7.2.1.15.7* Door openings not in proper operating condition shall be repaired or replaced without delay.

7.2.2 Stairs.

7.2.2.1 General.

7.2.2.1.1 Stairs used as a component in the means of egress shall conform to the general requirements of Section 7.1 and to the special requirements of 7.2.2, unless otherwise specified in 7.2.2.1.2.

7.2.2.1.2 The requirement of 7.2.2.1.1 shall not apply to the following:

(1) Aisle stairs in assembly occupancies, as provided in Chapters 12 and 13

(2) Approved existing noncomplying stairs

7.2.2.2 Dimensional Criteria.

7.2.2.2.1 Standard Stairs.

7.2.2.2.1.1 Stairs shall meet the following criteria:

(1) New stairs shall be in accordance with Table 7.2.2.2.1.1(a) and 7.2.2.2.1.2.

(2)*Existing stairs shall be permitted to remain in use, provided that they meet the requirements for existing stairs shown in Table 7.2.2.2.1.1(b).

(3) Approved existing stairs shall be permitted to be rebuilt in accordance with the following:

(a) Dimensional criteria of Table 7.2.2.2.1.1(b)

(b) Other stair requirements of 7.2.2

(4) The requirements for new and existing stairs shall not apply to stairs located in industrial equipment access areas where otherwise provided in 40.2.5.3.

7.2.2.2.1.2* Minimum New Stair Width. (See also 7.3.3.)

(A) Where the total occupant load of all stories served by the stair is fewer than 50, the minimum width clear of all obstructions, except projections not more than 4½ in. (114 mm) at or below handrail height on each side, shall be 36 in. (915 mm).

(B)* Where stairs serve occupant loads exceeding that permitted by 7.2.2.2.1.2(A), the minimum width clear of all obstructions, except projections not more than 4½ in. (114 mm) at or below handrail height on each side, shall be in accordance with Table 7.2.2.2.1.2(B) and the requirements of, 7.2.2.2.1.2(C), 7.2.2.2.1.2(D), 7.2.2.2.1.2(E), and 7.2.2.2.1.2(F).

Table 7.2.2.2.1.1(a) New Stairs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimensional Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum width</td>
<td>See 7.2.2.2.1.2.</td>
</tr>
<tr>
<td>Maximum height of risers</td>
<td>7 in. 180</td>
</tr>
<tr>
<td>Minimum height of risers</td>
<td>4 in. 100</td>
</tr>
<tr>
<td>Minimum tread depth</td>
<td>11 in. 280</td>
</tr>
<tr>
<td>Minimum headroom</td>
<td>6 ft 8 in. 2030</td>
</tr>
<tr>
<td>Maximum height between landings</td>
<td>12 ft 3660</td>
</tr>
<tr>
<td>Landing</td>
<td>See 7.2.1.3, 7.2.1.4.3.1, and 7.2.2.3.2.</td>
</tr>
</tbody>
</table>

Table 7.2.2.2.1.1(b) Existing Stairs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimensional Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum width clear of all obstructions, except projections not more than 4½ in. (114 mm) at or below handrail height on each side</td>
<td>36 in. 915</td>
</tr>
<tr>
<td>Maximum height of risers</td>
<td>8 in. 205</td>
</tr>
<tr>
<td>Minimum tread depth</td>
<td>9 in. 230</td>
</tr>
<tr>
<td>Minimum headroom</td>
<td>6 ft 8 in. 2030</td>
</tr>
<tr>
<td>Maximum height between landings</td>
<td>12 ft 3660</td>
</tr>
<tr>
<td>Landing</td>
<td>See 7.2.1.3 and 7.2.1.4.3.1.</td>
</tr>
</tbody>
</table>

Table 7.2.2.2.1.2(B) New Stair Width

<table>
<thead>
<tr>
<th>Total Cumulative Occupant Load Assigned to the Stair</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2000 persons</td>
<td>44 in. 1120</td>
</tr>
<tr>
<td>≥2000 persons</td>
<td>56 in. 1420</td>
</tr>
</tbody>
</table>

(C) The total cumulative occupant load assigned to a particular stair shall be that stair’s prorated share of the total occupant load, as stipulated in 7.2.2.2.1.2(D) and 7.2.2.2.1.2(E), calculated in proportion to the stair width.

(D) For downward egress travel, stair width shall be based on the total number of occupants from stories above the level where the width is measured.

(E) For upward egress travel, stair width shall be based on the total number of occupants from stories below the level where the width is measured.

(F) The clear width of door openings discharging from stairways required to be a minimum of 56 in. (1420 mm) wide in accordance with 7.2.2.2.1.2(B) shall be in accordance with 7.2.1.2.3.2(9).

7.2.2.2 Curved Stairs.

7.2.2.2.1 New curved stairs shall be permitted as a component in a means of egress, provided that the depth of tread is not less than 11 in. (280 mm) at a point 12 in. (305 mm) from the narrower end of the tread and the smallest radius is not less than twice the stair width.

7.2.2.2.2 Existing curved stairs shall be permitted as a component in a means of egress, provided that the depth of tread is not less than 10 in. (255 mm) at a point 12 in. (305 mm) from the narrower end of the tread and the smallest radius is not less than twice the stair width.
7.2.2.2.3 Spiral Stairs.

7.2.2.2.3.1 Where specifically permitted for individual occupancies by Chapters 11 through 43, spiral stairs shall be permitted as a component in a means of egress in accordance with 7.2.2.2.3.2 through 7.2.2.2.3.4.

7.2.2.2.3.2 Spiral stairs shall be permitted, provided that all of the following criteria are met:

1. Riser heights shall not exceed 7 in. (180 mm).
2. The stairway shall have a tread depth of not less than 11 in. (280 mm) for a portion of the stairway width sufficient to provide egress capacity for the occupant load served in accordance with 7.3.3.1.
3. At the outer side of the stairway, an additional 10 1/2 in. (265 mm) of width shall be provided clear to the other handrail, and this width shall not be included as part of the required egress capacity.
4. Handrails complying with 7.2.2.4 shall be provided on both sides of the spiral stairway.
5. The inner handrail shall be located within 24 in. (610 mm), measured horizontally, of the point where a tread depth of not less than 11 in. (280 mm) is provided.
6. The turn of the stairway shall be such that the outer handrail is at the right side of descending users.

