bends located immediately at the outlet or fitting.

(g) Metal raceways, and other metal enclosures for conductors, shall be metallically joined together into a continuous electrical conductor and shall be so connected to all boxes, fittings and cabinets as to provide effective electrical continuity. Raceways and cable assemblies shall be mechanically secured to boxes, fittings, cabinets and other enclosures.

(8) NUMBER OF WIRES. The number of wires or conductors run in rigid metal conduit, flexible metal conduit, electrical metallic tubing or raceways shall not exceed the requirements of this subsection.

(a) The sum of the cross section area of all the wires or conductors in conduit, metallic tubing or raceways shall not exceed 40% of the inside area of the conduit, metallic tubing, or raceways. The number of conductors shall be based on the area of conductors and conduits

as tabulated in Table 19 and Table 20 and the normal maximum number of conductors in a conduit when all are of the same size shall not exceed the number indicated in Table 21.

TABLE 19

Conduit	Total 100%	Useable 40%
½	.30	.12
¾	.53	.21
1	.86	.34
1¼	1.50	.60
1½	2.04	.82
2	3.36	1.34

TABLE 20

Wire Size	Square Inch Area* Ruber Covered	Square Inch Area* Thermo-plastic
18	.0167	.0088
16	.0196	.0109
14	.0230	.0135
12	.0278	.0172
10	.0460	.0224

*Area based on 2/64 inch insulation.

TABLE 21

Wire Size	½ Inch	¾ Inch	1 Inch	1¼ Inch	1½ Inch	2 Inch
18 Rubber	7	12	20	35	49	80
18 Thermo	12	21	34	68	90	146
16 Rubber	6	10	17	30	41	68
16 Thermo	9	17	22	48	73	118
14 Rubber	4	6	10	18	25	41
14 Rubber	7	13	23	38	52	80

(b) The percentage of the total interior cross sectional area of a raceway occupied by conductors shall be not more than will permit a ready installation or withdrawal of the conductors and dissipation of the heat generated without injury to the installation of the conductors.

(9) CONDUCTORS. Conductors for operating, control, power, signal, and lighting circuits of 600 volts or less may be run in the same traveling cable or raceway system provided that all conductors are insulated for the maximum voltage found in the cables or raceway system and all live parts of the equipment are insulated from ground for this maximum voltage. Such a traveling cable or raceway may also include a pair of telephone conductors for the car telephone provided such conductors are insulated for the maximum voltage found in the cable or raceway system.

(10) TRAVELING CABLES. Traveling cables shall be so suspended at the car and hoistway end as to reduce the strain on the individual copper conductors to a minimum.

(a) Cables, exceeding 100 feet in length and which have steel supporting fillers, shall be suspended directly by the steel supporting fillers.

(b) Where non-metallic fillers are used, the cables shall be suspended by looping the cables around the supports.

(c) Traveling cable supports shall be so located as to reduce to a minimum the possibility of damage due to the cables coming in contact with the hoistway construction or equipment in the hoistway. Where necessary, suitable guards shall be provided to protect the cables against damage.

(d) All conductors run in vertical raceways shall be supported at intervals not to exceed 100 feet by one of the methods of supports or a method of equal effectiveness outlined as follows:

1. By clamping devices constructed of or employing insulating wedges inserted in the ends of the conduit.

2. By inserting boxes at the required intervals in which insulating supports are installed and secured in a satisfactory manner to withstand the weight of the conductors attached thereto, the boxes being provided with covers.

(11) CONDUCTORS. Conductor cables and wires of Nos. 18 and 16 used for control and operating circuits and signal circuits shall be protected by overcurrent devices not to exceed 6 ampere for No. 18 and 10 ampere for No. 16 wire.

(12) CLEARANCES. Clearance around control panels for elevators and power dumbwaiters shall be provided for safe and convenient access to all live parts. The minimum clear working space about live parts shall be not less than the following:

(a) In the front—36 inches to live panel parts.

(b) In the rear—24 inches to live panel parts.

(c) On one side of a panel or a group of panels 18 inches.

(d) Escalator, moving walk or moving ramp control panels shall be totally enclosed.

(e) Where escalator, moving walk or moving ramp control panels are not located in the same place as the driving machine, the control panel doors shall be capable of being locked in the closed position.

(13) TERMINALS. Motor terminals shall be enclosed in a metal box of substantial construction. The box shall be of ample size to make proper connections.

(14) METALLIC TUBING. Electrical metallic tubing shall not be laid on the penthouse floor or pit floor or in any other location subject to mechanical damage.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.74 Grounding. For electric elevators, power dumbwaiters, escalators, moving walks or moving ramps, the frames of all motors, elevator machines, controllers, operating cable and metal enclosures for all electrical devices and wiring in or on the car or in the hoistway shall be grounded.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.75 Signal system. New and existing installations. (1) Every existing hand cable operated power elevator or dumbwaiter shall be equipped with a warning bell so arranged that it can be safely and conveniently operated from any landing.

(a) *Exception.* Elevators or dumwaiters equipped with hoistway landing door or gate electric contacts.

