

City of Elkhorn

Commercial Building Permit  
Information Packet

Stairways and Ramps

## **Technical Requirements**

### **Applicable Code Sections :**

- 1003.3.3.3 Stair treads and risers
- 1003.3.3.3.1 Dimensional uniformity
- 1003.3.3.3.2 Profile
- 1003.3.3.5.1 Stairway walking surface

The technical requirements for stair treads, risers and profiles are:

- ? Risers shall be solid
- ? ½-inch maximum radius of curvature of leading edge of tread
- ? 1 ¼-inch maximum projection of leading edge of tread
- ? 11-inch minimum tread depth
- ? Riser height between 4 and 7 inches
- ? 30-degree maximum angle for riser
- ? ½-inch maximum beveling of nosings
- ? The slope of treads or landings shall not be more than one unit vertical in 48 units horizontal (1:48) in any direction.

## Comments

Tread, risers and profile requirements are the same for all exit stairs. The profiles of treads and risers contribute to stairway safety. The maximum radius of curvature at the leading edge of the tread is intended to allow descending foot placement on a surface that does not pitch the foot forward or allow the ball of the foot to slide off the treads. If a stairway design uses a beveled nosing configuration, the bevel is limited to a depth of ½ inch. Solid risers with either no nosing are required so that the user's foot does not catch while ascending the stairway (IBC 1003.3.3.3.2).

The exception establishes that open risers within dwelling units are allowed where these units are not otherwise required to be accessible.

## Scoping Requirements for Stairs

### Applicable Code Sections :

1003.2.13.2	Enclosed stairways
1003.2.13.5.1	Size
1003.3.3.1	Stairway width
1003.3.3.4	Stairway landings

A stairway cannot function as part of an accessible route because it cannot be utilized by a person in a wheelchair. However many of the technical requirements for stairs incorporate concerns for persons with visual or mobility impairments.

A stairway can function as part of an accessible means of egress because utilization is "assisted".

In a nonsprinklered building, the stairway shall have a minimum clear width between handrails of 48 inches and an area of refuge within or adjacent to the stair enclosure (IBC 1003.2.13.2). In a fully sprinklered building, the typical exit stairway requirements would apply (IBC 1003.3.3.1).

## Comments

The 48-inch clear width requirement permits space for a person in a wheelchair to be carried down the stairs. For the area of refuge to be in the stairway enclosure, the landing must be large enough to provide space for the wheelchair. An area of refuge adjacent to the stair is also an alternative. Since the wheelchair will remain there for a period of time awaiting further instructions or evacuation assistance, the exit must accommodate the wheelchair without obstructing the use of the exit by other occupants (IBC 1003.2.13.5.1 & 100.3.3.4) (see Figures 3P and 3Q).

In the case of a horizontal exit, the floor areas on either side of the horizontal exit are each considered to be areas of refuge by virtue of the construction and separation requirements for horizontal exits. The discharge area is always assumed to be the nonfire side and, therefore, is protected from fire. As such, a stairway located anywhere within the horizontal exit discharge area constitutes an accessible means of egress. **Exception 3** relieves the requirement for a minimum 48-inch clear stairway width for stairways that are accessed from a horizontal exit (see Figure 3R).

There are other circumstances under which the minimum required 48-inch clear width is not required.

**Exception 1** includes stairways that serve an individual dwelling unit or guestroom in residential occupancies. Since these stairways are commonly unclosed and are not intended for use by other than the occupants of that unit, the 48-inch-wide requirement is neither realistic nor necessary.

**Exception 2** exempts the 48-inch width requirement and the requirement that the stairway be accessible from an area of refuge or a horizontal exit for any occupancy that is equipped throughout with an automatic sprinkler system in accordance with NFPA 13. This exception recognizes the increased level of safety and evacuation time that is afforded in a sprinklered occupancy. The expectation is that a supervised system will reduce the threat of fire by reliably controlling and confining the fire to the immediate area of origin.

**Exception 4** permits stairways in open garages to be exempt from the area of refuge and 48-inch width requirement. Stairways in open parking garages are typically unenclosed. This is permitted due to the low fire hazard within the space.

With all four exceptions, the minimum clear width for stairs in IBC 1003.3.3.1 would be applicable.

