



## State of Iowa

### EMPLOYMENT SAFETY COMMISSION

East Seventh and Court

Des Moines, Iowa 50319

## **SAFETY RULE FOR FLOOR AND WALL OPENINGS, RAILINGS, AND TOE BOARDS**

### COMMISSION MEMBERS

RICHARD C. LACY

Chairman

Wm. C. Leachman

Arlo Myers

H. C. Von Seggern

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STATE OF IOWA  
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**FOREWORD**

This rule establishes minimum Safety Standards for the protection of workers and others in places of employment from accidents so that places of employment shall be rendered safe and accidents shall be prevented.

This rule is promulgated by the Employment Safety Commission of the State of Iowa under the authority of Section 88A.11 of the 1966 Code of Iowa.

It became effective with the force and effect of law on July 13, 1966.

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## EMPLOYMENT SAFETY RULES

### Industrial Division

#### Title I

#### Chapter 1

### FLOOR AND WALL OPENINGS, RAILINGS, AND TOE BOARDS

1.1(88A) SCOPE. These rules apply to all places where there is a hazard of person or persons, material or materials falling through floor or wall openings and from stairways and runways. They apply to temporary or emergency conditions as well as permanent conditions. It does not apply to construction work to which the Construction Safety or Safety Construction Rules are applicable\* nor to private residences.

\*Note: As applied to machinery, cranes, etc., the strict observances of these rules is sometimes impracticable. In such cases, individual rules will not be considered mandatory except when unusual hazard is involved.

Wherever the words proper administrative authorities are referred to in these rules, they shall signify the Labor Commissioner and the Iowa Employment Safety Commission.

1.2(88A) PURPOSE. The purpose of these rules is to provide safety for life and limb. In cases of practical difficulty or unnecessary hardship, see Section 1.13 of the general rules, Variations From These Rules.

#### 1.3(88A) DEFINITIONS.

1.3(1) A Floor Opening is an opening in any floor, platform, pavement, or yard 12 inches or more in its least dimension.

Examples: Stair openings, ladder openings, hatchways, pits, and large manholes through which persons may fall.

Exceptions: Floor openings occupied by elevators, dumbwaiters, conveyers, machinery, or containers are excluded from the scope of this rule. For these, separate safety rules are applicable.

1.3(2) A Floor Hole is an opening in any floor, platform, pavement, or yard less than 12 inches but more than 1 inch in its least dimension.

Examples: Belt holes, pipe openings, and slot openings through which materials but not persons may fall.

1.3(3) A Wall Opening is an opening in any wall or partition having both height of at least 30 inches and width of at least 18 inches.

Examples: Yard-arm doorways and chute openings through which persons may fall.

1.3(4) A Wall Hole is an opening in any wall or partition having height of less than 30 inches but more than 1 inch and width unrestricted.

Examples: Ventilation holes, drainage scuppers.

1.3(5) A Platform is a working space for persons, elevated above the surrounding floor or ground having both length of more than 5 feet and width of more than 2 feet.

Examples: Balconies, platforms for the operation of machinery and equipment, etc.

1.3(6) A Runway is a passageway for persons, elevated above the surrounding floor or ground having length of more than 5 feet but width of not more than 2 feet.

Examples: Footwalks along shafting, walkways between buildings, etc.

1.3(7) A Standard Railing is a vertical barrier erected along exposed edges of floor openings, wall openings, ramps, platforms, and runways to prevent falls of persons.



Note: This rule, because its scope covers only falling persons and falling materials, does not cover railings used for guarding machinery or equipment. Guard railings for other hazards are treated in corresponding rules.

1.3(8) A Stair Railing is a vertical barrier erected along exposed sides of stairways to prevent falls of persons.

1.3(9) A Handrail is a single bar or pipe supported on brackets from a wall or partition to furnish persons with a handhold in case of tripping, as on stairways and ramps.