(2) Every automatic operated elevator shall be provided with an emergency electric call bell with a properly placarded push button in the car. This call bell shall be not less than 6 inches in diameter located inside the building and audible outside the hoistway. Only one bell is required for a group of elevators if operable from all cars in the group.

(3) All elevators located in acid towers, grain elevators and similar places, shall be provided with an emergency call bell or telephone to be used in case of emergency.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.76 Lighting. (1) Lighting and convenience outlets shall be provided to conform with the requirements outlined in this subsection.

(a) Elevator cars shall be provided with illumination of an intensity of not less than 5 foot-candles at the edge of the car platform.

(b) Every elevator hoistway landing entrance within or in connection with an occupied building shall be provided with illumination of an intensity of not less than 5 foot-candles at the landing sill.

(c) Every machine room and penthouse shall be provided with uniform artificial illumination of an intensity of not less than 5 foot-candles at the floor. Every area about a ceiling-type machine, including overhead sheave rooms or lofts shall be amply lighted. Conrtol of such lighting shall be at the approach to the machine room, penthouse or overhead equipment.

(d) Every power elevator hereafter installed shall be equipped with work light and convenience outlets as follows:

1. Work light recepacle and convenience outlet on top of car.
2. Work light receptacle on underside of car platform.
3. Work light receptacle and convenience outlet located in the hoistway approximately level with the lowest terminal landing floor if hoistway landing doors are used.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.77 Elevators not in use. (1) Elevators reported as not being used shall not be subjected to the annual inspection provided the installation conforms with the requirements listed as follows:

(a) All hoistway landing doors or gates shall be securely sealed on the inside to prevent opening from the landings.

(b) Fuses and wires to the disconnect switch shall be removed.

(c) For hand elevators, the car platform shall be substantially blocked; and the hoist cables removed from the car crosshead.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.78 Maintenance. New and existing installations.

(1) Elevators, dumbwaiters, escalators and moving walk or moving ramp equipment shall be kept in safe operating condition, properly lubricated and clean, including pits, penthouses and machine rooms.

(2) Hatch covers of the vertical rising type used on elevators shall not be used for storage purposes, nor as passageways.

(3) Material which is not a permanent part of the elevator equipment shall not be permitted on the top or cover of an elevator car.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

POWER DUMBWAITERS

Ind 4.79 Power dumbwaiters. (1) NEW AND EXISTING INSTALLATIONS. (a) The hoistway landing openings of every power dumbwaiter shall be provided with doors or gates that cover the full entrance opening, so arranged that the dumbwaiter cannot be started unless all doors or gates are closed. The slats or bars for gates where used shall be vertical and the net width of an opening shall not exceed 3 inches. Collapsible gates are prohibited. Where a fire-resistive hoistway is required, all landing doors shall be of fire-resistive construction, (see Wis. Adm. Code section Ind 4.10).

(b) Every dumbwaiter shall conform with the requirements as outlined in this subsection.

1. The car platform area shall not exceed 9 square feet.

2. The car height shall not exceed 4 feet.

3. The capacity shall not exceed 500 pounds.

4. The car top and sides shall be solidly enclosed, except for the entrance openings.

a. *Exception.* Dumbwaiters installed before August 12, 1926.

(2) NEW INSTALLATIONS. (a) Power dumbwaiters hereafter installed shall be automatic or continuous pressure operation.

(b) Dumbwaiter machines shall be equipped with an electrically released and spring applied brake so designed, installed and maintained so as to stop and hold the car with contract load.

1. *Exception.* Hydraulic dumbwaiters.

(c) Every dumbwaiter hoistway landing door or gate, shall be equipped with electric contacts and approved locks or interlocks.

(d) Power dumbwaiters with speeds greater than 100 feet per minute shall be equipped with interlocks.

(e) Power dumbwaiters shall be provided with limit switches to automatically stop the car at each terminal of travel. These switches shall be mounted to the guide rails and directly operated by a cam attached to the car.

(f) Power dumbwaiters equipped with winding drum machines shall be provided with a slack-cable switch, which will remove the power from the motor and brake if the car is obstructed in its descent.

(g) Where dumbwaiter hoistway landing doors are closed by power, the door operation shall conform with Wis. Adm. Code section Ind 4.39 (2) (b) or an audible signal shall be given for a minimum of 3 seconds before permitting the doors to close automatically.

(h) All terminal landing doors shall be provided with means to open the door irrespective of the position of the dumbwaiter car. The opening means shall be mounted adjacent to the door and shall be provided with a removable cover.

(j) Access shall be provided to the machines located in hoistways.

(k) Vision panels shall be provided in dumbwaiter hoistway landing doors to conform wth Wis. Adm. Code section Ind 4.38 (2) (b) 6.

(m) Access to the dumbwaiter machine room or penthouse shall not be through any toilet room, sleeping room or private quarters.

(n) The dumbwaiter circuit-breaker or disconnecting fused switch and controller shall comply with Wis. Adm. Code section Ind 4.70 (2).

(o) Dumbwaiter cars shall be of such strength and stiffness that they will not deform appreciably if the load leans or falls against the sides of the car.