# Ramp Requirements

## Applicable Code Sections:

1003.2.7	Elevation change
1003.3.4	Ramps (and all subsections)
1008.9	Assembly aisle walking surfaces
3408.7.4	Ramps

## Applicable Standard Sections:

303	Change in Level
405	Ramps (and all subsections)

A ramp is not a ramp when it is a sloped walk. When a walking surface has a 5 percent slope (i.e., 1-inch rise to a 20-inch run) or less, it is considered a sloped walk and not a ramp (IBC 1003.2.7, ICC A117.1 405.1). In general, ramps must have a slope between 5 percent minimum and 8 percent maximum (IBC 1003.3.4.1, ICC A117.1 405.2).

Ramps are utilized to negotiate changes in elevation, most typically changes less than a story in height. All ramps that are intended to serve as an accessible route or are utilized by the general public for access and means of egress must meet the same technical requirements. The exceptions are for ramps utilized for other purposes (e.g., ramps at a loading dock or service entrance, IBC 1003.3.4.1), ramps within assembly spaces (e.g., theaters, ballparks, IBC 1008.9) or ramps utilized for small elevation changes in existing buildings (i.e., less than 6-inch rise, IBC 3408.7.4).

Both the IBC and ICC standard address requirements for ramps. Only the standard addresses requirements for curb ramps. There has been a concerted effort to coordinate the ramp requirements in both. Not all requirements for ramps are addressed in the ICC technical document. The building code takes into consideration means of egress concerns that are in addition to the accessibility concerns addressed in the standard. The main points are as follows:

- ? **Changes in Level:** Look for the elevation changes at the end of a ramp or at the change from a ramp to a landing. A change in elevation of ½ inch at the bottom of a ramp could stop a person utilizing a wheelchair from even getting on to the ramp. This would also constitute a tripping hazard for anyone with mobility impairments (ICC A117.1 303).
- ? **Ramp and Landing Surfaces:** The ramp must be constructed of materials consistent with the type of construction, similar to stairways (IBC 1003.3.4.6). The surface material must be stable and slip resistant (IBC 1003.4.6.1). There is not a referenced standard to determine a value for slip resistance. The current testing available did not provide a consistent

result. If the ramp is exposed to adverse weather conditions, the ramp should also be designed to reduce the accumulation of water, ice or snow on the ramp surface (IBC 1003.3.4.6.2, ICC A117.1 405.10).

- ? **Minimum Width:** The width of a ramp is determined by a combination of the anticipated occupant load and the minimum width as required for exit access corridors. In no case may a ramp provide less than 36 inches clear between handrails, similar to an accessible route (IBC 1003.3.4.4.1, ICC A117.1 405.5). In addition, a ramp may not reduce in width in the direction of egress travel (IBC 1003.3.4.4.3), similar to exit stairways.
- ? **Maximum Rise:** The maximum rise between landings is 30 inches (IBC 1003.3.4.3, ICC A117.1 405.6). Many people that utilize ramps have stamina limitations as well as mobility impairments. Landings spaced at every 30 feet provide a level space to rest as a long ramp is negotiated.
- ? **Adequate Landings:** Landings must be located at the top and bottom of each ramp run, points of turning and at any doors located along the ramp (IBC 1003.3.3.4.5, ICC A117.1 405.7). This isn't intended to prohibit a curved ramp as long as the slope and cross slope criteria can be met. Landings must be level (IBC 1003.3.4.5.1, ICC A117.1 405.7.1). Where the path of travel along the ramp is a straight line, the landing is required to be as wide as the ramp is a straight line, the landing is required to be as wide as the ramp run and a minimum of 60-inches deep (IBC 1003.3.4.5.2, 1003.3.4.5.3, ICC A117.1 405.7.3, 405.7.4). At locations where ramps change direction, a ramp that permits a 60-inch turning circle is required (IBC 1003.3.4.5.4, ICC A117.1 405.7.4).

### **Figure 405.7**

If a doorway opens onto a landing the swing of the doorway cannot reduce the clear width of the landing to less than 42-inches (IBC 1003.4.3.3). The maneuvering space for the door may overlap the landing, but not the ramp (IBC 1003.3.4.5.5, ICC A117.1 405.7.5).

