



Determination 2010/85

Safety from falling from an infinity edge swimming pool at 4 Brookfield Street, St Heliers, Auckland

1. The matter to be determined

- 1.1 This is a Determination under Part 3 Subpart 1 of the Building Act 2004¹ (“the Act”) made under due authorisation by me, John Gardiner, Manager Determinations, Department of Building and Housing (“the Department”), for and on behalf of the Chief Executive of that Department.
- 1.2 The parties to this determination are:
 - the owner, Mrs C Stevens (“the applicant”) acting through the architect of the building (“the architect”) and represented by a legal adviser
 - the Auckland City Council carrying out its duties and functions as a territorial authority and a building consent authority (“the authority”).
- 1.3 This determination arises from a dispute about whether the proposed design of an infinity-style swimming pool² meets the requirements of Building Code Clause F4.
- 1.4 I therefore take the view that the matter for determination³ is whether the design of the swimming pool complies with Building Code Clause F4. I have also considered whether the revised design of the infinity edge detail to the pool presented to me during the determination complies with Clause F4.
- 1.5 The design of the swimming pool and fencing, with respect to the requirement to restrict the access of children under the age of six to the pool and immediate pool area, is not in dispute.
- 1.6 In making my decision, I have considered the submissions of the parties and the other evidence in this matter.
- 1.7 The relevant clauses of the Building Code are set out in Appendix A.

¹ The Building Act 2004 and the Building Regulations 1992 are available from the Department’s website at www.dbh.govt.nz.

² An infinity-style swimming pool provides a visual effect of water that extends or vanishes into the horizon.

³ In terms of section 177(a) of the Act (prior to 7 July 2010).

2. The background

- 2.1 The applicant has applied for a building consent (number B/2009/6780) for the construction of a new house with a swimming pool.
- 2.2 It appears from the application for determination that the authority took the view that the proposed swimming pool did not comply with the Building Code Clause F4. The authority requested further information on 11 February 2010 from the architect to demonstrate how compliance with Clause F4 would be achieved by the design.
- 2.3 The architect responded in a letter dated 22 February 2010 to the authority, justifying how the design features of the proposal comply with the Building Code.
- 2.4 The application for a determination was received by the Department on 8 March 2010.

3. The swimming pool

- 3.1 The swimming pool is to be located on the main terrace level of the new house. The swimming pool is a 'lap pool' that includes an infinity edge design. The swimming pool is approximately 10.6 metres long and 1.9 metres wide, and is approximately four metres above ground level at its northern end.
- 3.2 The swimming pool cantilevers out from the corner of the terrace. Around the terrace area, the swimming pool is separated on the southeast and southwest sides from other areas of the house by 1.2 metre high glass barriers. Near the main entrance to the house the swimming pool is separated by 1.2 metre high glass barrier.
- 3.3 The details of the edges of the pool (described in paragraphs 3.4 and 3.5) are shown in Figures 1 and 2.