7.2.2.2.3.3 Where the occupant load served does not exceed three, spiral stairs shall be permitted, provided that all of the following criteria are met:

1. The clear width of the stairs shall be not less than 26 in. (660 mm).
2. The height of risers shall not exceed 9 3/4 in. (240 mm).
3. The headroom shall be not less than 6 ft 6 in. (1980 mm).
4. Treads shall have a depth not less than 7 1/2 in. (190 mm) at a point 12 in. (305 mm) from the narrower edge.
5. All treads shall be identical.
6. Handrails shall be provided on both sides of the stairway.

7.2.2.2.3.4 Where the occupant load served does not exceed five, existing spiral stairs shall be permitted, provided that the requirements of 7.2.2.2.3.3(1) through (5) are met.

7.2.2.2.4* Winders.

7.2.2.2.4.1 Where specified in Chapters 11 through 43, winders shall be permitted in stairs, provided that they meet the requirements of 7.2.2.2.4.2 and 7.2.2.2.4.3.

7.2.2.2.4.2 New winders shall have a tread depth of not less than 6 in. (150 mm) and a tread depth of not less than 11 in. (280 mm) at a point 12 in. (305 mm) from the narrowest edge.

7.2.2.2.4.3 Existing winders shall be permitted to be continued in use, provided that they have a tread depth of not less than 6 in. (150 mm) and a tread depth of not less than 9 in. (230 mm) at a point 12 in. (305 mm) from the narrowest edge.

7.2.2.2.5 Stair Details.

7.2.2.2.5.1 Construction.

7.2.2.2.5.1.1 All stairs serving as required means of egress shall be of permanent fixed construction, unless they are stairs serving seating that is designed to be repositioned in accordance with Chapters 12 and 13.

7.2.2.2.5.1.2 Each stair, platform, and landing, not including handrails and existing stairs, in buildings required in this Code to be of Type I or Type II construction shall be of noncombustible material throughout.

7.2.2.3 Landings.

7.2.2.3.1 Stairs shall have landings at door openings, except as permitted in 7.2.2.3.2.5.

7.2.2.3.2 Stairs and intermediate landings shall continue with no decrease in width along the direction of egress travel.

7.2.2.3.3 In new buildings, every landing shall have a dimension, measured in the direction of travel, that is not less than the width of the stair.

7.2.2.3.4 Landings shall not be required to exceed 48 in. (1220 mm) in the direction of travel, provided that the stair has a straight run.

7.2.2.3.5 In existing buildings, a door assembly at the top of a stair shall be permitted to open directly to the stair, provided that the door leaf does not swing over the stair and the door opening serves an area with an occupant load of fewer than 50 persons.

7.2.2.3.6* Tread and Landing Slopes.

7.2.2.3.6.1 Tread depth shall be measured horizontally, between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread’s leading edge, but shall not include beveled or rounded tread surfaces that slope more than 20 degrees (a slope of 1 in 2.75). At tread nosings, such beveling or rounding shall not exceed 1/2 in. (13 mm) in horizontal dimension.

7.2.2.3.6.2* Riser Height and Tread Depth. Riser height shall be measured as the vertical distance between tread nosings. Tread depth shall be measured horizontally, between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread’s leading edge, but shall not include beveled or rounded tread surfaces that slope more than 20 degrees (a slope of 1 in 2.75). At tread nosings, such beveling or rounding shall not exceed 1/2 in. (13 mm) in horizontal dimension.

7.2.2.3.6.3* Dimensional Uniformity.

7.2.2.3.6.3.1 Variation in excess of 3/16 in. (4.8 mm) in the sizes of adjacent tread depths or in the height of adjacent risers shall be prohibited, unless otherwise permitted in 7.2.2.3.6.3.

7.2.2.3.6.3.2 The variation between the sizes of the largest and smallest riser or between the largest and smallest tread depths shall not exceed 3/16 in. (9.5 mm) in any flight.

7.2.2.3.6.3.3 Where the bottom or top riser adjoins a sloping public way, walk, or driveway having an established finished ground level and serves as a landing, the bottom or top riser shall be
7.2.2.4.4 Direction. For standard stairs, at least one handrail shall be installed at a right angle to the leading edge of the stair treads.

7.2.2.4.5* Handrail Details.

7.2.2.4.5.1 New handrails on stairs shall be not less than 34 in. (865 mm), and not more than 38 in. (965 mm), above the surface of the tread, measured vertically to the top of the rail from the leading edge of the tread.

7.2.2.4.5.2 Existing required handrails shall be not less than 30 in. (760 mm), and not more than 38 in. (965 mm), above the surface of the tread, measured vertically to the top of the rail from the leading edge of the tread.

7.2.2.4.5.3 The height of required handrails that form part of a guard shall be permitted to exceed 38 in. (965 mm), but shall not exceed 42 in. (1065 mm), measured vertically to the top of the rail from the leading edge of the tread.

7.2.2.4.5.4* Additional handrails that are lower or higher than the main handrail shall be permitted.

7.2.2.4.5.5 New handrails shall be installed to provide a clearance of not less than 2¾ in. (57 mm) between the handrail and the wall to which it is fastened.

7.2.2.4.5.6 Handrails shall include one of the following features:

(1) Circular cross section with an outside diameter of not less than 1¼ in. (32 mm) and not more than 2 in. (51 mm)

(2)*Shape that is other than circular with a perimeter dimension of not less than 4 in. (100 mm), but not more than 6¼ in. (160 mm), and with the largest cross-sectional dimension not more than 2¼ in. (57 mm), provided that graspable edges are rounded so as to provide a radius of not less than ½ in. (3.2 mm)

7.2.2.4.5.7 New handrails shall be continuously graspable along their entire length.

7.2.2.4.5.8 Handrail brackets or balusters attached to the bottom surface of the handrail shall not be considered to be obstructions to graspability, provided that both of the following criteria are met:

(1) They do not project horizontally beyond the sides of the handrail within 1½ in. (38 mm) of the bottom of the handrail and provided that, for each additional ½ in. (13 mm) of handrail perimeter dimension greater than 4 in. (100 mm), the vertical clearance dimension of 1½ in. (38 mm) is reduced by ½ in. (3.2 mm).

