

# Design Safety Barriers of Balconies and Windows from Decorative Iron Sections

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**Abstract** - The majority of houses, schools, sports areas, libraries, hotels, etc. owners usually decide to set up decorative wrought iron balcony and windows barriers for houses. It has Durability and strength and affordable that is this type of distinctive mixture of features. When set up wrought iron balcony railings it may be certain that they'll final a life time with no unnecessary stress to complete lots of restore and maintenance feature. Therefore, decorative wrought iron barriers placed for protection, but some designs have led to numerous incidents. Falls from windows and balconies are the leading cause of fatal and nonfatal unintentional injury in the home setting, Falls are one of the highest causes of injury among children. The potential for serious injury is greater as the height increases; however the number of injuries from low-height falls is much greater, rowing concerns over safety in houses and schools have led many districts to consider the implementation of new, more stringent security measures. The use of barriers to bolster houses and schools security – often as part of broader safety plans. Child safety barriers are intended to protect children from hazards and accident. Therefore, the problem of this study as: In many public areas barriers are needed to prevent falls. Usually these provide adequate protection for adults, however the protection provided for children is often very poor. Where the spaces between barriers and the openings in ornamental railings can present a hazardous invitation to children at play. The normal inquisitive child will climb his hands, feet, and head into openings which appear to be large enough to accommodate them, often with painfully disastrous results. Design aspects in relation to barriers needed to prevent falls of children. Design details that either facilitate or impair a young child's ability to climb. It is not always clear precisely what the physical design attributes were. The aim of this study was to analyse of barriers design for balconies and windows from decorative iron to improve the design of this barriers in the built environment, thereby safety to children. Be applied guards are required by most building codes to protect children from falling off the edges of balconies windows. So the research studied structure of elements of balconies originated from wrought iron, codes definitions window guards & balcony barriers metals and children's interaction with the built environment. Therefore, the results of this research show that when designing window guards & balcony barriers metals it must reduce the number of accidents involving falls by preventing the risk in specifications and design, manufacture and installation of safety barriers.

**Key words:** Child safety, fall, Balcony barriers, Window Guards, decorative iron.

## 1. INTRODUCTION

Balcony barriers & Window Guards are one of the leading types of structural decoration. They are special in the forms

of openings and their decorative ornaments. We can state that the forms of openings of the entrance portals and windows are usually rectangular.(1) Balconies are typically one of the most visible elements of a façade; they are key elements in determining its style, and play a significant role in its appearance. An integral feature of build is bay windows that provide facades more additional expressive volume and silhouette. Balconies provide residents with great enjoyment and direct access to fresh air and the outdoors. A balcony is also a horizontal surface exposed to the outdoors with a walking surface, however, it typically projects from the building and it is not located over an enclosed living space below. Balconies project from the face of the building, normal depth generally Balcony 3 to 4 feet.(2)

The designer should be aware of their duties in relation to all potential users, including children. Obviously children will be present in places like houses schools, child-care centers and shopping centers and design for children should be a clear requirement. However, in other public places, it is foreseeable that children will be present. This includes many workplaces, entertainment areas, sports areas, libraries, hotels, etc. Falls are among the highest causes of injury and a proportion of these injuries are fatal.

Children are a vulnerable group in society. They have a natural curiosity and climbing is a natural behavior for them. They can and will climb windows and balconies in their environment. Climbing is a natural childhood activity and plays a significant role in the emergence of coordinated and symmetrical motor skills and as they grow older they will climb more and more challenging objects in their environment and their climbing ability will improve. Two distinct categories of fall were noted. The first children under six years of age and were, in the main, falls from windows. The second group consisted of accidents involving older children and were associated with a wider range of often deliberate behaviour (balancing games, imitation, dares, flight from danger and, more rarely, suicide. These accidents were mainly falls from balconies.(3)

Toddlers, often avid climbers busy exploring their world without aid of experience, are particularly prone to fall from windows and balconies because their climbing ability is not matched by balancing or reasoning ability. Their small bodies can slip between widely spaced guardrail uprights, sometimes trapping the head, or their

climbing abilities may allow them to fall over top if they can gain a foothold. (4) The tall children were more likely to succeed in climbing the barriers, the psychological aspects are considered. For different children the physical properties are blended with psychological ones. It appears that both an inherent talent and agility, and living conditions such as the presence of brothers and sisters etc. play important roles for the total capacity of being a good climber. (5)