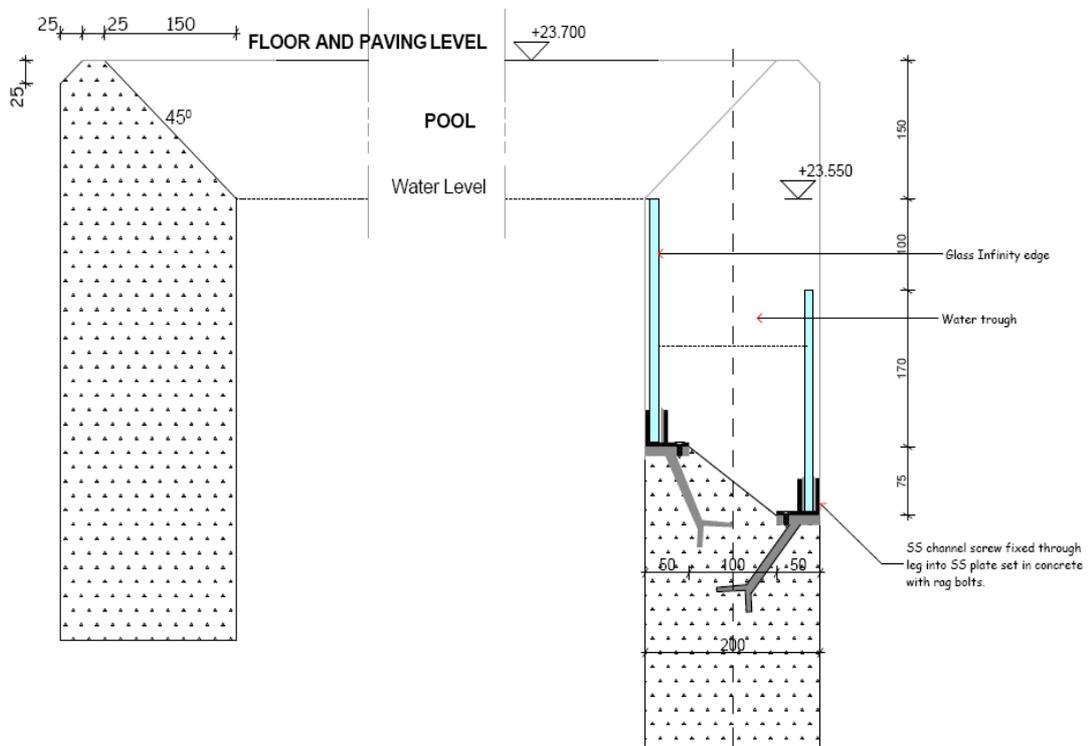


Figure 1: swimming pool wall sloping edge detail

Figure 2: swimming pool infinity edge detail

- 3.4 The western corner of the swimming pool has a side with a raised edge that extends from the terrace on the southwest side to the northern corner of the swimming pool. This side of the swimming pool has a width of 200mm and extends 150mm above the water level of the swimming pool. The top edge of this side of the pool has a 45° slope. This sloping edge detail of the swimming pool wall is shown in Figure 1.
- 3.5 The north eastern side of the pool (apart from at the northern most corner as described in paragraph 3.2) has an infinity edge. The infinity edge is formed by a 10mm thick sheet of glass. The infinity edge has a 200mm wide water trough and a second 10mm thick sheet of glass to form the outside edge. The infinity edge detail of the swimming pool is shown in Figure 2.

4. The submissions

- 4.1 In a covering letter addressed to the Department, the architect explained that
- ‘The pool... is a major architectural and visual element of the total house design. The main living area enjoys stunning views... and the pool has been designed to be as unobtrusive to the view as possible, including a section of infinity edge... The terrace has been designed to enjoy the view straight out from the house unobstructed.’
- 4.2 The application included a copy of a letter from the architect dated 22 February 2010, written in response to a number of questions raised by the authority about the code compliance of the proposed design. The architect made a number of points, in particular referring to a practice note (“the practice note”) in which the authority provided guidance about infinity pools, and which included comments from a subject matter expert from the Department. The architect stated:
- The infinity edge consists of a 10mm thick sheet of glass which by virtue of its thinness prevents people from sitting or walking on it. The balance of the unfenced section of the pool is shaped with a 45 degree slope and a 25mm top surface to achieve the same purpose. This design feature ... is therefore fully compliant.
- ... This is a lap pool which is very narrow at less than 2 metres in width. Therefore, both in terms of compatibility with intended use (a lap pool), and the narrow feature referred to in [the practice note], it is fully compliant.
- The [practice note] also emphasises that ‘the provision of a barrier can not be made dependent on the fall height for the reason given ...’ ... We should state that this pool is a lap pool which cantilevers off the terrace and forms the major architectural feature of the whole house design. It was designed to comply bearing in mind its primary aesthetic importance and limited function as a very narrow exercise lap pool.
- 4.3 The applicant’s submission also included a copy of architectural plans relating to the swimming pool area and a copy of the practice note.
- 4.4 Copies of the submissions and other evidence were provided to the parties. The authority did not acknowledge the application.
- 4.5 A draft determination was issued to the parties on 10 May 2010 for comment.
- 4.6 The authority accepted the draft determination without comment in a response dated 10 May 2010.
- 4.7 The applicant did not accept the draft determination and in a response dated 30 June 2010, consisting of a submission from the architect and a submission from the applicant’s legal adviser, made the following comments (in summary):

