071. FIXED STAIRS AND RAMPS
01. Scope
02. Definitions
03. General Requirements
04. Stair Strength
05. Stair Width
06. Stairway Rise and Run
07. Aisles
08. Winding Stairs
09. Curved or Circular Stairways
10. Spiral Stairways
11. Length of Stairways
12. Ramps

071. FIXED STAIRS AND RAMPS. (7-1-97)

01. Scope: (7-1-97)

a. This section contains specifications for the safe design and construction of fixed stairs and ramps. This classification includes interior and exterior stairs around machinery, tanks and other equipment, and stairs leading to or from floors, platforms, or pits. (7-1-97)

02. Definitions. For definitions of other terms used in this section, see sub-section 010 of this standard. (7-1-97)

a. Handrail is a single railing provided for grasping with the hand, supported on brackets from a wall or partition, to provide support for persons using a stairway or ramp. (7-1-97)

b. Landing is an extended step or platform breaking a continuous run of stairs. (7-1-97)

c. Nose, Nosing is that portion of a tread projecting beyond the face of the riser immediately below. (7-1-97)

d. Open Riser is the air space between the treads of stairways without upright members (risers). (7-1-97)
e. Platform is a working space for persons, elevated above the surrounding floor or ground, such as a balcony, or platform for the operation or maintenance of machinery and equipment. (7-1-97)

f. Ramp is a walking surface in an accessible space that has a running slope greater than one (1) vertical to every twenty (20) horizontal (1:20). (7-1-97)

g. Rise is the vertical distance from the top of a tread to the top of the next higher tread. (7-1-97)

h. Riser is the upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread. (7-1-97)

i. Stairs, Stairway is a series of steps leading from one level floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees, or only occasionally by specific individuals. A series of steps and landings having two or more risers constitutes stairs or stairway. (7-1-97)

j. Stair railing is a vertical barrier erected along exposed sides of a stairway to prevent falls of persons. (7-1-97)

k. Tread is the horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread. (4-7-83)

l. Tread run is the horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread. (4-7-83)

m. Tread width is the horizontal distance from front to back of tread including nosing when used. (4-7-83)

03. General Requirements: (7-1-97)

a. Where fixed stairs or ramps are required they shall conform to the requirements of this section. (7-1-97)

b. Every stairway having two or more risers shall conform to the requirements of this section. (7-1-97)

c. Every ramp with a rise greater than one-in-twenty (1:20) shall conform with the requirements of this section. (7-1-97)

d. Fixed stairs shall be provided for access from one structure level to another where operations necessitate regular travel between levels and for access to operating platforms at any equipment which requires attention routinely during operations. Fixed stairs shall also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or to the harmful substances, or for which purposes the carrying of tools or equipment by hand is
normally required. It is not the intent of this section to preclude the use of fixed ladders for access to elevated tanks, towers and similar structures, overhead traveling cranes, etc., where the use of fixed ladders is common practice. Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than five (5) feet. (7-1-97)

**04. Stair Strength:** (7-1-97)

a. Fixed stairways shall be designed and constructed to carry a load of five (5) times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of one-thousand (1,000) pounds. (7-1-97)

**05. Stair Width:** (7-1-97)

a. Stairs serving an occupant load of fifty (50) or more shall have a minimum width of not less than forty-four (44) inches and meet the requirements of Subsection 040.08.m of this standard. (7-1-97)

b. Stairs serving an occupant load of forty-nine (49) or less may have a minimum width of not less than thirty-six (36) inches and meet the requirements of Subsection 040.08.m of this standard. (7-1-97)

c. Stairs used to attend equipment shall have a minimum width of twenty-two (22) inches. (0-0-00)

**06. Stairway Rise and Run:** (7-1-97)

a. Fixed stairs shall be installed at an angle to the horizontal of not more than fifty (50) degrees. (7-1-97)

b. Every stairway shall have a headroom clearance of not less than six (6) feet eight (8) inches except as specifically permitted elsewhere in this standard. Headroom clearances shall be measured vertically from a plane parallel and tangent to the stairway tread nosing to the soffit above all points. See Figure 071.06-A. (7-1-97)

**FIGURE 071.06-A**
Measuring headroom. The nominal 6 ft. 8 in. dimension is permitted for projections descending from the ceiling and for stairs.