(2) They have edges with a radius of not less than 0.01 in. (0.25 mm).

7.2.2.4.5.9 New handrail ends shall be returned to the wall or floor or shall terminate at newel posts.

7.2.2.4.5.10 In other than dwelling units, new handrails that are not continuous between flights shall extend horizontally, at the required height, not less than 12 in. (305 mm) beyond the top riser and continue to slope for a depth of one tread beyond the bottom riser.

7.2.2.4.5.11 Within dwelling units, handrails shall extend, at the required height, to at least those points that are directly above the top and bottom risers.

7.2.2.4.6 Guard Details. See 7.1.8 for guard requirements.
7.2.2.4.6.1 The height of guards required in 7.1.8 shall be measured vertically to the top of the guard from the surface adjacent thereto.

7.2.2.4.6.2 Guards shall be not less than 42 in. (1065 mm) high, except as permitted by one of the following:

(1) Existing guards within dwelling units shall be permitted to be not less than 36 in. (915 mm) high.
(2) The requirement of 7.2.2.4.6.2 shall not apply in assembly occupancies where otherwise provided in Chapters 12 and 13.
(3)* Existing guards on existing stairs shall be permitted to be not less than 30 in. (760 mm) high.

7.2.2.4.6.3* Open guards, other than approved existing open guards, shall have intermediate rails or an ornamental pattern such that a sphere 4 in. (100 mm) in diameter is not able to pass through any opening up to a height of 34 in. (865 mm), and the following also shall apply:

(1) The triangular openings formed by the riser, tread, and bottom element of a guardrail at the open side of a stair shall be of such size that a sphere 6 in. (150 mm) in diameter is not able to pass through any opening up to a height of 34 in. (865 mm), and the following also shall apply:
(2) In detention and correctional occupancies, in industrial occupancies, and in storage occupancies, the clear distance between intermediate rails, measured at right angles to the rails, shall not exceed 21 in. (555 mm).

7.2.2.5 Enclosure and Protection of Stairs.

7.2.2.5.1 Enclosures.

7.2.2.5.1.1 All inside stairs serving as an exit or exit component shall be enclosed in accordance with 7.1.3.2.

7.2.2.5.1.2 Inside stairs, other than those serving as an exit or exit component, shall be protected in accordance with Section 8.6.

7.2.2.5.1.3 In existing buildings, where a two-story exit enclosure connects the story of exit discharge with an adjacent story, the exit shall be permitted to be enclosed only on the story of exit discharge, provided that not less than 50 percent of the number and capacity of exits on the story of exit discharge are independent of such enclosures.

7.2.2.5.2* Exposures.

7.2.2.5.2.1 Where nonrated walls or unprotected openings enclose the exterior of a stairway, other than an existing stairway, and the walls or openings are exposed by other parts of the building at an angle of less than 180 degrees, the building enclosure walls within 10 ft (3050 mm) horizontally of the nonrated wall or unprotected opening shall be constructed as required for stairway enclosures, including opening protective.

7.2.2.5.2.2 Construction shall extend vertically from the finished ground level to a point 10 ft (3050 mm) above the topmost landing of the stairs or to the roofline, whichever is lower.

7.2.2.5.2.3 The fire resistance rating of the separation extending 10 ft (3050 mm) from the stairs shall not be required to exceed 1 hour where openings have a minimum 3/4-hour fire protection rating.

7.2.2.5.3* Usable Space. Enclosed, usable spaces within exit enclosures shall be prohibited, including under stairs, unless otherwise permitted by 7.2.2.5.3.2.

7.2.2.5.3.1 Open space within the exit enclosure shall not be used for any purpose that has the potential to interfere with egress.

7.2.2.5.3.2 Enclosed, usable space shall be permitted under stairs, provided that both of the following criteria are met:

(1) The space shall be separated from the stair enclosure by the same fire resistance as the exit enclosure.
(2) Entrance to the enclosed, usable space shall not be from within the stair enclosure. (See also 7.1.3.2.3.)

7.2.2.5.4* Stairway Identification.

7.2.2.5.4.1 New enclosed stairs serving three or more stories and existing enclosed stairs, other than those addressed in 7.2.2.5.4.1(P), serving five or more stories shall comply with 7.2.2.5.4.1(A) through 7.2.2.5.4.1(O).

(A) The stairs shall be provided with special signage within the enclosure at each floor landing.
(B) The signage shall indicate the floor level.
(C) The signage shall indicate the terminus of the top and bottom of the stair enclosure.
(D) The signage shall indicate the identification of the stair enclosure.
(E) The signage shall indicate the floor level of, and the direction to, exit discharge.
(F) The signage shall be located inside the stair enclosure.
(G) The bottom of the signage shall be located a minimum of 48 in. (1220 mm) above the floor landing, and the top of the signage shall be located a maximum of 84 in. (2135 mm) above the floor landing.
(H) The signage shall be in a position that is visible when the door is in the open or closed position.
(I) The signage shall comply with 7.10.8.1 and 7.10.8.2 of this Code.
(J) The floor level designation shall also be tactile in accordance with ICC/ANSI A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
(K) The signage shall be painted or stenciled on the wall or on a separate sign securely attached to the wall.
(L) The stairway identification shall be located at the top of the sign in minimum 1 in. (25 mm) high lettering and shall be in accordance with 7.10.8.2.
(M)* Signage that reads NO ROOF ACCESS shall designate stairways that do not provide roof access. Lettering shall be a minimum of 1 in. (25 mm) high and shall be in accordance with 7.10.8.2.
(N) The floor level number shall be located below the stairway identifier in minimum 5 in. (125 mm) high numbers and shall be in accordance with 7.10.8.2. Mezzanine levels shall have the letter “M” or other appropriate identification letter preceding the floor number, while basement levels shall have the letter “B” or other appropriate identification letter preceding the floor level number.
(O) Identification of the lower and upper terminus of the stairway shall be on the sign in minimum 1 in. (25 mm) high letters or numbers and shall be in accordance with 7.10.8.2.
7.2.2.5.4.2 Wherever an enclosed stair requires travel in an upward direction to reach the level of exit discharge, special signs with directional indicators showing the direction to the level of exit discharge shall be provided at each floor level landing from which upward direction of travel is required, unless otherwise provided in 7.2.2.5.4.2(A) and 7.2.2.5.4.2(B), and both of the following also shall apply:

(1) Such signage shall comply with 7.10.8.1 and 7.10.8.2.
(2) Such signage shall be visible when the door leaf is in the open or closed position.

