V1.1

White Paper:
What Barrier Height Is Deemed Safe?
Understanding Global Approaches To Climbability, Upstands and NCZ's

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Global

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1. Executive Summary

Determining a safe barrier height for balconies is not a one-size-fits-all decision. What is considered safe depends on multiple factors, including:

- **National building codes and regulations** (which vary significantly by region)
- **Anthropometrics** (average height of the local population, which influences waist-height thresholds)
- **How those codes evolved** (metric vs. imperial systems, expert input, historical accident data)
- **Presence of climbable features or adjacent objects** (benches, parapets, planters)
- **Vulnerable users** (children, elderly, or at-risk adults in extra care facilities)

While sizes closer to 1100 mm from the balcony deck is the most common minimum guard height globally, true safety depends on more than that figure. Research shows that 30–40% of children aged 4–6 can scale a 1.1–1.2 m barrier if poorly designed, and nations with taller average populations (like the Netherlands) raise minimums to 1200 mm for high-rise applications.

This white paper compares standards across Europe, North America, Oceania, and Asia, using BS 8579:2020 as a benchmark. BS 8579 remains the only dedicated, international-influenced standard focusing specifically on balconies and terraces, addressing both cast-in-place concrete and modular/prefabricated balcony systems.

In contrast to stairs and access ramps—where handrail heights are dictated by ergonomic needs for grip—balconies do not require user access across the barrier. For this reason, the white paper focuses on guardings for multi-occupancy residential balconies and terraces, particularly in mid- and high-rise buildings.

Conclusion:
1100 mm remains a robust benchmark for most multi-residential balconies, but only when combined with:

a) Non-climbable infills (NCZs)

b) Adjustments for adjacent objects (+700 mm where applicable)

c) Placement above average waist height to keep users' centre of gravity behind the barrier.

For vulnerable user groups, such as extra care facilities, even taller guards may be required.

2. Introduction

This paper aims to answer a practical, safety-critical question: "What barrier height is deemed safe?" We approach this question through five key lenses to get a holistic view:

1. Internationally mandated guarding heights
2. Research on child climbing ability
3. Influence of adjacent objects and upstands
4. Guidance from BS 8579 and other codes
5. Concepts like Non-Climbable Zones (NCZs)

The goal is not just to compare measurements but to understand and compare the thinking, theory and principles behind them.

As this white paper is focused on balconies, the context is different from handrails for stairs and ramps: balcony barriers are not designed for user grip or to aid access into or through a building. Instead, their purpose is primarily to prevent falls and injuries. This means that balcony barrier height minimum permissible dimensions are driven almost entirely by safety performance, rather than accessibility or mobility assistance, making their design philosophy distinct from other guard or handrail contexts.

3. Minimum Guarding Heights

So what are the minimum heights of barriers and guardings and why do these table matters:
This comparison highlights mandated minimum guarding heights. These are the most basic regulatory expectations and form the backbone of what is 'deemed to satisfy' in each country. Grouping by region helps highlight variations that stem from cultural, ergonomic, and regulatory differences.

Europe

In Europe, the Eurocodes and other EN Standards govern much of the barrier requirements. To a certain extent the UK still follows EN Standards (i.e. Eurocodes), but also have specific UK focused guidance in both British standards and in Part K of the approved documents. Ireland in the main follow a mix of European standards but also have their Document K which is in large the same as the UK. Netherlands we have added knowing that in terms of heights of barriers they have specific and increased safety guidance more than most other regions do primarily for social reasons explored later in this paper.

