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SAFETY REQUIREMENTS FOR
FLOOR AND WALL OPENINGS, RAILINGS
AND TOE BOARDS

(*First Revision*)

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*Indian Standard*SAFETY REQUIREMENTS FOR
FLOOR AND WALL OPENINGS, RAILINGS
AND TOE BOARDS*(First Revision)*

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Indian Standard
**SAFETY REQUIREMENTS FOR
FLOOR AND WALL OPENINGS, RAILINGS
AND TOE BOARDS**
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 16 November 1978, after the draft finalized by the Safety in Construction Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Buildings when not provided with proper safety precautions may be hazardous, especially for use by those whose health and limbs are no more in the perfect and sound condition. In case of children, special precautions are to be taken for their safety inside the buildings particularly when the buildings rise higher than one storey and staircase and other means of lifting and lowering are involved in the use of the buildings.

0.3 This standard was first published in 1968. This is the first revision of the standard. In this revision, besides modifying the definitions of some of the terms, modifications have been incorporated in the scope and in the provisions relating to stairways, railings, height of guard railings, etc.

0.4 In the formulation of this standard, due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard deals with the safety requirements to be provided in buildings where there is danger of persons or materials falling through floor or wall openings, or from stairways, or catwalks.

1.2 The recommendations laid down in this standard apply to buildings under construction as well as to buildings after their completion.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Authority — Governmental agency or the employer/owner in the absence of governmental jurisdiction.

2.2 Catwalk — A passageway for persons, elevated above the surrounding level, such as a footwalk along shafting or a walkway between buildings.

2.3 Floor Hole — An opening measuring less than 30 cm but more than 2.5 cm in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening.

2.4 Floor Opening — An opening measuring 30 cm or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall; such as hatchway, stair or ladder opening, pit, or large manhole (floor opening occupied by elevators, dumb waiters, conveyors, machinery or containers are excluded from this standard).

2.5 Handrail — A member erected to act as hand grip on edges of a floor, stairways or on openings, etc.

2.6 Platform — A working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment.

2.7 Guard Railing — A barrier erected along exposed edges of an open sided floor opening, wall opening, ramp, platform, or catwalk or balcony, etc, to prevent fall of persons.

2.8 Stair Railing — A barrier erected along exposed sides of a stairway to prevent fall of persons.

2.9 Toe Board — A vertical barrier erected along exposed edge of a floor opening, wall opening, platform, catwalk, or ramp to prevent fall of materials or persons.

2.10 Wall Hole — An opening in any wall or partition having height of less than 75 cm but more than 2.5 cm and width unrestricted.

2.11 Wall Opening — An opening in any wall or partition having both height of at least 75 cm and width of at least 45 cm.

3. GUARDING OF FLOOR OPENINGS AND FLOOR HOLES

3.1 Every stairway floor opening shall be guarded by a railing as specified in 7.2. The railing shall be provided on all exposed sides, except at entrance to stairway.

3.1.1 However, for infrequently used stairways located in passageways (such as aisle/spaces, etc) where traffic across the openings prevents the use of fixed railings, the guard shall consist of a hinged floor opening cover of adequate strength and removable railings on all exposed sides (except at entrance to stairway). The removable railing should preferably be hinged or otherwise mounted so as to come into use automatically with the opening of the cover. This does not preclude greater protection than that prescribed in 7.1 to 7.3.2.

3.2 Every ladderway, floor opening or platform shall be guarded by a guard railing with 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.

3.3 Every hatchway and chute, floor opening, shall be guarded by one of the following:

- a) Hinged floor opening cover of adequate strength equipped with railings or 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 removable railings.
- b) A removable railing with toe board on not more than two sides of the opening and fixed railing 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. Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person falling through the opening.

3.4 Every skylight, floor opening, and hole shall be guarded by a skylight screen or a fixed railing on all exposed sides.

3.5 Every pit and trap-door floor opening, infrequently used, shall be guarded by floor opening cover of adequate strength which should be hinged in place. When the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable railings.

3.6 Every manhole floor opening shall be guarded by a manhole cover which need not be hinged in place. When the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable railings.

3.7 Every temporary floor opening shall have railings, or shall be constantly attended by someone.

3.8 Every floor hole into which persons can accidentally walk shall be guarded by either: (a) a railing with toe board on all exposed sides, or (b) a floor hole cover of adequate strength that should be hinged in place. When the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable railing.

3.9 Every floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment or walls) shall be protected by a cover that leaves no opening more than 2.5 cm wide. The cover shall be securely held in place to prevent tools or materials from falling through.

3.10 Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 50 cm.

4. GUARDING OF WALL OPENINGS AND HOLES

4.1 Every wall opening from which there is a drop of more than 120 cm shall be guarded by one of the following:

- 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 danger to persons working or passing below on account of the falling materials, a removable toe board or the 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. In addition, a grab handle shall be provided on each side of the opening with its centre approximately 120 cm above floor level and of adequate strength and mounting. The opening should have a sill that projects above the floor level at least 2.5 cm.
- b) Extension platform into which materials may be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications. It shall be of full length of the opening.