1. Cars shall be made of wood or metal and of solid construction.

2. Cars for power dumbwaiters shall be reinforced with metal from the bottom of the car to the point of suspension.

3. Metal cars shall be of metal sections rigidly riveted, welded or bolted together.

(p) Driving machines, car and counterweight suspension means, and overhead beams and supports shall be designed and installed to sustain the car with a structural capacity load not less than that specified in Table 22 based on the net inside platform area with the factors of safety as specified. The motive power shall not be required to be sufficient to lift the structural capacity load.

TABLE 22

ALLOWABLE STRUCTURAL CAPACITY LOAD CORRESPONDING TO NET INSIDE PLATFORM AREA

Net Platform Area in Square Feet	Structural Capacity Load in Pounds
4	100
5	150
6.25	300
9	500

(q) A metal plate shall be fastened in a conspicuous place in the car and shall give the rated capacity in letters and figures not less than ¼ inch high, stamped, etched or raised on the surface of the plate.

(r) Driving machines and sheaves shall be designed with a factor of safety based on the static load (the rated capacity plus the weight of the car, cables, counterweights, etc.), of not less than:

1. Six (6) for steel, and

2. Nine (9) for cast iron and other metals.

(s)) There shall be no thoroughfare under the hoistway of a dumbwaiter or its counterweight, unless one of the requirements are provided as follows:

1. A structure shall be provided under the hoistway to withstand without failure the impact of the car with contract load or the impact of the counterweight when either is dropped freely in its guides from the upper limits of travel, or:

2. Broken rope safeties shall be provided for car and counterweight.

(t) Guide rails shall be securely fastened to the hoistway and the joints shall be tongued and grooved, doweled or fitted with splice plates.

(u) Counterweights for dumbwaiters having a capacity exceeding 100 pounds or having a speed exceeding 100 feet per minute shall be secured by at least 2 tie rods passing through holes in all sections, except where metal counterweight frames are provided. The rods shall have lock nuts secured by cotter pins.

(v) Cars and counterweights shall be suspended by one or more iron or steel-wire hoisting cables or chains secured to the car or counterweight or cable hitch by babbitted sockets or cable clamps.

1. *Exception.* Hydraulic dumbwaiters.

(w) The factor of safety, based on the static load, of car and counterweight suspension means of power dumbwaiters shall be not less than the value specified in Table 23 for the actual speed of the cable or chain corresponding to the rated speed of the dumbwaiters.

TABLE 23

FACTORS OF SAFETY

Cable or Chain Speed Feet per Minute	Factor of Safety	
	For Cables	For Chains
50	4.8	6.0
100	5.2	6.5
150	5.5	6.9
200	5.9	7.4
250	6.2	7.8

(x) The clearance between any point of car travel and any stationary part shall be not less than ½ inch.

1. The clearance between the dumbwaiter car sill or gate threshold and hoistway landing sill or door threshold shall not exceed 2 inches.

(y) The minimum car and counterweight clearance at terminal landings shall be not less than 4 inches.

(z) Suitable guards shall be provided over the machines mounted in the pits to protect driving cable sheaves and drums from falling objects.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.80 Sidewalk elevators. Existing installations. (1) Every sidewalk elevator shall be covered at the top with hinged or vertical lifting type covers, which shall when closed be capable of sustaining a live load of 300 pounds per square foot. The surface of the covers shall be rough and no part of them shall project above the sidewalk when closed. Hinges of hatch covers shall be of sufficient strength and be securely fastened to withstand the service of normal operation.

(a) Every power sidewalk elevator shall be provided with one of the following requirements:

1. A device to prevent its operation until the hatch covers over the top of the hoistway are open, or,

2. Flat metal tops or arched bows of sufficient strength to open the hatch covers.

(b) When hatch covers are left open, a full guard not less than 30 inches in height shall be provided in each side of the sidewalk opening not fully protected by the hatch covers. This guard shall be so fastened that it cannot be pushed into the sidewalk opening.

(c) Every elevator traveling not more than 15 feet, or more than 1 story, shall comply with Wis. Adm. Code sections Ind 4.02, 4.05, 4.06, 4.07, 4.10(1), 4.12, 4.15 and sections Ind 4.37 and 4.38 (as applied to the lower landing), 4.73 (2), (3), (4), (5), (7), 4.74, 4.76 (1), 4.78.

(d) Every hand or power sidewalk elevator car platform shall be enclosed to a height of one foot on the sides not used for entrance.

(e) The hand cable on every hydraulic elevator shall be equipped with a limit stop to prevent damage to the valve mechanism.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

GRADE LEVEL ELEVATORS

Ind 4.81 Grade level elevators. New installations. (1) Every grade level elevator hereafter installed shall be subject to the following conditions:

(a) Shall not pierce a sidewalk, or be located within a building, and shall not be located in an area used by people or vehicles as a place of travel.

(b) Travel shall not exceed one story.

(c) Shall be controlled and operated by a spring loaded constant pressure key switch located at the upper landing only, adjacent to the metal doors.

(d) Speed shall not exceed 25 feet per minute.