Submission		Comments
Limit on application	Legal adviser	Clause F4.3.1 has a limit on its application that applies. The draft does not refer to the limits of application to Clause F4.3.1.
	Architect	Clause 4.3 is limited in its application, where a barrier would be incompatible with the intended use of an area. The approach taken in the draft would mean that no infinity edge pool would be possible where there was a fall of one metre or more. Previous Department guidance notes that small children will be closely supervised so that they would not run along narrow edges or get into difficulty in the water. Any need for a barrier is for older children or adults, who would be more aware of the potential fall heights. This is a clear directive that a barrier is not required.
Intended use	Legal adviser	The intended use of the pool is as a lap pool only. It is a major architectural and visual element of the house design. It is not a conventional recreational swimming pool and its size and shape are consistent with that intention. There has been no challenge to the applicant's 'declaration as to the intended use of the lap pool.' The draft determination relies on an example of a person using an air pillow, which can only be a reference to small children, as adults and older children can take care of their own safety, but small children inside the pool area will be supervised, as they cannot access the pool area unaided. The use of an air pillow is hypothetical and inconsistent with the intended use of the pool. The draft determination is inconsistent with previous guidance which directly addressed this hypothetical point.
	Architect	The pool is intended as a lap pool only, and is an architectural design characteristic. The shape of the lap pool limits its use and therefore it is not intended for or appropriate for the use of an air pillow.
Evidence for determination and determination process	Legal adviser	The authority provided no evidence and made no submissions prior to the preparation of the draft. The applicant, however, provided incontrovertible evidence of the intended use of the swimming pool, including its 'limited function as a very narrow exercise lap pool', 'the major architectural feature of the whole house design' and the ability to take advantage of the unobstructed views. When making a determination, the Chief Executive must comply with the law, consider the evidence (particularly where it is not challenged), and not consider irrelevant or hypothetical matters.
Management practices	Legal adviser	The draft determination refers to a previous determination about the management of buildings, which has no application to a case of the intended use of a swimming pool. Consideration of future owners is irrelevant, as Clause F4.3.1 requires focus to be on the intended use of the lap pool by the applicant, which depends on the evidence. The statement in the draft determination that 'future owners of the house... may not adopt the same management practices' is nonsensical. The pool will still be a lap pool with all the limitations on size and potential usage. A change of owner cannot turn it into a large recreational pool.
	Architect	The critical point is the intended use and proper management of the pool. The owners are responsible, aware of safety issues, and will ensure that the pool is used as intended. The hypothetical actions of a future owner are irrelevant
Infinity pool examples	Architect	A designer involved with 15 infinity pools and eight owners of infinity pools provided feedback. There are no problems or concerns with the pools design and safety. These infinity pools are mostly recreational and up to 2.5 metres above ground level.

- 4.9 I took these comments into account and amended the draft determination as I considered appropriate.
- 4.10 I note that the guidance referred to by the architect and legal adviser is a practice note written by the authority. It is noted on the practice note that it is for "Auckland City Council internal use only and is not to be used as a substitute for professional

advice”. The practice note refers to an email from an advisor of the Department that discusses generally a range of issues associated with infinity pools including the design of the pool walls, the likelihood of different persons falling, the effect of different fall heights, and refers to a previous determination concerning a roof deck where a barrier was provided in the form of a horizontal net set 1000mm down the outside wall. The email does not contain any particular advice one way or the other as to whether a barrier is required for infinity pools. I also note the email does not constitute guidance published by the Chief Executive under section 175, but simply contains a range of views and observations by an officer of the Department that have been provided to the authority for the purpose of assisting the authority in the development of its own policy in respect of infinity pools.

- 4.11 As the legal adviser and architect have described, the pool is going to be used by the applicant as a lap pool. The pool is limited in its size and shape and smaller than a conventional recreational pool. The pool is also a significant architectural design feature of the house. The architect and legal adviser are of the view that the limits on application of Clause F4.3.1 apply because a barrier is incompatible with the intended use of the pool, in terms of its use as a lap pool and the primary aesthetic importance of the pool to the architectural design of the house.
- 4.12 The limit on application of Clause F4.3.1 applies where a barrier would be incompatible with the intended use of the area. In Determination 2009/83, I considered whether barriers would be incompatible with the intended use of race walkways at a stock yard. The walkways were used by staff carrying out their duties, and staff needs to both walk around the walkways and climb up out of the races where the stock are. I found that the limit on application of Clause F4.3.1 applied to this situation and therefore that barriers were not required, because if barriers were provided, it would prevent the staff from carrying out their duties on the race walkways, which was the purpose of the race walkways.
- 4.13 In this case, I consider a barrier would not be incompatible with the intended use of the pool. A barrier would not prevent people from carrying out activities associated with the intended use of the pool i.e. entering or exiting the pool, or swimming or relaxing in the pool. Therefore, in my view the limit on application of Clause F4.3.1 does not apply. I also note that one of the purposes of the Act is to ensure that ‘people who use buildings can do so safely and without endangering their health’, and I therefore consider the aesthetic importance of the pool insufficient justification for not providing a barrier. I also note that a design solution such as a horizontal barrier or net may be able to be incorporated into the design to meet the requirement to safeguard people from falling, whilst not interfering with the aesthetics of the architectural design of the house.
- 4.14 A second draft determination was issued to the parties on 2 August 2010 for comment.

