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International Building Code 2000

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Equipment platforms shall have guards where required by Section 1003.2.12.

Definitions 1002

- 1) **Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

GUARD. A building component or a system of building components located at or near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

HANDRAIL. A horizontal or sloping rail intended for grasping by the hand for guidance or support.

NOSING. The leading edge of treads of stairs and of landings at the top of stairway flights.

RAMP. A walking surface that has a running slope steeper than one unit vertical in 20 units horizontal (5-percent slope).

General Means of Egress 1003

2) **System design requirements.** The means of egress system shall comply with the design requirements of Sections 1003.2.1 through 1003.2.13.7.1.

12) **Guards.** Guards shall be located along open-sided walking surfaces, mezzanines, industrial equipment platforms, stairways, ramps, and landings which are located more than 30 inches (762 mm) above the floor or grade below. Guards shall be adequate in strength and attachment in accordance with Section 1607.7. Guards shall also be located along glazed sides of stairways, ramps and landings that are located more than 30 inches (762 mm) above the floor or grade below where the glazing provided does not meet the strength and attachment requirements in Section 1607.7.

Exceptions: Guards are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.
3. On raised stage and platform floor areas such as runways, ramps and side stages used for entertainment or presentations.
4. At vertical openings in the performance area of stages and platforms.
5. At elevated walking surfaces appurtenant to stages and platforms for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating where guards in accordance with Section 1008.12 are permitted and provided.

1) **Height.** Guards shall form a protective barrier not less than 42 inches (1067 mm) high, measured vertically above the leading edge of the tread, adjacent walking surface or adjacent seatboard.

Exception: For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, both as applicable in Section 101.2, guards whose top rail also serves as a handrail shall have a height not less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from the leading edge of the stair tread nosing.

2) **Opening limitations.** Open guards shall have balusters or ornamental patterns such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 34 inches (864 mm). From a height of 34 inches (864 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.

Exceptions:

1. The triangular openings formed by the riser, tread and bottom rail at the open side of a stairway shall be of a maximum size such that a sphere of 6 inches (152 mm) in diameter cannot pass through the opening.
2. At elevated walking surfaces for access to and use of electrical, mechanical, or plumbing systems or equipment, guards shall have balusters or be of solid materials such that a sphere with a diameter of 21 inches (533 mm) cannot pass through any opening.
3. In occupancies in Group I-3, F, H or S, balusters, horizontal intermediate rails or other construction shall not permit a sphere with a diameter of 21 inches (533 mm) to pass through any opening.
4. In assembly seating areas, guards at the end of aisles where they terminate at a fascia of boxes, balconies, and galleries shall have balusters or ornamental patterns such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.

3) **Screen Porches.** Porches and decks which are enclosed with insect screening shall be provided with guards where the walking surface is located more than 30 inches (762 mm) above the floor or grade below.

4) **Mechanical equipment.** Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere.

3) **Means of egress components.** Doors, gates, stairways and ramps shall comply with the applicable requirements of Section 1003.

3) **Stairways.** Stairways shall comply with Sections 1003.3.3.1 through 1003.3.3.12.1.

10) **Alternating tread devices.** Alternating tread devices are limited to an element of a means of egress in buildings of Groups F, H and S from a mezzanine not more than 250 square feet (23 m²) in area and which serves not more than five occupants; in buildings of Group I-3 from a guard tower,

observation station or control room not more than 250 square feet (23 m²) in area; and for access to unoccupied roofs.

- 1) **Handrails of alternating tread devices.** Handrails shall be provided on both sides of alternating tread devices and shall conform to Section 1003.3.3.11.
- 2) **Treads of alternating tread devices.** Alternating tread devices shall have a minimum projected tread of 5 inches (127 mm), a minimum tread depth of 8.5 inches (216 mm), a minimum tread width of 7 inches (178 mm) and a maximum riser height of 9.5 inches (241 mm). The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

Exception: Alternating tread devices used as an element of a means of egress in buildings from a mezzanine area not more than 250 square feet (23 m²) in area which serves not more than five occupants shall have a minimum projected tread of 8.5 inches (216 mm) with a minimum tread depth of 10.5 inches (267 mm). The rise to the next alternating tread surface should not be more than 8 inches (203 mm).