1.3(10) A Toe Board is a vertical barrier at floor level erected along exposed edges of floor openings, wall openings, platforms, runways, and ramps to prevent the falling of materials, tools or equipment.

1.3(11) Adequate\* signifies any construction of railings, covers, or other guards that meets the approval of the proper administrative authority.

\*Note: The Rules permit alternate forms of guarding under certain sections where the use of standard construction is not practicable, but only when it is clearly evident that equivalent protection is thereby secured.

#### 1.4(88A) STANDARD SPECIFICATIONS.

1.4(1) A standard railing shall consist of top rail, intermediate rail, and posts, having a vertical height of approximately 42 inches from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

Exception: A minimum vertical height of 36 inches from top rail to floor, platform, runway, or ramp level shall suffice for all handrailing installations constructed prior to the adoption of this rule.

1.4(2) A standard stair railing shall be of construction similar to a standard railing but the vertical height shall be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of the tread in line with face of the riser at forward edge of the tread.

Exception: Intermediate rails shall not be required where stairways are 22 inches or less in width.

1.4(3) The strength of standard railings and standard stair railings under different types of construction is specified in the following paragraphs. For wood construction, nominal or rough dimensions are given. National lumber dressed sizes are acceptable as conforming with the corresponding rough dimensions required, but no rough dry sizes shall be less than will admit dressing to at least minimum dressed sizes. All stock shall be sound, well manufactured, with defects and blemishes limited to pitch pockets, slight wane, pinworm holes, seasoning checks, and sound tight knots, not exceeding in diameter one-third the width of the piece. For metal construction, dimensions are given as used in the trade; all stock shall be free from flaws, cracks, or burrs.

a. For wood railings, the posts shall be of at least 2-inch by 4-inch stock spaced not to exceed 8 feet; the top rails shall be of at least 2-inch by 4-inch stock or of two right angle pieces of at least 1-inch by 4-inch stock and the intermediate rails shall be of at least 2-inch by 2-inch stock or of at least 1-inch by 4-inch stock.

b. For pipe railings, the posts and top rails shall be metal pipe of at least 1¼ inches inside diameter and the intermediate rails shall be metal pipe of at least 1 inch inside diameter. The spacing of posts shall not exceed 8 feet.

c. For structural metal railings, the posts and top rails shall be angle iron of at least 1½ inches by 1½ inches by 3/16 inch or other metal shapes of equivalent bending strength; and the intermediate rails shall be angle iron of at least 1¼ inches by 1¼ inches by 1/8 inch or other metal shapes of equivalent bending strength. The spacing of posts shall not exceed 8 feet.



d. The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point of the top rail.

Note: It is recognized that the minimum value for railing strength here specified is inadequate for safety under operating conditions where railings are liable to receive heavy stresses from crowds, trucking, handling materials, etc. For such conditions, additional strength should be provided by use of heavier stock, closer spacing of posts, bracing, or otherwise.

e. Other types, sizes and arrangements of railing construction are acceptable whenever they meet the following conditions:

(1) A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level approximately 42 inches, or above surface of the tread in line with the face of the riser of not more than 34 inches nor less than 30 inches.

Exception: A minimum vertical height of 36 inches from top rail to floor, platform, runway, or ramp level shall suffice for all handrailing installations constructed prior to the adoption of this rule.

(2) A strength to withstand at least the standard requirement of 200 pounds top rail pressure.

(3) Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent to at least that afforded by a standard intermediate rail.

(4) Elimination of overhang of rail ends unless such overhang does not constitute a hazard.

Examples: Baluster railings, scroll-work railings, paneled railings.

1.4(4) A standard toe board shall be approximately 3 inches in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than  $\frac{1}{4}$  inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in length.

Note: It is recognized that the minimum height of toe board here specified is inadequate for safety where materials are piled. For such conditions, higher toe boards, paneling from floor to intermediate rail or paneling from floor to top rail shall be provided when necessary for safety in the opinion of the proper administrative authority.

