CONSULTATION REGULATION IMPACT STATEMENT (RIS 2010-04)

Proposal to revise the Building Code of Australia to reduce the risk of slips, trips and falls in buildings

September 2010

The Australian Building Codes Board (ABCB) has commissioned KPMG to assist in the preparation of this Consultation Regulation Impact Statement (RIS) in accordance with the requirements of Best Practice Regulation: A Guide for Ministerial Councils and National Standard Setting Bodies, endorsed by the Council of Australian Governments in 2007. Its purpose is to inform interested parties regarding a proposal to amend existing regulatory requirements to reduce the risk of slips, trips and falls in buildings. Comments are invited by close of business Friday 5 November 2010. Please title "STF RIS Public Comment" and forward by email to: Consultationris@abcb.gov.au

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1 Executive Summary

1.1 The Regulatory Impact Assessment process

Under Council of Australian Government's (COAG) requirements, national standard-setting bodies such as the Australian Building Codes Board (ABCB) are required to develop a Regulation Impact Statement (RIS) for public consultation for proposals that substantially alter existing regulatory arrangements.

A RIS examines the policy choices through a rational, comparative framework demonstrating that the resulting regulatory proposal is likely to result in higher net benefits to the community than the identified alternatives.

In accordance with these requirements, this RIS has been prepared on behalf of the ABCB to assess proposed Building Code of Australia (BCA) amendments to Volume One Section D (access and egress) and Volume Two Section 3.9 (safe movement and access) of the BCA to reduce the risk of slips, trips and falls in buildings[1]. The proposed BCA amendments are summarised below:

- requirement to have a handrail installed on all private stairways to at least one side;
- reducing the spread between the maximum and minimum going and riser dimensions for both private and public stairways;
- requirement to have an 865mm high barrier for openable windows where the distance from the floor level to the surface below is greater than one metre;
- requirement to have a non-climbable zone in a balustrade or barrier where the distance from the floor level to the surface below is greater than one metre; and
- requirement where single steps are not to be more than 180mm high, including at door thresholds.

1.2 The review process

The periodic review of the BCA is consistent with Government policy objectives, where COAG principles for best practice regulation states:

[1] Proposed BCA amendments of Volume One Section D and Volume Two Section 3.9 can be found in the BCA 2011 public comment draft - http://tinyurl.com/BCA2011publiccommentdraft

> *"to ensure regulation remains relevant and effective over time it is important that all regulations be reviewed periodically".*

Over time, the understanding of risks which exist in the broader built environment improves and there is a better appreciation of how the risks can best be managed. There will also be changes in the stock of building materials as a result of technological developments. The BCA is the basis for regulatory building standards in all of Australia's jurisdictions, therefore it is important that the BCA is reviewed on a regular basis to take account of these changes so its relevancy can be maintained and compliance burdens minimised.

The proposed BCA amendments have been developed as a result of detailed research and evaluation over a number of years. The research and evaluation process is summarised below:

- in 2003, the ABCB commissioned a report, *Health and Safety Risks in Buildings* that found that the main health and safety risks in buildings (both commercial and residential) appeared to be from slips, trips and falls;

- in 2006, the ABCB commissioned research conducted by the Monash University Accident Research Centre (MUARC), *The relationship between slips, trips and falls and the design and construction of buildings* (the Monash Report), to supplement the existing information to determine whether a relationship exists between the incidence of slips, trips and falls for the age group most at risk and the design and construction requirements for buildings. The Monash Report also ascertained whether current requirements in the BCA provide an acceptable minimum standard of safety and made a number of recommendations;

- in 2008, the recommendations from the Monash Report along with Proposals for Change (PFCs) of a similar nature were considered at the National Technical Summit of that year and by the ABCB's Building Codes Committee (BCC). Of all the MUARC recommendations and PFCs combined, 10 in total were supported for Preliminary Impact Assessments (PIAs). The PIAs found that, of the 10 individual proposals, five should be considered for further, more detailed analysis and possible inclusion in the BCA. These findings were considered by the BCC and, as a result, it was recommended that a RIS be developed. The Board agreed to move forward with the project and to have it included in the ABCB 2009/10 work program; and

- in 2010, further research was commissioned by the ABCB to help determine a current snapshot of typical riser and going stair dimensions and the provision of handrails used in private stairways as well as a report to analyse the construction cost implications of the proposed changes to the BCA.

Given the above, the key problem the proposed amendments are designed to address are the issues identified with current BCA requirements relating to preventative measures for slips, trips and falls.

1.3 Rationale for continued Government intervention

Government intervention is necessary when an issue or problem imposes social or economic costs to the community but is not adequately addressed by individuals or the market. In this instance, continued Government intervention is justified because of:

- inadequate individual response due to insufficient information and bounded rationality. The information required to understand the risks of slips, trips and falls, and appropriate risk mitigation measures is highly technical, extensive and difficult to comprehend. The theory of 'bounded rationality' could potentially result in a failure to adopt the appropriate design and protection measures during the construction of a new building, which is due to an inability of individuals to fully comprehend and interpret the risks to which they are exposed; and

- imperfect industry response due to split incentives. Without intervention, designers and builders do not have incentives to voluntarily incorporate additional preventative measures in the design and construction of buildings, where owners are price driven and unable to verify the benefits arising from an increase in building costs.

1.4 Objectives

The proposed BCA amendments are designed to support the objectives of both the BCA and COAG principles. They also seek to provide an efficient response to reduce the incidence of slips, trips and falls in buildings and the associated costs due to fall related injuries and fatalities. In particular, the proposed revisions and the alternative options being considered seek to achieve the following:

- provide people with safe, equitable and dignified access to a building and the services and facilities within a building, and safeguard occupants from illness or injury while evacuating in an emergency;

- address the identified market failures in relation to the provision of preventative features of slips, trips and falls; and

- ensure that the regulatory requirements are cost effective and transparent.

1.5 Identification of feasible policy options

In accordance with COAG requirements, this RIS identifies and considers the merits of alternative means of achieving the BCA's slips, trips and falls objectives, including:

- intermediate forms of regulation (self regulation, co-regulation or quasi-regulation); and
- non-regulatory options (information campaigns, voluntary standards, or taxes and subsidies).

The lack of alignment between those with responsibility for incorporating better preventative measures to reduce the incidence of slips, trips and falls in buildings and those who realise their benefits means it is unlikely that an intermediate form of regulation would achieve Government objectives. The risks associated with non-compliance include substantial risks to public health and safety, and economic impacts.

Similarly, non-regulatory interventions on their own appear to be inappropriate responses to ensure that the appropriate improved preventative measures for slips, trips and falls are put in place. Non-regulatory interventions would not provide the level of assurance of protection and minimisation of damages required by the public and Government.

Therefore, the proposed BCA amendments represent a regulatory option and involve changes that reflect the findings from the research, evaluation and review process conducted.

As such, this Consultation RIS provides a comparative assessment of alternative regulatory measures, namely:

- a *Base Case* – the status quo or 'existing regulation' option;
- *proposed BCA amendments* – the adoption of an all inclusive package of the proposed changes relating to the requirements for handrails, stair going and riser dimensions, barriers for openable windows, non-climbable zones for balustrades and barriers, and a maximum height for single steps; and
- an *Alternative Option* – the adoption of only those parts of the proposed BCA amendments which result in a net benefit to the community.

The costs and benefits associated with these shortlisted options are assessed in detail in the subsequent analysis.

1.6 Cost benefit analysis

The cost benefit analysis estimates the incremental impacts associated with each option compared to the Base Case, and separately considers the following:

- estimated cost impact on individual building owners;
- estimated aggregate cost impacts at a State/Territory level;
- estimated benefits for each proposed amendment; and
- an assessment of the expected qualitative costs and benefits.

The outcome of each component of the analysis is presented below.

1.6.1 Cost impact on individual building owners

The five proposed revisions do not apply to all building classes in the BCA. The proposed change to the requirement for handrails to be installed only applies to Class 1 buildings and private stairways in Class 2, 3 and 4 buildings. The other four revisions apply to all building classifications. The proposed amendment to barriers for openable windows and single steps are not expected to impose any incremental cost as a design change is all that is required to meet the amendment proposed.

Table 1-1 shows the aggregate cost of all proposed amendments with cost impacts (handrails, stair riser and going dimensions, non-climbable zones) per representative building in each BCA building class. The most significant cost impact is estimated to be borne by Class 5 buildings, set to incur an extra $2,200 cost to implement the proposed revisions. Class 6 buildings – shops, cafes etc – are expected to incur the least cost impact.

Table 1-1: Summary of average cost impact of the proposed revisions per representative building by building class

Building Class	Average cost impact per proposed revision ($)			Total ($)
	Handrails	Stair riser and going dimensions	Non-climbable zone	
1	378	66	1,000	1,444
2	378	1,161	0	1,539
3	378	1,356	0	1,734
4	378	83	0	461
5	0	2,220	0	2,220
6	0	111	0	111
7	0	1,104	0	1,104

Building Class	Average cost impact per proposed revision ($)			Total ($)
	Handrails	Stair riser and going dimensions	Non-climbable zone	
8	0	138	0	138
9	0	500	0	500
10	0	0	0	0

1.6.2 Aggregate cost impacts

The aggregate impacts (i.e. the State and national impacts) of the estimated change in construction costs were calculated based on the estimated percentage cost increases for the representative sample of affected buildings, and the assumed average annual building activity for each BCA class in each State and Territory.

Table 1-2 below provides a summary of the estimated aggregate cost impacts of the proposed BCA amendments in each State and Territory. The expected aggregate increase in construction costs under the proposed, all-inclusive package of revisions is in the order of $29.5 million per annum.

Table 1-2: Increase in construction costs by jurisdiction and proposed revision ($ per annum)

Jurisdiction	Handrail	Stair riser and going dimensions	Non-climbable zone	Total
VIC	626,200	4,928,386	3,623,642	9,178,228
NSW	361,609	3,167,933	2,076,808	5,606,350
QLD	435,751	3,459,695	2,520,091	6,415,537
SA	179,963	1,337,757	1,045,236	2,562,956
WA	290,402	2,143,732	1,687,401	4,121,535
TAS	47,895	407,759	275,649	731,303
NT	58,286	499,972	85,732	893,527
ACT			249,537	
AUS	**2,000,105**	**15,945,235**	**11,564,096**	**29,509,436**

Note that NT and ACT have been combined due to the small jurisdiction size

As shown above, implementation of the stair riser and going dimensions and non-climbable zone amendments are expected to incur the greatest cost.

1.6.3 Aggregate benefits

The benefits are calculated by applying the number of new buildings as a percentage of existing building stock and the effectiveness of the proposed

amendment in reducing slips, trips and falls on the total costs of injuries and fatalities that can be attributed to each proposed amendment. The benefits are calculated as a reduction in the cost of injuries and fatalities.

A number of assumptions were made in order to quantify the benefits that can be attributed to the amendments. These assumptions include the effectiveness rate of each amendment in preventing injuries and fatalities, the number of injuries/fatalities that result from the building components under the proposed amendments, and the proportion of the total building stock impacted by the amendments. Data assumptions (e.g. extrapolation of State data) were also required as limited data was available. The assumptions made to calculate the benefits are explained in more detail in Appendix B. Public comment is also sought to assist in improving the use and accuracy of the assumptions applied.

The table below indicates the stair riser and going dimension amendment is expected to result in the highest benefit.

Table 1-3: Benefits attributed to the proposed amendments in Year 1

Proposed amendment	% of new building in Year 1	Effectiveness rate (%)	Support for assumption on effectiveness rate	Total cost of injuries/ fatalities ($m)	Benefits in Year 1($m)^
Handrail	1.4[2]	30	Academic article[3]	139.4	0.6
Stair riser and going dimensions	1.6	30	ABCB assumption	188.8	0.9
Barrier for openable windows	1.6	30	ABCB assumption	6.35	0.04
Non-climbable zone	1.4	30	ABCB assumption	5.95	0.02
Single steps	1.6	5	ABCB assumption	4.0	0.003
Total	**--**	**--**	**--**	**344.5**	1.2*

^ The numbers in the benefits column are derived from the benefit calculations presented in Table B-1 in Appendix B, e.g. the benefit for barriers for openable windows is $35,760 and hence is shown as $0.04 million, and the benefit for the non-climbable zone is $24,990 and is therefore shown as $0.02 million in the table above.