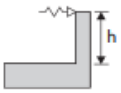
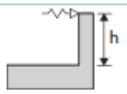
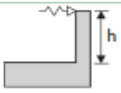
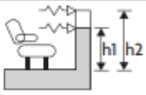
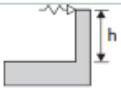
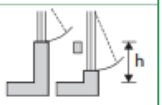
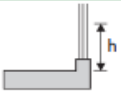
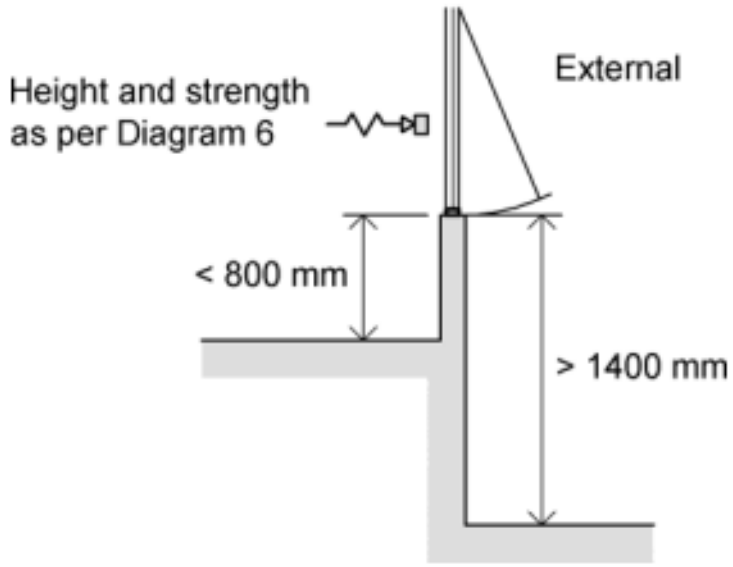
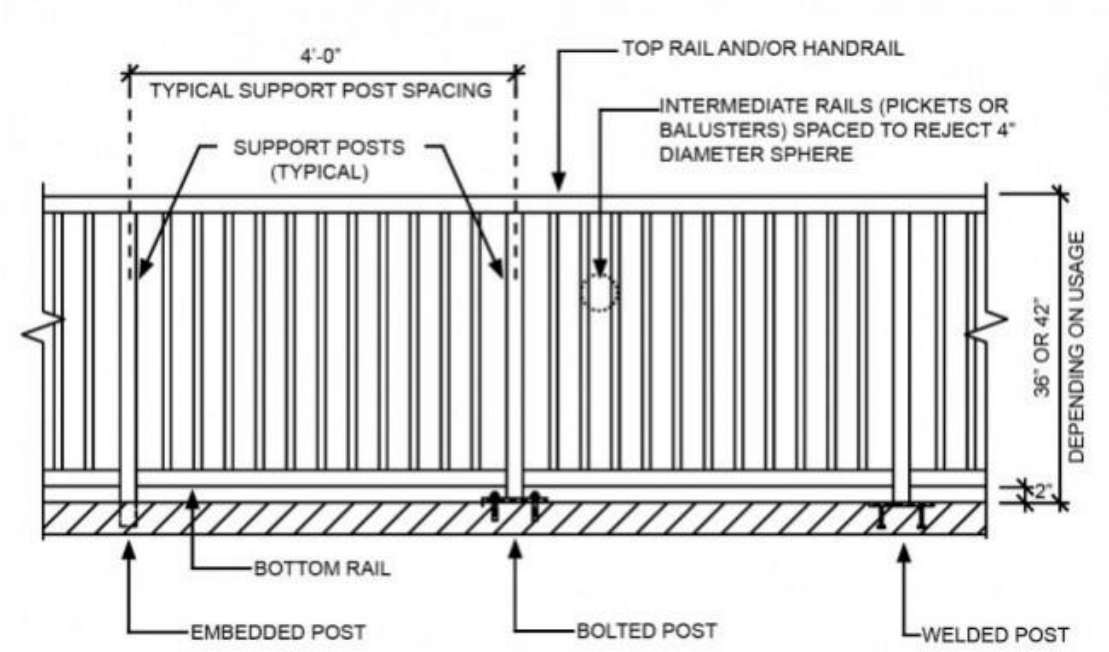
Building Category and location See paras 1.38, 3.2 and 3.4		**Height (h)**	
Single family dwellings	Stairs, landings, ramps, edges of internal floors	900mm for all elements	
	External balconies, including Juliette balconies and edges of roof	1100mm	
Factories and warehouses (light traffic)	Stairs, ramps	900mm	
	Landings and edges of floors	1100mm	
Residential, institutional, educational, office and public buildings	All locations	900mm for flights otherwise 1100mm	
Assembly	Within 530mm in front of fixed seating	800mm (h1)	
	All other locations	900mm for flights elsewhere 1100mm (h2)	
Retail	All locations	900mm for flights otherwise 1100mm	
Glazing in all buildings	At opening windows except roof windows in loft extensions, see Approved Document B1	800mm	
	At glazing to changes of levels to provide containment	Below 800mm	

