



Determination 2011/114

The safety of perimeter barriers to the roof and floors within the Reading Carpark Building at 24 Tory Street Wellington.

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 This is a Determination made on the initiative of the Chief Executive in the absence of an application for a Determination having been made, as permitted under section 181 of the Act². The decision of the Chief Executive to initiate this Determination arises from a recommendation included in the Coroner’s Findings dated 20 March 2009 prepared by the Wellington Regional Coroner. The Coroner’s inquiry related to the death of an individual who had fallen from the roof of the Reading Carpark Building (“the carpark”). (It is noted that the Coroner’s Findings state the building is located in Victoria Street Wellington. I am satisfied from the whole of the Coroner’s report, and other evidence I have sought, that the subject building is the Reading Carpark building located at 24 Tory Street Wellington.)
- 1.3 As part of the inquiry, the Coroner asked the Wellington City Council (“the authority”) to review safety aspects related to the safety rails (“the barrier”) on the building. The authority conducted a site visit and reviewed the records for the building, and came to the conclusion that the building with the existing barriers was not a dangerous building as defined in section 121. The authority also referred to the application of section 112 in regards to alterations to an existing building and noted that although some works were undertaken to the building, that work did not provide a basis for the authority to require that the barriers to be altered to comply with the requirements of the Act that were in place at the time the work was carried out.
- 1.4 The Coroner’s findings recommended that the Chief Executive make a Determination in respect of the barriers both on the top floor and intermediary floors of the carpark specifically in relation to the possibility that persons leaning against the barrier may, by their centre of gravity, topple over the rails due to the height of the barrier.

¹ The Building Act, Building Code, Compliance documents, past determinations and guidance documents issued by the Department are all available at www.dbh.govt.nz or by contacting the Department on 0800 242 243.

² In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

1.5 I take the view that the matter to be determined, under section 177(3)(f) of the Act, is whether the authority was correct in the exercise of its powers under section 124 in coming to the conclusion that the building is not dangerous, notwithstanding that the existing barrier is lower than the current Building Code requirement. In deciding this I must consider

- whether the barriers are required to comply with the Building Code
- the application of section 112
- the safety of the barriers in relation to the risk of toppling, and
- whether the building can be classified as dangerous in terms of section 121.

1.6 In this determination, I refer to the following legislation; the relevant parts of which are set out in Appendix A.

- Sections 121 and 124 of the Building Act
- Clause F4: Safety from Falling of the Building Code, referred to as Clause F4

2. The building

2.1 The building is a purpose built nine-level car park building constructed in 1988. Its construction predates the introduction of the Building Act 1991 (“the former Act”). The building has reinforced concrete frames and floor slabs, with generally no external cladding except where necessary to close off lifts and stairwells.

2.2 On the perimeter of each floor there are steel safety barriers, generally comprising horizontal tubes of approximately 85mm diameter, with vertical members, nominally 25mm by 4mm at 150mm spacing. In some instances the barriers sit on the edge of the floor slab, in other instances the guard rail is fixed above perimeter upstands varying in height between (nominally) 100 to 300mm high. The height of the top of the upper tubular member varies, but, according to the response from the authority, is not less than, 930mm from the surface upon which it is mounted. On some of the lower floors there are two barriers between each pair of columns, effectively closing off the whole of the opening-

3. Background

3.1 This determination arises from a coroner’s enquiry into the death of an individual who fell from the roof of the Reading Carpark building. The Coroner found no direct evidence as to whether or not the fall from the roof was accidental. As part of his investigations the Coroner wrote to the authority with respect to the issue of the barrier installed on the roof and on each level of the building, and in particular the legal requirements thereof. The authority advised by letter dated 2 March 2009 that:

- the minimum height of the existing barrier on the top level of the building (“the roof”) was 930mm;
- this was less than the (then) current requirement of 1100mm;
- the barriers met the specified standard at the date of construction;

- the Act does not require a building owner to upgrade existing barriers unless the barrier would be deemed dangerous under Section 121; and
- after detailed considerations, set out in the response, the existing barrier was not dangerous as defined by the Act.

In addition, the authority alerted the Coroner to provision within the Act for the Chief Executive to make a Determination in respect of the authority's exercise of its powers, the outcome of which would be binding on the authority.

3.2 The Coroner was unable to conclude whether the deceased had deliberately fallen from the roof, or had fallen accidentally from leaning over the barrier. He noted:

"There is a school of thought that if the safety rail is constructed to the new standards [sic] height of 1100mm, a person leaning against it is unlikely to topple over it, whilst anything at a lower height may not prevent a person from toppling over such a lower rail due to their body point of gravity."

