ICC Code Technology Committee
Climbable Guards Area of Study

Preliminary Analysis
July 7, 2005

Scope & Objectives
Approved 4/14/05

Scope:

The study of climbable guards will focus on determining the need for appropriate measures to prevent or inhibit an individual from utilizing the elements of a guard system, including rails, balusters and ornamental patterns, to climb the guard, thereby subjecting that person to the falling hazard which the guard system is intended to prevent.

Objective:

The objective of this investigation includes a determination of the parameters necessary in order to achieve code requirements for providing necessary and reasonable protection against the climbing of guards. These parameters include, but are not limited to:

1. Reviewing code development history.
2. Demographics of persons to be protected.
3. Identify occupancies where protection is required.
4. Acquire and review statistical injury data related to the scope of the study.
5. Identify patterns or arrangements of guard elements which implement or prohibit climbing by those meeting the demographics.
6. Develop code requirements which are responsive to identified public safety needs while providing reasonable latitude for the design and construction of alternative guard systems.
7. Develop an impact statement concerning the probable reduction of deaths and injuries resulting from a code requirement.

Work Product:

A report produced in accordance with Section 5.1 of CP #5 shall be submitted to the ICC CEO. The CTC Secretariat shall process the report according to the codes/standards development process of the ICC.

Summary Statement:

In a review of the literature available, in particular the information from the National Center for Injury Prevention and Control, falls are the leading cause of injury and deaths in the age groups of 14 and under. Falls out of or through a building structure (37.8%) and falls from one level to another (16.2%) are by far the leading causes of injury to people in this age group. However, the data related to these falls does not include the detail needed to determine if the fall was related to the interaction with building guards or railings. A review of the information from various states (California, Nebraska, Texas) reporting fall data confirms the information from the national statistics concerning the injuries and deaths related to falling. The most specific information available on falls related to guards was found in the referenced documentation from the Injury Prevention Center of Greater Dallas, *Childhood Injuries due to falls from apartment balconies and windows*. In regard to balconies, the Dallas study specifically stated that the major problem with falls from balconies were the results of railings with spacing more than 4 inches. Detail information in the Dallas study does provide more information on falls reporting that of the falls in which they were able to obtain more detailed information 11 falls (65%) were falls relate to spacing between railings with 5 falls (29%) related to the child climbing over the rails. However, there is no discussion on how these percentages relate to the total number of falls or the type of railing involved.

Climbable Guards/The Ladder Effect:

The referenced articles by Elliot Stephenson, *Climbable Guards, Special Enemy of the World's Children* and Tony Leto, *The Ladder Effect*, take opposite positions on the issue of climbable guards and the data supporting the need for guards that cannot be climbed by young people. The Stephenson information, supported by documentation on falls, does provide information on the number of injuries resulting from falls and jumping from balconies, decks and porches. It also mirrors the information discussed above that falls are a major cause of injuries for young people. However, as questioned in the article by Leto, and further detailed in the justification to proposed change RB 46-00, the Stephenson documentation does not specifically tie the falls to the design of the guard or that the fall was the result of the child climbing the guard.

Designs for Nonclimbable Guards:

Climbable Guards, Special Enemy of the World's Children by Stephenson is most important in the documentation of what is and is not a climbable guard. Testing in several countries has shown that even young children have the ability to climb over various guard configurations. Stephenson condenses his investigations into the following principle conclusions:

1. "Children in the two-year old group were possibly at their most dangerous age. They could climb some guards but did not yet have the knowledge to prevent injury."
2. "The three-year olds were able to use their knees and body strength more effectively than the two-year olds to leverage themselves over many of the guards."
3. "The four-year olds were able to climb almost all of the guards. The exception was the guard having verticals spaced at four inches apart extending to the top rail from a single toe hold four inches above the floor."
4. "A series of horizontal projections extending only four-tenths of one inch from the solid plywood face of a guard and spaced 12 inches apart vertically provided sufficient toe hold for some of the three-year olds to climb the guard."

The above summaries are supported by the documentation with some clarification. To be able to climb the guards the four-year olds needed to have something to grab onto so they could wedge their feet against the guard. In addition, some of the guards tested had openings at the top large enough for a child to get through and thus the children were able to climb through the guard, not over.

Stephenson concludes that codes limiting the design of guards to ones that do not provide a ladder effect do not provide the proper guidance to establish a guard that children cannot climb. He concludes that there are only three guard designs that will effectively prevent two- and three-year old children from climbing them:

1. A guard with a flexible wire at the top. However, he notes that this would not be a practical application at most locations.

2 & 3.Two guard designs having only vertical elements in all of their parts except the bottom and top 4 inches. He pictures these on the last page of the article as guards B and C.

Code Development History:

Current IBC Code Provision:

Section 1012.3 Opening limitations. Open guards shall have balusters or ornamental patterns such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 34 inches (864 mm). From a height of 34 inches (864 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.

Exceptions: Not affected.

Note: Proposed code change E62-04/05 recommended for approval revises the opening to 4 3/8 inches.

Current IRC Code Provision:

R312.2 Guard opening limitations. Required guards on open sides of stairways, raised floor areas, balconies and porches shall have intermediate rails or ornamental closures which do not allow passage of a sphere 4 inches (102 mm) or more in diameter.

Exceptions: Not affected.

Proposals with various approaches to not allow climbable guards have been proposed and rejected by the code development committees and the membership during the 2000-2004/2005 code development cycles. The proposals contained several terms that were not defined and hard to define. The proposals included the terms “ladder effect”, “horizontal rails”, “climbable guard”, “foothold”, and “toehold”. Following are examples of the reasons given for the rejections:

1. The phrase “that is designed to inhibit climbing by children” is vague and would lead to nonuniform enforcement. The list of occupancies is not consistent with those occupancies where children would likely to be present.
2. The proposed text includes vague language that would lead to nonuniform enforcement. The reason for specifying children under the age of 7 years has not been justified.
3. The definition is open for interpretation. For example: Is a “toe hold” with shoes or barefoot? Is the “walking surface” the surface adjacent to the guard at the high side or the low side?

Possible Code Provision for Guards that Children Cannot Climb:

Following is a possible revision to Section 1012.3 of the IBC that would prevent a climbable guard should the CTC determine a justified reason to support a change requiring guards that cannot be climbed. A similar change would be required for the IRC.

Section 1012.3 Opening limitations. Guards shall be solid panels or have smooth vertical balusters with no protrusions or ornamental patterns that will allow the passage of a 4-inch (102 mm) sphere though any opening between 4inches (102 mm) and 38 inches (966 mm) above the adjacent walking surface. Openings in the guard below 4 inches (102 mm) and above 38 inches (966 mm) shall not allow the passage of a 4-inch (102 mm) sphere.

Note: If proposal E62-04/05 is approved the 4-inch restriction would be revised to 4 3/8 inches.

Exceptions: To remain unchanged.

References

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International Code Council, *Climbable Guards, ICC Code Change History 2000-2004/2005* (International Code Council)

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International Code Council, *Proposed Change E62-04/05* (International Code Council)

U. S. Consumer Product Safety Commission, National Injury Information Clearinghouse, *Porches, Balconies, Open Side Floors, & Floor Openings; Children 6 and Younger, January 1993-May 1998* (National Electronic Injury Surveillance System)

Leto, Tony, *The Ladder Effect, Ornamental & Miscellaneous Metal Fabricator, July/August 2000*

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