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

[2] Note that the difference between the percentages of new buildings across the amendments is because the handrail and non-climbable zone amendments apply to residential buildings while the other amendments apply across all building classes. For the handrail and non-climbable zone amendment, the number of new residential approvals is calculated as a percentage of residential stock while for the other amendments, it is the number of new approvals (residential and non-residential) as a percentage of all building stock.

[3] Ishihara et al. (2002) found that of the 2,800 elderly respondents to a questionnaire concerning stair use, 34.2% reported being saved by a handrail when they nearly fell. The same investigation also found that handrails were particularly effective at preventing falls due to sub-standard illumination of stairwells, the effects of which are often exacerbated in the elderly by vision deterioration. (Monash Report, p. 25)

1.6.4 Qualitative assessment

The key benefit that can be attributed to preventative measures for slips, trips and falls is the avoidance of all costs associated with a slip trip or fall in addition to the reduction in hospitalisation costs and avoidance of fatality. In addition to the costs quantified in section 1.6.3 above, these also include the following:

- *indirect tangible costs* – costs associated with business disruptions, indirect production losses and reduction in unpaid work; and

- *intangible costs* – costs related to the pain and suffering of patients.

To the extent the proposed BCA amendments and/or the Alternative Option improves or reduces the incidence of slips, trips and falls, there is potential to increase or decrease the costs that individuals, building owners, businesses, Governments and the community incur as a result of slips, trips and falls. This requires knowledge of the contributions that the specific changes to the individual components can make to the reduction of slips, trips and falls, taking into account other factors that could influence the occurrence of slips, trips and falls.

In addition, there is a further cost that should be considered in addition to the construction costs that have been quantified:

- *Decrease in net rentable floor space* – For the assumed riser and going dimensions used in the calculations for the stair riser and going dimension amendment[4], Turner and Townsend reported that there was a decrease in the net rentable floor space due to an increase in the stairway footprint. The decrease in available floor area ranges between 2.75 per cent to 4.58 per cent for a 20m^2 room and 1.83 per cent to 3.06 per cent for a 30m^2 room. The actual decrease in rentable space ranges from 0.5m^2 to 1m^2, depending on the BCA Building Class. It should be noted that the effect on the net rentable floor space is also dependant on which riser and going dimension is used in the calculations.

- It is not possible to quantify the costs imposed as a result of the decrease in rentable space as the rental income differs across the building classes and is highly dependent on the location (e.g. city, industrial area or regional areas). Data on the number of buildings by building class, location and average rental income is unavailable in order to perform a quantitative assessment.

[4] Under the existing code, the assumed typical dimensions of 180mm riser and 250mm going were costed to the proposed amendment, where the assumed typical dimensions of 180mm riser and 280mm going were used.

1.6.5 Evaluation of options

The costs and benefits for each proposed amendment in the first year and over a 10-year period (the life of the regulation) are presented in the table below. The results indicate that only the barrier for openable windows and single step amendments result in a net benefit in the first year as the implementation of these amendments are not expected to impose any incremental construction costs.

Assuming 10 years for the life of the regulations, and given an assumed lifespan for buildings of 30 years, the benefits associated with the buildings built during this 10 year period of regulation will accrue over 40 years (i.e. building built in year 10 will realise benefits until year 40), while the costs associated with the proposed amendments will stop after the year 10. It is therefore possible that an amendment may impose a net cost in the first year but result in a net benefit over the 10-year period. The handrail amendment is such an example.

Table 1-4: Evaluation of options

Proposed amendments	Net Present Value over 10 years ($m)			Year 1 ($m)		
	Costs	Benefits	Net benefits/ (costs)	Costs	Benefits	Net benefits/ (costs)
Handrail	11.5	45.1	33.6	2	0.6	(1.4)
Stair riser and going dimensions	95.3	90.2	(5.1)	15.9	0.9	(15)
Barrier for openable windows	0	2.6	2.6	0	0.04	0.04
Non-climbable zone	66.8	1.9	(64.9)	11.6	0.02	(11.58)
Single steps	0	0.3	0.3	0	0.003	0.003
Total	**173.6**	**106.2***	**(67.4)***	**29.5**	**1.2***	**(28.3)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

1.7 Findings

The RIS analysis concludes the following.

Quantitative impacts

- The individual proposed BCA amendment is expected to impact on construction costs in the following manner:

- the private handrail requirement will increase building costs for Classes 1 to 3 buildings (Class 4 is assumed to have minimal activity and hence negligible impact) by $11.5 million (NPV) with potential benefits of $45.1 million (NPV) and a net benefit of $33.6 million (NPV) over the life of the regulation (10 years);

- the stair riser and going dimensions amendment will result in an increase in cost across all building classes of $95.3 million (NPV) with potential benefits of $90.2 million (NPV) and net cost of $5.1 million (NPV) over the life of the regulation;

- the requirement for a balustrade/barrier for an openable window where the surface beneath is greater than one metre will have a negligible cost impact but will result in a net benefit of $2.6 million (NPV) over the life of the regulation;

- the requirement for a non-climbable zone in balustrade/barriers where the surface beneath is more than one metre will result in an increase in construction costs for Class 1 buildings of $66.8 million (NPV) with potential benefits of $1.9 million (NPV) and a net cost of $64.9 million (NPV) over the life of the regulation; and

- assuming the single step requirement will have a negligible cost impact this amendment will result in a net benefit of $0.3 million (NPV) over the life of the regulation.

- In aggregate, the proposed BCA amendment option will lead to an increase in overall construction costs of $173.6 million (NPV) with potential benefits of $106.2 million (NPV) and a net cost of $67.4 million (NPV) imposed on the community over the life (10 years) of the regulation.

- In comparison, the Alternative Option (combination of the handrail, barrier for openable windows and single step amendments) will lead to an increase in cost of $11.5 million (NPV) with potential benefits of $48.0 million (NPV) and a net benefit of $36.5 million (NPV) imposed on the community over the life (10 years) of the regulation.

Qualitative impacts

- Under the proposed BCA amendment option, 7,976 injuries or eight fatalities would need to be prevented in new buildings constructed annually to justify the costs of implementing all the proposed revisions.

- In comparison, 541 fall-related injuries or one fatality need to be prevented annually under the Alternative Option.

- The Alternative Option presents a net benefit to the community and requires fewer injuries/fatalities to be prevented compared to the proposed BCA amendment option.

Conclusions

Based on the analysis undertaken, it can be concluded that the Alternative Option is more cost effective than the proposed BCA amendment option, delivering the greatest benefit to the community. This finding reflects both the number of injuries and fatalities currently assumed to be attributed to the building components subject to amendment, and the expected effectiveness of the proposed changes in preventing the injuries and fatalities from slips, trips and falls.

The proposed changes under the Alternative Option are also more closely aligned with objectives of the changes being proposed, namely they:

- will assist in providing people with safe, equitable and dignified access to buildings;
- address the indentified market failures; and
- represent cost effective and transparent regulatory requirements.

Finally, the research undertaken in this area in recent years provides strong support for the proposed changes, both in terms of the demonstrated risks associated with current regulatory requirements and the specific nature of the changes proposed.

2 Introduction

2.1 Purpose of this document

The purpose of this Consultation Regulation Impact Statement (RIS) is to analyse the likely impact of adopting the proposed BCA amendments[5] into the Building Code of Australia (BCA) to reduce the risk of slips, trips and falls in buildings.

Under Council of Australian Governments' (COAG) requirements, national standard-setting bodies such as the Australian Building Codes Board (ABCB) are required to develop a RIS for proposals that substantially alter existing regulatory arrangements. This requirement is reaffirmed in the ABCB's Inter-Government Agreement[6] (IGA) which requires that there must be a rigorously tested rationale for regulation.

A draft RIS is initially undertaken for the purposes of public consultation ('Consultation RIS'). The Consultation RIS may be developed further following its public release, taking into account the outcomes from the community consultation. A Final RIS is then developed for decision-makers. This entire process is undertaken in cooperation with the Office of Best Practice Regulation and in accordance with the process established in the COAG *Best Practice Regulation Guide*[7] and presents the rationale, costs and benefits, and impacts of the proposal.

The primary purpose of a RIS is to examine the policy choices through a rational, comparative framework and to determine whether the resulting regulatory proposal is likely to cause higher net benefits to the community than the identified alternatives.

2.2 Current regulatory arrangements

The BCA is a performance based document that contains the technical provisions for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment, and energy efficiency as well as certain aspects of health and amenity. The BCA is given the status of building regulations by all States and Territories.

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[5] Proposed BCA amendments of Volume One Section D and Volume Two Section 3.9 can be found in the BCA 2011 public comment draft - http://tinyurl.com/BCA2011publiccommentdraft
[6] The ABCB IGA is located at www.abcb.gov.au
[7] COAG Best Practice Regulation, A Guide for Ministerial Councils and National Standard Setting Bodies, October 2007, available at http://www.finance.gov.au/obpr/proposal/coag-guidance.html

Each section of the BCA specifies Objectives which are considered to reflect community expectations. It also defines mandatory Performance Requirements, which state the level of performance a Building Solution must meet to achieve the related BCA Objectives.

The BCA allows compliance with the Performance Requirements through the adoption of acceptable Building Solutions, i.e.:

- implementing the deemed-to-satisfy (DTS) provisions, which are specific requirements contained either in the BCA or in BCA referenced documents such as Australian Standards that are deemed to satisfy the Performance Requirements of the BCA; or
- formulating an Alternative Solution that can be shown to be at least equivalent to the DTS provisions or which can be demonstrated as complying with the Performance Requirements; or
- a combination of both.

In the context of this RIS, the DTS requirements with regard to the safe movement of people in buildings are set out in:

- BCA Volume One, Section D (access and egress); and
- BCA Volume Two, Section 3.9 (safe movement and access).

The requirements contained within Volumes One and Two of the BCA are designed to support the achievement of the following Objectives outlined in the table below.

Table 2-1: Relevant BCA Objectives

Volume One	BCA Objective
Section D – Access and Egress	DO1 The *Objective* of this Section is to– (a) provide, as far as is reasonable, people with safe, equitable and dignified access to– (i) a building; and (ii) the service and facilities within a building; and (b) safeguard occupants from illness or injury while evacuating in an emergency.

Volume Two	BCA Objective
Part 2.5 – Safe Movement and Access	O2.5 The *Objective* is to– (a) provide people with safe access to and within a building; and (b) safeguard young children from drowning or injury in a *swimming pool;* and (c) safeguard people from drowning or injury due to suction by a *swimming pool* water recirculation system.

Based on the above, it is evident that the key objectives of the BCA for building access relates to providing occupants/people with safe entry and passage throughout buildings.

2.3 Review of current arrangements

This Consultation RIS analyses the likely impact of adopting measures to reduce the risk of slips, trips and falls in buildings. These changes have been developed as a result of detailed research and evaluation over a number of years.

Table 2-2 below provides a summary of the review process undertaken to date.

Table 2-2: Review and research into building access and safety

Date	Description	Source	Comments
2003	Health and Safety Risks in Buildings	Atech Group	In 2003, the ABCB commissioned report found that the main health and safety risks in buildings (both commercial and residential) appeared to be from slips, trips and falls. The report recommended further work on identifying cost-effective building designs (or building components) that could reduce the incidence of slips, trips and falls.
2008	The relationship between slips, trips and falls and the design and construction of buildings (The Monash Report)	Monash University Accident Research Centre (MUARC)	In 2006, the ABCB commissioned research by MUARC to supplement the existing information to determine whether a relationship exists between the incidence of slips, trips and falls for the age group most at risk and the design and construction requirements for buildings. The Monash Report

Date	Description	Source	Comments
			also ascertained whether current requirements in the BCA provide an acceptable minimum standard of safety and made recommendations.
2008	Recommendations from the Monash Report	National Technical Summit	The recommendations from the Monash Report were considered at the National Technical Summit of that year and by the ABCB's Building Codes Committee (BCC).
2008	Preliminary Impact Assessments (PIAs)	Building Codes Committee	Preliminary Impact Assessments (PIAs) based on the Monash Report recommendations were considered by the BCC and the development of a RIS was recommended to the Board for decision.
2008	ABCB 2009/10 work program	Australian Building Codes Board	In November 2008, the Board agreed to move forward with the project and to have it included in the ABCB 2009/10 work program.
2010	Trips, Slips and Falls Project	Di Marzio Research Pty Ltd	The ABCB commissioned a report to help determine a current snapshot of typical riser and going stair dimensions and the provision of handrails used in private stairways.
2010	Cost Analysis Report	Turner & Townsend	The ABCB commissioned a report to analyse the construction cost implications of the proposed changes to the BCA.