(A) The requirement of 7.2.2.5.4.2 shall not apply where signs required by 7.2.2.5.4.1 are provided.

(B) The requirement of 7.2.2.5.4.2 shall not apply to stairways extending not more than one story below the level of exit discharge where the exit discharge is clearly obvious.

7.2.2.5.4.3* Stairway Tread Marking. Where new contrasting marking is applied to stairs, such marking shall comply with all of the following:

(1) They shall be placed on the wall with the bottom edge of the marking stripe consistent with the dimensional requirements for stair treads and shall be the same length as, and consistent with, the stripes on the steps.
(2) They shall continue across the floor in front of all doors.
(3) They shall not extend in front of exit doors leading out of the building.
(4) They shall be placed on the finished floor.

7.2.2.5.4.4* Where new contrast marking is provided for stairway handrails, it shall be applied to, or be part of, at least the upper surface of the handrail; have a minimum width of 1/2 in. (13 mm); and extend the full length of each handrail. After marking, the handrail shall comply with 7.2.2.4.5. Where handrails or handrail extensions bend or turn corners, the marking stripe shall be permitted to have a gap of not more than 1/2 in. (13 mm) from the leading edge of each step and shall not overlap the leading edge of the step by more than 1/2 in. (13 mm) down the vertical face of the step.

7.2.2.5.5 Exit Stair Path Markings. Where exit stair path markings are required in Chapters 11 through 43, such markings shall be installed in accordance with 7.2.2.5.5.1 through 7.2.2.5.5.11.

7.2.2.5.5.1* Exit Stair Treads. Exit stair treads shall incorporate a marking stripe that is applied as a paint/coating or be a material that is integral with the nosing of each step.

(A) The marking stripe shall be installed along the horizontal leading edge of the step and shall extend the full width of the step.

(B) The marking stripe shall also meet all of the following requirements:

(1) The marking stripe shall be not more than 1/2 in. (13 mm) from the leading edge of each step and shall not overlap the leading edge of the step by more than 1/2 in. (13 mm) down the vertical face of the step.
(2) The marking stripe shall have a minimum horizontal width of 1 in. (25 mm) and a maximum width of 2 in. (51 mm).

(3) The dimensions and placement of the marking stripe shall be uniform and consistent on each step throughout the exit enclosure.

(4) Surface-applied marking stripes using adhesive-backed tapes shall not be used.

7.2.2.5.5.2 Exit Stair Landings. The leading edge of exit stair landings shall be marked with a solid and continuous marking stripe consistent with the dimensional requirements for stair treads and shall be the same length as, and consistent with, the stripes on the steps.

7.2.2.5.5.3 Exit Stair Handrails. All handrails and handrail extensions shall be marked with a solid and continuous marking stripe and meet all of the following requirements:

(1) The marking stripe shall be applied to the upper surface of the handrail or be a material integral with the upper surface of the handrail for the entire length of the handrail, including extensions.

(2) Where handrails or handrail extensions bend or turn corners, the marking stripe shall be permitted to have a gap of not more than 4 in. (100 mm).

(3) The marking stripe shall have a minimum horizontal width of 1 in. (25 mm), which shall not apply to outlining stripes listed in accordance with ANSI/UL 1994, Standard for Luminous Egress Path Marking Systems.

(4) The dimensions and placement of the marking stripe shall be uniform and consistent on each handrail throughout the exit enclosure.

7.2.2.5.5.4 Perimeter Demarcation Marking. Stair landings, exit passageways, and other parts of the floor areas within the exit enclosure shall be provided with a solid and continuous perimeter demarcation marking stripe on the floor or on the walls or a combination of both. The marking stripe shall also meet all of the following requirements:

(1) The marking stripe shall have a minimum horizontal width of 1 in. (25 mm) and a maximum width of 2 in. (51 mm), with interruptions not exceeding 4 in. (100 mm).

(2) The minimum marking stripe width of 1 in. (25 mm) shall not apply to outlining stripes listed in accordance with ANSI/UL 1994, Standard for Luminous Egress Path Marking Systems.

(3) The dimensions and placement of the perimeter demarcation marking stripe shall be uniform and consistent throughout the exit enclosure.

(4) Surface-applied marking stripes using adhesive-backed tapes shall not be used.

(A) Perimeter floor demarcation lines shall comply with all of the following:

(1) They shall be placed within 4 in. (100 mm) of the wall and extend to within 2 in. (51 mm) of the markings on the leading edge of landings.

(2) They shall continue across the floor in front of all doors.

(3) They shall not extend in front of exit doors leading out of an exit enclosure and through which occupants must travel to complete the egress path.

(B) Perimeter wall demarcation lines shall comply with all of the following:

(1) They shall be placed on the wall with the bottom edge of the stripe not more than 4 in. (100 mm) above the finished floor.
7.2.2.5.5.6 Doors Serving Exit Enclosure. All doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel shall be provided with a marking stripe on the top and sides of the door(s) frame(s). The marking stripe shall also meet all of the following requirements:

1. The marking stripe shall have a minimum horizontal width of 1 in. (25 mm) and a maximum width of 2 in. (51 mm).
2. Gaps shall be permitted in the continuity of door frame markings where a line is fitted into a corner or bend, but shall be as small as practicable, and in no case shall gaps be greater than 1 in. (25 mm).
3. Where the door molding does not provide enough flat surface on which to locate the marking stripe, the marking stripe shall be located on the wall surrounding the frame.
4. The dimensions and placement of the marking stripe shall be uniform and consistent on all doors in the exit enclosure.

7.2.2.5.5.7 Door Hardware Marking.

(A) The door hardware for the doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel shall be provided with a marking stripe.