Therefore, it is difficult to determine age or height ranges that are protected within a safety margin. (6) Falls from windows or balconies are among the most common types of unintentional injuries to children and they are a major public health concern, especially in urban communities. (7) For example in the United States, about one third of all unintentional injuries occur in the home environment. Most of these injuries occur in young children and the elderly. (8) Window or balcony falls the child used a nearby chair, sofa, bed, bedside table, or window ledge to climb to the window or child fell from between the balcony rails were made of metal falls the balconies were made of metal and in 11 instances the children had fallen between the balcony rails which were at least 5 in (13 cm) apart. All of the apartments involved were built prior to 1984 when the building code allowed for a rail spacing of up to 9 in (23 cm). (9)

Window guards are metal installed in windows in order to keep young children from climbing out and being killed or injured. Young children may not understand the danger of an open window and may fall to their death at a moment when no older person is watching them. Guardrails can be constructed of metal. The guardrails

By 1700 sash-windows had already proved their worth in the eyes of a large section of the English population as domestic windows par excellence-their advantages over traditional window forms being hailed as the sign of a modern age of light, comfort and luxury [5].

However, was the significant progress made during the latter half of the eighteenth century in the industrial production of wrought iron. Fear of fire even more than economic considerations was the reason for the increased use of iron in industrial buildings during the eighteenth century. The Industrial Revolution began to provide the technology to overcome the drawbacks of the earlier form of metal window. Metals also had distinct properties of their own such as incombustibility, superior strength and pliability which gave them important practical and aesthetic advantages over wood. (12)

require special attention is at the bottom, where the guardrail may be fastened directly through to the horizontal surface of the balcony

## 2- THEORETICAL AND ANALYSIS STUDIES

### 2.1. Windows and balconies originated from wrought iron

Windows and balconies have become the most distinct structural elements of façade decoration. The architectural object is often estimated at first by the finishing of its façades. Historically, porches, galleries and balconies were an outside room where property owners could find a sheltered transition into their buildings, exterior living space, a place to meet and converse with neighbors and welcome visitors.

During the 1660s. In the hands of the inventive English craftsmen and architects the new window type was soon transformed into what we now know as the sash-window. (10) For example used many wrought iron windows still survive *in situ* in historic houses in Somerset. From the time when glass became generally available to the introduction of sash windows they were fitted in all elevations in all types of house. Sash windows were available from the 1660s but at first they were installed only in palaces and the greatest houses. (11)



Fig. 1. A wrought iron window of the 16th century

The visual effect achievable with wrought iron ranged from simple, straight, geometric designs to curvilinear, organic designs. In general, wrought iron is light in appearance and uses only enough material to achieve the desired design. In contrast, cast iron usually appears more massive (larger designs were usually hollow but appear solid) with highly repetitive design elements. Many nonstructural uses of wrought iron were only minimally decorative. (13) Cast-iron failed to gain a foothold as a suitable constructional material for windows in the eighteenth century other than in relatively restricted categories of use where cost, security and fire resistance were of overriding importance. (14)

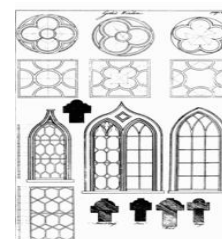
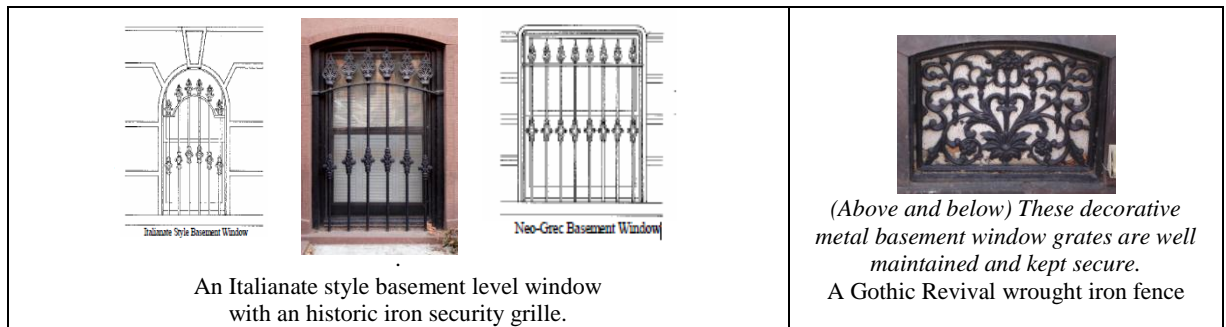