3 Nature and extent of the problem

3.1 Overview

The proposed BCA amendments[8]seek to address the incidence of slips, trips and falls in buildings.

Where building purchasers do not perceive value from prevention measures of slips, trips and falls or are not aware of their level of exposure to the risk of slips, trips and falls, there is little or no incentive for builders to include such features in construction. This is because purchasers are unlikely to choose to meet the additional costs that builders may incur to provide these protections.

Further, to the extent that the current codes do not reflect current knowledge about the nature and extent of risks associated with current building design and construction requirements, the relationship with slips, trips and falls, and the effectiveness of different prevention measures in mitigating those risks, it may be timely to review the BCA. The need for a review is supported by COAG best practice regulation guidelines which requires regulation be reviewed periodically to ensure its relevance.

In this section, the nature and extent of this problem is explored. The incidence of slips, trips and falls and how they impact on vulnerable populations, as well as the costs associated with fall injuries and fatalities, are discussed. We also consider whether the current regulatory requirements, individual responses and the market's response are adequate in trying to reduce the incidence of slips, trips and falls.

This discussion highlights the opportunity to reduce the incidence of slips, trips and falls, and the associated costs with minor modifications to current building designs and construction requirements. It also suggests that the magnitude of the problem will increase in years to come as the percentage of aged people in the population increases. Combined, these considerations underpin the case for Government intervention in this area.

3.2 Nature and extent of the problem

In 2003, the ABCB commissioned a report, *Health and Safety Risks in Buildings*[9]. The report found that the main health and safety risks in buildings (both commercial and residential) appeared to be from slips, trips and falls. However, based on information available at that time, it was not possible to readily determine the actual risk contribution of any number of relevant factors

[8] Proposed BCA amendments of Volume One Section D and Volume Two Section 3.9 can be found in the BCA 2011 public comment draft - http://tinyurl.com/BCA2011publiccommentdraft
[9] Atech Group, *Health and Safety Risks in Buildings*, submitted to the ABCB, 2003.

such as building design (or building component), obstacles that are not part of the structure that create a trip hazard, surface contaminants, the degree of alertness of the persons suffering the injury and the number of people exposed to each particular hazard.[10] A recommendation from the report stated that the ABCB should commission a literature review to indicate cost-effective building designs (or building components) that could be utilised in new or existing buildings to reduce the incidence of slips, trips and falls.[11]

3.2.1 Incidence of slips, trips and falls in buildings

In 2006, the ABCB commissioned the Monash University Accident Research Centre (MUARC) to investigate, whether the design and construction of buildings contributes to slips, trips and falls. In 2008, MUARC submitted a report, *The relationship between Slips, Trips and Falls and the design and construction of buildings* (the Monash Report), which found that between 2002/03 and 2004/05 an average of 106,000 hospital admissions occurred each year as a result of falls in buildings.[12] The Monash Report found that slips, trips and falls disproportionately affected the vulnerable pockets of the population, particularly young children and older people.

For young children, the Monash Report found that :

- the most common cause of hospitalisation for children between the ages of 0 to 14 is fall related injury;
- in Australia, fall-related injuries occur at a rate of 628.1 per 100,000 hospitalisations in children, with children between the ages of 5 and 9 years having the highest rate at 654.6 fall-related injuries per 100,000 hospitalisations;[13] and
- even though fall mortality rates for children are lower, children carry the largest fall injury burden with nearly 50 per cent of the total number of disability-adjusted life years lost worldwide to falls, occurring in children under the age of 15 years.[14]

For older people, the Monash Report found that:

- around 30 per cent of persons aged 70 years and over were found to fall at least once a year with 19 per cent falling more than once;

[10] ibid, p. 87.
[11] ibid, pp. 87-88.
[12] Monash University Accident Research Centre, *The relationship between slips, trips and falls and the design and construction of buildings*, funded by the ABCB, 2008.
[13] ibid, p. 12.
[14] ibid, p. ix

- older persons living in residential care facilities tend to sustain fall injuries more often than older persons in the community[15];

- those over the age of 65 accounted for over 92 per cent of acute public hospital costs per bed day related to fall injuries; and

- older people represent 75 per cent of fall fatalities and 10.9 per cent of all hospital bed days. These frequencies represent an over-representation by a factor of 6 for this age group.

The Australian Department of Health and Ageing (DHA) *National Slips and Falls Prevention Project* reported similar findings.[16] DHA found that falls are the leading cause of death and injury for people aged over 65 years and that 1 in 3 people aged over 65 years living in the community fall each year.[17] The DHA report listed the environment as one of the main risk factors for falls in older people, and identified steps with no handrails as one of the environmental hazards commonly associated with falls.[18]

The Monash Report established the major causes of falls were:

- slips, trips and stumbles on the same level (29.2 per cent);

- other falls on the same level (20.6 per cent);

- falls involving beds (6.6 per cent);

- falls on and from stairs and steps (6.0 per cent);

- combined falls from heights (including falls on and from ladders, falls from, out or through buildings or structures and other falls from one level to another) (5.8 per cent); and

- falls involving chairs (3.9 per cent).[19]

The reasons behind the remaining 25 per cent of hospital admissions caused by falls were not specified.

3.2.2 The costs of slips, trips and falls

The economic costs associated with falls in buildings can be separated into the following categories:

[15] ibid, p. 12.
[16] Australian Department of Health and Ageing, *National Slips and Falls Prevention Project*, 2005.
[17] ibid, p. 4.
[18] ibid, p. 20.
[19] Monash University Accident Research Centre, *The relationship between slips, trips and falls and the design and construction of buildings*, funded by the ABCB, 2008, p. x.

- direct tangible costs;
- indirect tangible costs; and
- intangible costs.

Each of these costs are discussed in further detail below.

3.2.2.1 Direct tangible costs

The *direct tangible costs* associated with falls in buildings are driven by the medical and rehabilitation costs associated with treating an injury (e.g. time spent in hospital).

Injuries

The Monash Report estimated the total cost to the public health system from falls in buildings which resulted in injuries and hospitalisation. This calculation was based on:

- an average hospital admission of 3.7 days;
- an average acute public hospital bed cost per day of about $1,000; and
- 3.39 million acute public hospital bed days resulting from falls most likely occurring in buildings for the years 2002 to 2005.

From 2002 to 2005, the total cost was estimated to be at $3.4 billion of which $3.1 billion can be attributed to people aged over 65 years as they account for 75 per cent of acute public hospital bed days attributed to falls.[20]

The reasons that fall injuries incur such high hospitalisation costs is largely because older people are more susceptible to falls[21] and possess a weaker body constitution (e.g. decreased vision, balance and bone density) resulting in the likelihood that more serious injuries would be sustained from falls (e.g. hip fractures) and hence longer stays in hospitals[22].

Falls are also a primary source of traumatic brain injury (29 per cent) and spinal cord injury (33 per cent) in Australia, second only to transport accidents.[23] Although these injuries are a relatively uncommon result of falls (representing less than one per cent of fall-related hospitalisation), the direct lifetime costs,

[20] ibid, p. xiii.
[21] ibid, p. 12.
[22] ibid, p. 23
[23] Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, 2009, p223, 24

including the provision of attendant care and healthcare services, can be quite substantial.[24] In 2008, the lifetime cost of new cases of brain and spinal cord injury was estimated at $3.02 billion.[25]

Brain Injury Australia referred to falls-related traumatic brain injury (TBI) data sourced from the Sydney Children's Hospital at Randwick and The Children's Hospital at Westmead, which noted that between 2003 and 2007, 23 children (14 boys and 9 girls) aged between 0 and 11 years were admitted to the Sydney Children's Hospital after falls out of a window. Of these, 11 children sustained a TBI and one child died in hospital as a result. Over the same period 42 children were admitted to The Children's Hospital at Westmead after falling out of windows, with 26 of the children sustaining a TBI and one fatality.[26]

Fatalities

The Monash Report also quantified the economic costs of fall fatalities in buildings. Using an assigned economic value of life of $729,727.90[27], the Monash Report estimated the total economic cost resulting from falls in buildings to be $1.25 billion from 2001 to 2005 or $250 million per annum. For the purpose of this RIS, the economic value of a life is valued at $3.5 million according to the guidance provided by the Office of Best Practice Regulations.[28]

The report also found that:

- over the period, building fall related fatalities increased by 24.5 per cent;
- males accounted for the majority (57.6 per cent) of building fall related fatalities, constituting a total cost of about $720 million while female deaths accounted for 42.4 per cent and cost about $530 million; and
- falls occurring in the home made up 52.4 per cent of building fall related fatalities, with 30.9 per cent occurring in hospitals or health service areas (including nursing homes).

It should also be noted that, although the Monash Report has estimated the economic costs of injuries and fatalities, the available data is likely to underestimate the true extent of hospitalisations and fatalities in Australia

[24] Monash University Accident Research Centre, *The relationship between slips, trips and falls and the design and construction of buildings*, funded by the ABCB, 2008, p. 104.
[25] Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, 2009, p. xiv
[26] Information provided by Brain Injury Australia to the ABCB.
[27] This figure represents the median value of life for Australians in March 2003 determined by a PricewaterhouseCoopers study ($650,000), adjusted for CPI between the March 2003 to September 2007 quarters.
[28] The average economic value of life is assumed to be $3.5 million according to guidance provided by the Office of Best Practice Regulation (http://www.finance.gov.au/obpr/docs/ValuingStatisticalLife.pdf).

attributed to falls. While the impact of falls resulting in deaths is relatively easy to collect, many other injuries from falls may not be captured in the Monash Report's estimation. Fall related injuries that are treated by general practitioners, nurses, family and friends or by individuals themselves would not have been captured using public hospitalisation costs data.

3.2.2.2 Indirect intangible costs

The *indirect tangible costs* are more difficult to identify but arise as a consequence of the event and include:

- business disruption (e.g. legal and compensation costs);
- indirect production losses (as a result of increased staff absenteeism); and
- reduction in unpaid work (e.g. housekeeping or parenting).

While indirect tangible costs such as business disruptions and production losses are difficult to quantify, given that the majority of victims of falls are older persons and to a lesser extent children, it is likely that such costs would be marginal as older persons and children are unlikely to be actively contributing to business and other productive activities.

As an indication of the potential magnitude of indirect tangible costs:

- *Compensation awarded for a slip, trip or fall* – In 2006, a woman was awarded $277,000 compensation after a fall at the Bondi Hotel in Sydney.[29] The largest settlement to date in Australia for a single slip and fall accident is believed to be $2.75 million.[30]
- *Production losses* – Xie et al. (2008)[31] estimated the indirect cost affecting patients suffering from knee osteoarthritis affects a similar population demographic as slips, trips and falls (i.e. the majority of patients are retirees). The study found that indirect costs imposed on patients accounted for between 2.3 per cent to 3.6 per cent of the annual average household income. Higher indirect costs were borne by working patients while retirees and homemakers bore the lower end of the cost range.

[29] *CG Maloney Pty Ltd v Hutton– Potts & Or* [2006] NSWCA 136
[30] Best Non-Slip Solution Website, accessed on 26 February 2010, http://www.bestnonslip.com.au/
[31] Xie F., Thumboo J., Fong K.Y., Lo N.N., Yeo S.J., Yang K.Y. and Li S.C., A Study on Indirect and Intangible Costs for Patients with Knee Osteoarthritis in Singapore, *Value in Heath*, Vol II Supplement I, 2008, p. S86.