Diagram 3.1 Guarding design

Approved Document Part K in England and Wales stipulates both hieghts of barriers and for windows. The same images are used in Irelands TGD K but the below (Diagram 7) is also shown separately for window guarding. It would perhaps indicate the climbability is generally expected to be 800mm :



Typical guidance in North America:



Europe

Country	Min Guard Height	Notes / Exceptions	Reference
UK	1100 mm	900 mm on stairs	AD K Diagram 3.1; BS 8579; BS 6180
Ireland	1100 mm	800 mm for internal sills	TGD K Section 1.1
Netherlands	1000 mm (<13 m) 1200 mm (>13 m)	Stairs and some parapets which reduce climability	Bouwbesluit Art 2.18

North America

Country	Min Guard Height	Notes / Exceptions	Reference
Canada	1070 mm (42")	900 mm for private / low-rise decks	OBC 9.8.8.3; NBC Part 9
USA	1067 mm (42")	914 mm (36") for 1-2 family homes	IBC 1015.3; IRC R312

Oceania

Country	Min Guard Height	Notes / Exceptions	Reference
Australia	1000 mm	865 mm on internal stairs/landings	NCC Part 3.9.2; Part 11.3
New Zealand	1000 mm (private); 1100 mm (shared)	900 mm on internal stairs	NZBC F4/AS1

Asia

Country	Minimum Balcony Guard Height	Notes / Exceptions	Reference
Japan	1000–1100 mm	800 mm internally for single dwellings	Building Standard Law Article 28

This illustrates that 1100 mm is not universal—Netherlands (1200 mm) accounts for taller populations, while imperial-based regions like North America (42”) sit slightly below. Designers must consider local code and high-risk scenarios when determining a safe height.

4. Climbability and Child Safety

While building codes often specify that balcony guardings must be “not easily climbed”, few define what this means in measurable terms. Understanding how children interact with barriers is key to turning this vague requirement into a defensible design strategy.

Research by ANEC (European Child Safety Federation) and guidance like UK Building Control Note 16 reveal that height alone is insufficient. Children aged 4–6 can climb smooth 1.1–1.2 m barriers, even vertical ones, if footholds or adjacent objects exist. Tests showed:

- Many 3–4-year-olds can step up to 410 mm (about knee height) and a few can reach 550 mm, enabling them to use small upstands or objects as ladders.
- Around 30–40% of 4–6-year-olds successfully climbed plain vertical guards within 10–20 seconds.
- Whilst often not practical to create balconies like this, when the barrier incorporated an inclined/sloped top, climb rates fell to below 10%, and no climbs occurred within 10 seconds, giving supervising adults time to intervene. In public areas like seawalls etc it is common to see horizontal rails on a seafront barrier guarding because they have been inclined. The reason these are more common here is because space is not at a premium in the same way as balcony guardings generally are and also balconies will often have unattended young children present whereas it is uncommon for a seafront guarding to have unattended children present for extended periods.

These findings underline two principles:

1. Barrier detailing is as important as overall height. Vertical infills, solid glass, and smooth surfaces slow climbing, while horizontal members or ledges (“ladder effect”) turn a guard into a climbing frame.
2. Delay is critical. Since children can climb rapidly, the aim is to make ascent slow enough to be noticed and stopped, not just theoretically impossible.

For specifiers, this means:

- Avoiding horizontal rails or cable systems where children may be present.
- Designing for a 900 mm “non-climbable zone” (NCZ) in the bottom section (see Section 9).

These measures complement the 1100 mm minimum height by ensuring that, in practice, children and vulnerable users are protected from falls—not just that the barrier meets a number on paper.

Age Group	Step-Up Ability	Climb Success (Plain 1.1–1.2 m)	Time to Climb
2–3 years	18% can step onto 600 mm rung	Rare without assistance	>30 seconds
3–4 years	50% can step onto 410 mm 3% onto 550 mm	Can climb with adjacent features	~20 seconds
4–6 years Vertical	410–550 mm step-ups common	30–40% can climb plain guards	10–20 seconds
4–6 years (inclined)	N/A	<10% can climb	None <10 seconds

5. Interaction with Adjacent Elements

Nearby features can render a compliant barrier unsafe. Standards like BS 8579 mandate +700 mm guard height above any climbable object.