On elevated runways such as those connecting upper floors of detached buildings, and which are not roofed or covered, a removable section of toe board may be used to facilitate the removal of snow. It is suggested that a  $\frac{1}{2}$  inch opening be provided between the top surface of the runway and the bottom of the toe board. Such runways should preferably be covered and enclosed.

1.4(5) A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail where possible so as to offer no obstruction to a smooth surface along the top and both sides of the handrail. The handrail shall be of rounded or other section that will furnish an adequate handhold for any one grasping it to avoid falling. The ends of the handrail should be turned into the supporting wall or otherwise arranged so as not to constitute a projection hazard.

The height of handrails shall be not more than 34 inches nor less than 30 inches from the upper surface of the handrail to surface of the tread in line with the face of the riser or to the surface of the ramp.

The length of handrail brackets shall be such as will give a clearance between handrails and wall or any projection thereon of at least  $1\frac{1}{2}$  inches. The spacing of brackets shall not exceed 8 feet.



**Note:** Certain State Regulations and the Building Exits Code or Rules base the permissible occupancy on the net width of exit stairways measured from rail to rail. It is desirable, therefore, to keep the total overhang of handrails at the minimum consistent with their function of supplying handholds for persons using stairs or ramps. The total projection into the width of stairway should not exceed 3½ inches.

The mounting and handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the top rail.

1.4(6) Standard floor opening covers and their supports are those designed to take a live load at least as great as that for which the adjacent floor is designed.

**Exception:** Trench or conduit covers and their supports, when located in plant roadways, shall be designed to carry a truck rear axle load of at least 20,000 pounds.

**Exception:** Manhole covers and their supports, when located in plant roadways, shall comply with local standard highway requirements if any; otherwise, they shall be designed to carry a truck rear axle load of at least 20,000 pounds.

The construction of floor opening covers may be of any materials that meet the specifications on strength. They shall be of solid construction except where there is no exposure to falling materials, grill or slatted covers with openings not over 1 inch may be used. The tops of covers should be of non-slip surfaces and shall set flush with the adjacent floor level, except that covers projecting not more than 1 inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30 degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.

1.4(7) Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the openings, the barrier

is capable of withstanding a load of at least 200 pounds applied in any direction (except vertically upward) at any point on the top rail or corresponding member.

1.4(8) Wall openings grab handles shall be not less than 12 inches in length and shall be so mounted as to give 1½ inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.

1.4(9) Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 100 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grill work with openings not more than 8 inches long, or of slat work with openings not more than 4 inches wide with length unrestricted.

## 1.5(88A) GUARDING OF FLOOR OPENINGS AND FLOOR HOLES.

**Note:** Standards of size, strength, and construction for the guards specified in this section are given in 1.4(88A) of this rule.

Floor openings occupied by elevators, dumbwaiters, conveyers, machinery, vats, or other containers are not considered in this section. For their guarding, reference should be made to the appropriate safety rule.

1.5(1) Every stairway floor opening shall be guarded by a railing of standard strength, standard anchorage, and of any type of construction specified in 1.4(88A), but the vertical height shall be not more than 42 inches nor less than 36 inches from upper surface of top rail to floor level. The railing shall be provided on all exposed sides (except at entrance to stairway). Standard toe boards shall be provided also, except in stair towers.



Exception: For infrequently used stairways where traffic across the opening prevents the use of permanent railings as when located in aisle spaces, etc., the guard shall consist of a hinged floor opening cover of standard strength and construction and adequate removable railings on all exposed sides (except at entrance to stairway). The removable railings should preferably be hinged or otherwise mounted so as to come into use automatically with the opening of the cover.

Exception: This does not preclude equal protection to a greater height.