(B) The marking stripe shall also meet the following requirements:

1. The door hardware necessary to release the latch shall be outlined with an approved marking stripe having a minimum width of 1 in. (25 mm).
2. Where panic hardware is installed, both of the following criteria shall be met:
   a. The marking stripe shall have a minimum width of 1 in. (25 mm) and be applied to the entire length of the actuating bar or touch pad.
   b. The placement of the marking stripe shall not interfere with viewing of any instructions on the actuating bar or touch pad.

7.2.2.5.5.8 Emergency Exit Symbol. An emergency exit symbol with a luminescent background shall be applied on all doors serving the exit enclosure that swing out from the enclosure in the direction of egress travel. The emergency exit symbol shall also meet both of the following requirements:

1. The emergency exit symbol shall meet the requirements of NFPA 170, Standard for Fire Safety and Emergency Symbols.
2. The emergency exit symbol applied on the door shall be a minimum of 4 in. (100 mm) in height and shall be applied to the door, centered horizontally, with the top of the symbol not higher than 18 in. (455 mm) above the finished floor.

7.2.2.5.5.9 Uniformity. Placement and dimensions of the marking stripes shall be consistent and uniform throughout the same exit enclosure.

7.2.2.5.5.10 Materials. Exit stair path markings shall be made of any material, including paint, provided that an electrical charge is not required to maintain the required luminescence. Such materials shall include, but shall not be limited to, self-luminous materials and photoluminescent materials. Materials shall comply with one of the following:

1. ASTM E 2072, Standard Specification for Photoluminescent (Phosphorescent) Safety Markings, with the following exceptions:
   a. The charging source shall be 1 ft-candle (10.8 lux) of fluorescent illumination for 60 minutes.
   b. The minimum luminance shall be 5 millicandelas/m² after 90 minutes.
2. ANSI/UL 949, Standard for Luminous Egress Path Marking Systems

7.2.2.5.5.11 Exit Stair Illumination. Exit enclosures where photoluminescent materials are installed shall comply with all of the following:

1. The exit enclosure shall be continuously illuminated for at least 60 minutes prior to periods when the building is occupied.
2. The illumination shall remain on when the building is occupied.
3. Lighting control devices provided for illumination within the exit enclosure shall meet all of the following requirements:
   a. Lighting control devices that automatically turn exit enclosure lighting on and off, based on occupancy, shall be permitted, provided that they turn on illumination for charging photoluminescent materials for at least 60 minutes prior to periods when the building is occupied.
   b. Lighting equipment shall not be controlled by motion sensors.
   c. Lighting control devices that dim the lighting levels within the exit enclosure shall not be installed unless they provide a minimum of 1 ft-candle (10.8 lux) of illumination within the exit enclosure measured at the walking surface.

7.2.2.6 Special Provisions for Outside Stairs.

7.2.2.6.1 Access. Where approved by the authority having jurisdiction, outside stairs shall be permitted to lead to roofs of other sections of a building or an adjoining building where the construction is fire resistive and there is a continuous and safe means of egress from the roof. (See also 7.7.6.)

7.2.2.6.2Visual Protection. Outside stairs shall be arranged to avoid any impediments to their use by persons having a fear.
7.2.2.6.3 Separation and Protection of Outside Stairs.

7.2.2.6.3.1* Outside stairs shall be separated from the interior of the building by construction with the fire resistance rating required for enclosed stairs with fixed or self-closing opening protectives, except as follows:

1. Outside stairs serving an exterior exit access balcony that has two remote outside stairways or ramps shall be permitted to be unprotected.
2. Outside stairs serving two or fewer adjacent stories, including the story where the exit discharges, shall be permitted to be unprotected where there is a remotely located second exit.
3. In existing buildings, existing outside stairs serving three or fewer adjacent stories, including the story where the exit discharges, shall be permitted to be unprotected where there is a remotely located second exit.
4. The fire resistance rating of a separation extending 10 ft (3050 mm) from the stairs shall not be required to exceed 1 hour where openings have a minimum ¾-hour fire protection rating.
5. Outside stairs in existing buildings protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7 shall be permitted to be unprotected.

7.2.2.6.3.2 Wall construction required by 7.2.2.6.3.1 shall extend as follows:

1. Vertically from the finished ground level to a point 10 ft (3050 mm) above the topmost landing of the stairs or to the roofline, whichever is lower.
2. Horizontally for not less than 10 ft (3050 mm)

7.2.2.6.3.3 Roof construction required by 7.2.2.6.3.1 shall meet both of the following criteria:

1. It shall provide protection beneath the stairs.
2. It shall extend horizontally to each side of the stair for not less than 10 ft (3050 mm).

7.2.2.6.4 Protection of Openings. All openings below an outside stair shall be protected with an assembly having a minimum ¾-hour fire protection rating as follows:

1. Where located in an enclosed court (see 3.3.50.1), the smallest dimension of which does not exceed one-third its height
2. Where located in an alcove having a width that does not exceed one-third its height and a depth that does not exceed one-fourth its height

7.2.2.6.5 Water Accumulation. Outside stairs and landings, other than existing outside stairs and landings, shall be designed to minimize water accumulation on their surfaces.

7.2.2.6.6 Openness. Outside stairs, other than existing outside stairs, shall be not less than 50 percent open on one side. Outside stairs shall be arranged to restrict the accumulation of smoke.

7.2.3 Smokeproof Enclosures.

7.2.3.1 General. Where smokeproof enclosures are required in other sections of this Code, they shall comply with 7.2.3, unless they are approved existing smokeproof enclosures.

7.2.3.2 Performance Design. An appropriate design method shall be used to provide a system that meets the definition of smokeproof enclosure (see 3.3.257). The smokeproof enclosure shall be permitted to be created by using natural ventilation, by using mechanical ventilation incorporating a vestibule, or by pressurizing the stair enclosure.

7.2.3.3 Enclosure.

7.2.3.3.1 A smokeproof enclosure shall be continuously enclosed by barriers having a 2-hour fire resistance rating from the highest point to the level of exit discharge, except as otherwise permitted in 7.2.3.3.3.