c. The rise of every step in a stairway shall not be less than four (4) inches or greater than seven (7) inches except as specifically permitted elsewhere in this standard. (7-1-97)

d. The run of each step shall not be less than eleven (11) inches as measured horizontally between the vertical planes of the furthermost projection of adjacent threads except as specifically permitted elsewhere in this standard. See Figure 071.06-B. (7-1-97)

FIGURE 071.06-B

e. The rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs. The greatest riser height within any flight of stairs shall not exceed the smallest by more than three-eights (3/8) inch with no variation in height exceeding three-sixteenths (3/16) inch between adjacent risers except as specifically permitted elsewhere in this standard. The largest tread width within any flight of stairs shall not exceed the smallest by more than three-eights (3/8) inch except as specifically permitted elsewhere in this standard. EXCEPTION: Where the bottom or top riser adjoins a sloping public way, walk, or driveway having an established grade and serving as a landing, the bottom or top riser may be reduced along the slope to less than four (4) inches in height with the variation in height of the bottom or top riser not to exceed three (3) inches in every three (3) feet of stairway width. See Figure 071.06-C (7-1-97)
Permissible across-the-stair slope.

f. Each tread and the top landing of a stairway, where risers are used, shall not have a nose which extends more than one-half (1/2) inch beyond the face of the lower riser. Noses should have an even leading edge. All treads shall be reasonably slip-resistant and the nosings shall be of nonslip finish. Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design. Open grating type treads are desirable for outside stairs. (7-1-97)

g. Fixed stairs used to access maintenance areas, access unoccupied roofs, and used for construction shall be installed at angles to the horizontal of between thirty (30) degrees and fifty (50) degrees. Any uniform combination of rise/tread dimensions may be used that will result in a stairway at any angle to the horizontal within the permissible range. Table 071.06-A gives rise/tread dimensions which will produce a stairway within the permissible range, stating the angle to the horizontal produced by each combination. However, the rise/tread combinations are not limited to those given in Table 071.06-A. (7-1-97)

<table>
<thead>
<tr>
<th>Angle to Horizontal</th>
<th>Rise (in inches)</th>
<th>Tread run (in inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Deg 35'</td>
<td>6 1/2</td>
<td>11</td>
</tr>
<tr>
<td>32 Deg 08'</td>
<td>6 3/4</td>
<td>10 3/4</td>
</tr>
<tr>
<td>33 Deg 41'</td>
<td>7</td>
<td>10 1/2</td>
</tr>
<tr>
<td>35 Deg 16'</td>
<td>7 1/4</td>
<td>10 1/4</td>
</tr>
<tr>
<td>36 Deg 52'</td>
<td>7 1/2</td>
<td>10</td>
</tr>
<tr>
<td>38 Deg 29'</td>
<td>7 3/4</td>
<td>9 3/4</td>
</tr>
</tbody>
</table>
07. Aisles:

a. Aisles, with a slope steeper than one vertical to eight horizontal, in assembly rooms shall have steps that shall consist of a series of risers and treads extending across the entire width of the aisle. The height of the risers shall not be more than seven (7) inches or less than four (4) inches and the tread run shall not be less than eleven (11) inches. The riser height shall be uniform within each flight and the tread run shall be uniform throughout the aisle. Variations in run or height between adjacent treads or risers shall not exceed three-sixteenths (3/16) inch. A contrasting marking stripe or other approved marking shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of one (1) inch wide and a maximum of two (2) inches wide. EXCEPTION: When the slope of the aisle steps and the adjoining seating area is the same, the riser heights may be increased to a maximum of nine (9) inches and may be nonuniform but only to the extent necessitated by changes in the slope of the adjoining seating area to maintain adequate sight-lines. (7-1-97)

08. Winding Stairs: (7-1-97)

a. Winding stairs shall not be allowed except as specifically permitted elsewhere in this standard. Where allowed winders may be used if the required width of run, eleven (11) inches, is provided at a point not more than twelve (12) inches from the side of the stairway where the tread are narrower, but in no case shall any width of run be less than six (6) inches at any point. Winding stairs are permitted to be used in dwellings, lodging houses, and congregate residencies accommodating ten or less persons and as private stairways in hotels, apartment houses, and congregate residences accommodating more than ten persons. See figure 071.08-A. (7-1-97)
Acceptable winders.