1.5(2) Every ladderway floor opening shall be guarded by a standard railing with standard toe board on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

1.5(3) Every hatchway and chute floor opening shall be guarded by either:

a. Hinged floor-opening cover of standard strength and construction equipped with railings of adequate strength permanently attached thereto so as to leave only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by adequate removable rails, ropes, or chains; or

b. An adequate removable railing with toe board on not more than two sides of the opening and standard permanent railings with toe boards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use and should preferably be hinged or otherwise mounted so as to be conveniently replaceable.

Exception: Where operating conditions necessitate the feeding of materials into any hatchway or chute opening from all sides, the standard guarding requirements may

be waived if bars, chains, or other adequate protection is provided to prevent a person from falling through the opening.

1.5(4) Every pit and trap-door floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction which should be hinged in place. While the cover is not in place, pit and trap openings shall be constantly attended by someone or shall be protected on all exposed sides by adequate removable railings that need not be of standard construction.

Note: This section is applicable only to floor openings used so infrequently that the hazard is slight in the opinion of the proper administrative authority. Wherever there is periodic or frequent use, the opening shall be guarded as specified in 1.5(3).

1.5(5) Every manhole floor opening shall be guarded by a manhole cover of sufficient strength to adequately carry any load to which the area will be subjected. While the cover is not in place, manhole openings shall be constantly attended by someone or shall be adequately protected by a portable enclosing railing that need not be of standard height and strength.

1.5(6) Every temporary floor opening caused by minor building alterations, yard excavations, etc., shall have adequate guards provided but these need not be of standard construction.

Note: Where, in the opinion of the proper administrative authority, there is any considerable exposure to this class of hazard, the requirements of the Construction Safety Rule shall be followed.

1.5(7) Every floor hole into which persons can accidentally walk shall be guarded by either:

a. A standard railing with standard toe board on all exposed sides; or



b. A floor opening cover of standard strength and construction that should be hinged in place. While the cover is not in place, floor holes shall be constantly attended by someone or shall be protected by a portable enclosing railing that need not be of standard construction.

1.5(8) Any floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment, walls or other projections) shall be considered adequately guarded. However, when any floor hole might be so located where there is exposure below to falling materials, it must be guarded by means such as:

a. A cover that leaves no openings more than 1 inch wide. The cover shall be securely held in place but need not be of standard strength and may project above the floor surface; or

b. A standard toe board on all exposed sides of the opening.

#### 1.6(88A) GUARDING OF WALL OPENINGS AND HOLES.

Note: Standards of size, strength, and construction for the guards specified in this section are given in 1.4(88A) of this rule.

The guard shall be so constructed as to permit emergency entrance in case of fire.

1.6(1) Every yard-arm doorway, from which there is a drop of more than 4 feet, shall be guarded by either:

a. A fixed or rolling barrier rail of standard strength and mounting, extending across the whole opening at a height above the floor level of not less than 2 feet and not more than 4 feet. The opening should have a sill or threshold that projects above the floor level at least 1 inch. All handling of materials through the opening shall be done without removal of the barrier; or

b. A grab handle on each side frame of the opening with its center approximately 4 feet above floor level and

of standard strength and mounting or a substantial (2" x 6" or greater) removable door opening barrier at standard height. The opening should have a sill or threshold that projects above the floor level at least 1 inch; or

c. An extension platform onto which materials can be hoisted squarely for handling. The platform and its supports shall have adequate strength for the loads to be handled and shall have side rails, side chains, or equivalent guards for persons working on the platform.

1.6(2) Every doorway without yard-arm or other hoisting equipment from which there is a drop of more than 4 feet shall be guarded by a rail, roller, picket fence, half-door, or equivalent barrier. The guard may be removable but should preferably be hinged or otherwise mounted so as to be conveniently replaceable. Where there is exposure below to falling materials, a removable toe board or equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening.

1.6(3) Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by one or more of the barriers specified in 1.6(1) and 1.6(2), as required by the conditions.

1.6(4) Every temporary wall opening, caused by minor building alterations, etc., shall have adequate guards but these need not be of standard construction.