4.2 Every chute wall opening from which there is a drop of more than 120 cm shall be guarded by one or more of the barriers specified in 4.1, or as required by the conditions.

4.3 Every window wall opening at a stairway landing, floor, platform, or balcony from which there is a drop of more than 120 cm and where the bottom of the opening is less than 90 cm above the platform or landing, shall be guarded by slabs, grill work as specified in 7.10.

4.3.1 Where the window opening is below the landing, or platform, a toe board shall be provided. This requirement may be waived, where, in the opinion of the administrative authority, the hazard is adequately guarded.

4.4 Every temporary wall opening shall have adequate guards.

4.5 Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 10 cm above the floor, and the far side of the hole more than 150 cm above the next lower level, the hole shall be protected by a toe board, or an enclosing screen either of solid construction or as specified in 7.10.

5. GUARDING OF OPEN-SIDE FLOORS, PLATFORMS, AND CATWALKS

5.1 Every open-sided floor or platform 120 cm or more above adjacent floor or ground level shall be guarded by a railing (or the equivalent as specified in 7.3) on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toe board beneath the open sides wherever:

- a) persons may pass,
- b) there is moving machinery, or
- c) there is equipment with which falling materials could create a hazard.

5.2 Every catwalk shall be guarded by a railing (or the equivalent as specified in 7.3) on all open sides 120 cm or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the cat-walk, a toe board shall also be provided on each exposed side.

5.2.1 Catwalks 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 provided the falling hazard is minimized by using a catwalk of not less than 42 cm wide.

5.2.2 Where persons upon entering catwalks become exposed to machinery, electrical equipment, dangers other than falling hazard, additional guarding shall be provided.

5.3 Regardless of height, open-sided floors, walkways, platforms, or catwalks above the adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with a railing and toe board.

6. STAIRWAY RAILINGS AND GUARDS

6.1 Every flight of stairs having four or more risers shall be equipped with stair railings or handrails as specified below. The width of the stair measured clear of all constructions except handrails:

- a) On stairways less than 150 cm wide having both sides enclosed, at least one handrail, preferably on the right side descending.
- b) On stairways less than 150 cm wide having one side open, at least one stair railing on the open side.
- c) On stairways less than 150 cm wide having both sides open, one stair railing on each side.
- d) On stairways more than 150 cm wide one handrail on each enclosed side and one stair railing on each open side.

NOTE — Provisions under (a) and (d) shall not be applicable to staircases serving only one residence.

6.2 Stairways used principally by children, as in school-houses, playgrounds, etc, shall be provided with additional handrails mounted on the stairway wall of railing at less than standard height. In staircases used by toddlers the openings in the stair railing shall be suitably designed to prevent children from falling through.

7. CONSTRUCTIONAL DETAILS OF SAFETY MEASURES

7.1 A railing shall consist of top rail, intermediate rail, and posts, and shall be not less than 90 cm vertical height 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 ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

7.2 A stair railing shall be of construction similar to a railing but the vertical height shall be not more than 85 cm nor less than 75 cm from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

7.3 Minimum requirements for railings under various types of construction shall conform to the requirements given under **7.3.1** to **7.3.4**.

7.3.1 The anchoring of posts and framing members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a point load of at least 90 kg applied in any direction at any point on the top rail.

7.3.2 Where railings are likely to receive heavy stresses from crowds, trucking or handling materials, additional strength should be provided by use of heavier stock, closer spacing of posts, bracing or by other means.

7.3.3 The maximum distance between any two horizontal or vertical members should not exceed 20 cm in one direction.

7.3.4 Overhangs shall be eliminated at the rail ends unless such overhangs do not constitute a hazard, such as baluster railings, scroll work railings and panelled railings.

7.4 A toe board shall be 15 cm nominal 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 6 cm clearance above floor level. It may be made of any substantial material either solid or with openings not over 2.5 cm in greatest dimension.

7.4.1 Where material is piled to such height that a toe board does not provide protection, panelling from floor to intermediate rail, or to top rail shall be provided.

7.5 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 so as to offer no obstruction to a smooth surface along the top and both sides of the handrail. The handrail shall be rounded or be of such 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.

7.5.1 The height of handrails shall be not more than 85 cm measured vertically above pitch line; a handrail is required for all stairs, or ramp having rise of more than 60 cm.

7.5.2 The sizes of handrails, when made of hardwood, shall be at least 5 cm in diameter. The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereon of at least 7.5 cm.

7.5.3 The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 90 kg applied in any direction at any point on the rail.

7.6 Floor opening covers may be of any material that meets the strength requirements of the surrounding floor.

7.7 Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 90 kg applied perpendicularly at any one point on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grill work with openings not more than 10 cm long or of slat work with openings not more than 5 cm wide and length unrestricted.

7.8 Wall openings barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 90 kg in any direction (except upward) at any point on the top rail or corresponding member.

7.9 Wall opening grab handles shall be not less than 30 cm in length and shall be mounted as to give 7.5 cm 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 90 kg applied in any direction at any point of the handle.

7.10 Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 90 kg 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 20 cm long, or of slat work with openings not more than 10 cm wide with length unrestricted.

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