Element	Risk Impact	Required Response
Upstand	Acts as a step, lowering effective height	Guard must be 1100 mm from deck or +700 mm above upstand
Parapet Wall	May serve as seat or step	Combine width + height ≥1100 mm; avoid broad flat tops
Planter / Bench	Provides foothold	Add backrests or +700 mm guard above surface
Window Sill	Falls from sills <800 mm	Guard or restrictor required (UK AD O, Ireland TGD K)

Furnishings and fixed elements like planters and air con units on balconies can present a risk.

6. Anthropometrics and Regional Variation

Guard heights are not chosen arbitrarily—they must reflect the average height of local populations to ensure the barrier sits above the user's waistline, keeping their centre of gravity safely behind the guard. If the top rail falls near hip height, a leaning or off-balance person's weight can project forward, increasing the risk of a fall.

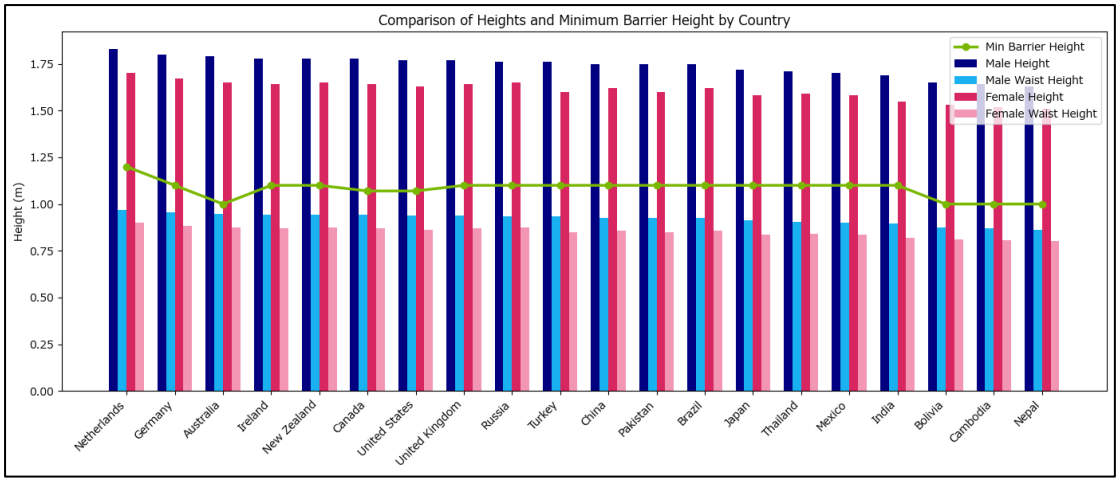
Average male heights by region explain some of the variation in codes:

Country	Male Height m	Female Height m	Min Barrier Height m
Netherlands	1.83	1.7	1.2
Germany	1.80	1.67	1.1
Australia	1.79	1.65	1.0
Ireland	1.78	1.64	1.1
New Zealand	1.78	1.65	1.1
Canada	1.78	1.64	1.07
United States	1.77	1.63	1.07
United Kingdom	1.77	1.64	1.1
Russia	1.76	1.65	1.1
Turkey	1.76	1.6	1.1
China	1.75	1.62	1.1
Pakistan	1.75	1.6	1.1
Brazil	1.75	1.62	1.1
Japan	1.72	1.58	1.1
Thailand	1.71	1.59	1.1
Mexico	1.70	1.58	1.1
India	1.69	1.55	1.1
Bolivia	1.65	1.53	1.0
Cambodia	1.64	1.52	1.0
Nepal	1.63	1.51	1.0

- Netherlands: ≈ 183 cm average; codes mandate 1200 mm for high-rise balconies.
- UK & Ireland: ≈ 177 cm average; 1100 mm is generally sufficient.
- USA & Canada: ≈ 175–177 cm average; 42" (1067–1070 mm) is typical.
- Japan: ≈ 172 cm average; 1000–1100 mm is common.