Note: Where, in the opinion of the proper administrative authority, there is any considerable exposure to this class of hazard, the requirements of the Construction Safety Rules shall be followed.

1.6(5) Every wall hole shall be guarded if its lower edge is either (a) on the near side, 3 inches or less above floor level, or (b) on the far side, 5 feet or more above ground (or floor) level. The guard shall be either a standard toe board across the bottom of the hole, or an enclosing screen of either solid construction or of grill or slat work with openings not over 1 inch in width.



Note: While the "near" side of a wall hole is usually inside the building, occasionally for basement wall holes, etc., it is necessary to consider the hole from outside the building to determine the requirements for guarding.

Exception: The exemption from guarding may be extended to wall holes in other positions when the falling materials hazard is negligible in the opinion of the proper administrative authority.

Exception: 1.6(5) is based only on the hazard of materials moving along floor level. Wall holes above floor level shall also be adequately guarded where, in the opinion of the proper administrative authority, it is rendered necessary by the piling of materials near the holes or by the projection of materials from machinery, etc. (The latter hazard, however, should preferably be guarded at the source of projection and standards for such guarding will sometimes be found in the safety rule that deals with the type of machinery in question.)

Guarding may be waived where, in the opinion of the proper administrative authority, the hazard is adequately guarded by fixed equipment or fixed window sash.

#### 1.7(88A) GUARDING OF OPEN-SIDED FLOORS, PLATFORMS AND RUNWAYS.

Note: Standards of size, strength, and construction for the guards specified in this section are given in 1.4(88A) of this rule.

1.7(1) Every open-sided floor and platform shall be guarded by a standard railing (or the equivalent as specified in 1.4(3) on all open sides 5 feet or more above the adjacent floor (platform) or ground level, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toe board wherever, beneath the open sides: (a) persons can pass, (b) there is moving machinery, or (c) there is equipment with which falling materials could create a hazard.

Exception: The intermediate railing and the toe board may be omitted where materials have to be regularly passed over the edge of the floor (platform) as in lumber storage.

Exception: The entire railing and toe board may be omitted from particular sections of open-sided floors and platforms where, in the opinion of the proper administrative authority special or regular operating conditions make a railing wholly impracticable.

1.7(2) Every runway shall be guarded by a standard railing (or the equivalent as specified in 1.4(3)) on all open sides 5 feet or more above floor or ground level. Whenever tools, machine parts or materials are likely to be used on the runway, a toe board shall also be provided on each exposed side.

Exception: Runways, used exclusively for special purposes (such as oiling, shafting, or filling tank cars), may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a width of runway not less than 18 inches.

Note: Where persons entering upon runways become thereby exposed to machinery, electrical equipment, or other danger not a falling hazard, additional guarding than is here specified may be required to maintain safety. For such guarding, reference should be made to the appropriate safety rules.

#### 1.8(88A) STAIRWAY RAILING AND GUARDS.

Note: Detailed specifications for strength and construction of stairways and for width of exit stairs are not within the scope of this rule. Reference therefore should be made to the Building Exits Code or Rules.

Standards of size, strength, and construction for the stair railings and handrailings specified in this section are given in 1.4(88A) of these rules.



1.8(1) Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as specified below, the width of the stair to be measured clear of all obstructions except handrails:

a. On stairways of width less than 44 inches and having both sides enclosed, at least one handrail that should preferably be on the right side descending.

b. On stairways of width less than 44 inches and having one side open, at least one stair railing that shall be on the open side.

Note: Stairways of width less than 44 inches are intended to be used for a single file of persons only.

c. On stairways of width less than 44 inches and having both sides open, one stair railing on each side.

Exception: Intermediate rails shall not be required where stairways are 22 inches or less in width.

d. On stairways of width 44 inches or more but less than 88 inches, one handrail on each enclosed side and one stair railing on each open side.

e. On stairways 88 inches or more in width, one handrail on each enclosed side, one stair railing on each open side and one intermediate handrail located approximately midway of the width.