3.3 The Coroner then included in his report the following recommendation to the Chief Executive:

That pursuant to Section 177 of the Building Act, a Determination be made as to the aspect of the safety rails, both on the top floor and the intermediary floors of the Reading Carpark in relation to the possibility that a person leaning against the safety rail may, by their centre of gravity, topple over due to the height of that rail.

3.4 The report included the following direction:

It is also directed that a copy of these findings, together with the eventual determination, be sent to the Chief Executive of the Wellington District Council with a view to inspect all car parking buildings within the city.

3.5 I consider it is relevant to note that some five pages of the ten page coroner's report were devoted to discussion of the barriers, reflecting the significance given to this issue by him.

4. Submissions

4.1 Before considering this matter, I invited submissions from the authority and the owners of the building (Courtenay Car Park Ltd). The authority advised by email dated 3 June 2011 they would not make a submission. No response was received from the owners.

4.2 The determination was issued in draft format to the parties on 22 August 2011. Both parties accepted the draft without comment.

5. Discussion

5.1 Compliance of the barriers with the Building Code

5.1.1 In considering Clause F4 I note that the paragraphs that may be considered to address the matter of a person toppling are Clause F4.3.4(b) requiring that the barriers be of 'appropriate height' and F4.3.4(h) which states that barriers shall be constructed so they are not readily able to be used as a seat (refer Appendix A).

5.1.2 In its response to the coroner, the authority advised that the barriers appear to be compliant when assessed against the criteria specifically defined within F4.3.4 including paragraph (h). The authority was silent on its views as to compliance with F4.3.4(b).

- 5.1.3 It is a matter of fact that the barriers do not comply with Compliance Document Clause F4 Safety from Falling 3rd Edition 2006. The Acceptable Solution F4/AS1 defines the required height for a barrier in such a location to be 1100mm.
- 5.1.4 When Compliance document F4/AS1 was first published in 1993 it specified the barrier height in buildings other than housing as 1000mm. Prior to the introduction of the Building Code in January 1993, NZS 1900³ Chapter 5 required barriers on egress routes to be 915mm.
- 5.1.5 Barrier heights in F4/AS1 were reviewed in 2003/2004 following a fatality at a movie theatre in Auckland (refer paragraph 5.4.4). Since 2007 the barrier height specified in F4/AS1 in buildings other than housing has been 1100mm.
- 5.1.6 As noted in paragraph 2.1, the building was constructed in 1988 and predates the introduction of the former Act, and therefore there were no requirements in place at the time of its construction as to the height of the barriers around the perimeters of each level.
- 5.1.7 Under Section 8 of the former Act, existing buildings were not required to be upgraded to comply with the then Building Code. The barriers to the building are also not required under the Act to be upgraded to meet the requirements of the current Building Code, unless the building is deemed to be dangerous under section 121.

5.2 The application of section 112 (or section 38 of the former Act)

- 5.2.1 The authority has indicated that although some works were undertaken to the building since its construction and after the Building Act came into force, that work did not provide a basis for the authority to require that the barriers be altered to comply with the requirements of the Building Code that was in place at the time the work was carried out.
- 5.2.2 Though I have not received any information as to the nature of the work that was conducted or the date this was carried out, I am satisfied that unless the work was directly related to the barriers the authority had no power under either section 112 of the Act or section 38 of the former Act to require the building owner to alter the barriers to ensure compliance with the Building Code in force at the time the work was undertaken.
- 5.2.3 I note that the Coroner asked the authority to advise him in regard to ‘the legal requirements for rail protection on car parking buildings.’ I am satisfied that the response from the authority dated 2 March 2009 addressed that request.
- 5.3 In light of the above I conclude that the authority was correct in its conclusion that although the barrier is less than the current Building Code requirement the Act does not require an owner of the building to upgrade existing barriers unless the barrier is deemed to be dangerous under section 121 of the Act.

5.4 Application of section 121

- 5.4.1 I note the provisions of section 121 of the Act are as follows:

121 Meaning of dangerous building

(1) A building is dangerous for the purposes of this Act if,—

³ New Zealand Standard NZS 1900 Model Building Bylaw

- (a) in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause—
 - (i) injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property; or
 - (ii) damage to other property; or
- (b) ...

5.4.2 In order to form a view as to whether the building is dangerous as defined in section 121 I must consider whether in the ordinary course of events the existing barriers on the roof and intermediary floors are likely to cause injury or death.