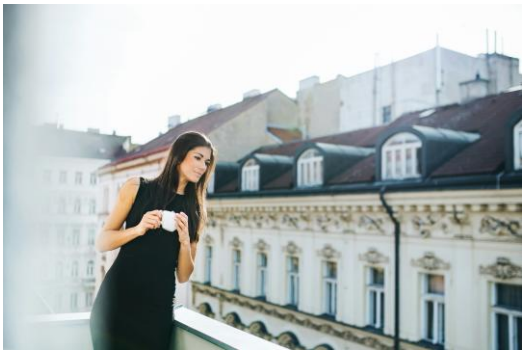
This 8–10 cm difference in stature justifies taller guards (up to 1.2 m) for taller populations, preventing a scenario where the user's centre of mass exceeds the top rail, which would make toppling forward far more likely.

Studies indicate that for an average 180 cm adult male, waist height is about 1.05 m. Thus, a 1100 mm guard provides a margin of ~50 mm. In contexts with taller users, 1200 mm barriers—or even 1350–1500 mm in high-risk environments such as extra care or psychiatric facilities—are more appropriate.



Climbability vs. Railing Height:

A waist-high or taller guard keeps an adult's centre of gravity behind the barrier, reducing the chance of toppling forward. Rails below waist level (hip height) pose a serious tipping risk. At the same time, eliminating horizontal bars or ledges below the top 900 mm ("ladder effect") prevents children scaling the guard. Both height and climb-resistance must work together.



The left hand image above shows a scenario where a users waist is considerably above the toprail, presenting a scenario unlikely to protect the users adequately and unlikely to comply in most regions. On the right hand image you can see the toprail height is above the waist height of both uses and much less probable of presenting a risk.

7. Why Window Sill Heights Matter in a Balcony Guarding Context

Although window sills are not balconies, their guarding requirements provide valuable insight into the same safety challenge—child climbability and fall risk. Both scenarios involve a horizontal surface at low level, a potential drop to the exterior, and often, young children in the household.

Examining window sill guarding rules helps us understand:

a) How regulators judge a "climbable" threshold—e.g. many codes set 800–900 mm as the point at which a child can readily reach or hoist themselves onto a surface.
b) The logic behind trigger heights for guards or restrictors, are based on research into how far toddlers can step or climb and how quickly they can escape supervision.
c) Parallels with balcony design—an openable window with a low sill behaves like a miniature balcony edge, meaning the same principles of non-climbable barriers, minimum clear heights, and gap limitations apply.

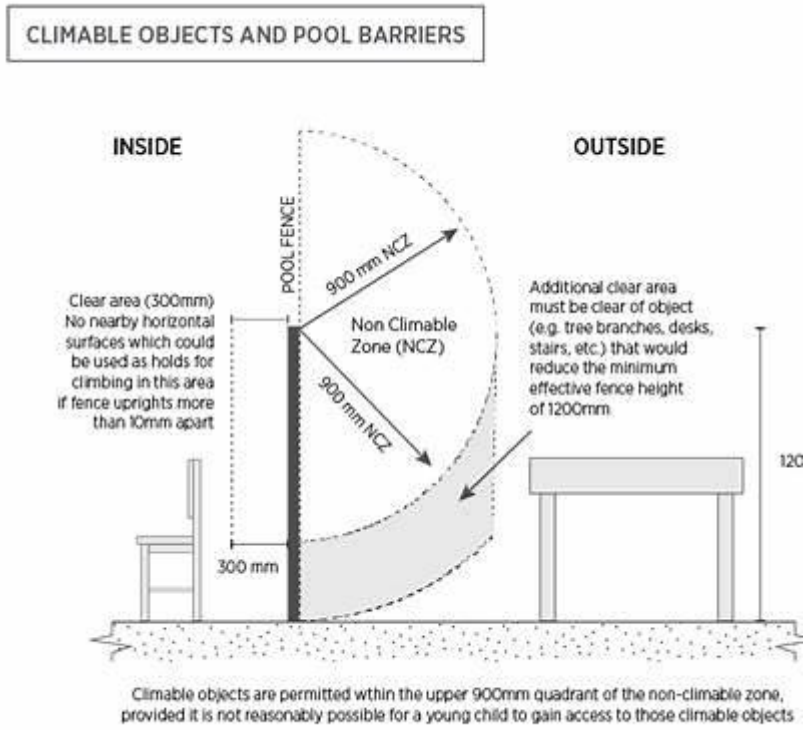
That said, because the key consideration with barriers is safety where as in windows centre of gravity is less often consider however access to windows for wheelchair users is often and addition consideration meaning that Sill heights are often considered to be safe with a lesser height than if it were the guardrail of a balcony.

