

"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 direction 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) **LANDING.** That portion of a floor, balcony, or platform used to receive and discharge passengers or freight.

(a) *Terminal.* The highest and lowest landing served by the elevator.

(59) **OVERHEAD HEIGHT.** The overhead height of an elevator is the vertical distance from the top terminal landing level to the lowest point of the overhead structure or any other overhead obstruction directly above the car in the elevator's related hoistway.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64; r. and recr. (25) intro. par., and (25) (n); cr. (25) (p); r. and recr. (27) (b). Register, September, 1967, No. 141, eff. 10-1-67; am. (26), r. and recr. (27), Register, December, 1967, No. 144, eff. 1-1-68; r. and recr. (14); am. (25), intro. par., and recr. (25) (a) and (29) (a); am. (58), cr. (59), Register, October, 1970, No. 178, eff. 11-1-70.

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.

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(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) Mechanical lifts inclined not greater than $62\frac{1}{2}$ degrees with the horizontal and serving not more than one story and a maximum vertical rise of 14 feet.

(d) 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 sections Wis. Adm. Code Ind 35.28 to 35.31 inclusive of the general orders on Safety in Construction and Wis. Adm. Code sections Ind 44.01 to 44.37 inclusive, Personnel Hoists, issued by the industrial commission.

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

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

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64; r. and recr., Register, September, 1967, No. 141, eff. 10-1-67.

Ind 4.04 Approval of plans. (1) Every manufacturer, manufacturer's representative or distributor who furnishes elevator, power dumb-waiter, material handling elevator, moving, walk, moving ramp or escalator equipment, shall submit 3 complete plans (See subsection Ind 4.04(3)) with 2 completed copies of Form SB-22 "Application for Erection or Remodeling" to the Department of Industry, Labor and Human Relations for any new installation or major alteration to existing equipment installations.

Note: Application Form SB-22 may be obtained from the Department of Industry, Labor and Human Relations, Division of Industrial Safety and Buildings, Post Office Box 2209, Madison, Wisconsin 53701.

(a) The submission of plans for installation of equipment described in subsection (1) shall be the responsibility of the building owner when the manufacturer, manufacturer's representative or distributor do not satisfy requirements of subsection (1).

(b) Minor alteration or remodeling of existing equipment installations requiring no plan submission, will require two completed copies of Form SB-22 to be submitted to the Department of Industry, Labor and Human Relations before commencing work.

(2) Plans for any new equipment installation or major alteration to existing equipment installations shall be approved before commencing work on installation of equipment.

(3) Complete plans shall include:

(a) Sectional plan of car and hoistway, showing all running clearances.

(b) Section through hoistway, machine room, pit and car showing all necessary applicable dimensions required by section Ind 4.18. All landings shall be clearly shown, indicating types of hoistway doors or gates used.

(c) Plan of machine and machine supports showing reaction loads, material and sizes of beams.

(e) The size and weight per foot of guide rails and details of their support, also their reinforcement where required.

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

(5) Subsection (1) shall not apply in cities where permits are issued by the city in the manner approved by the Department of Industry, Labor and Human Relations.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64; r. and recr., Register, October, 1970, No. 178, eff. 11-1-70.

Ind 4.05 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; renum. from Ind 4.08 to be Ind 4.05, Register, October, 1970, No. 178, eff. 11-1-70.

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Ind 4.06 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; renum. from Ind 4.07 to be Ind 4.06, Register, October, 1970, No. 178, eff. 11-1-70.

Ind 4.07 Registration numbers. (1) All new elevators, dumbwaiters, escalators, moving walks and ramps shall be assigned a unit number.

(2) The registration number shall be located as follows:

(a) For elevators—on the car crosshead.

(b) For dumbwaiters—in or on dumbwaiter car structure.

(c) For escalators, moving walks or ramps—in the machine room at a location easily recognized from access opening.

(3) The registration number shall be on a metal plate, which shall include state of Wisconsin identification.

(4) All existing elevators, dumbwaiters, escalators, moving walks or ramps shall retain unit number previously assigned and in existing locations.

History: Cr. Register, October, 1970, No. 178, eff. 11-1-70.

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Ind 4.08 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; renum. from Ind 4.06 to be Ind 4.08, Register, October, 1970, No. 178, eff. 11-1-70.

Ind 4.09 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 4.06.)