The hearing

- 4.15 I held a hearing in Auckland on 24 August 2010 at the request of the applicant. In attendance at the hearing was the applicant, represented by her architect, legal adviser, and a technical adviser, and representatives of the Department including a referee engaged under section 187.

- 4.16 The legal adviser summarised the information provided in the previous submissions. The legal adviser was of the view that the applicant was entitled to a determination concluding that the original design met the requirements of the Building Code, however, would accept a determination that approves a revised design subject to the analysis provided by the technical adviser.
- 4.17 The applicant submitted that:
- the pool is not a recreational pool, and the intention is to use it largely for exercise purposes
 - the architect has designed a barrier to mitigate the highly unlikely risks associated with the use of this pool.
- 4.18 The technical adviser analysed the risks and hazards for the situation and found:
- a fall over the infinity edge is a highly unlikely event resulting from circumstances such as inappropriate use of a lap pool, boisterous behaviour or lack of parental supervision
 - fall protection would not seem to be necessary for a fall of less than one metre
 - a fall of four metres could have potentially serious consequences
 - mitigation of such risk should be considered, that ideally fits within the intended use and design purpose, despite the highly unlikely outcome
 - appropriate mitigation is a rail 0.25 metres below the infinity edge extending out to 0.5 metres, as the rail would greatly reduce the consequence of a fall and does not interfere with the design concept proposed
 - this solution is consistent with calculations undertaken, experiments performed, and existing guidance on this matter.
- 4.19 The architect produced a revised design (refer to paragraph 5.12, Figure 3) incorporating a horizontal barrier (“the horizontal barrier”) to take account of the analysis of the technical adviser. The architect noted that in his view the original design was sufficient to comply with the Building Code, however the revised design would mitigate the ‘additional hypothetical risks’, leading from a grossly inappropriate use of the lap pool, a lack of sensible supervision, boisterous behaviour within the pool, and irresponsible conduct by future owners.
- 4.20 The authority did not provide a submission or comment on the information presented at the hearing.

5. Discussion

- 5.1 Clause F4.2 requires that buildings be constructed to reduce the likelihood of accidental fall. Clause F4 affords protection from falling to all people, not just children, therefore the likelihood of a person falling over the edge of the pool must be considered. The objective of Clause F4 is an important one and is also reflected in the purposes provision of the Act where the very first purpose of the Act is listed in section 3 as ensuring that ‘people who use buildings can do so safely and without endangering their health’.

5.2 Clause F4.2 does not require people to be absolutely protected from falling, only that the risk of accidental fall is reduced. However, an accidental fall is just that – an accident; and even with the best care and intentions people can suffer accidents. The performance requirement in Clause F4.3.1 requires a barrier where people could fall one metre or more. A person falling greater than this height is likely to suffer considerable injuries and where a fall is significantly greater than one metre the consequence may be very serious injury or death. Clause F4.2 requires the likelihood of such accidents to be reduced.

5.3 The ‘likelihood of accidental fall’ relates to the chance of falling. Likely and likelihood are not defined in the Building Act or the Building Code. However, the word likely in section 64 of the Building Act 1991 has been considered in court, and it was held that:

“Likely” does not mean probable, as that puts the test too high. On the other hand, a mere possibility is not enough. What is required is “a reasonable consequence or [something which] could well happen.”⁴

“Likely” means that there is a reasonable probability, or that having regard to the circumstances of the case it could well happen.⁵

5.4 The pool could be used for recreational purposes as well as lap swimming. The reason for reaching this view, notwithstanding the stated intention of the applicant to use the pool only as a lap pool, is the requirement in section 16 of the Act that the purpose of the Building Code is to prescribe ‘the performance criteria with which buildings must comply in their intended use’. The term ‘intended use’ is defined in section 7 of the Act:

intended use, in relation to a building,—

(a) includes any or all of the following:

(i) any reasonably foreseeable occasional use that is not incompatible with the intended use: ...