FIG. 2. Designs for Gothic windows in wood, brass and iron from William Pain, *The Building Companion and Workman's General Assistant* (1758) (British Library).



Windows and balconies have been traditional architectural uses of wrought iron. The iron combines the strength and ornamentation desired in each of these items. The wrought iron balcony at Congress Hall in Philadelphia was signed and dated by the craftsman, S. Wheeler, in 1788. Toward the end of the 18th century, Adam-style ironwork can still be seen in older American cities such as Boston, Philadelphia, and Charleston. (15)



Figure(4). Wrought-iron Balcony, Samuel Wheeler, blacksmith; Congress Hall, 1787-1789..

Tireless advocate for the use of iron in buildings was an inventive New Yorker, the self-taught architect/engineer James Bogardus. From 1840 on, Bogardus extolled its virtues of strength, structural stability, durability, relative lightness, ability to be cast in almost any shape and, above all, the fire-resistant qualities so sought after in an age of serious urban conflagrations. He also stressed that the foundry processes, by which iron was made into building elements, were thoroughly compatible with the new concepts of prefabrication, mass production, and use of identical interchangeable parts. Wrought iron and cast iron was used in private residences, windows and balconies built in the late 19th century. (16)

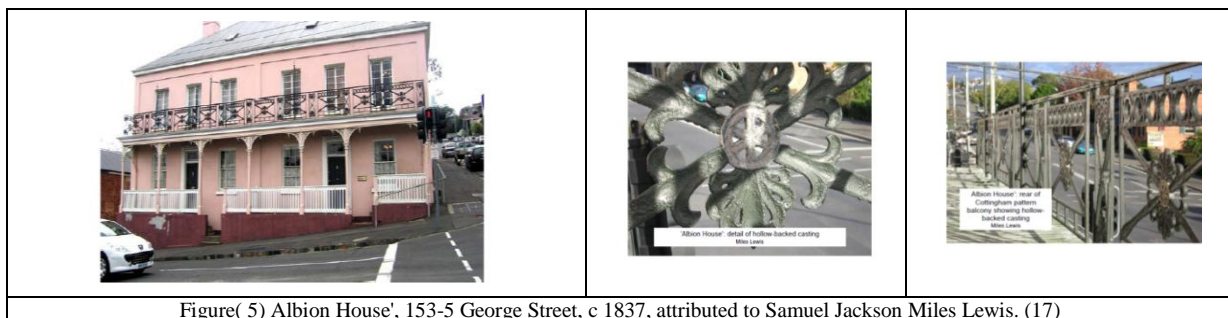


Figure (5) Albion House', 153-5 George Street, c 1837, attributed to Samuel Jackson Miles Lewis. (17)

2.2.Change Building codes Definitions Window Guards & Balcony barriers metals:

end to be more constant but differences were noted between countries. The differentiates between guards, rails and barriers

Guards: Vertical protective barrier erected along exposed edges of stairways, balconies, and similar areas to prevent falls. (18) Guards are defined as “A building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level. Window guards screw into the side of a window frame and have bars no more than 4 inches apart. They are sold in different sizes for various size windows and adjust for width. Guards must meet requirements for

There is inconsistent use of terminology for guards, rails, barriers, balusters, etc. Building codes t spacing and strength and those that allow for escape in case of emergencies must be difficult for very young children to open. (19)

A guard rail is a safety railing or barrier located along a horizontal surface such as a balcony. The purpose of guard railings is to prevent someone from falling off or through the open side(s) of a balcony. (20) The term uses “barrier” for open sides of elevated walking surfaces to minimize the possibility of a fall from the walking surface to a lower level. Researchers of peer-review literature in this also use the term “fencing” which is synonymous.