(e) Horizontal openings for grade level elevators shall be protected by weather-tight hinged metal doors having a non-slip upper surface.

(f) Doors shall be of sufficient strength to support safely the static load of not less than 300 pounds per square foot uniformly distributed.

(g) The limitations of the grade opening shall in no case exceed 5 feet at right angle to, and 7 feet parallel to the building line.

(h) Hinges of the doors shall be of sufficient strength and be securely fastened to withstand the service of normal operation. The line of the hinges shall be at right angles to the building wall.

(j) The edge of the door adjacent to any building wall or other obstruction shall not be more than 4 inches from such wall or obstruction.

(k) There shall be a minimum clearance of 18 inches between the face of the door and any obstruction when the doors are in the open position.

(m) The doors shall be opened by the ascending car and shall be self-closing as the car descends and shall be kept in the closed position when the car is not at the top landing. Stops shall be provided to prevent the doors from opening more than 85 degrees from their closed position.

(n) If the platform of any grade level elevator rises above the grade level, the underside of the car platform shall be equipped with vertical aprons, protecting all exposed sides, extending at least 2 inches below the grade level when the car is at the upper limit of travel.

(o) Guide shoes for grade level elevators (except plunger elevators) shall be at least 24 inches long unless 2 sets of shoes are used, spaced 18 inches between center.

(p) If single guide shoes not less than 24 inches long are used, 6 inches of the shoe may be off the rail when the platform is level with the top landing.

(q) All wiring shall be in rigid conduit. Fittings, switches and all electrical equipment shall be of the waterproof type.

(r) Every grade level elevator shall comply with the requirements for power freight elevators.

1. *Exception.* Wis. Adm. Code section Ind 4.70 (3) and Ind 4.34 (2) (d) and (e).

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.

POWER CHAIN OR CABLE HOIST

Ind 4.82 Special requirements. (1) Every power chain or cable hoist used as means of raising or lowering an elevator shall comply with requirements outlined as follows:

(a) The rated capacity of the hoist shall be not less than 2,000 pounds.

(b) The elevator capacity shall not exceed 800 pounds.

(c) Speed shall not exceed 25 feet per minute.

(d) Travel shall not exceed 15 feet or more than one story, and a broken rope safety shall be provided when the travel exceeds 10 feet.

(e) The elevator shall be operated from the landings only and shall be constant pressure push button operation.

(2) Every installation shall conform with the requirements as described in this subsection.

(a) The hoistway shall be solidly enclosed with wood or metal.

(b) The clearance between the car entrance sill and any landing sill shall be not less than ½ inch or more than 1½ inches.

(c) Pit depth shall be not less than 12 inches.

(d) The overhead supports shall be designed and constructed to carry the total load plus double the load for impact.

(e) The car shall be permanently enclosed on all sides to the height of 6 feet, except, the sides used for entrance.

(f) Each hoistway landing entrance shall be provided with a balanced type gate equipped with an electric contact and lock.

1. The gates shall be not less than 3½ feet in height.

2. The bottom of each landing gate shall extend to within 2 inches of the sill when closed.

3. The distance from the hoistway landing sill to the landing gate shall not exceed 4 inches.

4. The net width of an opening between slats or bars shall not exceed 2 inches.

(g) Hoistway landing gate construction shall conform with the following:

1. Shall be so constructed and guided as to withstand a lateral pressure of 100 pounds concentrated at the center of the gate without being deflected beyond the line of the landing sill.

2. Shall be counterbalanced from 2 sides and hung with substantial sash cord, flexible cable or chain over pulleys not less than 3 inches in diameter.

3. The gate counterweights shall be boxed in, or shall run in metal guides to prevent being dislodged. The bottom of the boxes or guide shall be of such construction that the counterweight will be retained if the suspension means break.

(h) Provide a metal capacity plate with raised letters not less than ½ inch in height stating the capacity of 800 pounds, located in a conspicuous place in the car.

(j) A slack cable switch shall be provided which will automatically shut off the power to the motor in the event the hoist cables or chain loosen or break.

(k) Directional limit switches shall be provided at each terminal of travel, and shall be operated by the movement of the car and shall stop the car approximately level at each terminal landing. These switches shall be mounted to the guiderails and directly operated by a cam attached to the car.

(m) Every installation shall be equipped with an electrically released and spring applied brake so designed, installed and maintained so as to stop and hold the car with capacity load.

(n) An enclosed, externally operated disconnecting fused switch opening all lines shall be installed separately in the supply circuit. This switch shall be located adjacent to the hoistway and readily accessible.

(o) All wiring shall be installed in rigid conduit or electrical metallic tubing, except that flexible metal conduit not over 3 feet in length may be used between risers, limit switches and push buttons.

(p) The entire equipment shall be effectively grounded as a unit.

(q) The car shall be provided with illumination of an intensity of not less than 5 foot-candles.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.85 Hydraulic elevators. (1) Hydraulic elevators hereafter installed shall be of the direct plunger type and shall conform with the applicable requirements for power elevators, including the requirements outlined as follows:

(a) An anti-creep up direction leveling device shall be provided for every elevator which shall cause the electrical power unit to compensate for the creeping of the car away from the landing.