Safety of the barriers in relation to the risk of toppling

- 5.4.3 The Coroner's recommendation that a determination be made was specifically in relation to the possibility that persons leaning against the barrier may, by their centre of gravity, topple over the rails due to the height of the barrier.
- 5.4.4 Following a fatality at a movie theatre in Auckland, a review of the barrier heights in F4/AS1 was conducted in 2003/2004. The ergonomics relating to falling were considered, and barrier heights in other countries reviewed. Australia now has 1000mm, USA generally 1070mm (42 inches), and UK has 1100mm.
- 5.4.5 As part of the ergonomics consideration, a report by a qualified ergonomist on a fall at the Ritz Hotel in London in 1985 was reviewed ("the Ritz report"). The opinion of the report writer, and other ergonomists consulted during the review, was that a person's vertical centre of gravity is the key determinant in how easily a person can inadvertently fall over a barrier. A barrier needs to be at least as high as the centre of gravity of a person leaning against it to give adequate protection against falling.
- 5.4.6 The vertical centre of gravity is usually taken as coinciding with the hip on people of normal build and can also be estimated as 55% of the person's height. Anthropomorphic data used in the Ritz report indicated the 95 percentile male centre of gravity to be 1035mm from floor, allowing 25mm for a man wearing shoes.
- 5.4.7 Anthropometric data from NZ (NZ Ergonomics Society Newsletter, Nov 1992) indicates the 95 percentile male hip height to be 995mm. The corresponding full height was 1840mm (6 ft and one half inch) and 55% of this figure is 1012mm. Consequently, the Ritz report figure for the 95 percentile male centre of gravity being at 1035mm from the floor is relevant to NZ.
- 5.4.8 In 2011, the 95 percentile male hip height in NZ is likely to be greater than the 1992 figure of 995mm. The Ritz report considered that the 1100mm UK Building Regulations barrier height was a reasonable minimum above the 1035mm centre of gravity height to provide sufficient safety, should a person be moving or standing on their toes.
- 5.4.9 The risk of toppling is, irrespective of other considerations, related to the height of the centre of gravity of the individual, and the geometry of the barrier:
- The influence of the height of an individual is clear: if a person's centre of gravity is above the effective height of the barrier the risk of toppling over the barrier arises. The taller the person the greater the likelihood of toppling.
 - The effective height of a barrier is taken to be the height to the point where the horizontal force is resisted by the barrier. In this case the effective height is 887.5mm. In relation to typical adults this may be considered to be somewhat

low. Clearly it is below the current requirement for barrier height of 1100mm, as a proportion of the height of a typical adult.

- 5.4.10 After consideration of the above I conclude that the barriers to the roof and intermediary floors do present some risk of toppling for a greater proportion of the population than would a modern code-compliant building. The implications of this are discussed in the following paragraphs.

Classification as a Dangerous Building

- 5.4.11 In considering the issue of whether or not the building may be classified as dangerous under Section 121, I must consider the intended use of the building and the likelihood of an individual toppling ‘in the ordinary course of events’. I note that my approach differs somewhat to that taken by the authority in their response to the Coroner. That analysis was, in my view, largely concerned with confirming compliance. One element only of their consideration that addressed the issue of the intended use. In my view that issue is the material consideration.
- 5.4.12 The authority noted that in relation to the intended use, the barrier is located around the edge of a car park building “... situated in an area where people are not expected to congregate during normal use, other than to return to a vehicle.” On the basis of that finding and the general compliance of the barriers themselves – i.e. compliant apart from the then current height requirement – the authority concluded the barriers were “not dangerous as defined by the act.”
- 5.4.13 In reviewing the conclusion of the authority I consider it is necessary to examine in greater detail whether, in relation to the intended use of the building, in the ordinary course of events the building is likely to cause injury or death.
- 5.4.14 The first element I have turned my mind to is the interpretation of “the ordinary course of events”, in relation to the intended use of the building. I note:
- The intended use of the intermediary floors of the building is a car park facility, which means that adults can be expected not to be moving at any greater speed than walking, when using the facility. [Whilst children may occasionally run within the building I am satisfied the barriers offer adequate protection to them.]
 - In the ordinary course of events adults will move directly to their vehicle without spending time in the vicinity of the barriers.
- 5.4.15 The second element I have turned my mind to is the meaning of “likely”. The word “likely” in the context of section 64 of the former Act, (now section 121 of the Act), has been interpreted as follows:

“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”. *Auckland CC v Weldon Properties Ltd* 7/8/96, Judge Boshier, DC Auckland NP2627/95, [1996] DCR 635.

I find that the words ‘likely to cause injury or death’ in [s 64(1)(a) of the former Act, now s 121(a)] mean that the reasonable probabilities are that the building will cause injury or death unless it gets timeous attention. *Rotorua DC v Rua Developments Ltd* 3/3/98, Judge McGuire, DC Rotorua NP966/97.

‘Likely’, as used in [s 64(1)(a) BA91, now s 121(a)], means that there is a reasonable probability (see *Dowling v South Canterbury Electric Power Board* [1966] NZLR 676, 678); or that having regard to the circumstances of the case it could well happen (see *Browne v Partridge* [1992] 1 NZLR 220, 226). *Rotorua DC v Rua Developments Ltd* 17/12/99, Judge McGuire, DC Rotorua NP1327/97

I take the view that those decisions are good law in respect of the word “likely” in section 121.