7.2.3.3.2 Where a vestibule is used, it shall be within the 2-hour-rated enclosure and shall be considered part of the smokeproof enclosure.

7.2.3.3.3 A smokeproof enclosure comprised of an enclosed stair and serving floors below the level of exit discharge shall not be required to comply with 7.2.3.3.1 where the portion of the stairway below is separated from the stairway enclosure at the level of exit discharge by barriers with a 1-hour fire resistance rating.

7.2.3.4 Vestibule. Where a vestibule is provided, the door opening into the vestibule shall be protected with an approved fire door assembly having a minimum 1½-hour fire protection rating, and the fire door assembly from the vestibule to the smokeproof enclosure shall have a minimum 20-minute fire protection rating. Door leaves shall be designed to minimize air leakage and shall be self-closing or shall be automatic-closing by actuation of a smoke detector within 10 ft (3050 mm) of the vestibule door opening. New door assemblies shall be installed in accordance with NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives.

7.2.3.5 Discharge.

7.2.3.5.1 Every smokeproof enclosure shall discharge into a public way, into a yard or court having direct access to a public way, or into an exit passageway. Such exit passageways shall be without openings, other than the entrance to the smokeproof enclosure and the door opening to the outside yard, court, or public way. The exit passageway shall be separated from the remainder of the building by a 2-hour fire resistance rating.

7.2.3.5.2 The smokeproof enclosure shall be permitted to discharge through interior building areas, provided that all of the following criteria are met:

1. The building shall be protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.
2. The discharge from the smokeproof enclosure shall lead to a free and unobstructed way to an exterior exit, and such way shall be readily visible and identifiable from the point of discharge from the smokeproof enclosure.
3. Not more than 50 percent of the required number and capacity of exits comprised of smokeproof enclosures shall discharge through interior building areas in accordance with 7.7.2.

7.2.3.6 Access. For smokeproof enclosures other than those consisting of a pressurized enclosure complying with 7.2.3.9, access to the smokeproof enclosure shall be by way of a vestibule or by way of an exterior balcony.
7.2.3.7 Natural Ventilation. Smokeproof enclosures using natural ventilation shall comply with 7.2.3.3 and all of the following:

(1) Where access to the enclosure is by means of an open exterior balcony, the door assembly to the enclosure shall have a minimum 1/2-hour fire protection rating and shall be self-closing or shall be automatic-closing by actuation of a smoke detector.

(2) Openings adjacent to the exterior balcony specified in 7.2.3.7(1) shall be protected in accordance with 7.2.2.6.4.

(3) Every vestibule shall have a net area of not less than 16 ft^2 (1.5 m^2) of opening in an exterior wall facing an exterior court, yard, or public space not less than 20 ft (6100 mm) in width.

(4) Every vestibule shall have a minimum dimension of not less than the required width of the corridor leading to it and a dimension of not less than 6 ft (1830 mm) in the direction of travel.

7.2.3.8 Mechanical Ventilation. Smokeproof enclosures using mechanical ventilation shall comply with 7.2.3.3 and the requirements of 7.2.3.8.1 through 7.2.3.8.4.

7.2.3.8.1 Vestibules shall have a dimension of not less than 44 in. (1120 mm) in width and not less than 6 ft (1830 mm) in the direction of travel.

7.2.3.8.2 The vestibule shall be provided with not less than one air change per minute, and the exhaust shall be 150 percent of the supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate tightly constructed ducts used only for such purposes. Supply air shall enter the vestibule within 6 in. (150 mm) of the floor level. The top of the exhaust register shall be located not more than 6 in. (150 mm) below the top of the trap and shall be entirely within the smoke trap area. Door leaves, when in the open position, shall not obstruct duct openings. Controlling dampers shall be permitted in duct openings if needed to meet the design requirements.

7.2.3.8.3 To serve as a smoke and heat trap and to provide an upward-moving air column, the vestibule ceiling shall be not less than 20 in. (510 mm) higher than the door opening into the vestibule. The height shall be permitted to be decreased where justified by engineering design and field testing.

7.2.3.8.4 The stair shall be provided with a dampered relief opening at the top and supplied mechanically with sufficient air to discharge at least 2500 ft^3/min (70.8 m^3/min) through the relief opening while maintaining a positive pressure of not less than 0.10 in. water column (25 N/m^2) in the stair, relative to the vestibule with all door leaves closed.

7.2.3.9 Enclosure Pressurization.

7.2.3.9.1* Smokeproof enclosures using pressurization shall use an approved engineered system with a design pressure difference across the barrier of not less than 0.05 in. water column (12.5 N/m^2) in sprinklered buildings, or 0.10 in. water column (25 N/m^2) in nonsprinklered buildings, and shall be capable of maintaining these pressure differences under likely conditions of stack effect or wind. The pressure difference across door openings shall not exceed that which allows the door leaves to begin to be opened by a force of 30 lbf (139 N) in accordance with 7.2.1.4.5.

7.2.3.9.2 Equipment and ductwork for pressurization shall be located in accordance with one of the following specifications:

(1) Exterior to the building and directly connected to the enclosure by ductwork enclosed in noncombustible construction

(2) Within the enclosure with intake and exhaust air vented directly to the outside or through ductwork enclosed by a 2-hour fire-resistive rating

(3) Within the building under the following conditions:
(a) Where the equipment and ductwork are separated from the remainder of the building, including other mechanical equipment, by a 2-hour fire-resistive rating
(b) Where the building, including the enclosure, is protected throughout by an approved, supervised automatic sprinkler system installed in accordance with Section 9.7, and the equipment and ductwork are separated from the remainder of the building, including other mechanical equipment, by not less than a 1-hour fire-resistive rating

7.2.3.9.3 In all cases specified by 7.2.3.9.2(1) through (3), openings into the required fire resistance–rated construction shall be limited to those needed for maintenance and operation and shall be protected by self-closing fire protection–rated devices in accordance with 8.3.4.

7.2.3.10 Activation of Mechanical Ventilation and Pressurized Enclosure Systems.

7.2.3.10.1 For both mechanical ventilation and pressurized enclosure systems, the activation of the systems shall be initiated by a smoke detector installed in an approved location within 10 ft (3050 mm) of each entrance to the smokeproof enclosure.