Barrier Any building element intended to prevent a person from falling and to retain, stop or guide a person. (21)

Pre-1970 Guardrail height codes (railings on landings and balconies that are more than 30" above floors or grade): required and must be  $\Rightarrow$  36" high (prior to 1970 in many jurisdictions) Current Recommended Guardrail height requirement is 42-inches or higher above adjacent surfaces changed many of the standards previously agreed upon from the industry. For example, a study conducted by the American Academy of Pediatrics prior to the 1991 version of the Life Safety Code, indicated that approximately 950 out of 1,000 children under the age of 10 could pass through a 6 in. wide opening between guards. These statistics have caused the industry to revise past standards to reflect a more stringent approach to protection. (22)

The IRC 2006 Edition requires a (36 in [91.44 cm] minimum height) guard on open sides of porches, balconies. Guards are required to have intermediate rails or ornamental closures that do not allow passage of a sphere 4 in (10 cm) or larger in diameter.

The National Building Code of Canada (NRC-NBC 2005) requires a (42 in [106.68 cm] minimum height) guard on open sides of porches, balconies. Guards are required to have intermediate rails or ornamental closures that do not allow passage of a sphere 4 in (10 cm) or larger in diameter. Australian Codes barrier construction is required for floors more than 39.4 in (10 cm)

The New Zealand Building Code 2007 Edition requires a (39.37 in [100 cm] minimum height) barrier on open sides of balconies and edges of internal floors or mezzanine floors that are located more than 39.4 in (100 cm) above the floor or grade below. Barriers are required to have intermediate rails or ornamental closures that do not allow passage of a sphere 3.94 in (100 mm) or larger in diameter. Over the years the Building Code requirements have changed and surely will change again. Structures built under less-demanding minimum requirements may not necessarily be "safe". This highlights the need for building safety to be the subject of periodic review.

### 2.3. Children's Interaction with the Built Environment (23)

A pilot program combining education and free window guards led to a 35% reduction in window-related fall injuries. In 1976, the New York City Board of Health passed a law requiring the owners of multistory buildings to provide window guards for units housing children. This mandatory program was followed by a 96% reduction in local hospital admissions for window-related falls. Window guards and fall prevention programs are associated with reduced injury resulting from falls from buildings and should be mandated in multifamily dwellings where small children reside. Indeed, a drastic decline in window-related falls quickly followed the introduction of the New York City window guard legislation in 1976. (24)

Existing buildings: Building regulations apply where new construction work or a conversion takes place. but therefore they do not apply retrospectively to existing properties. A key purpose of this leaflet is to raise awareness of hazards that may exist for children in existing 'non-domestic buildings' with a protective barrier having gaps or openings larger than 100 mm. Such gaps may constitute a risk to children by not offering adequate protection. (25) New buildings: Recent changes to building regulations now mean that openings in protective barriers within most 'non-domestic buildings' are constructed to prevent a child from passing through. (For the purpose of this guide a 'non-domestic building' is any building that is not a dwelling.) In other words, that all new buildings, with a few exceptions, will have barriers with openings or gaps that will not permit the passage of a 100 mm diameter ball.

Children under five years of age falling from balcony and windows, when the center of gravity of a standing child is higher than the height of a barrier then it is possible for the child to lose his or her balance and topple over the barrier. Consequently the height of the barrier should exceed the height of the center of gravity of the standing child. For a 4.5-year-old child this means that the barrier should be greater than 25.2 in (64 cm) high. (26) A child's head may become entrapped if the child enters and opening either feet first or head fist.

- Head breadth – the breadth of the head (side-to-side) is smaller than the length of the head (front-to-back) and this dimension is used as a guide to prevent entrapment of the head. Here the important dimension is the smallest head size of the youngest child. For a 2-year-old child this means that the size of any aperture in a barrier should be less than 4.7 in (12 cm).

Design of guards to not facilitate climbing: the ability of a child to climb a barrier will be affected by the step height distance between footholds. If the maximum step height distance for the oldest child is exceeded then climbing will be more difficult and less comfortable. For a 4.5-year-old child the maximum vertical height between surfaces on which a child could put their foot to use it as a step should exceed 21.9 in (55.5 cm).