- 11) **Handrails.** Stairways shall have handrails on each side. Handrails shall be adequate in strength and attachment in accordance with Section 1607.7.

Exceptions:

1. Aisle stairs provided with a center handrail need not have additional handrails.
 2. Stairways within dwelling units, spiral stairways and aisle stairs serving seating only on one side are permitted to have a handrail on one side only.
 3. Decks, patios, and walkways that have a single change in elevations where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require handrails.
 4. In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require handrails.
 5. Changes in room elevations of only one riser within dwelling units, in Group R-2 and R-3 occupancies do not require handrails.
- 1) **Height.** Handrail height, measured above stair tread nosings, or finish surface of ramp slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm).
 - 2) **Intermediate handrails.** Intermediate handrails are required so that all portions of the stairway width required for egress capacity are within 30

inches (762 mm) of a handrail. On monumental stairs, handrails shall be located along the most direct path of egress travel.

- 3) **Handrail graspability.** Handrails with a circular cross section shall have an outside diameter of at least 1.25 inches (32 mm) and not greater than 2 inches (51 mm) or shall provide equivalent graspability. If the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6.25 inches (159 mm) with a maximum cross-section dimension of 2.25 inches (57 mm). Edges shall have a minimum radius of 0.125 inch (3.2 mm).
- 5) **Handrail extensions.** Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches (305 mm) beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser.

Exceptions:

1. Handrails within a dwelling unit that is not required to be accessible need extend only from the top riser to the bottom riser.
 2. Aisle handrails in Group A occupancies in accordance with Section 1008.11.
- 6) **Clearance.** Clear space between a handrail and a wall or other surface shall be a minimum of 1.5 inches (38 mm). A handrail and a wall or other surface adjacent to the handrail shall be free of any sharp or abrasive elements.
 - 7) **Stairway projections.** Projections into the required width at each handrail shall not exceed 4.5 inches (114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section 1003.3.3.2.
- 4) **Ramps.** Ramps used as a component of a means of egress shall conform to the provisions of Sections 1003.3.4.1 through 1003.3.4.9.

Exceptions:

1. Ramped aisles within assembly rooms or spaces shall conform to the provisions in Section 1008.9.
 2. Curb ramps shall comply with ICC A117.1.
- 7) **Handrails.** Ramps with a rise greater than 6 inches (152 mm) shall have handrails on both sides complying with Section 1003.3.3.11.

9) **Guards.** Guards shall be provided where required by Section 1003.2.12 and shall be constructed in accordance with Section 1003.2.12.

Assembly 1008

11) **Handrails.** Ramped aisles having a slope exceeding one unit vertical in 15 units horizontal (6.7-percent slope) and aisle stairs shall be provided with handrails located either at the side or within the aisle width.

Exceptions:

1. Handrails are not required for ramped aisles having a gradient no greater than one unit vertical in eight units horizontal (12.5-percent slope) and seating on both sides.
2. Handrails are not required if, at the side of the aisle, there is a guard that complies with the graspability requirement of handrails.

Live Loads 1607

7) **Loads on handrails, guards, grab bars and vehicle barriers.** Handrails, guards, grab bars as designed in ICC A117.1, and vehicle barriers shall be designed and constructed to the structural loading conditions set forth in this section.

- 1) **Handrails and guards.** Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (pound per foot) (0.73 kN/m) applied in any directions at the top and to transfer this load through the supports to the structure.