- 5.4.16 It is relevant to note that apart from the fatality which was the subject of the Coroner’s Findings, there have been no other known fatalities associated with the barriers in this building, which is some 23 years old, nor in buildings with barriers of this height.
- 5.4.17 After consideration of the above points I conclude that users of the building are potentially exposed to an increased risk of toppling over the barrier. However I consider that “in the ordinary course of events” the building is not “likely to cause injury or death.” Therefore I must conclude the building is not dangerous in terms of Section 121 of the Act.

6. Decision

- 6.1 In accordance with section 188 of the Act, and in relation to the recommendation contained in the Coroners Findings dated 20 March 2009 in regard to a fatality occurring in relation to the Reading Carpark building, I determine that the authority was correct in the exercise of its powers under section 124 in coming to the conclusion that the building is not dangerous, notwithstanding that the existing barrier is lower than the current Building Code requirement.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 22 December 2011.

John Gardiner
Manager Determinations

Appendix A:

A.1 The relevant sections of the Building Act 1991 (the former Act):

II: Purposes and Principles

8 Existing buildings not required to be upgraded

- 8 Existing buildings not required to be upgraded---Except as specifically provided to the contrary in this Act, nothing in this Act shall be read as requiring any building, the construction of which was completed or commenced before the coming into force of Part VI of this Act, to meet the requirements of the building code.

V: Building Work and Use of Buildings

Limitations and Restrictions on Building Consents

38 Alterations to existing buildings

38. Alterations to existing buildings---No building consent shall be granted for the alteration of an existing building unless the territorial authority is satisfied that after the alteration the building will---
- (a) Comply with the provisions of the building code for means of escape from fire, and for access and facilities for use by people with disabilities (where this is a requirement in terms of section 25 of the Disabled Persons Community Welfare Act 1975), as nearly as is reasonably practicable, to the same extent as if it were a new building; and
 - (b) Continue to comply with the other provisions of the building code to at least the same extent as before the alteration.

IX: Legal Proceedings and Miscellaneous Provisions

Dangerous and Insanitary Buildings

64. Buildings which are deemed to be dangerous or insanitary---
- (1) A building shall be deemed to be dangerous for the purposes of this Act if it is---
 - (a) A building which, in the ordinary course of events (excluding earthquakes), is likely to cause injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property or damage to any other property; or
 - (b) ...
 - (2) ...

A.2 The relevant sections of the Building Act 2004 (the Act):

112 Alterations to existing buildings

- (1) A building consent authority must not grant a building consent for the alteration of an existing building, or part of an existing building, unless the building consent authority is satisfied that, after the alteration, the building will—
 - (a) comply, as nearly as is reasonably practicable, with the provisions of the building code that relate to—
 - (i) means of escape from fire; and
 - (ii) access and facilities for persons with disabilities (if this is a requirement in terms of section 118); and
 - (b) continue to comply with the other provisions of the building code to at least the same extent as before the alteration.
- (2) ...

121 Meaning of dangerous building

- (1) A building is dangerous for the purposes of this Act if,—
- (a) in the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause—
 - (i) injury or death (whether by collapse or otherwise) to any persons in it or to persons on other property; or
 - (ii) damage to other property; or
 - (b) ...
- (2) ...

A.3 The relevant performance requirements of the Building Code Clause F4 Safety from falling include:

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 of level within or associated with a building, a barrier shall be provided.

F4.3.2 Roofs with permanent access shall have barriers provided.

F4.3.3 ...

F4.3.4 Barriers shall:

- (a) Be continuous and extend for the full extent 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 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.
- (h) Be constructed so that they are not readily able to be used as seats.

A.4 The relevant table from Compliance Document – Acceptable Solution F4/AS1:

Table 1: Minimum Barrier Heights Paragraph 1.1.1, Figures 1-5		
Building type	Location	Barrier height (mm) (Note 1)
Detached dwellings and within <i>household units</i> of multi-unit dwellings	Stairs and ramps and their landings	900
	Balconies and decks, and edges of internal floors or mezzanine floors	1000
All other <i>buildings</i> , and common areas of multi-unit dwellings	Stairs or ramps	900
	Barriers within 530 mm of the front of fixed seating	800
	All other locations	1100

Note:

1. Heights are measured vertically from finished floor level (ignoring carpet or vinyl, or similar thickness coverings) on floors, landings and ramps. On stairs the height is measured vertically from the *pitch line* or stair *nosings*.
2. A landing is a platform with the sole function of providing access.
3. Clause F4.3.1 has a limit on its application that may exclude the need for barriers in certain locations such as working wharves and loading docks.
4. An 800 mm high barrier in front of fixed seating would be appropriate in cinemas, *theatres*, and stadiums.