(2) The plunger shall be of uniform diameter and of approximately uniform thickness and shall be finished on the outside.

(a) Gray cast iron or other brittle material shall not be used for the plunger or connecting couplings. Gray cast iron, where used in other portions of the plunger assembly, shall have a factor of safety of at least 10.

(b) The plunger shall be attached to the car with fastenings of sufficient strength to support the weight of the plunger with a factor of safety of not less than 4.

(c) Where the plunger is subjected to eccentric loading, shall conform with the requirements as follows:

1. The plunger connection to the car shall be so designed and constructed as to transmit the full eccentric moment into the plunger with a factor of safety of not less than 4.

2. The plunger and plunger connection to the car shall also be so designed and constructed that the total vertical deflection of the leading edge of the car platform due to eccentric loading of the car shall not exceed ¾ inch.

(d) Plunger assembly shall be designed with a factor of safety of not less than 5 based on the ultimate strength.

(e) Plungers shall be provided with solid metal stops to limit the car travel and to prevent the plunger from traveling beyond the limits of the cylinder. Stops shall be so designed and constructed as to stop the plunger from maximum speed in the up direction under

full pressure without damage to the hydraulic system. For rated speeds exceeding 100 feet per minute, means other than the normal terminal stopping devices shall be provided to retard the car to 100 feet per minute before striking the stop.

(3) Cylinders and their components shall have a factor of safety of not less than 5.

(a) Cylinders and their components of gray cast iron, if used in the cylinder assembly, shall have a factor of safety of not less than 10.

(b) Clearance shall be provided at the bottom of the cylinder so that the bottom of the plunger assembly will not strike the bottom of the cylinder when the car is resting on its fully compressed buffer.

(c) Cylinders shall have a reservoir or drip ring provided and located below the packing gland at the top of the cylinder to collect oil leakage and to automatically return the oil back to pump unit reservoir.

(4) Valve, piping and fittings shall not be subjected to working pressures exceeding those recommended by the manufacturer for the type of service used.

Note: Threads of valves, piping and fittings to conform to American Standard Pipe Threads.

(a) Piping shall be so supported as to eliminate undue stresses at joints and fittings.

(b) Cast iron fittings are prohibited.

(5) Each pump or group of pumps shall be equipped with a relief valve to conform with the requirements outlined as follows:

(a) The relief valve shall be located between the pump and the check valve and shall be of such a type and so installed in a by-pass connection that the valve cannot be shut off from the hydraulic system.

(b) The relief valve shall be pre-set to open at a pressure not greater than 125% of the working pressure at the pump.

(c) The size of the relief valve and by-pass shall be sufficient to pass the maximum rated capacity of the pump without raising the pressure more than 20% above that at which the valve opens. Two or more relief valves may be used to obtain the required capacity.

(d) Relief valves having exposed pressure adjustments, if used, shall have their means of adjustment sealed after being set to the correct pressure.

(6) A check valve shall be provided and so installed that it will hold the elevator car with rated load at any point when the pump stops, or the maintained pressure drops below the minimum operating pressure.

(7) The supply tanks shall be so designed and constructed to support the total weight when completely filled.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

ESCALATORS

Ind 4.90 Escalators. (1) Escalators hereafter installed shall conform with the requirements outlined in this subsection.

(2) The rate of speed measured along the angle of inclination shall be not more than 90 feet per minute.

(3) The angle of inclination of an escalator shall not exceed 30 degrees from the horizontal.

(4) All floor openings shall be protected against passage of flame, smoke or gasses in accordance with the requirement of Wisconsin Building Code, Wis. Adm. Code section Ind 51.23.

(5) The sides and undersides of escalator trusses shall be enclosed with fire-resistive material.

(6) The width between the balustrades shall be not less than 22 inches, nor more than 48 inches measured at a point 27 inches vertically above the nose line of the steps. This width shall not exceed the width of the steps by more than 13 inches.

(a) A solid balustrade shall be provided on each side of the moving steps. The balustrade on the step side shall have no areas or moldings depressed or raised more than ¼ inch from the parent surface. Such areas or moldings shall have all boundary surfaces beveled, unless parallel to the direction of travel.

(b) Glass panels, if used in balustrades, shall be of approved safety glass.

(c) The clearance on either side of the steps between the steps and the adjacent skirt guard shall be not more than $\frac{3}{16}$ inch, and the sum of the clearance on both sides shall be not more than ¼ inch.

(d) The width between the balustrades in the direction of travel shall not be changed abruptly, nor by more than 8% of the greatest width. In changing from the greater to the smaller width, the maximum allowable angle change in the balustrading shall be 15 degrees from the line of travel.

(7) A solid guard shall be provided in the intersecting angle of the outside balustrade (deck board) and the ceiling or soffitt.

(a) *Exception.* Where the intersection of the outside balustrade (deck board) and the ceiling or soffitt is more than 24 inches from the center line of the handrail.

(b) The vertical face of the guard shall project at least 14 inches horizontally from the apex of the angle.