(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; renum. from Ind 4.05 to be Ind 4.09, Register, October, 1970, No. 178, eff. 11-1-70.

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 and ventilator openings shall be prohibited in elevator hoistway walls.

(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; r. and recr. (2) (e), Register, September, 1967, No. 141, eff. 10-1-67.

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 $\frac{1}{2}$ inch in diameter or equivalent and spaced not more than 10 inches center to center, or wire screen of wire not less than $\frac{1}{4}$ 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 $\frac{1}{4}$ inch thick, with the ends securely anchored, will be considered the equivalent of $\frac{1}{2}$ 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 $\frac{1}{2}$ 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 $\frac{1}{8}$ 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 fascia 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 fascia 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 $\frac{1}{2}$ inch, and not greater than $1\frac{1}{2}$ inches, except for corner post construction the clearance shall be not less than $\frac{3}{4}$ 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.

1. Exception: On freight elevators where double swing doors are used with locks and contacts or interlocks, 4 inches is permitted, providing section Ind 4.16 (2) (d) is complied with.

(b) Vertical or horizontal sliding doors, $2\frac{1}{4}$ 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 ¼ 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; r. and recr. (2) intro. par. and (a), (b) and (c), Register, September, 1967, No. 141, eff. 10-1-67.

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) In existing buildings where existing foundation footings are encountered 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) The pit of every power elevator hereafter installed shall be provided with an enclosed emergency stop switch, series connected to the elevator control safety circuit, of the type to satisfy Ind 4.70 (7) (a), (b), (c) and (d).

(a) In pit depths 6 feet 4 inches or less the location of the enclosed emergency stop switch shall satisfy the following conditions:

1. Shall be accessible from the lowest hoistway entrance.
2. Shall be adjacent to the ladder.
3. Shall be within 2 inches of a line parallel with the sill of the lowest hoistway entrance.

(b) In pit depths greater than 6 feet 4 inches enclosed emergency stop switches shall be provided, series connected to the elevator control safety circuit, at the following locations:

1. Provide one switch in the position stated in section Ind 4.17 (7) (a).
2. Provide the additional switch adjacent to the ladder at a height approximately 4 feet 6 inches from the pit floor.

(c) Pits of elevators with separate pit access doors shall have the enclosed emergency stop switch placed adjacent to the nearest point of access to each pit from the pit access door at a height approximately 4 feet 6 inches above pit floor. Ind 4.17(7) (b) 1. and 2. may be omitted in these installations.

(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; r. and recr. (7), Register, December, 1967, No. 144, eff. 1-1-68; r. and recr. (3); am. (7) (intro. par.). (7) (a) 3. and (7) (b) 1., Register, October, 1970, No. 178, eff. 11-1-70.

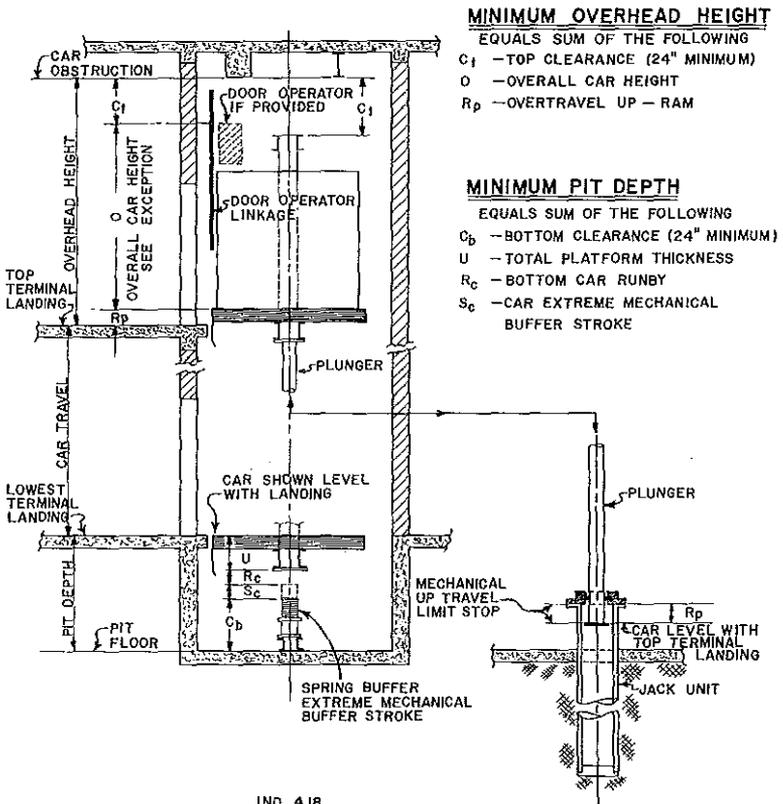
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Ind 4.18 Minimum pit depth and overhead height. (1) The minimum pit depth for every power elevator shall be not less than is required for the installation of buffers, compensating sheaves if any, and all other elevator equipment located therein, and to provide the minimum bottom clearance and runby as required by Ind 4.19 (c) and Ind 4.18 (1) (d).