3.2.2.3 Intangible costs

Intangible costs largely relate to the pain and suffering of patients, which are usually measured by using the reduction in quality of life or through the elicitation of the willingness-to-pay for a cure.

Xie et al. (2008) estimated that the intangible costs imposed on patients suffering from knee osteoarthritis accounted for 3.3 per cent of average annual household income. Intangible costs are found to be influenced by the income levels of patients, with patients on higher income experiencing high intangible costs.[32]

3.2.3 Risk factors contributing to slips, trips and falls

The incidence and costs associated with injuries and fatalities resulting from slips, trips and falls in buildings are driven by a number of risk factors. These risk factors include:

- biological and medical risk factors such as muscle weakness and reduced physical fitness, impaired control of balance and gait, vision changes, chronic illness, physical disability, acute illness, cognitive impairments and depression;

- behavioural risk factors including a history of previous falls, risk-taking behaviour (e.g. seniors climbing ladders or standing on unsteady chairs), medication and multiple prescriptions, excessive alcohol and inappropriate footwear and clothing;

- environmental risk factors including stairs, factors in and about the home (e.g. absence of night lights, hazardous shower stalls and lack of grab bars or handrails), factors in the public environment where poor building design and inadequate maintenance of buildings can also contribute to falls and falls hazards in long term care settings and hospitals (e.g. bed heights, floor surfaces and bad lighting); and

- socio-economic risk factors such as income, education, housing and social connectedness are recognised social determinants of health and can have an impact on the likelihood of falls. Research has shown that financial strain was an independent predictor of both falls and injurious falls, particularly among the caregivers of veterans.[33]

While it is difficult to effectively influence biological, behavioural and socio-economic risk factors, it is possible to reduce the risks of slips, trips and falls

[32] ibid, p. S86.
[33] Public Health *Agency of Canada, Report on Seniors' falls in Canada*, 2005, pp. 30-36.

from some environmental risk factors, which is the focus of this Consultation RIS.

The Monash Report made recommendations in five areas with regards to changes to the BCA that could potentially reduce the incidence and costs associated with slips, trips and falls by addressing proven environmental risk factors:

1 Stair and step geometry

- Background:
  - Studies have shown that up to 80 per cent of stairway falls occur during descent.[34] The Monash Report recognised that the narrow going width (the lower end of the allowable range of stair riser and going dimensions), currently allowed by the BCA could potentially encourage falls during descent.
- Recommendation:
  - Narrow the wide range of geometrical going and riser combination currently allowed in the BCA.

2 Provision, design for optimal height of handrails and balustrades

- Background:
  - Handrails: The BCA does not currently require handrails in private stairways (i.e. stairways in Class 1 buildings and in dwelling units of Class 2, 3 & 4 buildings). The Monash Report noted the potential for injury if the anchoring function provided by a handrail is absent. In public stairways, handrails must be provided to both sides where the stairway is two or more metres wide. If the stairway is less than two metres wide, handrails (a balustrade with a top rail would be sufficient) are required for at least one side. The Monash Report noted the potential for injury if the anchoring function provided by a handrail is absent. The potential for injury on stairs bound by solid walls is also increased by the possibility of colliding with those walls during a fall.

[34] Studies included:
1. Jackson, P.L. and Cohen H.H., An in-depth investigation of 40 stairway accidents and the safety of stair literature, *Journal of Safety Research*, Vol. 26(3), 1995, pp. 115-159.
2. Salter, A.E., K.M. Khan, M.G. Donaldson et al., Community-dwelling seniors who present to the emergency department with a fall do not received Guideline care and their fall risk profile worsen significantly: a 6-month prospective study, *Osteoporosis International*, Vol. 17(5) May, 2006, pp. 672-683.
3. Tse T., The environment and falls prevention: Do environmental modifications make a difference?, *Australia Occupational Therapy Journal*, Vol. 52(4), 2005, pp. 271-281.

- Balustrades: The Report noted that current BCA regulations do not require verandahs of less than one metre above the surface beneath in height to have a railing or balustrade even though falls from such low heights can have severe injury consequences.

- Recommendations:

  - Amend the BCA to raise the minimum stairway handrail height from 865mm to over 900mm. This recommendation was assessed in an earlier Preliminary Impact Assessment. It was found that the existing injury data was not robust enough to allow for any meaningful disaggregation of fall injury data that would correlate to a person's centre of gravity.

  - Include in the BCA provisions of non-climbable barriers of sufficient heights for verandahs of less than 1000mm in height.

3 Slip resistance of flooring surfaces

- Background:

  - Current BCA refers to terms 'non-slip', 'non-skid' and 'slip resistance' to describe the requirements of various surface finishes, but does not actually specify what constitutes a non-slip, non-skid or slip resistant surface finish.

- Recommendations:

  - A definition of slip resistance be included in future editions of the BCA.

  - Manufacturers and retailers to provide to consumers comparative information on slip resistance and the slip resistant properties of different surfaces.

4 Trip hazards

- Background

  - The Monash Report describes trip hazards generally as those obstacles that, if removed, would have prevented a fall. Trip hazards can include door frames, steps, clutter or cables.

- Recommendation:

  - A provision to recess or "rebate" structural trip hazards such as door frames, shower door frames and other structural trip hazards in new or

renovated domestic dwellings, be considered in future editions of the BCA.

5 Falls from heights

- Background

  - Windows, balconies and verandahs: The Monash Report considered that current BCA provisions governing the required height of verandah balustrades and the acceptable minimum space of 125mm between the horizontal and vertical balcony railings are old and no longer applicable. Climbability of balcony and verandah railings was also considered unacceptable from a safety perspective. The Monash Report also commented that the current BCA does not require a railing or balustrade where verandahs are less than one metre in height above the surface beneath. Severe injuries can result from such falls and can be mitigated through more stringent balustrade/barrier and non-climbable design provisions.

  - Residential building maintenance and access to heights: The Monash Report noted that it is impossible to regulate domestic maintenance activity and that elimination of hazards is the only practical prevention strategy for hazards associated with domestic building maintenance and the accompanying need to access heights.

- Recommendations:

  - The ABCB, building industry, local councils and other stakeholders investigate the possibility of limiting or reducing the need to attain heights for domestic maintenance purposes.

  - The BCA should consider a provision for the required installation of window guards at second storey height in all domestic dwellings, irrespective of whether they exceed four meters in height above the surface beneath.

  - The BCA to be amended to require handrails for stairs in all domestic dwellings.

  - All balcony, stair and verandah balustrades, irrespective of height above ground level, should be of non-climbable design and adequate height to prevent toppling-over.

Due to the extensive nature of the Monash Report, not all recommendations could be addressed through the BCA and assessed through this RIS. The Monash report recommendation concerning the issue of slip resistance for

example would require further extensive research and time to formulate an appropriate definition and testing protocol with industry. A suitable approach to achieve this has been found to be problematic in the past, when the issue of slip resistance has been raised.

The recommendation to raise the handrail height to at least 910mm due to an increase in the average person's centre of gravity was also not included as it would also require further extensive research. Furthermore, the Preliminary Impact Assessments demonstrated that the existing injury data was not robust enough to allow for any meaningful disaggregation of fall injuries that could be correlated to a person's centre of gravity. The same reasons found in the PIAs also precluded the recommendation to eliminate structural trip hazards such as door rebates and shower frames.

Other recommendations are simply outside the scope of the BCA. Furthermore, existing BCA requirements were not investigated for their cost effectiveness in reducing slip trips and falls as this too is outside the scope of the RIS. This Consultation RIS therefore considers only those recommendations which have passed the ABCB's impact analysis process (PFC & PIA processes) where its regulatory impact can be assessed without the need for further research and that are within the framework of the BCA. They include and relate to:

- revising stair riser and going dimensions;
- the regulation of single steps;
- provision of handrails on private stairways;
- barriers for openable windows where the distance from the floor to the surface below is greater than one metre; and
- a non-climbable zone in a balustrade/barrier where the distance from the floor to the surface below is greater than one metre.

3.2.4 Future risks

The incidence and costs imposed by slips, trips and falls are likely to increase going forward due to the following factors:

- changing population demographics; and
- increasing building activity.

3.2.4.1 Changes in population demographics

Ageing population

The number of injuries and fatalities attributed to falls of older people is expected to increase as the proportion of older persons rise.

The United Nations estimated that by the year 2050, the number of older persons worldwide will for the first time exceed the number of younger persons. The proportion of persons aged over 60 years then will be twice that compared to the year 2000.[35]

The Australian Treasury forecasted that Australians aged 65 years and over will increase from around 2.5 million in 2002 to 6.2 million in 2042. This implies that the proportion of persons aged over 65 years will increase from making up around 13 per cent of the population to around 25 per cent. For Australians aged 85 and over, the growth is even more rapid, from around 300,000 in 2002 to 1.1 million in 2042.[36]

Children

The proportion of people in Australia aged under 15 years is projected to decrease from 19 per cent in 2007 to between 15 per cent and 18 per cent in 2056 and to between 14 per cent and 17 per cent in 2101, with the lower percentage based on the assumptions of lower fertility levels and net overseas migrations. [37]

Even though the proportion of people aged under 15 years is forecast to decrease in the future, given that the Australian population is projected to reach between 30.9 to 42.5 million by 2056 and 33.7 to 62.2 million by 2101, the absolute number of children at risk from falls will increase.[38]

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[35] ibid, p.12.
[36] Australian Treasury website, *Australia's Demographic Challenges*, accessed 13th May 2010. http://demographics.treasury.gov.au/content/_download/australias_demographic_challenges/html/adc-04.asp
[37] Australian Bureau of Statistics website, Catalogue No. 3222.0 – Population Projections, Australia, 2006 to 2101, accessed 16th May 2010. http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3222.0Main+Features12006%20to%202101?OpenDocument
[38] ibid. http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/3222.0Main+Features12006%20to%202101?OpenDocument

3.2.4.2 Increase in building activity

As a result of higher density living due to the urbanisation of the environment, it is more likely that people will access buildings more frequently or live in buildings that could contribute to higher occurrence of slips, trips and falls.

In a recent newsletter, the Victorian Building Commission reported that it expects construction business activity, employment and conditions to remain steady or positive over the next six months based on results from its Building Industry Economic Survey conducted in January 2010. The results are driven by the domestic and residential sector as it is more positive than the commercial sector in their forecasts for their value of their building projects and employment levels for the next six months.[39]

The Building Commission reported that between 2008 and 2009, the number of approved building permits increased 3 per cent to 105,568 with the value increasing 6 per cent to $21.3 billion.[40] Even though the recent global financial crisis is likely to impact adversely on construction activity due to higher interest rates and a tighter credit market, the increasing population in Australia will place pressure on the demand for housing. To accommodate an increasing population, construction activity is likely to focus on the building of higher density multi-storey dwellings. An increase in the number of such buildings could contribute to the occurrence of slips, trips and falls.

3.3 Current regulatory arrangements

3.3.1 Overview

There is a range of slips, trips and falls prevention measures available to building owners to mitigate their level of risk exposure to fall injuries and fatalities. Typically, these measures are designed to:

- provide, as far as is reasonable, people with safe, equitable and dignified access to a building and the service and facilities within a building; and
- safeguard occupants from illness or injury while evacuating in an emergency.

The following sections outline the provisions in the BCA that are designed to prevent or minimise the risks of injury caused by slips, trips and falls.

[39] Building Commission website, *Pulse Today Extra*, Issue 12, April 2010, accessed 16th May 2010. http://www.pulse.buildingcommission.com.au/resources/documents/Jan_2010_BIES_report.pdf
[40] Ibid.

3.3.2 Stairways

The BCA currently prescribes a range of design requirements for the construction of stairs of all Classes of buildings, including:

- all goings and risers are to be constant throughout a flight of stairs;
- risers that have openings to not allow a 125mm sphere to pass through between the treads; and
- treads to have non-slip finishes.

In addition, the BCA establishes a maximum and minimum ratio for risers and goings using the quantity ratio (2R + G). The following table summarises the riser and going dimensions currently outlined in the BCA.