7.2.3.10.2 The required mechanical system shall operate upon the activation of the smoke detectors specified in 7.2.3.10.1 and by manual controls accessible to the fire department. The required system also shall be initiated by the following, if provided:

(1) Waterflow signal from a complete automatic sprinkler system

(2) General evacuation alarm signal (see 9.6.3.6)

7.2.3.11 Door Leaf Closers. The activation of an automatic-closing device on any door leaf in the smokeproof enclosure shall activate all other automatic-closing devices on door leaves in the smokeproof enclosure.

7.2.3.12 Emergency Power Supply System (EPSS). Power shall be provided as follows:

(1) A Type 60, Class 2, Level 2 EPSS for new mechanical ventilation equipment shall be provided in accordance with NFPA 110, Standard for Emergency and Standby Power Systems.

(2) A previously approved existing standby power generator installation with a fuel supply adequate to operate the equipment for 2 hours shall be permitted in lieu of 7.2.3.12(1).

(3) The generator shall be located in a room separated from the remainder of the building by fire barriers having a minimum 1-hour fire resistance rating.

7.2.3.13 Testing. Before the mechanical equipment is accepted by the authority having jurisdiction, it shall be tested to confirm that it is operating in compliance with the requirements of 7.2.3. All operating parts of the system shall be tested semiannually by approved personnel, and a log shall be kept of the results.
7.2.4 Horizontal Exits.

7.2.4.1 General.

7.2.4.1.1 Where horizontal exits are used in the means of egress, they shall conform to the general requirements of Section 7.1 and the special requirements of 7.2.4.

7.2.4.1.2* Horizontal exits shall be permitted to be substituted for other exits where the total egress capacity and the total number of the other exits (stairs, ramps, door openings leading outside the building) is not less than half that required for the entire area of the building or connected buildings, and provided that none of the other exits is a horizontal exit, unless otherwise permitted by 7.2.4.1.3.

7.2.4.1.3 The requirement of 7.2.4.1.2 shall not apply to the following:

(1) Health care occupancies as otherwise provided in Chapters 18 and 19
(2) Detention and correctional occupancies as otherwise provided in Chapters 22 and 23

7.2.4.2 Fire Compartments.

7.2.4.2.1 Every fire compartment for which credit is permitted in connection with a horizontal exit(s) also shall have at least one additional exit, but not less than 50 percent of the required number and capacity of exits, that is not a horizontal exit, unless otherwise provided in 7.2.4.2.1.2.

7.2.4.2.1.1 Any fire compartment not having an exit leading outside shall be considered as part of an adjoining compartment with an exit leading to the outside.

7.2.4.2.1.2 The requirement of 7.2.4.2.1 shall not apply to the following:

(1) Health care occupancies as otherwise provided in Chapters 18 and 19
(2) Detention and correctional occupancies as otherwise provided in Chapters 22 and 23

7.2.4.2.2 Every horizontal exit for which credit is permitted shall be arranged so that there are continuously available paths of travel leading from each side of the exit to stairways or other means of egress leading to outside the building.

7.2.4.2.3 Wherever either side of a horizontal exit is occupied, the door leaves used in connection with the horizontal exit shall be unlocked from the egress side, unless otherwise permitted for the following:

(1) Health care occupancies as provided in Chapters 18 and 19
(2) Detention and correctional occupancies as provided in Chapters 22 and 23

7.2.4.2.4 The floor area on either side of a horizontal exit shall be sufficient to hold the occupants of both floor areas and shall provide at least 3 ft² (0.28 m²) clear floor area per person, unless otherwise permitted for the following:

(1) Health care occupancies as provided in Chapters 18 and 19
(2) Detention and correctional occupancies as provided in Chapters 22 and 23

7.2.4.3 Fire Barriers.

7.2.4.3.1* Fire barriers separating buildings or areas between which there are horizontal exits shall meet both of the following requirements:

(1) The barrier shall have a minimum 2-hour fire resistance rating, unless otherwise provided in 7.2.4.4.1.
(2) The barrier shall provide a separation that is continuous to the finished ground level, unless otherwise provided in 7.2.4.3.2. (See also Section 8.3.)

7.2.4.3.2* The separation required by 7.2.4.3.1(2) shall not be required to extend below the lowest level providing discharge to the exterior where both of the following are met:

(1) Stories below the lowest level providing discharge to the exterior do not have a horizontal exit.
(2) Stories below the lowest level providing discharge to the exterior are separated from the level above by a minimum of 2-hour fire resistance-rated construction.

7.2.4.3.3 Where a fire barrier provides a horizontal exit in any story of a building, such fire barrier shall not be required on other stories, provided that all of the following criteria are met:

(1) The stories on which the fire barrier is omitted are separated from the story with the horizontal exit by construction having a fire resistance rating at least equal to that of the horizontal exit fire barrier.
(2) Vertical openings between the story with the horizontal exit and the open fire area story are enclosed with construction having a fire resistance rating at least equal to that of the horizontal exit fire barrier.
(3) All required exits, other than horizontal exits, discharge directly to the outside.

7.2.4.3.4 Where fire barriers serving horizontal exits, other than existing horizontal exits, terminate at outside walls, and the outside walls are at an angle of less than 180 degrees for a distance of 10 ft (3050 mm) on each side of the horizontal exit, the outside walls shall be protected by one of the following methods:

(1) The outside walls shall have a minimum 1-hour fire resistance rating, with opening protections having a minimum ½-hour fire protection rating, for a distance of 10 ft (3050 mm) on each side of the horizontal exit.
(2) One of the outside walls shall have a 2-hour fire resistance rating with opening protections having a minimum 1½-hour fire protection rating, for a distance of 10 ft (3050 mm) from intersection with the horizontal exit.

7.2.4.3.5* Fire barriers forming horizontal exits shall not be penetrated by ducts, unless one of the following criteria is met:

(1) The ducts are existing penetrations protected by approved and listed fire dampers.
(2) The building is protected throughout by an approved, supervised automatic sprinkler system in accordance with Section 9.7.
(3) The duct penetrations are those permitted in detention and correctional occupancies as otherwise provided in Chapters 22 and 23 and are protected by combination fire dampers/smoke leakage–rated dampers that meet the smoke damper actuation requirements of 8.5.5.