- Stature – the height of the child affects the vertical climbing reach distance for children to be able to grasp the top of a barrier to use their arms to assist in climbing. Vertical grip reach – the vertical distance from the floor to a comfortable hand grip affects the child's climbing ability. If the height of the barrier exceeds this distance then the child will not be able to reach to the top of the barrier without some type of aid. Here the important dimension is the greatest vertical reach grip distance of the oldest child. For a 4.5-year-old child this means that the height of a barrier should be more than 53.5 in (136 cm).

Low barrier height (less than 39.4 in (100 cm) Higher barrier height (39.4 in [100 cm] plus) Easily graspable top rail Top rail that is difficult to grasp, and not broad enough for a child to stand on Horizontal rails spaced to serve as rungs Horizontal rails with very close or

very wide spacing Vertical rails Openings to flat surfaces that serve as stable footholds Openings that are too small for footholds Steeply angled surfaces. There are a number of important points in the design of barriers and among these are that:-

The barrier be non-climbable; and where bars are used (e.g. vertical bars used to fulfill point 1.) that they are spaced in such a way as to prevent both complete passage and entrapment of a child.

It is widely recognized that barriers should be non climbable. This can be achieved by using vertical bars and supporting horizontal elements must be positioned carefully to avoid creating a climbing hazard.

There should be absolutely no climbable objects placed near to the windows and balcony. Any furniture placed on balcony or windows near to should be: positioned well away from the balustrade heavy enough to discourage children from moving it close to the barriers. Child access to decks and balconies can be restricted by installing high locks and latches and self-closing devices on the access points. (27)

The climb ability of any structure is affected by the barrier height, the size, and distance between any horizontal and vertical supports, the smoothness and shape of the supports, and that materials used to construct the barrier. Higher barriers with fewer smoother, rounded horizontal supports, preferably metal, and placed at greater vertical distances will be more difficult to climb because of the difficulty of using the supports as a foot or handhold. This is why the choice of materiality is essential when considering objects that come in touch with children. Climbing simulation studies have been conducted in several countries to determine the. (28)

Other studies of barrier designs agree that for a barrier to be unclimbable by a young child under 4 years of age this has to be at least 55.1 in (140 cm) high and made of vertical rounded metal rails, but such a design is impractical in many situations. (29) It is likely a child can gain access to a window; the opening should be limited to a maximum of 100 mm. To do this, windows can be fitted with devices (to allow a window to only open 100 mm for example) or barriers (metal mesh or bars with no opening greater than 100 mm). Natural ventilation of rooms will also need to be considered where windows are fitted with these devices or barriers.

Window stops that restrict openings to 4 inches are an alternative to window guards. It is important that window guards or stops be operable (can be opened quickly by an adult) and not fixed to allow egress in case of fire. Despite the proven effectiveness of window guards, some areas have been slow to include them in building codes (AAP, 2001). (30)

Open guards shall have intermediate guards or an ornamental pattern such that a sphere 4 in. in diameter cannot pass through any opening up to a height of 34 in. The open space located from 34 in. to 42 in. does not need to be protected with additional guards spaced every 4 in. (31) Most children 5 years old and younger can slip

through a 6-inch space. However, children 1 year and older cannot slip through a 4-inch opening. Railings with vertical bars spaced 4 inches or closer effectively prevent pediatric falls. Building codes in much of the United States now require new construction to comply with 4-inch spacing (32)

Vertical guards are required to reduce the potential of children climbing the railings. Horizontal bars (above 8 in. & below 34 in. in height) are unacceptable as they assist small children to climb them and significantly increase the danger of falling.

Gaps in barriers for windows cannot have openings greater than 125mm .

The barrier must not have any climbable elements, such as horizontal rails, located between 150 mm and 760 mm from the floor.

A guideline for the use, inspection and maintenance of decks, balconies and windows

The construction of a balcony railing built at a height too long to provide reasonable protection against a fall (933.5mm).

Iron railings were not only less expensive and lighter than stone, but they were stronger and more fire-resistant than wood. Iron railings were both functional and decorative.