Note: For existing buildings see subsection Ind 4.17 (3).

(a) Where vertical opening biparting freight elevator doors are installed there shall be a minimum of four (4) inches clearance between the pit floor and bottom of the door when fully open.

(b) When the car rests on its buffers, compressed to their extreme mechanical limit, there shall be a vertical clearance of not less than 24 inches between the pit floor and the lowest structural or mechanical part, equipment or device installed beneath the car platform except



PIT DEPTH AND OVERHEAD HEIGHT FOR
 DIRECT ACTING PLUNGER HYDRAULIC ELEVATORS

FIGURE 3
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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 ft/min with exception of hydraulic elevators. (See table 1.) than-shown-in-table 6 of this section.

(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.

(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-

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

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 33¾% 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; am. (1) (a), Register, October, 1970, No. 178, eff. 11-1-70.

Ind 4.20 Hoistways, machine rooms and pits. Restrictions. New and existing installations. (1) Wires, cables, pipes or conductor enclosures shall not be installed in any hoistway nor machine room immediately offset and an integral part of the 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 only be elevator and/or dumbwaiter equipment located in the machine room.

(a) Adjoining areas connected with the machine room shall be separated by the following method:

1. A fixed partition not less than 6 feet in height located not less than 3 feet from elevator equipment.

2. On new installations, wires, cables, pipes, or conductor enclosures above the machine room area shall be separated from the machine room area by a fixed unpierced ceiling whose height shall satisfy installation of elevator equipment but in no case be less than 7 feet above the machine room floor.

3. On new installations hazardous piping such as noxious gases, water or steam lines with pressures exceeding 15 pounds per sq. in. shall be isolated from the machine room area by the following means:

a. Unpierced walls, ceiling and entrance door construction.

b. Ceiling height shall satisfy installation of elevator equipment but in no case be less than 7 ft. above the machine room floor.

c. Entrance door sill shall be no less than 6 inches above machine room floor.

(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; r. and recr. (1) intro par. and (4), Register, September, 1967, No. 141, eff. 10-1-67.

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) *Exception:* Providing there are no other access openings from outside the hoistway, a floor or grating is not required where the governor and sheaves can be serviced while standing on top of the car or car structure, and the governor is of a type that can be released by movement of the car in the up direction.

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

(c) 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 is 4 feet or more above the roof, a stairway-type ladder shall be provided to the access door.

(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; r. and recr. (4), Register, September, 1967, No. 141, eff. 10-1-67; am. (4) (a), Register, October, 1970, No. 178, eff. 11-1-70.

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 hand-rail), 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 hereinafter installed, access to the machine room or penthouse shall be made from outside the hoistway by means of an unobstructed stairway (with handrails), inclined not more than 60 degrees with the horizontal and the treads shall not be less than 24 inches in width. 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 penthouses 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 substantial 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; am. (4), Register, October, 1970, No. 178, eff. 11-1-70.

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.

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Ind 4.23 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 $\frac{3}{4}$ 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 $\frac{1}{8}$ 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 $\frac{1}{2}$ 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 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.

(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; r. and recr. (6) (a) 1, Register, September, 1967, No. 141, eff. 10-1-67; r. and recr. (6) (a), Register, October, 1970, No. 178, eff. 11-1-70.

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) Elevators in buildings where occupancies require handrails in corridors, shall have handrails provided in car to satisfy the following requirements:

(a) Handrails shall be provided on each side, except on the entrance side or sides.

(b) Handrails shall be located approximately 3½ feet above the floor of elevator.