(c) The exposed edge of the guard shall be rounded to eliminate shear hazard. Guards may be of glass, if of approved safety type.

(8) Each balustrade shall be provided with a handrail moving in the same direction and at substantially the same speed as the steps.

(a) Each moving handrail shall extend to normal handrail height not less than 12 inches beyond the line of points of the combplate teeth at the upper and lower landings.

(b) Hand or finger guards shall be provided at the points where the handrail enters the balustrade.

(9) Step frames and treads shall be made of incombustible material.

Exception. Step treads made of slow-burning material and covered on the underside with sheet metal not less than No. 27 U. S. gauge or equivalent fire-resistive material.

(a) Step treads shall be horizontal.

(b) The depth of any step tread in the direction of travel shall be not less than 15¾ inches, and the rise between treads shall be not more than 8½ inches. The width of a step tread shall be not less than 16 inches.

(c) The maximum clearance between step treads on the horizontal run shall be $\frac{5}{32}$ inch.

(d) The tread surface of each step shall be slotted in a direction parallel to the travel of the steps. Each slot shall be not more than ¼ inch wide and not less than ⅜ inch deep; and the distance from center to center of adjoining slots shall be not more than ⅜ inch.

(10) There shall be a combplate at the entrance and at the exit of every escalator.

(a) The combplate teeth shall be meshed with and set into the slots in the tread surface so that the points of the teeth are always below the upper surface of the treads.

(b) Combplate shall be adjustable vertically. Sections forming the combplate teeth shall be readily replaceable.

(11) The truss or girder shall be designed to safely sustain the steps and running gear in operation. In the event of failure of the track system it shall retain the running gear in its guides. Where tightening devices are operated by means of tension weights, provision shall be made to retain these weights in the truss if they should be released.

(12) Step wheel tracks shall be so designed as to prevent displacement of the steps and running gear if a step chain breaks.

(13) The contract loading, in pounds, shall be computed by the following formula:

$$\text{Contract load} = 4.6\ WA$$

Note: In this formula W is the width in inches between the balustrades (see section Ind 4.90 (6)) and A the horizontal distance in feet between the upper and lower combplate teeth.

(14) The factors of safety, based on the static loads, shall be at least the following:

(a) For trusses and all structural members including tracks, 5.

(b) For driving machine parts:

1. Where made of steel or bronze, 8.

2. Where made of cast iron or other materials, 10.

3. For power-transmission members, 10, except step chains composed of cast-steel links which shall be thoroughly annealed, in which case the factor of safety shall be 20.

(15) An electric motor shall not drive more than one escalator.

(a) The driving machine shall be connected to the main drive shaft by toothed gearing, a coupling, or a chain.

(16) Each escalator shall be provided with an electrically released, mechanically applied brake capable of stopping the up or down traveling escalator with any load up to rated load. This brake shall be located either on the driving machine or on the main drive shaft.

(a) Where a chain is used to connect the driving machine to the main drive shaft, a brake shall be provided on this shaft. It is not required that this brake be of the electrically released type if an electrically released brake is provided on the driving machine.

(17) Operating and safety devices shall be provided to conform with the requirements outlined as follows:

(a) A starting switch shall be of the key-operated type and shall be located within full sight of all the escalator steps.

(b) Emergency stop buttons or other type of manually operated switches shall have red buttons or handles and shall be accessibly

located at or near the top and bottom landings of each escalator, and shall be protected against accidental operation. The operation of either of these buttons or switches shall interrupt the power to the driving machine. It shall not be possible to start the driving machine by these buttons or switches.

(c) A speed governor shall be provided, the operation of which will cause the interruption of power to the driving machine should the speed of the steps exceed a predetermined value, which shall be not more than 40% above the rated speed.

1. *Exception.* An overspeed governor is not required where a low slip alternating current squirrel cage induction motor is used and the motor is directly connected to the driving machine.

Note: The governor may be omitted in such case even though a chain is used to connect the sprocket on the driving machine to the sprocket on the main drive shaft as required in sub-section (15) (a).

(18) A broken step-chain device shall be provided that will cause the interruption of power to the driving machine if a step chain breaks, and, where no automatic chain tension device is provided, if excessive sag occurs in either step chain.

(19) Where the driving machine is connected to the main drive shaft by a chain, a device shall be provided which will cause the application of the brake on the main drive shaft if the drive chain parts.

(20) An electrical release brake shall automatically stop the escalator when any of the safety devices required in subsection (17) (b), (17) (c), (18) and (19) function.

(21) Every machine room shall be provided with permanent artificial illumination of an intensity of not less than 5 foot-candles. The lighting switch shall be so located that it can be operated without passing over or reaching under any other part of machinery.

(a) The entire run of step treads shall be provided with permanent uniform artificial illumination of an intensity of not less than 5 foot-candles.

(22) Reasonable access to the interior of the escalator shall be provided for inspection and maintenance.

(23) Electrical wiring shall conform with the requirements as specified in Wis. Adm. Code section Ind 4.73.

(24) An externally operated circuit breaker or disconnecting fused switch shall be provided to conform with the requirements as specified in Wis. Adm. Code section Ind 4.70 (1).