Table 3-1: Riser and going dimensions (summary of Table D2.13 and Figure 3.9.1.2 in the BCA)

	Riser (R) (mm)		Going (G) (mm)		Quantity (2R + G) (mm)	
Vol One - Table D2.13(Class 2-9 buildings)	Max	Min	Max	Min	Max	Min
Public stairways	190	115	355	250	700	550
Private stairways	190	115	355	240	700	550
Vol Two - Figure 3.9.1.2 (Class 1 & 10 buildings)	Max	Min	Max	Min	Max	Min
Stairs (other than spiral)	190	115	355	240	700	550
Spiral	220	140	370	210	680	590

The design, construction and regulation of stairs are based heavily on tradition rather than principals of ergonomics and universal design. Reliance on tradition does not necessarily mean that the current design of stairs is adequate.[41]

3.3.3 Handrails and balustrades

The requirements to build a barrier in the form of a balustrade or barriers along roofs, stairs, ramps and balconies etc in all types of buildings are outlined in BCA Volume One D2.16 and in BCA Volume 2, Part 3.9.2.2. The BCA provides that stairs meet the requirements if they are bounded by a wall.

At a summary level, these provisions cover:

- when a balustrade/barrier is required to be built – for example stairways, ramps, balconies, decks, verandas where the distance from the floor to the surface below is greater than one metre and windows where the distance from the floor to the surface below is greater than four metres; and

- the height and construction of the balustrade/barrier.

3.3.4 Non-climbable zone

To maximise the effectiveness of the balustrade provision, the BCA outlines a non-climbable zone provision. The non-climbable zone is required for balustrades/barriers where the distance from the floor to the surface below is greater than four metres. The building parameters of a non-climbable zone

[41] Monash University Accident Research Centre, *The relationship between slips, trips and falls and the design and construction of buildings*, funded by the ABCB, 2008, p. 21.

currently describe that any horizontal or near horizontal elements between 150mm and 760mm above the floor must not facilitate climbing.

There are no non-climbable zone provisions for balustrades/barriers where the height from the floor to the surface below is less than four metres.

3.3.5 Single step

There are no current provisions in the BCA that outline the requirements for a single step except at external door thresholds. BCA Volume One D2.15 and BCA Volume Two 3.9.1.5 currently requires external door thresholds to be no more than 190 mm, however for single steps elsewhere, there are no requirements and this would allow a single step at any height.

3.3.6 Conclusion – slips, trips and falls prevention

Some of the issues with the current provisions outlined above that aim to minimise or prevent slips, trips and falls include:

- the handrail provisions do not apply to private stairways – particularly an issue with multistorey Class 1 buildings and within private areas of Class 2 (buildings containing two or more dwellings), Class 3 (guest house, motel or backpacker accommodation) and Class 4 (single dwelling in a Class 5, 6, 7, 8 or 9) buildings;

- currently, the ranges for risers and goings are broad – particularly an issue in regard to narrow stair goings and tall risers. This makes the design and construction of stairs less consistent across all buildings. In addition, no regulation exists for the maximum height of a single step; and

- balustrade/barrier provisions are required only for openable windows where the distance is greater than four metres from the floor to the surface beneath.

3.4 Rationale for a review of current arrangements

The current review of the BCA requirements is necessary as:

- the Monash Report identified that slips, trips and falls are the second largest cause of unintentional injury deaths after road traffic injuries and that building design has the potential to mitigate many of these falls injuries and deaths in vulnerable populations;

- the provisions for some building design components, such as those that relate to the construction of stair risers and treads, are based on traditional rules and not principles of ergonomics and universal design; and

- it is consistent with Government policy objectives, where COAG principles for best practice regulation states that "to ensure regulation remains relevant and effective over time it is important that all regulations be reviewed periodically". Over time, the understanding of risks which exist in the broader built environment improves and there is a better appreciation of how the risks can best be managed. There will also be changes in the stock of building materials as a result of technological developments. The BCA is the basis for the regulatory building standards in all of Australia's jurisdictions, therefore it is important that the BCA is reviewed on a regular basis to take account of these changes so its relevancy can be maintained and compliance burdens minimised.

3.5 The rationale for continued intervention – market failures

3.5.1 Introduction

In considering the appropriateness of existing arrangements, it is important to confirm the rationale for continued Government intervention in a particular area. Government intervention is necessary when an issue or problem (e.g. incidence of slips, trips and falls) imposes social or economic costs (e.g. hospitalisation and fatality costs) to the community but is not adequately addressed by individuals or the market.

Generally, in the event that a market does not deliver an efficient outcome, it is said to be 'failing' and Government intervention is justified on the grounds that it could improve economic outcomes and the economic welfare of society. The market can be inefficient due to a variety of factors, that include:

- imperfect individual responses; and

- imperfect industry responses.

These imperfect responses arise due to an array of market failures including insufficient information, bounded rationality and information asymmetry, and provide a rationale for continued Government intervention. These market failures are further explored in the following sections.

3.5.2 Imperfect individual responses

Building owners, especially owner-occupiers, clearly have a strong self-interest in protecting themselves from slips, trips and falls. While owners can choose to

implement protection measures to mitigate these risks, they require accurate and readily available information to ensure an appropriate level of mitigation is provided.

Given this information, owners are able to balance the risk of loss against the cost of risk mitigation measures, and thus choose the level of exposure they are willing to accept. However in practice, this may not occur because of the market failures summarised below.

Insufficient information and 'bounded rationality'

To determine the risks associated with a particular building and the appropriate approach to mitigating those risks, building owners require information about the following:

- how risks are influenced by specific building, property and occupant characteristics; and
- how different modifications made to the design of various building components can effectively mitigate the risks of slips, trips and falls.

This information is highly technical, extensive and difficult to comprehend. In practical terms, it may not be realistic to assume that individuals would, as a matter of course, have the capacity to assemble, analyse and assess the range of information necessary to form a fully informed view of the building risks and the appropriate mitigation measures.

The theory of 'bounded rationality' could potentially result in a failure to adopt the inappropriate design and installation of protection measures during the construction of a new building, which is due to an inability of individuals to fully comprehend and interpret the risks to which they are exposed.

Finally, where the users of a particular building are not aware of the level or appropriateness of the various preventative measures in operation, an information asymmetry exists. That is, users may assume that they already have adequate protection from slips, trips and falls for the level of risk exposure. They may not necessarily have the capability to understand the information or even be able to access the required information to assess its appropriateness.

3.5.3 Imperfect industry response – split incentives

The benefits of preventing slips, trips and falls in buildings normally do not accrue to the party that designs or constructs the building. Designers and builders have incentives to minimise building costs in order to attract purchasers and remain competitive in the building industry, yet decisions made during the

building design and construction phases can significantly impact on the probability of fall injuries and fatalities. Without intervention, builders do not have incentives to voluntarily incorporate additional preventative measures in the design and construction of buildings, where owners are price driven and unable to verify the benefits arising from an increase in building costs.

3.6 Summary of rationale for proposed amendments and continued Government intervention

The rationale for a review of the current arrangements is based on the following:

- inadequacies related to the current BCA requirements that relate to the slips, trips and falls preventative measures as identified by the Monash Report. Modifications to those measures have the potential to reduce the number and costs of falls injuries and deaths; and

- COAG support for the periodic review of regulation to reflect current knowledge and technology.

Continued Government intervention is based on the following market failures:

- individuals are unlikely to make appropriate decisions due to insufficient information and bounded rationality (i.e. sufficient information is difficult to obtain and analyse); and

- the building industry is unlikely to voluntarily incorporate adequate protection measures in the design and construction of new buildings as they can involve an increase in building costs, and because purchasers are unable to verify the long term benefits associated with those measures.

In light of these considerations, there is a strong case for continued Government intervention, and a review of the current regulatory arrangements, to assess whether the risk of slips, trips and falls in buildings and its impact and costs on the community can be addressed more effectively and efficiently than the status quo.

4 Objectives of Government intervention

Government intervention would be implemented principally by the ABCB amending the BCA. The ABCB's mission is to address issues relating to health, safety, amenity and sustainability in buildings through the creation of nationally consistent building codes, standards, regulatory requirements and regulatory systems.

ABCB objectives

The objectives of the ABCB are to:

- develop building codes and standards that accord with strategic priorities established by Ministers from time to time, having regard to societal needs and expectations;
- establish building codes and standards that are the minimum necessary to achieve relevant health, safety, amenity and sustainability objectives efficiently; and
- ensure that, in determining the area of regulation and the level of the requirements:
  - there is a rigorously tested rationale for the regulation;
  - the regulation would generate benefits to society greater than the costs (that is, net benefits);
  - there is no regulatory or non-regulatory alternative (whether under the responsibility of the Board or not) that would generate higher net benefits; and
  - the competitive effects of the regulation have been considered and the regulation is no more restrictive than necessary in the public interest.

Objectives of the draft revisions to the BCA

The proposed amendments to the BCA are designed to support the objectives of both the ABCB and COAG's principles for best practice regulation, which support the periodic review of regulation to ensure it remains suitable for its purpose. They also seek to provide an efficient response to reduce the incidence of slips, trips and falls in buildings and the associated costs due to fall related injuries and fatalities. In particular, the proposed revisions and the alternative options being considered seek to achieve the following:

- provide people with safe, equitable and dignified access to a building and the service and facilities within a building, and safeguard occupants from illness or injury while evacuating in an emergency;

- address the identified market failures in relation to the provision of preventative features of slips, trips and falls; and

- ensure that the regulatory requirements are cost effective and transparent.

5 Identification of feasible policy options

5.1 Introduction

This section identifies and considers the merits of alternative means of achieving the Government objectives of reducing the incidence of slips, trips and falls through revisions to the BCA. This discussion of feasible alternatives is divided into three sections:

- a description of the regulatory proposal (i.e. the proposed BCA amendments being the central case) and how it differs from the status quo (i.e. continuing with the current requirements in the BCA);
- a discussion of other forms of regulation and non-regulatory options; and
- a shortlist of feasible policy options for detailed assessment.

The shortlisted options are then assessed in further detail in the subsequent analysis.

5.2 Description of the regulatory proposal

The proposed BCA amendments were prepared by the ABCB based primarily on the recommendations from the Monash Report. The preparation of a Consultation RIS for the proposed BCA amendments was recommended by the Building Codes Committee to the Board, which subsequently agreed to move forward with the project and have it included in the ABCB 2009/10 work program.

5.2.1 Summary of proposed BCA amendments and key changes from current arrangements

The proposed BCA amendments make changes to the DTS requirements that apply to the design and construction of stair risers and goings (including single steps), handrails, non-climbable zones and barriers for openable windows. The five proposed revisions and key changes from current arrangements are summarised in the table below. More details on the proposed amendments can be found in the BCA 2011 Public Comment Draft.[42]

[42] Proposed BCA amendments of Volume One Section D and Volume Two Section 3.9 can be found in the BCA 2011 public comment draft - http://tinyurl.com/BCA2011publiccommentdraft

The proposed BCA amendments are a result of the review process explained in section 2.3. This RIS explores the costs and benefits associated with the proposed amendments, but do not assess the cost effectiveness of existing arrangements or other potential cost-effective changes to the BCA.