(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.

(6) Apparatus or equipment, other than that used in connection with the operation of the elevator, shall not be installed on or within any elevator except for lighting, heating, ventilating or sealed air conditioning systems.

History: Cr. Register, October, 1964, No. 106, eff. 11-1-64; r. and recr. (2), cr. (6), Register, October, 1970, No. 178, eff. 11-1-70.

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.

(a) Where car gates are permitted they shall be of the horizontal sliding type.

1. The gate when closed shall guard the full opening.

2. The gate shall be provided with a gate electric contact. (See exception under a. below.)

a. Movement of the car is permitted within the leveling zone with the car gate open.

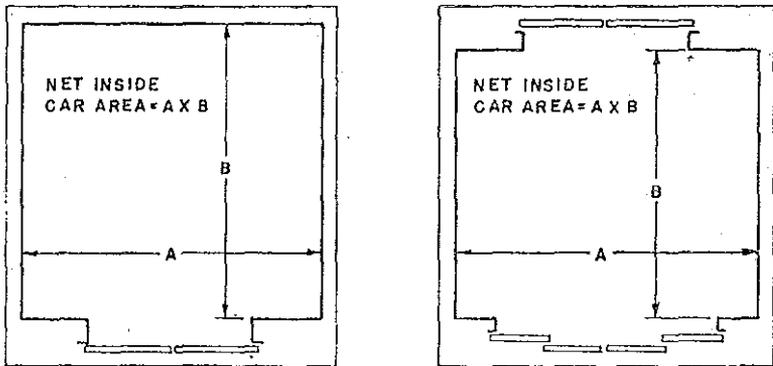
(b) A car door of the horizontal sliding type shall be provided at each entrance to elevator car where the car speed exceeds 100 feet per minute.

1. The door when closed shall guard the full opening.

2. The door shall be provided with a door electric contact. (See exception under subsection (1) (b) 2. a. below.)

a. Movement of the car is permitted within the leveling zone with the car gate open.

(2) Passenger elevators installed in a hoistway having separate landings used exclusively for passengers and other landings for freight



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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{4}$ 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 $\frac{1}{2}$ 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,

Register, October, 1970, No. 178
Elevator Code

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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 18,000	Gross Section 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 Plane
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

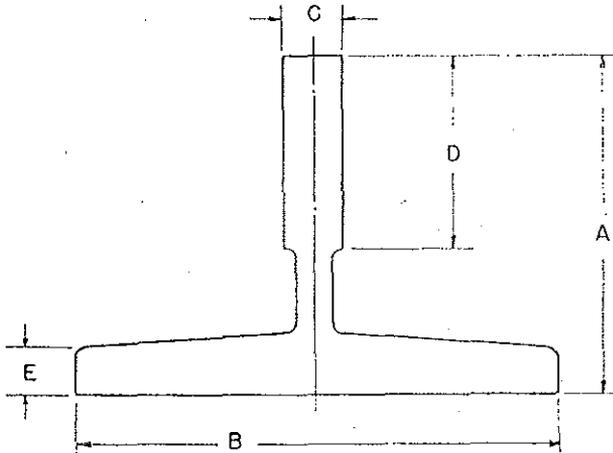


TABLE 11
T SECTION RAIL

Nominal Weight Per Foot in Lb.	Nominal Dimension in Inches				
	A	B	C	D	E
8	$2\frac{7}{16}$	$3\frac{1}{2}$	$\frac{5}{8}$	$1\frac{1}{4}$	$\frac{5}{16}$
11	$3\frac{1}{2}$	$4\frac{1}{2}$	$\frac{5}{8}$	$1\frac{1}{2}$	$\frac{5}{16}$
12	$3\frac{1}{2}$	5	$\frac{5}{8}$	$1\frac{3}{4}$	$\frac{5}{16}$
15	$3\frac{1}{2}$	5	$\frac{5}{8}$	$1\frac{3}{4}$	$\frac{1}{2}$
$18\frac{1}{2}$	$4\frac{1}{4}$	$5\frac{1}{2}$	$\frac{3}{4}$	$1\frac{3}{4}$	$\frac{1}{2}$
$22\frac{1}{2}$	4	$5\frac{1}{2}$	$1\frac{1}{8}$	2	$\frac{3}{8}$
30	5	$5\frac{1}{2}$	$1\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{8}$

(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	$\frac{9}{16}$	$\frac{1}{2}$
11	$\frac{11}{16}$	$\frac{5}{8}$
12	$\frac{11}{16}$	$\frac{5}{8}$
15	$\frac{13}{16}$	$\frac{5}{8}$
18 $\frac{1}{2}$	$\frac{13}{16}$	$\frac{5}{8}$
22 $\frac{1}{2}$	$\frac{13}{16}$	$\frac{3}{4}$
30	$\frac{15}{16}$	$\frac{3}{4}$

(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; am. tables 11 and 12, Register, October, 1970, No. 178, eff. 11-1-70.