By considering window sill thresholds alongside balcony barrier standards, we get a fuller picture of real-world climbability, particularly for children aged 2–6, and can better understand the 1100 mm+ benchmark for balcony guards as a height that resists both accidental falls by adults and deliberate climbing by children.

Country	**Maximum Sill Without Guard**	**Guarding Trigger**
UK	800 mm	Guard/restrictor if sill <800 mm and window opens
Ireland	800 mm	Guard if sill <800 mm and drop >1.4 m
Canada	900 mm	Guard or limiter if sill <900 mm
USA	1118 mm (44")	Egress sill max; others follow guard rules (IBC/IRC)
Australia	1100 mm	Matches balcony rules for drops >4 m
New Zealand	1100 mm	Matches barrier rules for public/shared areas

8. The Concept of a Non-Climbable Zone (NCZ)

Explanation of the 900mm NCZ zone, its use in BS 8579 and pool fencing standards, with global examples.



An NCZ is typically the bottom 900 mm of a barrier, kept free of:

- Horizontal elements, ledges, or footholds
- Openings >100 mm (to prevent entrapment and toe-holds)
- Adjacent objects (planters, furniture) that enable climbing

Originally from pool fencing standards (Australia, US), NCZs are now integrated into building codes:

- **Australia (NCC):** no climbable features 150–760 mm for falls >4 m
- **Netherlands:** bans horizontal members 200–700 mm
- **Canada:** prohibits climbable details between 140–900 mm in family occupancies
- **BS 8579:** enforces NCZ indirectly via its +700 mm rule.

BS 8579:2020 – Upstands and the +700 mm Rule

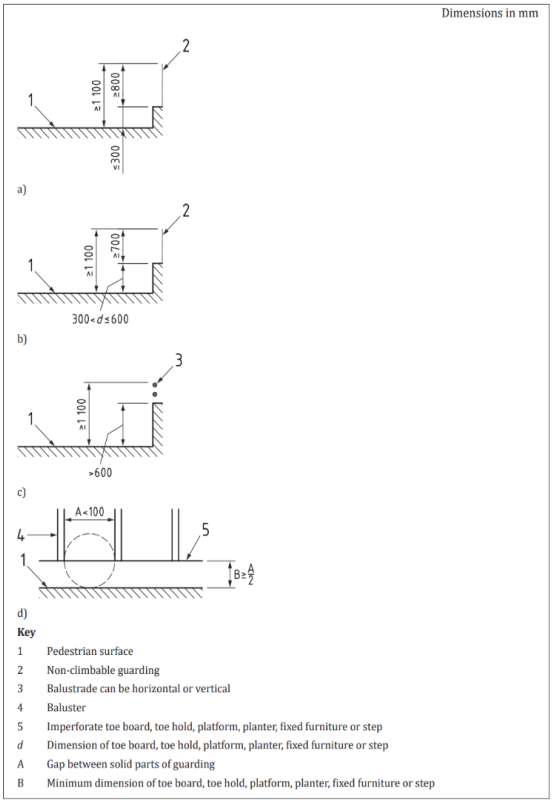
BS 8579:2020 places a strong emphasis on preventing falls by ensuring that guarding heights are maintained above any feature that could act as a climbing aid or standing surface—including steps, shelves, parapets, plinths, toe boards, or planters.

The standard makes several key points:

- Guarding must always be at least 1100 mm above the finished floor or pedestrian surface. Remember this standard is focused on Balconies and Terraces.
- Any step, parapet, plinth, or toe hold deeper than 25 mm is considered a climbing aid, even if aligned with vertical balusters, as it can accept a foot.
- Where such a feature exists and cannot be eliminated, the guarding height must be measured from the top of that feature, not the deck level.
- If a toe hold or platform sits 400–600 mm above the pedestrian surface, the guard must be increased to a minimum of 700 mm above that point, ensuring the overall height remains at least 1100 mm from the main floor level.

Figure 6 of BS 8579 (see below image) illustrates these principles, showing how to dimension balcony guards so that they remain effective even when fixed furniture, planters, or architectural elements are present.