A similar definition is contained in Clause A2. The definition in the Building Code is not identical to the Act but is the same for the purposes of this determination:

intended use of a building includes—

(a) any reasonably foreseeable occasional other use that is not incompatible with the intended use; ...

5.5 Therefore, the performance requirements in Clause F4.3.1 apply not just to the applicant’s stated intention of using the pool as a lap pool but also to other intended uses that come within the definition of ‘intended use’. The intended uses of the lap pool would include all realistic possible uses that would not be contrary to how the pool is intended to be used. While the pool is going to be used as a lap pool by the applicant for exercise and is a significant architectural design feature, I consider it is reasonably foreseeable that it could, at some time in its life, even if only on an occasional or infrequent basis, be used as a recreational pool. The smaller size and the shape of the pool do not prevent the pool being used for recreational activities and relaxation. Recreation in pools can involve activities such as playing games,

⁴ Auckland City Council v Weldon Properties Limited 8/8/96, Judge Boshier, DC Auckland NP2627/95, upheld on appeal in Weldon Properties Limited v Auckland City Council 21/8/97, Salmon J, HC Auckland HC26/97

⁵ Rotorua DC v Rua Developments Limited 17/12/99, Judge McGuire, DC Rotorua NP1327/97

general boisterous behaviour, and playing with equipment such as inflatable airbeds and floatation devices.

- 5.6 I note that, on average, houses in New Zealand change ownership with relative frequency, of the order of every seven years or so. In considering what activities are likely to be carried out in the pool, I must take account of the requirements of section 16 of the Act that buildings must comply with the performance criteria in the building code in their intended use and that this would include the intended uses of both present and future owners of the house for the life of the building. That corresponds to the approach the predecessor to the Department took to management matters in various determinations under the former Building Act 1991, determining that management practices cannot achieve compliance with the Building Code. I appreciate that taking that approach means an owner might feel aggrieved when a determination about their building is based on the likelihood that future owners will not adopt good management practices.
- 5.7 I must therefore consider if the requirements of F4.2 are met in this case, in that the likelihood of falling is sufficiently low that no further measures to mitigate that likelihood of fall are required. Both the sloping edge detail (refer to Figure 2) and the infinity edge detail (refer to Figure 3) are sufficient to prevent people from walking on the edges of the swimming pool. However, I consider that recreational activities could well raise people to or above water level and therefore above the edge of the infinity pool. In such instances the glass edge of the infinity pool at the height of the water level does not provide a barrier to people at water level in the pool.
- 5.8 I consider that the design of the infinity edge means that people could prop themselves up using the glass edge, could fall over the edge from on a floatation device that brings their centre of gravity slightly above the top of the water level when using the pool for recreational purposes, or fall over the edge if they were raised above the water level playing games or participating in generally boisterous activities.
- 5.9 I believe such an event is likely in the terms described above in that it could well happen, although I note the views expressed by the applicant's technical adviser that the probability of such an event is considered highly unlikely. Nonetheless I consider that a barrier is required to reduce the likelihood of falling because of the very serious consequences of a fall in this case.
- 5.10 As mentioned in paragraph 4.13, there are design solutions such as horizontal barriers or safety nets that could be incorporated into the design that would reduce the likelihood of falling and that will not detrimentally affect the visual effects of the pool as viewed from inside the house, which are a major architectural feature.
- 5.11 I note in the generic case of a freestanding swimming pool where the 1.2 metre high pool wall forms the safety barrier into the pool, an authority may well be acting reasonably in issuing a waiver to the requirement to provide a barrier to protect people from falling out of the pool. While Clause F4 considers reducing the risk of falling, the consequence of falling must be considered in granting a waiver of the requirement for a barrier, and given the consequence of a fall of approximately four metres, I do not consider it would be reasonable to consider a waiver, particularly as design solutions exist in this case.