(25) Control panels which are not located in the machine room shall conform with the requirements of Wis. Adm. Code section Ind 4.73 (12) (e).

(26) Grounding of electrical equipment shall conform with the requirements of Wis. Adm. Code section Ind 4.74.

History: Cr. Register, October, 1964, No. 106, eff. 11–1–64.

Ind 4.92 Moving walks and moving ramps. (1) Moving walks and moving ramps shall be designed, constructed, installed and operated primarily for the purpose of transporting passengers, and shall conform with the requirements outlined in this subsection.

(a) Passage from a landing to moving walks or moving ramps or vice versa shall be in the direction of the treadway travel at the point of passenger entrance or exit.

(b) The structural design shall be based on the load rating of not less than 100 pounds per square foot of exposed treadway.

(c) The brake treadway and power transmission shall be based on the rated load calculated by the following formula:

$$\text{Rated load} = 4.6\ WA$$

Note: The rated load in pounds W is the width in inches of treadway, and A, the horizontal distance in feet between the upper and lower combplate teeth.

(2) The exposed width of a moving walk or moving ramp treadway shall not be decreased in its direction of travel and shall not be less than 16 inches.

(a) The maximum treadway speed shall not exceed 140 feet per minute.

(b) The maximum treadway slope or angle for *moving walks* at any point shall not exceed 3 degrees.

(c) The slope or angle of a *moving ramp* treadway shall not exceed 15 degrees at any point.

(3) For moving ramps the treadway speed, slope or angle and treadway width shall conform with the requirements outlined in Table 24.

TABLE 24

Maximum Treadway Speed	Maximum Treadway Slope at Any Point on Treadway	Maximum Moving Ramp Treadway Width
140 feet per minute	3.1 to 5 degrees	110 inches
140 feet per minute	5.1 to 8 degrees	78 inches
130 feet per minute	8.1 to 12 degrees	40 inches
125 feet per minute	12.1 to 15 degrees	40 inches

(4) Belt type treadways shall be designed with a factor of safety of not less than 5 based on the ultimate strength.

(a) Splicing of the treadways shall be made in such a manner as to result in a continuous unbroken treadway surface of the same characteristics as the balance of the treadway.

(b) The treadway surface shall be grooved in a direction parallel to its travel for the purpose of meshing the combplate at the landings. Each groove shall be not more than ¼ inch wide at the treadway surface and not less than $\frac{3}{16}$ inch deep: and the distance from center to center of adjoining grooves shall be not more than ½ inch. Sides of grooves may slope for mold draft purposes and filleted at the bottom.

(5) Belt pallet type treadways shall be so designed that the pallet connecting chains or other connecting devices between pallets, and pallets where part of the propelling system shall have a factor of safety of not less than 10 based on the ultimate strength.

(a) Splicing of the treadway belt shall be made to conform with subsection (4) (a).

(b) The treadway surface shall be grooved in a direction parallel to its travel to conform with subsection (4) (b).

(c) Adjacent ends of pallets shall not vary in elevation more than $\frac{1}{16}$ inch. The fasteners that attach the belt to the pallets shall not project above the exposed treadway surface.

(6) Pallet-type treadway shall be so designed that the pallet connecting chains or other connecting devices and pallets where part of the propelling system, shall have a factor of safety of not less than 10 based on the ultimate strength.

(a) The clearance between pallets shall not exceed $\frac{5}{32}$ inch.

(b) The treadway surface of each pallet shall be grooved in a direction parallel to its travel and shall conform with subsection (4) (b).

(c) Adjacent ends of pallets shall not vary in elevation more than $\frac{1}{16}$ inch.

(7) Belt supports for treadway shall conform with the requirements outlined in this subsection.

(a) *Slider bed.* The carrying portion of the treadway shall be supported for its entire width and length, except where it passes from a support to a pulley. The surface of the slider bed shall be smooth. It shall be so constructed that it will not support combustion.

(b) *Roller bed.* Where the roller bed treadway is supported on a series of rollers, the combination of roller spacing, belt tension and belt stiffness shall be such that the deflection of the treadway surface, midway between rollers, shall not exceed ⅛ inch when measured as follows:

1. The treadway surface shall be loaded midway between rollers with a 25 pound weight concentrated on a cylindrical foot piece 2 inches long by 1 inch diameter placed with its long axis across the belt. The rollers shall be concentric and true running within commercially acceptable tolerances.

(8) For pallet and belt pallet type construction, the wheel tracks shall be so designed and located as to prevent more than ⅛ inch vertical displacement of the treadway underload or should the pallet connection break.

(9) The entrance to or the exit from a moving treadway shall be provided with a threshold plate designed and installed to provide a smooth passage between treadway and landing and vice versa and shall conform with the following:

(a) The threshold plate shall be provided with a comb.

(b) The treshold combteeth shall be meshed with and set into grooves of the treadway surface so the end of the surface of the teeth are always below the upper surface of the treadway.

(c) The surface of the plate shall afford a secure foot-hold. Where the threshold comb intersects with the treadway, there shall be a smooth area for a distance of not less than 2 inches or more than 4 inches for the full width of the threshold plate.