Often the most economical option, “are quick to install and provide visibility to both sides of the fence. Ornamental fences, such as wrought iron, steel fencing, are a highly secure option that cannot be easily scaled or vandalized. (33)

From through a general visual inspection on a yearly basis should identify any problems. Some risk factors to look-out for are handrails fixed. If there is anything suspicious about a balcony’s stability, it’s advised you avoid the area and restrict access. Contact a suitably qualified building practitioner, who will be able to inspect and determine the full scale of the problem. (34)

When designing a child safety barrier it is therefore important also to consider that there should be no potential source of injury such as protruding parts, dangerous gaps and sharp

## RESULT & DISCUSSION

- Balcony barriers & window guards from decorative material not be easy to vandalize, cut, or climb, such as wrought iron, are considered to be the best.
- Designers of windows and balconies can contribute to reducing the number of accidents involving falls from windows by including provisions aimed at preventing this risk in specifications and in the design, manufacture and installation of safety barriers.
- Children have a natural curiosity and climbing is a natural behavior for them. They can and will climb objects in their environment. It is important that any gaps or openings in protective barriers do not allow children to fall through. This is particularly important for the protection of children.
- The most common reasons children fall from a balcony are climbing horizontal parts of window guard’s metal passing through the horizontal and vertical parts of a window guard climbing on furniture.

- A balcony barriers & window guards of decorative iron must also not have any climbable elements, such as horizontal rails, located between 150mm and 760 mm from the floor.
- A Balcony barriers & window guards of decorative iron design can play an important part in helping prevent injuries from falls from windows and recommend that buildings occupied by children should be adapted to make them safe.
- Some designs that limit opportunity for young children to gain toe-holds that would enable them to easily climb a barrier. In general, barriers with full-height vertical members are the hardest to climb for children while horizontal rails can easily be climbed by a two-year or older child.
- identify some general design features that will make climbing more difficult, and these include: barrier height top rail that is difficult to grasp, and not broad enough for a child to stand on; horizontal rails with very close or very wide spacing; vertical rails; openings that are too small for stable footholds; and steeply angled surfaces.
- There is inconsistent use of terminology for guards, rails, barriers, balusters, etc., in the building codes.
- Study consistently showed that the decorative iron barriers were the hardest design to climb unassisted and that when children were successful then usually it took the longest to climb.
- To provide good enough safety function by increasing the height, it would be possible to design a very high barrier but barriers much higher than 1.2 m would probably not be acceptable from a practical and aesthetical point of view.
- Develop code requirements which are responsive to identified public safety needs while providing reasonable latitude for the safety design..
- Building Codes which is a multi-volume set of comprehensive documents that are updated annually with interim amendments and new editions published on a three-year cycle .So the designers always follows the new editions published of building. There is a need for lowering the protected age interval or revising the requirements in some of the current standards as the requirements and age intervals might be misleading.
- Neglected maintenance and components window guards &balcony barriers metals may result in higher operating damage to other building components, and safety risks.
- Much of the research that has been conducted has focused on window falls in young children, and most of the studies have been conducted using incidents that occurred without window guards.

- Accidents involving falls from windows appear to be a predominantly urban, likely to be worse in areas with many high-rise blocks of flats.
- Older children between two and four years of age can easily, and without fear, climb a ladder to a height of 1.5 meters.
- Should identify window guards &balcony barriers metals that are unlikely to perform their required function in particular in relation to climb ability and accessible gaps.

Balcony barriers & Window Guards specific design elements can either entice children to climb or discourage them from attempting to do so. Some designs barrier constructional that limit opportunity for young children to gain toe-holds that would enable them to easily climb a barrier. In general, barriers with full-height vertical members are the hardest to climb for children while horizontal rails can easily be climbed by a two-year or older child.

- Guarding should not be readily climbable and should be designed in such a way as to discourage young children from climbing it. Features in the guarding that might provide a foothold should be avoided e.g. horizontal rails etc.
- The authors infer that a majority of these are the result of falls from windows rather than from balconies or other building structures.
- There are no significant differences in climbing success between boys and girls for any of the fence designs.
- Several design modifications have played important roles in reducing pediatric injuries caused by home falls.
- A child safety barriers and guards have to be a compromise as there must be a balance between the demand of safety and the demands of function and aesthetics.
- When designing a child safety barrier it is therefore important also to consider that there should be no potential source of injury such as protruding parts, dangerous gaps, sharp edges etc.
- Window guards &balcony barriers of decorative iron vertical members 3.5 in (8.26 cm) apart, with a 45 in (114.3 cm) gap between horizontal members. No decorative cutouts. Capable of withstanding a pressure of 75 kg
- In buildings dwellings which are likely to be used by children under five years old, guarding and barriers should be so constructed that a 100 mm diameter sphere cannot pass through any openings in the guarding.