7.2.4.3.6 Any opening in the fire barriers specified in 7.2.4.3.5 shall be protected as provided in 8.3.4.

7.2.4.3.7 Door assemblies in horizontal exits shall comply with 7.2.1.4, unless they are sliding door assemblies in industrial or storage occupancies as otherwise provided in Chapters 40 and 42.
7.2.4.3.8 Unless otherwise specified in 7.2.4.3.8.1 and 7.2.4.3.8.2, swinging fire door assemblies shall be permitted in horizontal exits, provided that the criteria of both 7.2.4.3.8(1) and (2), or the criteria of both 7.2.4.3.8(1) and (3), are met as follows:

(1) The door leaves shall swing in the direction of egress travel.
(2) In other than sleeping room areas in detention and correctional occupancies, where a horizontal exit serves areas on both sides of a fire barrier, adjacent openings with swinging door leaves that open in opposite directions shall be provided, with signs on each side of the fire barrier identifying the door leaf that swings with the travel from that side.
(3) The door assemblies shall be of any other approved arrangement, provided that the door leaves always swing with any possible egress travel.

7.2.4.3.8.1 The requirements of 7.2.4.3.8 shall not apply to horizontal exit door leaf swing as provided in Chapters 19 and 23.

7.2.4.3.8.2 The requirements of 7.2.4.3.8 shall not apply to horizontal exit door assemblies in corridors not more than 6 ft (1830 mm) wide in existing buildings.

7.2.4.3.9 Door leaves in horizontal exits shall be designed and installed to minimize air leakage. New door assemblies in horizontal exits shall be installed in accordance with NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives.

7.2.4.3.10 All fire door assemblies in horizontal exits shall be self-closing or automatic-closing in accordance with 7.2.1.8.

7.2.4.3.11 Horizontal exit door assemblies located across a corridor, other than approved existing door assemblies, shall be automatic-closing in accordance with 7.2.1.8.2.

7.2.4.4 Bridges Serving Horizontal Exits Between Buildings.

The provisions of 7.2.4.4 shall apply to bridges serving horizontal exits between buildings and to the associated horizontal exit fire barrier.

7.2.4.4.1 The minimum 2-hour fire resistance-rated barrier required by 7.2.4.3.1 shall extend as follows:

(1) Vertically from the ground to a point 10 ft (3050 mm) above the bridge or to the roofline, whichever is lower
(2) Horizontally for not less than 10 ft (3050 mm) to each side of the bridge

7.2.4.4.2 Any opening in the fire barrier addressed in 7.2.4.4.1 shall be protected with fire door assemblies or fixed fire window assemblies having a 3/4-hour fire protection rating, unless otherwise provided in 7.2.4.4.3.

7.2.4.4.3 The requirement of 7.2.4.4.2 shall not apply to approved existing bridges.

7.2.4.4.4 Where the bridge serves as a horizontal exit in one direction, the horizontal exit door leaf shall be required to swing only in the direction of egress travel, unless the door leaf complies with the swing requirements for the following:

(1) Existing health care occupancies in Chapter 19
(2) Existing detention and correctional occupancies in Chapter 23

7.2.4.4.5 Where the bridge serves as a horizontal exit in both directions, door leaves shall be provided in pairs that swing in opposite directions, with only the door leaf swinging in the direction of egress travel included when determining egress capacity, unless otherwise provided in 7.2.4.4.5.1 through 7.2.4.4.5.3.

7.2.4.4.5.1 Approved existing door assemblies on both ends of the bridge shall be permitted to swing out from the building.

7.2.4.4.5.2 The requirement of 7.2.4.4.5 shall not apply to existing bridges if the bridge has sufficient floor area to accommodate the occupant load of either connected building or fire area based on 3 ft² (0.28 m²) per person.

7.2.4.4.5.3 The requirement of 7.2.4.4.5 shall not apply to horizontal exit door leaf swing as provided for the following:

(1) Existing health care occupancies in Chapter 19
(2) Existing detention and correctional occupancies in Chapter 23

7.2.4.4.6 Every bridge shall be not less than the width of the door opening to which it leads and shall be not less than 44 in. (1120 mm) wide for new construction.

7.2.4.4.7 In climates subject to the accumulation of snow and ice, the bridge floor shall be protected to prevent the accumulation of snow and ice.

7.2.4.4.8 In existing buildings, one step not exceeding 8 in. (205 mm) shall be permitted below the level of the inside floor.

7.2.5 Ramps.

7.2.5.1 General. Every ramp used as a component in a means of egress shall conform to the general requirements of Section 7.1 and to the special requirements of 7.2.5.

7.2.5.2 Vehicle Ramps. Vehicle ramps in parking structures, as permitted in 42.8.2.2.6, and not an accessible means of egress or other accessible element, shall be exempt from the provisions of 7.2.5.

7.2.5.3 Dimensional Criteria. The following dimensional criteria shall apply to ramps:

(1) New ramps shall be in accordance with Table 7.2.5.3(a), unless otherwise permitted by the following:

(a) Table 7.2.5.3(a) shall not apply to industrial equipment access areas as provided in 40.2.5.3.
(b) The maximum slope requirement shall not apply to ramps in assembly occupancies as provided in Chapter 12.
(c) The maximum slope or maximum rise for a single ramp run shall not apply to ramps providing access to vehicles, vessels, mobile structures, and aircraft.

(2) Existing ramps shall be permitted to remain in use or be rebuilt, provided that they meet the requirements shown in Table 7.2.5.3(b), unless otherwise permitted by any of the following:

(a) The requirements of Table 7.2.5.3(b) shall not apply to industrial equipment access areas as provided in 40.2.5.3.
(b) The maximum slope or maximum height between landings for a single ramp run shall not apply to ramps providing access to vehicles, vessels, mobile structures, and aircraft.
(c) Approved existing ramps with slopes not steeper than 1 in 6 shall be permitted to remain in use.
(d) Existing ramps with slopes not steeper than 1 in 10 shall not be required to be provided with landings.