Table 5-1: Summary of the proposed BCA amendments and current arrangements

Building component		Proposed revisions	Current arrangement
1.	Handrails	• Handrails to be installed on all private stairways to at least one side. • Applicable to Class 1 buildings and private stairways in Class 2, 3, and 4 buildings.	• Current BCA requirements do not apply to private stairways.
2.	Stair riser and going dimensions	• Reducing the spread between the maximum and minimum going and riser dimensions for both private and public stairways • Riser dimensions to be between 150mm to 180mm (range of 30mm) and going dimensions to be between 280mm to 355mm (range of 75mm). • No requirement for riser and going dimensions to satisfy the equation '2R+G'. • Applicable across all building classes. Spiral stairways are excluded.	• Current allowable spread in riser dimensions is between 115mm to 190mm, a range of 75mm. • Current allowable spread in going dimensions is between 250mm to 355mm, a range of 115mm. • Current riser and going relationship to satisfy the equation '2R+G'.
3.	Barrier for openable windows	• Requirement to have an 865mm high barrier for openable windows where the distance from the floor level to the surface below is greater than one metre. • Applicable across all building classes.	• Current trigger for BCA balustrade or barrier requirements for openable windows is when the difference between the floor level and the surface below is greater than four metres.
4.	Non-climbable zone	• Requirement to have a non-climbable zone in a balustrade or barrier where the distance from the floor level to the surface below is greater than one metre. • The non-climbable zone within a balustrade or barrier sits between 150mm and 760mm above the floor and must not have any horizontal elements that facilitate climbing. • Applicable across all building classes.	• Currently a balustrade or barrier is not required to have a non-climbable zone unless the floor level is greater than four metres above the surface below.
5.	Single step	• Single steps are not to be more than 180mm high, including door thresholds. • Applicable across all building classes.	• Current provisions in the BCA do not regulate the height of single steps. • Current provisions in the BCA for riser minimum and maximum dimensions only apply to two or more risers.

Consultation Questions:

- Are there other potential cost-effective measures that could be implemented to reduce slips, trips and falls in buildings?
- How cost-effective are current arrangements?

5.3 Alternative policy approaches

5.3.1 Other forms of regulation

The regulatory proposal involves making changes to the provisions in the BCA that govern the design and construction of various building components. These revisions being subject to explicit government regulation, are one form of regulation. The COAG *Best Practice Regulation* guide identified a spectrum of regulatory approaches with explicit government regulation at one end of the spectrum and self-regulation at the other. Intermediate forms of regulation (quasi-regulation and co-regulation) are also identified.

Self-regulation

Self-regulation involves industry formulating rules and codes of conduct, and being solely responsible for their enforcement. It generally requires a viable industry association with broad coverage and members that will voluntarily adhere to a code of conduct devised by other members. Minimal sanctions such as loss of membership or peer disapproval are required to ensure broad compliance, and the Government role is reduced to facilitation and advice.

Self-regulation should be considered where:

- there is no strong public concern, in particular, no major health and safety concern;
- the problem is a low risk event and of low impact or significance; and
- the problem can be fixed by the market itself, for example, there may be an incentive for individuals or groups to develop and comply with self-regulatory arrangements (industry survival or market advantage).[43]

This matter appears unlikely to meet these criteria. Self-regulation is unlikely to provide an adequate incentive for the reduction in the occurrence of slips, trips and falls in buildings. Slips, trips and falls are high risk occurring events (particularly with an ageing population and increase in construction activity)

[43] Office of Best Practice Regulation *Best Practice Regulation Handbook 2010, p. 34.*

and their potential impacts are substantial, particularly in the areas of public health costs and safety concerns for vulnerable populations.

Further, because the benefits of enhanced preventative measures of slips, trips and falls in buildings do not accrue to the building industry (i.e. there are split incentives), it is unlikely that self-regulation would result in an appropriate level of protection being incorporated in the design and construction of such building components in new or refurbished buildings.

Quasi-regulation

Quasi-regulation is similar to self-regulation, but is distinguished by a stronger role for Governments in endorsing industry codes, providing technical guidance, or entering into Government-industry agreements.

One option could be for Government to encourage and assist the building industry to formulate appropriate standards but leave the compliance as a voluntary matter or subject to professional sanction. Possible sanctions range from information sanctions to exclusions from professional bodies.

Similar to self-regulation, it is unlikely that quasi-regulation would deliver an efficient outcome for construction of new or refurbished buildings. Given compliance is voluntary, there is a risk of non-compliance that will not result in a reduction in the incidence of slips, trips and falls.

Co-regulation

Co-regulation involves Governments providing some form of legislative underpinning for industry codes and standards. This may involve delegating regulatory powers to industry, enforcement of undertakings to comply with codes, or providing a fall-back position of explicit regulation in the event that industry fails to self-regulate.

Co-regulation is also unlikely to achieve Government policy objectives for revisions that govern the design and construction of the building components that could reduce the incidence of slips, trips and falls in buildings. This is because without Government and legislative backing, there is considerable risk that a co-regulatory approach would result in higher levels of non-compliance, with a potential consequence of a continuing rise in the incidence of slips, trips and falls.

Conclusions

The lack of alignment between those with responsibility for incorporating better preventative measures to reduce the incidence of slips, trips and falls in buildings and those who realise their benefits, mean it is unlikely that an intermediate form of regulation would achieve Government objectives. The

risks associated with non-compliance include substantial risks to public health and safety, and economic impacts.

5.3.2 Non-regulatory intervention

A range of alternative instruments that might be used as alternatives to regulatory intervention, include:

- information and education campaigns;
- standards including voluntary, non-regulatory, performance-based or prescriptive; and
- market-based instruments such as taxes and subsidies.

Information and education campaigns

Information and education campaigns regarding improvements to the design and construction of building components that could reduce the incidence of slips, trips and falls in buildings can potentially improve the performance of buildings. However, as outlined in Section 3.5, even with complete information, individuals are unlikely to be able to design, construct and incorporate the appropriate preventative measures due to the technical aspects of risk assessment and product knowledge combined with the assumed limited technical and analytical ability of lay-people (i.e. bounded rationality). This limits the effectiveness of any information or education campaigns.

Standards

While voluntary Standards could provide flexibility, it is unlikely that, without legislative backing, e.g. through State and Territory based legislation, the building industry would voluntarily comply with the Standards. This relates to the issue of split incentives, where the benefits associated with the increased levels of protection do not accrue to the building industry.

The current arrangement incorporates some characteristics of a non-regulatory approach such as using a performance-based framework and providing builders with flexibility to satisfy the BCA Performance Requirements through the DTS provisions or allowing builders to formulate an alternative solution that demonstrates compliance. That is, the Standards facilitate the process of compliance but the BCA does not mandate compulsory compliance with the Standards if a building practitioner is able to demonstrate compliance via an alternative manner.

Taxes and subsidies

Taxes and subsidies are unlikely to provide sufficient incentive to encourage the adoption of improved preventative measures to reduce the incidence of slips, trips and falls in buildings as they would still require individuals to bear substantial up-front costs. Although these additional costs are likely to be outweighed by longer term benefits, the lack of readily available information around the risk of slipping, tripping and falling and the likely difficulties individuals would face in comprehending and acting rationally on that information, mean that there could be a significant risk that individuals would have insufficient incentive to incur the costs of implementing effective new measures for slips, trips and falls.

Conclusions

Non-regulatory interventions, on their own, appear to be inappropriate responses to ensure implementation of appropriate preventative measures of slips, trips and falls because they would not provide the level of assurance of protection and minimisation of damages required by the public and Governments.

5.4 Shortlist of options for detailed consideration

Given the above assessments of voluntary and information based approaches and the imperfections in the individual and market responses to this problem, these approaches are likely to have limited effectiveness in isolation. There is however, a strong rationale for a continuing regulatory approach; this RIS provides a comparative assessment of alternative regulatory measures, namely:

- A *Base Case* – the status quo or 'existing regulation' option;
- *Proposed BCA amendments option* – an all inclusive package of all the proposed revisions relating to the requirements for handrails, stair going and rising dimensions, barriers for openable windows, non-climbable zones for balustrades and barriers, and maximum height for a single step; and
- An *Alternative Option* – the adoption of only those parts of the proposed BCA amendments which result in a net benefit to the community.

The costs and benefits associated with these shortlisted options are assessed in detail in the subsequent analysis.

6 Cost impact of proposals on building owners

6.1 Introduction

This section provides an assessment of the impact of the proposed BCA amendments in different types of buildings. It involves quantification of the incremental change in costs for a representative sample of buildings. The estimated cost impacts are extended to the State and national level in the following section, together with an assessment of the other costs and benefits associated with the proposal.

This section will perform the analysis for the proposed BCA amendment option as follows:

- identify the expected design implications for each of the five proposed revisions for different types of building (i.e. by BCA classification); and
- calculate the likely cost impact of each proposed revision for each different class of building.

The remainder of this section details the analysis in each of these areas.

6.2 Proposed revisions and the BCA building classifications

The five proposed revisions do not apply to all building classes in the BCA. The proposed change to the requirement for handrails to be installed only applies to Class 1 buildings and private stairways in Class 2, 3 and 4 buildings. The other four revisions apply to all building classifications.Table ***6-1*** provides a brief overview of the building classes defined by the BCA. For the purpose of this Consultation RIS (unless otherwise stated), Classes 1 and 2 are considered residential buildings while Classes 3 to 10 are considered commercial buildings.

Table 6-1: Applicability of proposed revision to the BCA building classes

Class	Description	Type
1	Single dwelling, including terrace or townhouse	Residential buildings
2	Building containing two or more dwellings	
3	Guest house, motel, backpacker accommodation etc	Commercial buildings
4	Single dwelling in a Class 5, 6, 7, 8, or 9 building	
5	Office building	
6	Shop, café or restaurant etc	
7	Carpark or wholesale type warehouse	
8	Laboratory or factory	

Class	Description	Type
9a	Health-care building, hospitals etc	
9b	Assembly building	
9c	Aged care building	
10	Non-habitable building or structure such as private garage or swimming pool etc	

6.3 Handrails on private stairways

The costs of supplying and installing handrails to buildings in Classes 1 to 4 are provided by a cost analysis report by Turner and Townsend[44] as shown in Table 6-2. Note that the Turner and Townsend report provided cost estimates for handrails of lengths four, five and six metres based on three different types of materials. Cost estimates provided by Turner and Townsend are exclusive of GST. These cost estimates represent the incremental cost of implementing the proposed change as there are no current BCA requirements for private stairways.

Table 6-2: Cost estimates for proposed handrail requirement

Type	4 metres	5 metres	6 metres
Hardwood timber	$264	$330	$400
Anodised Aluminium	$1,000	$1,250	$1,500
Steel with PVC sheathing	$670	$840	$1,000

The analysis has assumed (based on ABCB advice) that, for a representative building in each building class impacted by the revision, the average length of a handrail constructed is eight metres. The ABCB also provided advice that it was reasonable to assume that private stairways would already have a balustrade along half the length of the stairway, therefore only the remaining four metres along a stairway would require the construction of a handrail in order to comply with the proposed amendment. Therefore the cost impact of the proposed revision for a building in Classes 1 to 4 ranges from $264 to $1,000 depending on the material used.

6.4 Stair riser and going dimensions

The reduction in the spread between the maximum and minimum stair riser and going dimensions applies across all building classes. Turner and Townsend estimated the incremental cost implication of the revision for each building class using two different types of materials (in-situ concrete and timber) as shown in Table 6-3. When estimating the incremental costs, Turner and Townsend have also assumed a slab to slab height for each class. Further, to estimate the incremental cost, Turner and Townsend assumed that the typical riser and going dimension under the current code is 180mm (riser)

[44] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 2.

and 250mm (going), and that under the proposed code it would increase to 180mm (riser) and 280mm (going).[45]

The ABCB provided further assumptions in relation to the average number of storeys for a representative building in each BCA class as well as the type of material to be used for residential (timber) versus commercial (in-situ concrete) buildings. The ABCB have advised that buildings in Classes 2 and 3 will incorporate both residential and commercial stairways. Further, it was assumed that there is an average of 10 single occupancy units (SOUs) on each storey of the building and that around 5 per cent of these units are double storey and would require the construction of one flight of timber residential stairs. All buildings within Classes 2 and 3 were also assumed to incorporate concrete public stairways.

Consultation Questions:

- Is it reasonable to assume for the purposes of this RIS that there is an average of 10 single occupancy units on each floor of a Class 2 or 3 building?
- Is it reasonable to assume that 5 per cent of single occupancy units located within a Class 2 or 3 building are double storey?

Table 6-3 and Table 6-4 show the cost estimates for residential stairs and commercial stairs respectively, calculated using the information provided by Turner and Townsend and taking into account the assumptions provided by the ABCB.

