

# Safe Stairs ● ● ● Small Elevation Changes

V.P.I. & S.U. LIBRARY

DEC 9 1977

BLACKSBURG VIRGINIA



Single risers are often unnoticed (except at entrances) and may cause an injurious tripping fall.

Small abrupt elevation changes create hazardous situations because often the change is unnoticed or unrecognized. The unexpected change in the elevation of the walking surface can cause a bad fall. Considering the consequences, single risers in the residential scheme should be avoided. Stairs should have at least two or three risers, although a single riser is acceptable at the entrance stoop. At this location, the single riser is more easily recognized because of the activities associated with opening a door in preparation for entering or leaving the home, and a walking rhythm has not yet been established.

Where slight elevation changes are necessary, ramps can be used. In case a resident of the home is confined to a wheel chair, the ramp becomes a necessity and ease of negotiation is of prime concern. The maximum recommended slope for these ramps is 7 degrees.

## RECOMMENDATIONS:

To reduce the frequency of accidents associated with minor changes in elevation, the following recommendations deserve serious consideration:

- Single risers, both inside and outside the home shall be avoided.
- Use of a ramp if a wheel chair is a consideration. The use of ramp(s) shall incorporate a rise in slope of no more than 7 degrees.

Before building, consult the BOCA code.

Extension Division • Virginia Polytechnic Institute and State University • MI-154 • October 1977

Prepared by Helen L. Wells, Housing Specialist

Originally prepared for the Office of Research and Technology, U.S. Department of Housing and Urban Development,

"A Design Guide for Home Safety" HUD-RT-17 January 1972

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. W. R. Van Dresser, Dean, Extension Division, Cooperative Extension Service, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061.

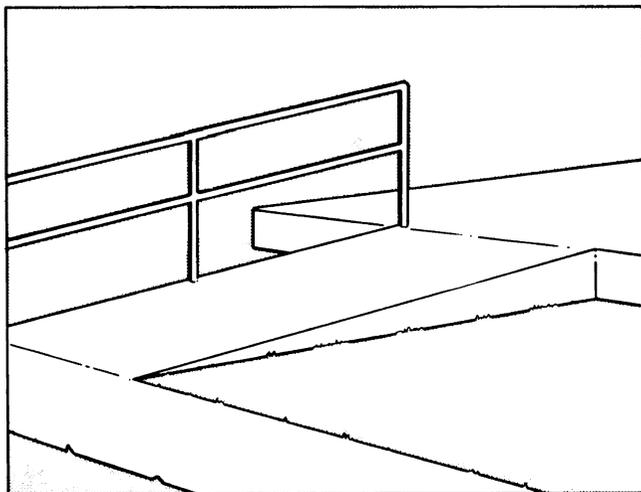
The Virginia Cooperative Extension Service by law and purpose is dedicated to serve all people on an equal and nondiscriminatory basis.  
An Equal Opportunity/Affirmative Action Employer

Changes in elevation for exterior applications may be accomplished by use of ramps and stepped ramps. A ramp would facilitate the movement of equipment and would provide ease of personnel movement. Ramps are normally easier and less expensive to fabricate than stairs. Design standards currently used by architects and engineers recommend the use of ramps with a slope of 7 to 15 degrees, although ramps with slopes of up to 20 degrees are permissible. A ramp that is too short is hazardous since it requires varying stride lengths to negotiate from one level to another. A ramp that is too long can be tiring. A considered optimum length of a ramp would be either one or three easy strides between starting and ending points or between sets of risers in the case of stepped ramps. (A stepped ramp is a combination of steps and ramps.) The ramp portion of stepped ramps need not be as steep as a ramp alone, thereby making the ascent and descent easier and more comfortable. The riser height and tread width of the step portion should be 5 and 15 inches, respectively, the same as for those which are normally used in the garden and not attached to the dwelling.

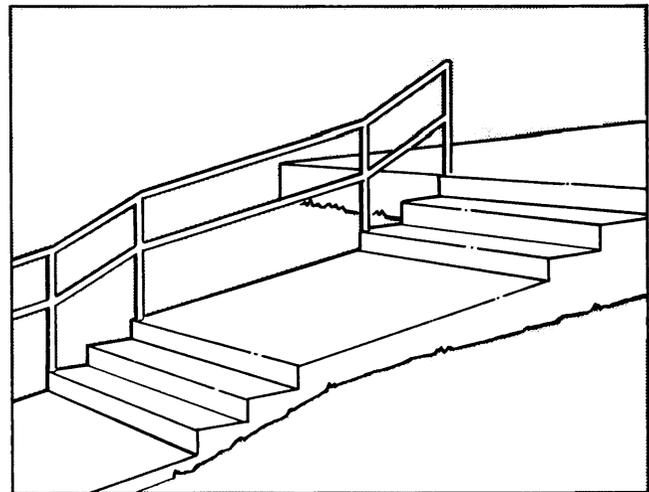
Ramps and stepped ramps present a similar slipping hazard as with stairs; therefore, they should have a natural or applied slip-resistant surface. Broom-finished concrete, rough brick or stone or application of slip-resistant safety strips or cleats would reduce the slipping hazard.

**RECOMMENDATIONS:**

**For consideration of safety in negotiating changes of elevation in exterior applications, the design of ramps and stepped ramps shall incorporate the following characteristics:**



**RAMP**



**STEPPED RAMP**

**Ramps**

- **Preferable slope of 7 to 15 degrees; maximum, 20 degrees.**

**Stepped Ramps**

- **Maximum riser height - 5 inches.**
- **Minimum tread width - 15 inches.**
- **Ramp gradient:**  
  
**Maximum - one degree (¼ inch per foot, or two percent).**  
  
**Minimum - one half degree (1/8 inch per foot, or one percent).**
- **Ramp Length:**  
  
**One or three easy strides (3 or 6 feet suggested).**
- **Overall Gradient:**  
  
**15 degrees - (3-1/4 inches per foot or 27.1 percent) or as low as 10 degrees (2-1/8 inches per foot or 17.7 percent) with 4-inch risers and 1 percent treads.**

The methods recommended for reducing slippery characteristics on ramps and stepped ramps shall be the same as those for stairs.