Figure 6 — *Guarding dimensions for balconies and terraces*



Key

1	Pedestrian surface
2	Non-climbable guarding
3	Balustrade can be horizontal or vertical
4	Baluster
5	Imperforate toe board, toe hold, platform, planter, fixed furniture or step
d	Dimension of toe board, toe hold, platform, planter, fixed furniture or step
A	Gap between solid parts of guarding
B	Minimum dimension of toe board, toe hold, platform, planter, fixed furniture or step

This guidance recognises that upstands, parapets, and furniture are often added for beneficial reasons—to improve weatherproofing, act as kick plates, or enhance comfort—but they must never compromise the barrier's protective function. By treating any substantial horizontal surface as a secondary pedestrian surface, BS 8579 ensures the barrier still delivers full-height fall protection even when these elements are part of the design.

BS 8579 doesn't just state a single height figure—it codifies how to handle real-world balcony features. This ensures upstands and kick plates remain a net safety benefit (by blocking gaps and improving user comfort) while not creating a false sense of security by reducing effective guarding height.

9. Consideration given to suicide and how this effects balcony design

While this white paper has focused on barrier height from the perspective of fall prevention—particularly accidental falls or child climbing—there is growing public and regulatory interest in how built environments may deter suicide attempts, especially in high-rise contexts. That said, it is important to note that balconies in private residential dwellings are generally not yet a focus of formal suicide-prevention design strategies.

Suicide mitigation measures have become more prominent in public and semi-public infrastructure—such as bridges, multi-storey car parks, hospitals, and railways—where access is open, unmonitored, and the psychological barriers to impulsive action are lower.

- **City of London's Planning Advice Note (2022):** This non-statutory document advises developers of high-rise buildings (10 m +) to consider design-based suicide prevention measures like taller, inward-angled/anti-climb guards, and controlled access for rooftops and terraces. However, it does not apply to private residential balconies and is geared toward commercial, communal, or public-access spaces.
- **"Gabe's Law" (2023):** Prompted by a tragic fall from an open car park in Liverpool, this Private Member's Bill seeks to raise guarding heights in car parks and mandate retrofitting of older structures. While important in the context of unmonitored public spaces, this legislation is not aimed at private balconies directly.
- **Institutional settings:** Around the word legal obligations are often placed on foreseeable suicide risks to be mitigated in institutional settings—e.g. hospitals, psychiatric facilities, and care homes—but usually such requirement do not apply to residential dwellings or high-rise apartment balconies.

Residential Balcony Falls are uncommon but tragic

Where suicide has been associated with residential buildings, it is most often in shared-access areas or through open windows and rooftop terraces, not from private balconies. Notable coroner reports following student deaths or health-related accidental falls have occasionally raised concerns about low railings or climbable designs—but such cases are still relatively infrequent and have not led to new national requirements in most jurisdictions.

Should Suicide Risk Be a Consideration in Balcony Design?

The answer depends on the context. In certain applications it maybe required — including:

- Student housing
- Assisted living or mental health facilities
- Rooftop communal terraces
- Hotels or hostels

Designers may wish to proactively assess suicide prevention as part of their design risk review, particularly if the site is high-profile or multi-storey.

10. Conclusion

Across global standards, 1100 mm from deck level is the most practical and widely accepted benchmark. It:

- Sits above waist height for average adults, keeping the centre of gravity behind the guard
- Allows for kick plates and upstands without undermining protection
- Aligns with both metric and imperial systems

However:

- Height alone isn't enough—NCZs, vertical infills, sloped tops, and adjacency rules are critical.
- Taller guards (1200 mm+) are sensible in Netherlands-style contexts (taller populations) and extra care settings.

Designers and specifiers should adopt 1100 mm as the baseline, but follow BS 8579's enhanced provisions to ensure balconies are not just compliant, but genuinely safe.

Sources and References

- BS 8579:2020 – BSI Standards
- BS6189:2011 – BSI Standards
- UK Approved Documents (Part K) – gov.uk
- TGD K (Ireland) – gov.ie
- Ontario Building Code (Canada) – ontario.ca
- IBC & IRC (USA) – ICC Codes
- NCC (Australia) – ABCB
- NZBC Clause F4 – building.govt.nz
- Bouwbesluit 2012 (Netherlands) – rijksoverheid.nl
- ANEC Child Safety Research (2009–2010) – anec.eu
- BCGN 16 (UK) – London Building Control

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