Table *6-3*: Cost estimates for proposed change to stair riser and going dimensions for (private) residential stairs

Building Class	No. of storeys	No. of SOUs affected	No. flights of stairs per SOU	Assumed slab to slab height (m)	Incremental cost per flight ($)		Cost estimates ($)
					In-situ concrete	Timber	
1	2	NA	1	3	--	66	66
2	5	2.5	1	3	--	66	165
	10	5	1	3	--	66	330
3	5	2.5	1	3.5	--	77	193
	10	5	1	3.5	--	77	385

Source: 1. Incremental cost estimates from Turner and Townsend. 2. Assumptions regarding number of flights of steps from ABCB. 3. Calculations performed by KPMG.

[45] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 3.

Table 6-4: Cost estimates for proposed change to stair riser and going dimensions for (public) commercial stairs

Building Class	No. of storeys	No. of stairwells per building	Total no. flights of stairs	Assumed slab to slab height (m)	Incremental cost per flight ($)		Cost estimates ($)
					In-situ concrete	Timber	
2	5	1	4	3	83	--	332
	10	2	18	3	83	--	1,494
3	5	1	4	3.5	97	--	388
	10	2	18	3.5	97	--	1,746
4	2	1	1	3	83	--	83
5	5	1	4	4	111	--	444
	10	2	18	4	111	--	1,998
	20	2	38	4	111	--	4,218
6	2	1	1	4	111	--	111
7	3	1	2	5	138	--	276
	5	1	4	5	138	--	552
	10	2	18	5	138	--	2,484
8	2	1	1	5	138	--	138
9	2	1	1	4	111	--	111
	5	2	8	4	111	--	888
10	N/A	NA	N/A	N/A	97	--	N/A

Source: 1. Incremental cost estimates from Turner and Townsend. 2. Assumptions regarding number of flights of steps from ABCB. 3. Calculations performed by KPMG.

For Class 2 and 3 buildings, there is a combination of residential and commercial stairs. The data and assumptions (based on ABCB advice) indicate that for a:

- Class 2:
  - five storey building, there is an estimated net cost of $497;
  - ten storey building, there is an estimated net cost of $1,824;
- Class 3:
  - five storey building, there is an estimated net cost of $581; and
  - ten storey building, there is an estimated net cost of $2,131.

Across all building classes, the cost increase of the proposed amendments ranges from $66 (Class 1) to $4,218 (Class 5 – 20 storey building).

6.5 Barrier for openable windows

The proposed requirement to have an 865mm high barrier for openable windows where the distance from the floor to the surface below is greater than one metre applies across all building classifications. The cost estimates provided by Turner and Townsend relate to the unit rates for the supply of Juliet balconies and the cost of infilling the risk zone with different construction materials as shown in Table 6-5.[46] Turner and Townsend reported that in the scenario of an opening full height window or sliding door, the bottom 865mm would need to be fixed. As there are a range of possible design variations, Turner and Townsend were unable to provide the cost impacts under this scenario.

Table 6-5: Cost estimates for proposed barrier for openable windows

Infill material	Cost ($)
Powder coated aluminium balcony with safety glass infill	550
Powder coated aluminium framework balcony with vertical balusters	410
Plasterboard on metal frame, insulation, brick outer skin wall construction	265
Plasterboard on metal frame, insulation, brick/render/paint outer skin wall	265
6.38 laminated safety glass in lieu of 4mm float glass	50

In practice however, the proposed requirement is more likely to result in a design change for new buildings rather than the construction of Juliet balconies, e.g. an increase in the height of window sills. Hypothetically, even where there is a design change resulting from a full height window to the use of a smaller window at an increased sill height, the substitution cost of roughly $265 per square metre for a typical compliant wall system (see Table 6-5) would be offset by the saving of roughly $285 per square metre for a typical window[47]. Hence it is assumed that no significant incremental construction cost would be incurred for a representative building in each building class as a design change would not incur any significant costs and is sufficient to address the proposed requirement.

Consultation Question:

- Is it reasonable to assume that designers will design buildings using windows with higher sills rather than openable windows that require the use of Juliet balconies where a balustrade/barrier is required for openable windows?
- Is it reasonable to assume that the requirement for a non-climbable zone is unlikely to impose an incremental cost for Class 2 to 9 buildings because it is unlikely that buildings would have different balustrade designs above and below four metres?

[46] ibid , p. 5.
[47] Rawlinsons - Australian Construction Handbook 2009 p. 358

6.6 Non-climbable zone

The proposed requirement to have a non-climbable zone in a balustrade or barrier where the distance from the floor to the surface level below is greater than one metre applies across all building classifications.

Due to the existing requirement where no part of the balustrade above the nosing allows a 125mm sphere to pass through, and that the spacing between support rails for vertical wire balustrades must not exceed 900mm, Turner and Townsend assumed a minimal difference between the actual cost of the "barrier wire/rod" in either a vertical or horizontal system.

However, Turner and Townsend commented that in the vertical system, there would be a need to provide an additional support bar at the bottom of the balustrade. In the horizontal system, there is no need as the lowest wire/bar is supported by vertical bars which are a requirement in both circumstances. Hence, Turner and Townsend concluded that the cost impact would only apply to a vertical system at an incremental cost of approximately $50 per metre for a representative building in each building class.[48]

The current BCA requirement states that a non-climbable zone is to apply to a balustrade or barrier where the surface beneath is greater than four metres in height. In practice, it is unlikely that designers and builders for high rise buildings (Classes 2 to 9) will apply different design requirements for balustrades and barriers above the four metre threshold when the non-climbable zone provisions would apply. It is assumed that, in order to maintain a consistent design and look, all balustrades and barriers on high-rise buildings will use the one design that will comply with the non-climbable zone provisions regardless of whether it is below the four metre threshold. On this basis, the new requirement is unlikely to result in an incremental cost for Class 2 to 9 buildings. Therefore, from the perspective of this RIS, the new requirement is only applicable to multi-storey buildings in Class 1 buildings. The cost impacts for Class 1 buildings are shown in Table 6-6.

Table 6-6: Cost estimate for proposed requirement for a non-climbable zone

Building class	Cost ($)		
	10 metres	20 metres	30 metres
Class 1	500	1,000	1,500

Consultation Question:

- Is it reasonable to assume 5 per cent of single storey and 25 per cent of double storey Class 1 buildings would be affected by the non-climbable zone proposed changes?
- Is it reasonable to assume that the requirement for a non-climbable zone is unlikely to impose an incremental cost for Class 2 to 9 buildings?

[48] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 7

6.7 Single steps

The requirement for single steps to be not more than 180mm high applies across all building classes. The Turner and Townsend report stated that the new requirement is unlikely to have any impact as building owners will build new buildings within the Code.

However the report noted that in existing buildings undergoing major refurbishments, where there is need to introduce a change in level, there are "dead" zones which cannot be supported by typical construction techniques that would enable the new requirement to be met most cost efficiently. The first "dead" zone is a change in level between 180 – 300mm. If the two levels differ within this range (180mm - 300mm), it is not possible to construct stairs that comply with the proposed riser dimensions with the existing requirement to have constant risers throughout a flight. It is also not possible to construct a single step to comply with the proposed single step height requirement. For major refurbishments, the potential remedial options can be onerous and would include:

- increasing the lower floor or decreasing the higher floor level to maintain a change in level outside of the "dead" zone. This would provide a single step; and

- decreasing the lower floor or increasing the higher floor level to maintain a change in level outside the "dead" zone. This would provide a flight with two steps and an associated handrail.

The ABCB has advised of other "dead" zones between 360mm to 450mm, 540mm to 600mm and 720mm to 750mm. In each of these circumstances, staircases cannot be built with consistent riser heights to the proposed minimum and maximum riser dimensions. Where these dead zones occur, the floors of the properties will either need to be raised or lowered by the appropriate amount. Depending on the site conditions, the remedial treatments to existing premises could be extremely difficult and expensive. In some circumstances, they may not be possible without altering the foundations.

The ABCB has also advised that while the encounter of "dead" zones in major refurbishments would translate to onerous construction, this can be mitigated with careful planning during the design phase of the building project and would be no different to other design considerations necessary for a BCA compliant building. There may also be a level of flexibility and discretion with regards to the application of this requirement on existing buildings undergoing renovations/refurbishment, by councils and building certifiers[49].

[49] The application of the BCA to existing buildings being altered extended or undergoing a change of use or classification is controlled by the relevant building legislation of each State and Territory. As such, individual jurisdictions or approval authorities (usually the local council or private certifier) can apply the BCA to existing buildings undergoing refurbishment as rigorously as their legislation allows.

Consultation Questions:

- Is it reasonable to assume negligible cost impact on the proposed single step provisions?
- How often are inherent "dead zones" with regards to the proposed riser and going dimensions encountered on building sites? Is it reasonable to assume building designers will design buildings with this in mind to avoid these "dead zones"?
- Are the cost estimates for all proposed amendments provided by the Turner and Townsend report reflective of the marketplace?

6.8 Estimated impact of total construction costs

The cost impacts of the five proposed revisions are summarised in the tables below.

Table 6-7: Summary of building cost impact of the proposed revisions

Proposed revision	Cost range ($)		
	Low	Medium	High
Handrail	264	670	1,000
Stair riser and going dimensions	66	--	4,218
Barrier for openable windows	--	--	--
Non-climbable zone	500	1,000	1,500
Single steps	--	--	--

Table 6-8: Summary of average cost impact of the proposed revisions per representative building by building class

Building Class	Average cost impact per proposed revision ($)			Total ($)
	Handrails	Stair riser and going dimensions	Non-climbable zone	
1	378	66	1,000	1,444
2	378	1,161	0	1,539
3	378	1,356	0	1,734
4	378	83	0	461
5	0	2,220	0	2,220
6	0	111	0	111
7	0	1,104	0	1,104

Building Class	Average cost impact per proposed revision ($)			Total ($)
	Handrails	Stair riser and going dimensions	Non-climbable zone	
8	0	138	0	138
9	0	500	0	500
10	0	0	0	0

Table 6-8 above shows the aggregate cost of all proposed revisions with cost impacts (handrails, stair riser and going dimensions, non-climbable zones) per representative building in each BCA building class. The most significant cost impact is estimated to be borne by Class 5 buildings, with an average new building to incur an extra $2,220 cost to implement the proposed revisions. Class 6 buildings – shops, cafes etc – are expected to incur the least cost impact.

The estimated cost impact per proposed revision and per representative building under the Alternative Option can be derived by packaging different combinations of the individual proposed revisions.

7 Estimate the impact of the proposed changes at the State and national level

7.1 Introduction

This section provides an assessment of the estimated impact of the proposed all-inclusive package of revisions in the proposed BCA amendment option and the Alternative Option at the State and national level, and is structured as follows:

- identification of the different groups impacted by the proposed revisions;
- a quantitative assessment of the costs and benefits associated with the proposed BCA amendments;
- a qualitative assessment of other costs and benefits associated with the proposed BCA amendments; and
- a comparative assessment of the costs and benefits associated with the proposed BCA amendments.

A quantitative assessment of costs takes into account only the estimated changes in costs to the design and construction of the building components under revision. All other costs, such as production losses and legal/compensation awarded as a result of slips, trips and falls in buildings, are considered qualitatively.

The quantification of benefits associated with the proposed amendments is based on a range of assumptions reflecting data limitations and uncertainty associated with many of the anticipated impacts. For example, it is not possible to identify the extent to which a change in a preventative measure might increase or decrease the risk of slips, trips and falls and its associated costs, making it difficult to quantify benefits associated with the specific changes proposed. However, where possible, the assessment has sought to utilise data to understand the magnitude of the unquantified impacts.

7.2 Groups impacted by the proposed revisions

This RIS expects the proposed BCA amendments to impact the following stakeholder groups:

- individuals, e.g. building owners;
- businesses, e.g. building practitioners, manufacturers, etc; and
- Government, e.g. regulators.

The section below outlines the nature of the expected impacts of each option for each stakeholder group.

7.2.1 Individuals

The proposed all-inclusive BCA amendments option and the Alternative Option could both involve a range of different impacts on the owners and occupants of buildings, namely:

- potential changes to the costs associated with the design and construction of the building components impacted by the revisions; and
- potential implications for the safety and well-being of building occupants through a reduction in the occurrence of slips, trips and falls in buildings.

Each of these impacts is described and assessed in further detail below.