09. Curved or Circular Stairways: (7-1-97)

a. Curved or circular stairways may be used as an exit component, provided the minimum width of the run is not less than ten (10) inches and the smaller radius is not less than twice the width of the stairway. Riser height and tread width shall meet the requirements of sub-section 071.06 of this section. See figure 071.09-A. (7-1-97)

FIGURE 071.09-A

Curved stairs. Dimension B must be at least twice A. Dimension C must be at least 11 inches.

10. Spiral Stairways: (7-1-97)

a. Spiral stairways may be used, for access to mechanical and maintenance areas, in dwellings, lodging houses, and congregate residences accommodating ten (10), five (5) after July 1, 2002, or less persons and as private stairways in hotels, apartment houses, and congregate residences accommodating more than ten (10) persons. Spiral stairways may be used, where allowed, for required exits when the area served is limited to four-hundred (400), two hundred fifty (250) after July 1, 2002, square feet. The tread must provide a clear walking area measuring at least
twenty-six (26) inches from the outer edge of the supporting column to the inner edge of the handrail. A run of at least seven and one-half (7 1/2) inches is to be provided at a point twelve (12) inches from where the tread is the narrowest. The rise must be sufficient to provide a six (6) foot six (6) inch head clearance. The riser height shall not exceed nine and one-half (9 1/2) inches. See figure 071.10-A. (7-1-03)

FIGURE 071.10-A

Spiral stairs. All treads must be identical, and the stair can serve a maximum occupant load of five persons.

11. Length of Stairways: (4-7-83)

a. There shall not be more than twelve (12) feet vertically between landings and the terminus of the stairs. Stairway landings shall be not less than the width of a stairway or the width of the door, which ever is the greater and a minimum of forty-four (44) inches in length measured in the direction of travel. See Figure 071.11-A (7-1-97)

FIGURE 071.11-A

Uniform width of stairs and intermediate landings. Intermediate landings provide level surfaces to facilitate recovering from trips and falls.
12. Ramps: (7-1-97)

a. Any part of an accessible route with a slope greater than one-in-twenty (1:20) shall be considered a ramp. The least possible slope shall be used for any ramp. The maximum slope of a ramp constructed after January 26, 1992 shall be one-in-twelve (1:12). A ramp slope greater than one-in-eight (1:8) is not allowed. (7-1-97)

b. The maximum slope for a service or construction ramp shall be one-in-eight (1:8). A ramp slope greater than one-in-eight (1:8) is not allowed. (7-1-97)

c. The maximum rise for any ramp run shall be thirty (30) inches between terminals, terminals and landings, or landings and landings. (7-1-97)

d. The maximum rise for a service or construction ramp run shall be sixty (60) inches between terminals, terminals and landings, or landings and landings (7-1-97)

e. The width of ramps shall be a minimum of forty-four (44) inches when serving an occupant load of fifty (50) or more. Ramps serving an occupant load of forty-nine (49) or less may have a minimum width of thirty-six (36) inches. (7-1-97)

f. Ramps shall have level landings at the top and bottom of the ramp and each ramp run. Landings shall comply with the following: the landing shall be as wide as the ramp leading to it; the landing length shall be a minimum of sixty (60) inches; and when ramps change directions at landings, the minimum landing size shall be sixty (60) inches by sixty (60) inches. (7-1-97)

g. Ramps having slopes greater than one-in-fifteen (1:15) and a rise greater than six (6) inches shall have handrails as required for stairways. Ramped aisles need not have handrails on sides serving fixed seating. (7-1-97)

h. The surface of ramps shall be roughened or shall be of slip resistant materials. (7-1-97)

i. Ramps shall have a headroom clearance of not less than seven (7) feet measured vertically from the finished floor surface of the ramp and landing to the soffit above at all points. (7-1-97)

j. Ramps and landings shall be of substantial and reliable construction and shall be maintained in that condition. (7-1-97)

k. Ramps and landings with drop-offs shall have curbs, walls, guardrails, or projecting surfaces that prevent slipping off the ramp or landing. Curbs, when used, shall be a minimum of two (2) inches high. (7-1-97)

l. Outdoor ramps, landings, and their approaches shall be designed and maintained so that water will not accumulate on the walking surface. (7-1-97)