

Industrial Buildings and Plant Layout

Stairs and walkways

Stairs are taking the place of ladders in boiler rooms and other places both inside and outside of buildings. Circular stairways should be avoided, but if absolutely necessary, should be designed with a minimum variation in tread width. Treads should be covered with a durable antislip material.

The preferred slope for a stairway is between 30 and 35 degrees from the horizontal (Fig 16-5 and Table 16-B). The most suit-

TABLE 16-B
SLOPE AND DIMENSIONS OF TREADS
AND RISERS

Angle of Stairway with Horizontal	Riser (inches)	Tread and Nosing (inches)
28° 27'	6½	12
29° 25'	6⅝	11¾
30° 25'	6¾	11½
31° 26'	6⅞	11¼
32° 28'	7	11
33° 32'	7⅛	10¾
34° 37'	7¼	10½
35° 44'	7⅝	10¼
36° 52'	7½	10
38° 2'	7⅞	9¾
39° 12'	7¾	9½
40° 25'	7⅞	9¼
41° 38'	8	9
42° 53'	8⅛	8¾
44° 9'	8¼	8½
45° 26'	8⅝	8¼
46° 44'	8½	8
48° 4'	8⅞	7¾
49° 24'	8¾	7½
50° 0'	8⅞	7⅝

able slope for a fixed ladder is from 75 to 90 degrees.

A tread width of not less than 9½ in. plus a nonslip nosing of 1 in. are recommended. Riser height should not be more than 8 or less than 5 in., and should be constant for each flight.

A flight of stairs having four or more risers

should have a standard handrail as specified in ASI Standard A12, *Safety Code for Floor and Wall Openings, Railings, and Toe Boards*. Rails should be 30 to 34 in. from the top surface of the stair tread, measured in line with the face of the riser. A center handrail is recommended for stairways over 88 in. wide. Consult applicable local and state codes.

Hardwood handrails should be at least 2 in. diameter. If standard black iron pipe is used, the diameter should be at least 1½ in. Clearance between the handrail and the wall should be at least 1½ in.

Rails are mounted directly on a wall or partition by means of brackets attached to the lower part of the handrail, to provide a smooth surface along the top and both sides of the handrail. Brackets should be spaced not more than 8 ft apart, and the mounting should be able to withstand a 200 pound load applied on the handrail.

Because of space limitations, a permanent stairway sometimes has to be installed at an angle above 50 degrees. Such an installation (commonly called an inclined ladder or "ship's ladder") should have handrails on both sides and open risers.

Design should not include long flights. Landings every tenth or twelfth tread are recommended by some authorities. At least one state limits the vertical distance between landings in factories to 12½ ft.

Adequate illumination by lights located so they do not cause glare is important. Outside stairways should be covered to keep off rain, snow and ice, if possible.

It is good practice to enclose all inside stairs with partitions of fireproof or fire-resistive material and to install approved fire doors to prevent the spread of smoke or flames from one floor to another. Check codes and insurance men about this.

Stairs and landings should be able to sustain a live load of not less than 100 pounds per square foot with a factor of safety of four.

The original plans should specify elevated walkways and platforms on tanks, bins, big machinery, and other places where men must go during normal operations or for maintenance purposes. Conveyors should be provided with crossovers having nonslip surfaces. Railings and toeboards should also be provided.

Many injuries are due to standing on im-