- ? **Edge protection:** It is a concern that when a wheelchair user is traveling along a ramp, a momentary loss of control could send him or her off the ramp; therefore, some type of edge protection is required. For ramps with guards, the opening limitations would allow for only a four-inch opening between the ramp surface and the bottom of the guard (IBC 1003.2.12.2). This would form an effective edge protection (IBC 1003.3.4.8.2, ICC A117.1 405.9.2). Note that the standard does address requirements for guards. It is when the ramps are equipped with handrails, but not guards, that the IBC and ICC A117.1 are slightly different in their requirements. Both require some type of edge protection along all ramps. The exceptions listed are applicable to curb ramps and ramp landings (IBC 1003.3.4.8, ICC 405.9). Both offer the alternative that edge protection may be provided by a four-inch high curb or a bar located at four-inches above the ramp (IBC 1003.3.4.8.2, ICC 405.9.2). The IBC allows edge protection to

be provided by a bar located midway between the ramp surface and the handrail (IBC 1003.3.4.8.1). The standard does not require the curb or bar if the ramp surface is at least 12-inches past the inside face of the handrail (ICC A117.1. 405.9.1).

## **Comments:**

The design of a safe and usable ramp is critical for accessibility to a space. Items that can result in a temporary loss of control or fall are of great concern. Collection of snow, ice or debris on a ramp can be very hazardous. An incorrect cross slope can also pitch a wheelchair user towards the side of the ramp. Edge protection is critical to prevent the small caster wheels or a crutch tip from slipping off the edge surface. From a design aspect, a 4-inch curb is permitted. However, the chances of debris collection are greater than with a 4-inch high bar. Guards are not required until the drop-off is greater than 30-inches, however, if someone does fall or stumble on a ramp, he or she could pitch sideways under the handrail.

# Guards and Handrails

## Applicable Code Sections:

1003.2.5	Protruding objects
1003.2.12	Guards
1003.3.3.11	Handrails (Stairways)
1003.3.4.7	Handrails (Ramps)
1003.3.4.8	Guards (Ramps)

Guards minimize the possibility of a fall from a path to an area below. Handrails are for guidance and support.

## Comments

For the visually impaired, handrails provide guidance as to the top, bottom and continuation of stairways. Handrails also support the physically impaired and elderly. Handrail extensions must be detailed in such a manner as to be detectable by a visually impaired person so that the extensions do not become a hazard to an individual walking perpendicular to the stair run.

Guards are required at elevated walking surfaces adjacent to drop-offs more than 30 inches. Handrails are required on both sides of stairs and at ramps with a riser greater than 6-inches. Intermediate handrails are required so that all portions of a required stair width are within 30 inches, and on monumental stairs along the most direct path of travel (see figures 3T and 3U).

Guards must be 42 inches in height. Along stairways within individual dwelling units, guards may be 34-inches to 38-inches high.

Handrails shall be continuous. The adjacent surface shall be free of sharp or abrasive objects, with a clear space greater than 1½ inches. Handrails must not project more than 4½ inches into the required width of the path of travel. A 36-inch minimum clear width between handrails must be maintained along a ramp. Heights for handrails are between 34-inches and 38-inches. (see Figure 3V). If guards are required a separate handrail must be provided inside the guard.

Where not continuous, handrails shall extend 12 inches beyond the top riser and one tread depth beyond the bottom riser at a stair; or 12 inches beyond the top and bottom of a ramp. Handrails shall have a circular cross section between 1¼ and 2 inches in diameter, or approved rails or equivalent graspability (IBC 1022.2.5)(see Figure 3W).

Guards and handrails shall be designed to resist loads specified in ASCE 7. All handrails must be of sturdy construction and be designed to resist a 200-pound concentrated force applied in any direction and at any point on the rail between supports. With the exception of handrails within one- and two-family dwelling units and limited areas in I-3, F, H and S occupancies, handrails must also be capable of sustaining a uniform force of 50 pounds per linear foot applied in any direction. The 200-pound concentrated load and the 50-pound linear load are not to be applied simultaneously (IBC 1607.7).

## Comments

For handrails at stairways, ICC A117.1 Section 505.10.3 and the current ADAAG require a 12-inch horizontal handrail in addition to the sloped rail bottom extension. The 12-inch horizontal extension was a requirement in the *Model Building Code* until 1992. It was removed as a coordination effort with CABO 117.1-1992. At the time the technical standard only required a 12-inch horizontal extension if there was space. Since the ICC A117.1 requirements for stair handrails are not referenced by the IBC, the 12-inch extension is not a code requirement. However, if a builder does provide this extension, he or she is providing something in excess of code requirements.