The revised design

- 5.12 As discussed in paragraph 4.19, the architect produced a revised design incorporating a horizontal barrier for the infinity edge detail as shown in Figure 3.
- 5.13 The revised design includes a slightly sloping horizontal barrier consisting of a 38mm diameter outer rail running the length of the infinity edge and 250mm beyond at both ends, and returning back to the pool wall to close the rail off. The rail will be supported on 12mm diameter rods at 1 metre centres maximum with an intermediate rail located at the centre of the support rods.

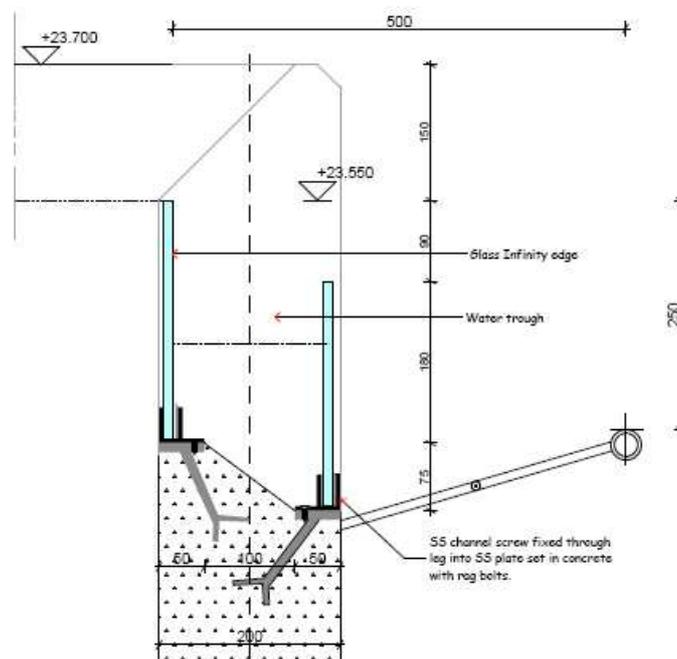


Figure 3: revised swimming pool infinity edge detail with a safety barrier

- 5.14 With respect to the compliance with Clause F4 of the revised design, I note:
- the horizontal barrier would not reduce the likelihood of accidental fall (Clause F4.2) but would safeguard people from injury caused by falling (Clause F4.1) because the height of the fall is limited
 - the horizontal barrier is of an appropriate width given the height that the barrier is positioned at approximately 250mm below the infinity edge, and less to the outer edge of the water trough
 - the horizontal barrier complies with Clause F4.3.4.
- 5.15 Accordingly, I consider the revised design complies with Clause F4 of the Building Code.

6. The decision

6.1 In accordance with section 188 of the Act, I hereby determine that:

- the design of the pool does not comply with Clause F4 of the Building Code with respect to the protection for safety from falling
- the revised design of the infinity edge complies with Clause F4 of the Building Code.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 14 September 2010.

John Gardiner
Manager Determinations

Appendix A

The legislation

The relevant provisions of the Building Code:

CLAUSE F4—SAFETY FROM FALLING

OBJECTIVE

F4.1 The objective of this provision is to safeguard people from injury caused by falling.

FUNCTIONAL REQUIREMENT

F4.2 Buildings shall be constructed to reduce the likelihood of accidental fall.

PERFORMANCE

Provisions	Limits on application
<p>F4.3.1 Where people could fall 1 metre or more from an opening in the external envelope or floor of a building, or from a sudden change in level within or associated with a building, a barrier shall be provided.</p>	<p>Performance F4.3.1 shall not apply where such a barrier would be incompatible with the intended use of an area, or to temporary barriers on construction sites where the possible fall is less than 3 metres[, or to building providing pedestrian access in remote locations where the route served presents similar natural hazards].</p>
<p>F4.3.4 Barriers shall:</p> <ul style="list-style-type: none"> (a) Be continuous and extend for the full height of the hazard, (b) Be of appropriate height, (c) Be constructed with adequate rigidity, (d) Be of adequate strength to withstand the foreseeable impact of people and, where appropriate, the static pressure of people pressing against them, (e) Be constructed to prevent people from falling through them, and (f) In the case of a swimming pool, restrict the access of children under 6 years of age to the pool or the immediate pool area, (g) Restrict the passage of children under 6 years of age when provided to guard a change of level in areas likely to be frequented by them. 	<p>Performance F4.3.4(f) shall not apply to any pool exempted under section 5 of the Fencing of Swimming Pools Act 1987.</p>