(10) Two moving handrails shall be provided on each moving walk or moving ramp.

Exception 1. Moving handrails are not required for moving walks having a slope or angle of 3 degrees or less and a speed of 70 feet per minute or less.

Exception 2. At least one moving handrail shall be provided for moving ramps having widths of 21 inches or less.

(a) The moving handrail at both the entrance and exit landing shall extend at normal height at least 12 inches beyond the end of the exposed treadway.

(b) Hand or finger guards shall be provided at the points where the handrails enter the balustrade.

(c) The moving handrail return run and its driving and supporting machinery shall be fully enclosed.

(d) Each moving handrail shall move in the same direction and at substantially the same speed as the treadway.

(11) Enclosed balustrades shall be provided for each side of the moving walks and moving ramps and shall conform with the requirements listed as follows:

(a) Balustrades without moving handrails shall be designed so as to provide no surface which can be gripped by a passenger. The treadway side of the balustrade shall have no areas or moldings depressed or raised more than ¼ inch from the parent surface. Such areas or moldings shall have all boundary surfaces beveled unless parallel to the direction of travel. The balustrades shall extend at normal height at least 12 inches beyond the end of the exposed treadway. Glass panels if used, shall be approved safety type.

(b) The height of a balustrade shall be not less than 30 inches measured perpendicular to the treadway surface. At this height, the inner surface of the balustrade shall be located not more than 8 inches outside the vertically protected edge of the exposed treadway.

(c) The clearance between the top surface of the treadway and the underside of the balustrade shall not exceed ⅛ inch.

(12) Where the intersection of the balustrade (deck board) and ceiling or soffitt is less than 24 inches from the center line of the handrail, a solid guard shall be provided in the intersecting angle. The vertical face of the guard shall have a height of at least 7 inches and shall be rounded. Guards may be of glass, if of the approved safety type.

(13) The driving machine shall be connected to the main drive shaft by toothed gearing, a coupling or a chain.

(14) Each moving walk or moving ramp shall be provided with an electrically released, mechanically applied brake capable of stopping and holding the treadway with any load up to the load rating. This brake shall be located either on the driving machine or on the main drive shaft.

Exception. Slider bed and other moving walks which will not run in the down direction by gravity under any load condition up to their load rating with the power supply interrupted do not require brakes.

(a) Where a chain is used to connect the driving machine to the main drive shaft, a brake shall be provided on that shaft. It is not required that this brake be of the electrically released type if an electrically released brake is provided on the driving machine.

(b) Electrically released brakes shall stop the treadway automatically upon failure of power or when any of the safety devices

specified in subsection (16) (b), (c), (d) and (e) operate. Brakes on the main drive shaft, if not of the electrically released type, shall be applied when the drive chain parts.

(15) Pallet propelling chains and drive components other than those specified shall have a factor of safety of not less than 10 based on the ultimate strength.

(16) Operating and safety devices shall be provided to conform with the requirements outlined as follows:

(a) A starting switch shall be of the key-operated type and shall be located within full sight of the moving walk or moving ramp treadway.

(b) Emergency stop buttons or other types of manually operated stop switches shall have red buttons or handles and shall be accesibly located at or near the top and bottom landings of each moving walk or moving ramp, and shall be protected against accidental operation. The operation of either of these buttons or switches shall interrupt the power to the driving machine. It shall not be possible to start the driving machine by these buttons or switches.

(c) Moving walks and moving ramps equipped with a brake as required in subsection (14) and driven by a direct current motor, shall be provided with a speed governor which will cause interruption of power to the driving machine and brake, and where provided, the governor shall be set to trip at a speed not greater than 40% above the rated treadway speed.

Exception. A governor will not be required for moving walks or moving ramps which will not run by gravity under any load conditions up to their load rating and/or where driven by a low slip alternating current induction motor.

(d) A broken drive-chain device shall be provided to conform with subsection (14) (a).

(e) A treadway device shall be provided which will cause interruption of power to the driving machine and to the brake, if the connecting means between pallets or the treadway elongates excessively.

(17) An externally operated enclosed, fused disconnecting switch or circuit breaker shall be provided to conform with the requirements of Wis. Adm. Code section Ind 4.70 (1).

(18) Control panels which are not located in the machine room shall conform with the requirements of Wis. Adm. Code section Ind 4.73 (12) (e).

(19) All electrical wiring shall conform with the requirements of Wis. Adm. Code section Ind 4.73.

(20) Grounding of electrical equipment shall conform with the requirements of Wis. Adm. Code section Ind 4.74.

(21) Every machine room shall be provided with permanent artificial illumination of an intensity of not less than 5 foot-candles. The lighting switch shall be so located that it can be operated without passing over or reaching under any other part of machinery.

(a) The entire run of moving walk or moving ramp shall be provided with permanent uniform artificial illumination of not less than 5 foot-candles.

(22) All floor openings shall be protected against passage of flame, smoke or gases in accordance with the requirements of Wisconsin Building Code.

(23) The sides and undersides of moving walks or moving ramps shall be enclosed with fire-resistive material.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64.