Table (1) Balconies barriers and window guards of decorative iron & consideration design safety.

| Window guards. & Balconies barriers |  |
|-------------------------------------|--|
| A child passing through the barrier | All building codes reviewed in this study agree that any aperture should be no larger than a 4-in (10 cm) sphere, except for the Building Code of Australia which requires maximum 4.9 in (12.5 cm) sphere..   |
| Install                             | <ul style="list-style-type: none"> <li>▪ Install window guards to prevent children from falling out of windows install. -It can easily removable to allow for escape during residential fires.</li> <li>▪ -Window guards should be installed in children's bedrooms and other rooms where young children spend time (parent's room)</li> <li>▪ -Install window stops that permit windows to open no more than 4 inches.</li> </ul> |
| above external ground level         | In dwellings where a window has an opening section through which a children may fall and is more than 1400 mm above external ground level, suitable safety restrictors should be provided.   |
| connections                         | Balcones with combination of guard walls and guardrails. Guardrail connection to the wall can be a vulnerable point of water ingress. Maintain drains free of obstructions, dirt or debris to ensure they are free flowing and to prevent water.   |
| Check the openings in the barrier.  | Barriers that have been designed with containing gaps or openings that will prevent the passage of a 100 mm diameter ball will protect all the users of a building, including children. (e.g., did the child fall through the rails, did they climb over the balcony, did they use another object to aid climbing).  |
| Defining minimum dimensions         | Basic barriers heights 110 – 120 cm do provide good enough protection for children.<br>Existing barrier in dwelling units to include landings, balconies shall not be less than 36 in. high.<br>Building codes vary in barrier height requirements between 36 in (91.4 cm) and 42 in (107 cm).   |

Importunes to based design methodology that seeks to create “a climate of safety in a community by designing a physical environment that positively influences human behavior. used to improve safety in a variety of structural spaces, including schools etc. identify the design factors that inhibit falling. Designed safety barriers including balconies and guard.



The design safety of Balcony barriers & window guards of decorative iron

Design awareness towards Balcony barriers & window guards of decorative iron

There is an annual awareness campaign targeting families and careers responsible for children. A public health inspector visits the owner of the building in which a breach of the law has been reported. If the window guard is not brought up to standard within a specified period of time, the Department of Housing Preservation and Development will install or repair the guard and recover the cost from the owner.

Technical solutions are not sufficient in themselves to prevent the risk of falls from windows. The victims of this type of accident are too young to take responsibility for their own safety, or to remember warnings. The adults, both parents and carers, who have young children in their charge, must remain particularlyvigilant. They must anticipate dangerous behaviour and take a number of precautions when locating furnishings or fittings close to windows.

- Never leave objects attractive to a child on a balcony. Keep furniture away from windows, to discourage children from climbing near windows and Keep all objects that could be used by a child as a step well away from any window or balcony.
- Cultural factors are more important, especially when families need to adapt to high-rise buildings or when often large families of children are left in the care of older siblings who may not themselves be aware of the dangers. This factor may,
- As a safety measure, all home owners with balconies should ensure inspected on a regular basis for any warning signs of potential collapse.
- It is hard to design barriers that will protect all children. One of the most important functions of a child safety



barrier is to increase the time for a child to reach a potential danger. And the parents can take a number of precautions to help ensure the safety of children around balconies.

- Some hazards within a non-domestic building will be obvious to users, such as windows or balconies. Less obvious will be the potential hazard that a protective barrier may present if it contains gaps or openings.
- large enough that a child may be able to pass through. In these situations it is less likely that an accompanying adult would readily identify the hazard and so take appropriate measures to minimise the risk of an incident.
- It should be stressed that at the design stage, a good barrier differs mainly in thought and care rather than cost. Compliance with the current would see better barriers included on new structures, although some more stringent requirements would be advisable.

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