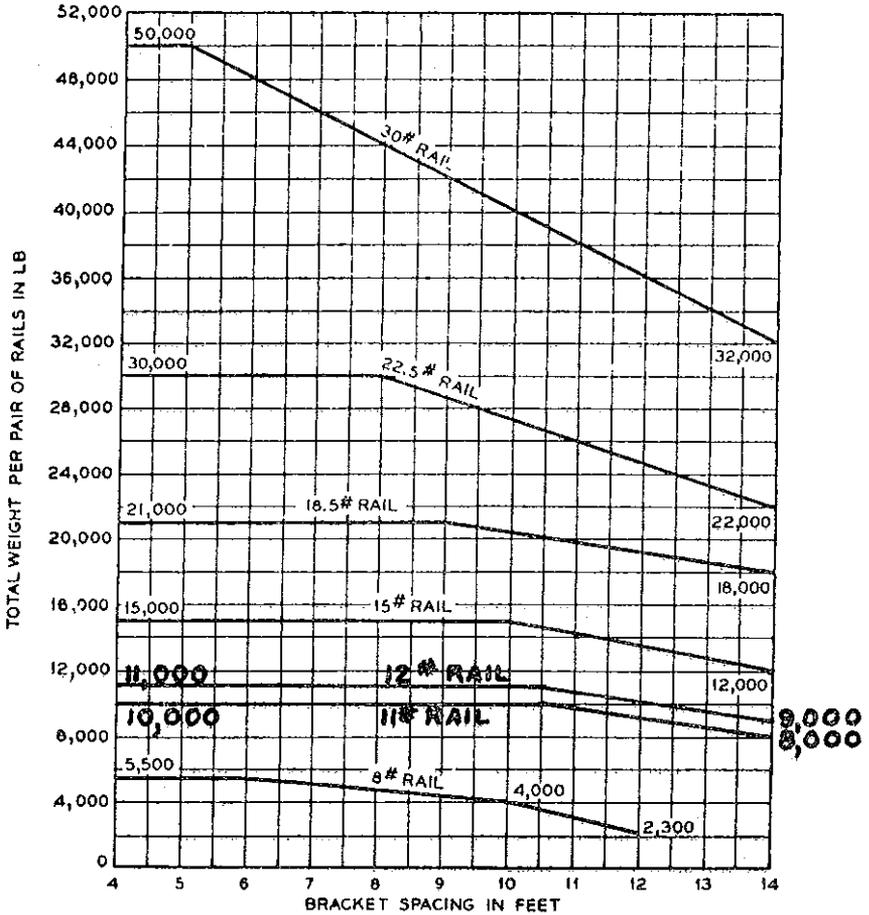
Ind 4.56 Guide rails and supports; stresses and deflections; new installations. (1) The stresses in a guide rail or in the rail and its reinforcements, due to the horizontal forces imposed on the rail during loading, unloading or running, calculated without impact, shall not exceed 15,000 pounds per square inch based upon the class of loading; and the total deflection shall not exceed $\frac{1}{4}$ 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 $\frac{1}{8}$ 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 Reinforcement in Feet
15,000	8	16
27,000	11	16
29,000	12	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; am. figure 4.56 and table 13, Register, October, 1970, No. 178, eff. 11-1-70.

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	1/8
11	5/8
12	5/8
15	5/8
18½	5/8
22½	3/4
30	3/4

(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 $\frac{1}{4}$ 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; am, table 15 in (2), Register, October, 1970, No. 178, eff. 11-1-70.

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
$\frac{1}{2}$	20
$\frac{3}{8}$	22
$\frac{1}{4}$	24
$\frac{3}{16}$	30
$\frac{1}{8}$	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.