Exceptions:

1. For one- and two- family dwellings, only the single, concentrated load required by Section 1607.7.1.1 shall be applied.
 3. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an occupant load no greater than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).
- 1) **Concentrated load.** Handrail assemblies and guards shall be able to resist a single concentrated load of 200 pounds (0.89 kN), applied in any direction at any point along the top, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.
 - 2) **Components.** Intermediated rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area not to exceed 1 square foot (305 mm²) including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of either preceding paragraph.
 - 3) **Stress increase.** Where handrails and guards are designed in accordance with the provisions for allowable stress design (working stress design) exclusively for the loads specified in Section 1607.7.1, the allowable stress for the members and their attachments are permitted to be increased by one-third.
 - 3) **Vehicle barriers.** Vehicle barrier systems for passenger cars shall be designed to resist a single load of 6,000 pounds (26.70 kN) applied horizontally in any direction to the barrier system and shall have anchorage or attachment capable of transmitting this load to the structure. For design of the system, the load shall be assumed to act at a minimum height of 1 foot, 6 inches (457 mm) above the floor or ramp surface on an area not to exceed 1 square foot (305 mm²), and is not required to be assumed to act concurrently with any handrail or guard loadings specified in the preceding paragraphs of Section 1607.7.1. Garages

accommodating trucks and buses shall be designed in accordance with an approved method that contains provision for traffic railings.

8) **Impact loads.** The live loads specified in Section 1607.2 include allowance for impact conditions. Provision shall be made in the structural design for uses and loads that involve unusual vibrations and impact forces.

- 1) **Elevators.** Elevator loads shall be increased by 100 percent for impact and the structural supports shall be designed within the limits of deflection prescribed by ASME A17.1.
- 2) **Machinery.** For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact: (1) elevator machinery, 100 percent; (2) light machinery, shaft- or motor-driven, 20 percent; (3) reciprocating machinery or power-driven units, 50 percent; (4) hangers for floors or balconies, 33 percent. Percentages shall be increased where specified by the manufacturer.

Safety Glazing 2406

2) Hazardous locations. The following shall be considered specific hazardous locations requiring safety glazing materials:

10) Glazing adjacent to stairways, landings and ramps where the following conditions are present:

10.1. Within 36 inches (914 mm) horizontally of a walking surface;

10.2. Within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction: and

10.3. Bottom edge less than 60 inches (1524 mm) above the plane of the adjacent walking surface (or stairways, measured from the nose of the tread).

Exception: Safety glazing for condition number 10 is not required for the following installations where:

1. The side of a stairway, landing or ramp has a guard or handrail, including balusters or in-fill panels, complying with the provisions of Sections 1003.2.12 and 1607.7; and
2. The plane of the glass is 18 inches (457 mm) from the railing.

Glass in Handrails and Guards 2407

- 1) **Materials.** Glass used as structural balustrade panels in railings shall be constructed of either single fully tempered glass, laminated fully tempered glass or laminated heat-strengthened glass. Glazing in railing in-fill panels shall conform to ANSI Z97.1 listed in Chapter 35 or shall be of an approved safety glazing material that conforms to the provisions of Section 2406.1. For all glazing types, the minimum nominal thickness shall be ¼ inch (6.4 mm). Fully tempered glass and laminated glass shall comply with Category II of CPSC 16 CFR 1201, listed in Chapter 35. Wired glass shall comply with ANSI Z97.1 listed in Chapter 35.
 - 1) **Loads.** The panels and their support system shall be designed to withstand the loads specified in Section 1607.7. A safety factor of 4 shall be used.
 - 2) **Support.** Each handrail or guard section shall be supported by a minimum of three glass balusters or shall be otherwise supported to remain in place should one baluster panel fail. Glass balusters shall not be installed without an attached handrail or guard.
 - 3) **Parking garages.** Glazing materials shall not be installed in railings in parking garages except for pedestrian areas not exposed to impact from vehicles.

Light-Transmitting Plastics 2606

- 5) **Structural requirements.** Light-transmitting plastic materials in their assembly shall be of adequate strength and durability to withstand the loads indicated in Chapter 16. Technical data shall be submitted to establish stresses, maximum unsupported spans and such other information for the various thicknesses and forms used as deemed necessary by the building official.

Protection of Pedestrians 3306

- 4) **Construction railings.** Construction railings shall be at least 42 inches (1067 mm) in height and shall be sufficient to direct pedestrians around construction areas.