7.2.2 Businesses

The proposed BCA amendments option and the Alternative Option are likely to impact businesses operating in the design and building industry. This may include potential variations in demand for the design and construction of building components that meet the new requirements as a result of the proposed arrangements, and a requirement for building practitioners to become familiar with and implement the proposed revisions.

The proposed revisions could also potentially provide benefits for businesses occupying new Class 3 to 10 buildings by reducing productivity losses that would otherwise result from employees suffering slips, trips and falls.

7.2.3 Government

The provision of additional preventative measures should enable Governments to more effectively and efficiently meet their regulatory objectives of addressing market failures and reducing the incidence of slips, trips and falls in buildings.

7.3 Quantitative assessment – design and construction costs

The quantitative assessment of costs associated with the proposed BCA amendments option and the Alternative Option is limited to an estimate of the change in construction costs at a State and national level. The cost estimates provided are based on the estimated impact on the representative sample of building types (refer to Section 6) and projections of future construction activity across Australia for Class 1 to 10 buildings. It should be noted that the aggregate costs for implementing the proposed revisions for barriers for openable windows and single steps are not presented in this section as

Sections 6.5 and 6.7 have indicated that the incremental costs associated with these proposed changes are negligible.

Due to data limitations and uncertainty around the nature and extent of future construction activity, the aggregate cost estimates are based on a number of simplifying assumptions and should be considered indicative. A detailed description of the approach taken and the assumptions made is provided at Appendix A to this RIS.

7.3.1 Estimating construction activity for BCA Class 1 to 10 buildings

The estimated construction activity for Class 1 to 10 buildings in each State and Territory was based on a combination of a specific data requested from the Victorian Building Commission and ABS Building Approvals Data for all jurisdictions.[50] Victorian Building Commission data relating to the number of building permits across each BCA Class was used to obtain a similar breakdown from ABS figures for other jurisdictions (refer Table 7-1 below). It is important to note that while the Building Commission of Victoria does not collect building approval data, which directly corresponds to the approval data reported by ABS, the data it collects on building permit volumes are essentially gathered from the same source. The key difference being that the ABS applies a cost threshold of $10,000 for residential buildings and $50,000 for commercial buildings when collating the data for approvals, while the permit volume data from the Building Commission of Victoria does not impose this restriction.[51] Therefore, the building approval data from the ABS is effectively a subset of the permit volume data from the Building Commission of Victoria, and so is comparable for the purposes of this analysis.

Table 7-1: Indicative estimate of building approvals for each BCA class (volume in 2008/09)*

Jurisdictions	BCA Building Class										
	1	2	3	4	5	6	7	8	9	10	Total
VIC	40,863	770	66	14	623	748	269	151	524	5,175	49,203
NSW	23,420	441	51	11	478	573	206	116	401	3,977	29,664
QLD	28,418	536	47	10	445	534	192	108	374	3,693	34,356
SA	11,787	222	16	3	150	180	65	36	126	1,248	13,835
WA	19,028	359	25	5	237	285	102	57	199	1,987	22,267
TAS	3,108	59	6	1	59	71	25	14	50	489	3,883
NT / ACT**	3,781	71	8	2	73	88	32	18	61	607	4,740
AUS	**130,405**	**2,458**	**219**	**47**	**2,065**	**2,478**	**891**	**500**	**1,736**	**1,748**	**157,948**

Note: * The number of building approvals in 2008/09 was substantially lower than the average for 2004/05 to 2007/08 and is likely to reflect the impact of the global financial crisis on the building and construction industry.

** Note that the ABS does not separate all building approval data for NT and ACT

[50] ABS Catalogue number 8731.0, "Building approvals, Australia"
[51] This explanation was provided by the Building Commission of Victoria's Information Analyst.

As the above figures rely on an assumed proportional breakdown of aggregate ABS data, they should be considered only as an indicative estimate of annual building activity within each BCA class. The development of robust estimates for all jurisdictions would require a census of councils and State and Territory Governments, which is beyond the scope of this RIS. It is also important to note that not all of the approvals outlined above will result in actual construction in the year of approval. However, for the purpose of this exercise, any timing difference between approvals that were granted prior to 2008/09 and construction started in 2008/09, and 2008/09 approvals where construction is delayed to later years, is assumed to be immaterial.

7.3.2 Aggregate cost impact

The aggregate impact of the estimated increase in design and construction costs for each of the five proposed revisions in the proposed BCA amendment option is calculated based on annual building activity and the estimated cost impacts for a representative sample of affected buildings (refer Section 6).

7.3.2.1 Handrails on private stairways

The aggregate cost impact for the handrail requirement as shown in Table 7-2 is calculated taking into account:

- the construction activity in the BCA Classes 1 to 4 across all States and Territories;
- the percentage of buildings within each BCA class that are multi-storey dwellings and are therefore impacted by the proposed handrail provision.
  - It is assumed that for BCA Classes 2 and 3, there are 10 single occupancy units per storey and that 5 per cent of single occupancy units located within each building are double storey and would require a handrail. These percentages are applied to the construction activity in each BCA class.
  - For Class 4, it is assumed that there is minimal activity within this class where the proposed change is likely to apply and hence the overall impact is insignificant[52]; and
- the current level of non-compliance with the proposed handrail requirement[53], which is assumed to be 15 per cent for BCA Classes 1 to 3.[54]

[52] Assumption provided by the ABCB. Refer to Appendix A for more information.
[53] For the purposes of this RIS, the level of non compliance reflects the percentage of existing buildings that would not voluntarily install handrails on stairways. This percentage is used to calculate the level of new buildings that would be affected by the proposed handrail amendment.
[54] Di Marzio Research Pty Ltd, *Trips Slips and Falls Project*, prepared for the ABCB, 2010.

Table 7-2: Aggregate cost (2008/09 dollars) for proposed handrail requirement

State	BCA Building Class				
	1	2	3	4	Total ($)
VIC	448,309	163,847	14,044	--	626,200
NSW	256,938	93,905	10,766	--	361,609
QLD	311,780	113,948	10,022	--	435,751
SA	129,314	47,261	3,388	--	179,963
WA	208,762	76,298	5,343	--	290,402
TAS	34,103	12,464	1,328	--	47,895
NT and ACT	41,479	15,160	1,647	--	58,286
AUS	**1,430,685**	**522,882**	**46,538**	--	**2,000,105**

Note that the ABS does not separate all building approval data for NT and ACT.

The total annual cost related to the proposed handrail requirements is estimated to be in the order of $2.0 million (2008/09 dollars) across all new BCA Class 1 to 4 buildings, with Class 1 and 2 (residential) buildings incurring nearly all the cost impact. The majority, if not all, of the cost would be borne by individuals as any additional design and construction costs incurred by builders are likely be passed on to consumers.

7.3.2.2 Stair riser and going dimensions

The aggregate cost impact for the proposed reduction in the spread between the maximum and minimum of stair riser and going dimensions, as shown in Table 7-3, is calculated taking into account:

- the construction activity in the BCA Classes 1 to 10 across all States and Territories;
- the likely percentage use of the two types of materials listed in the Turner and Townsend report (timber and in-situ concrete) for the construction of stairs[55]; and
- the current level of non-compliance with the proposed stair riser and going dimensions[56], is assumed to be 89 per cent for residential stairways in BCA Class 1 to 3 buildings, and 83 per cent for commercial stairways in BCA Class 2 to 10 buildings.[57]

[55] Assumption provided by the ABCB. Refer to Appendix A for more information.
[56] For the purposes of this RIS, the level of non compliance reflects the percentage of existing buildings that do not typically construct stairways within the proposed riser and going dimensions. This percentage is used to calculate the level of new buildings that would be affected by the proposed stair riser and going dimension amendment.
[57] Di Marzio Research Pty Ltd, *Trips Slips and Falls Project*, prepared for the ABCB, 2010.

Table 7-3: Aggregate cost (2008/09 dollars) for proposed change to stair riser and going dimensions

Jurisdiction	BCA building class		Total ($)
	Residential (Classes 1 to 3)	Commercial (Classes 2 to 10)	
VIC	2,586,899	2,341,487	4,928,386
NSW	1,485,904	1,682,029	3,167,933
QLD	1,799,387	1,660,308	3,459,695
SA	745,387	592,370	1,337,757
WA	1,203,181	940,552	2,143,732
TAS	197,098	210,661	407,759
NT	61,797	260,205	499,972
ACT	177,970		
AUS	**8,257,623**	**7,687,612**	**15,945,235**

Note that the ABS does not separate all building approval data NT and ACT.

In aggregate, the proposed requirement to narrow the range of stair dimensions will result in a net annual cost of approximately $15.9 million (2008/09 dollars), which although incurred by builder / developers are largely expected to be passed on to individuals or businesses purchasing new buildings.

7.3.2.3 Non-climbable zone

The aggregate cost impact of the proposed requirement to have a non-climbable zone in a balustrade or barrier where the distance from the floor to the surface below is greater than one metre is calculated using the cost estimate from Section 6 for a representative building in a Class 1 building and taking into account the construction activity in the BCA Class 1 building across all States and Territories.

Table 7-4: Aggregate cost (2008/09 dollars) for proposed requirement for a non-climbable zone ($)

Jurisdiction	Total ($)
VIC	3,623,642
NSW	2,076,808
QLD	2,520,091
SA	1,045,236
WA	1,687,401
TAS	275,649
NT	85,732
ACT	249,537
AUS	**11,564,096**

The total annual cost of incorporating a non-climbable zone in Class 1 buildings is estimated to be approximately $11.6 million (2008/09 dollars), which again will be primarily borne by individuals purchasing new buildings.

7.3.2.4 Summary of total aggregate costs

The aggregate cost impacts of the proposed amendments are summarised in the table below.

Table 7-5: Increase in construction costs by jurisdiction and proposed revision ($ per annum in 2008/09 dollars)

Jurisdiction	Handrail	Stair riser and going dimensions	Non-climbable zone	Total
VIC	626,200	4,928,386	3,623,642	9,178,228
NSW	361,609	3,167,933	2,076,808	5,606,350
QLD	435,751	3,459,695	2,520,091	6,415,537
SA	179,963	1,337,757	1,045,236	2,562,956
WA	290,402	2,143,732	1,687,401	4,121,535
TAS	47,895	407,759	275,649	731,303
NT	58,286	499,972	85,732	893,527
ACT			249,537	
AUS	**2,000,105**	**15,945,235**	**11,564,096**	**29,509,436**

Note that the ABS does not separate building approval data for NT and ACT.

The expected aggregate increase in annual construction costs under the proposed all-inclusive package of revisions is in the order of $29.5 million per annum.

7.3.2.5 Net present value of total aggregate costs

Over the life of the regulations (10 years), the net present value of the costs (discount rate of 7 per cent) associated with each proposed amendment is summarised in the table below. Details of the costs' net present value calculations including for discount rates of 3 per cent and 11 per cent are included in Section 7.7 and Appendix A.

Table 7-6: Net present value calculation for costs (2008/09 dollars)

Proposed amendment	Net present value ($m)
Handrail	11.5
Stair riser and going dimensions	95.3
Barrier for openable windows	0
Non-climbable zone	66.8
Single steps	0

Total	**173.6**

The net present value of total costs associated with the proposed suite of amendments is $173.6 million over 10 years.

7.3.2.6 Qualitative assessment of costs

The following potential cost was also identified and assessed as unlikely to be significant under the proposed arrangements:

- *Decrease in net rentable floor space* – For the assumed riser and going dimensions used in the calculations for the stair riser and going dimension amendment[58], Turner and Townsend reported that there was a decrease in the net rentable floor space due to an increase in the stairway footprint. The decrease in available floor area ranges between 2.75 per cent to 4.58 per cent for a $20m^2$ room and 1.83 per cent to 3.06 per cent for a $30m^2$ room. The actual decrease in rentable space range from $0.5m^2$ to $1m^2$, depending on the BCA building class. It should be noted that the effect on the net rentable floor space is also dependant on which riser and going dimension is used in the calculations.

- It is not possible to quantify the costs imposed as a result of the decrease in rentable space. The rental income differs across the building classes and is highly dependent on location (e.g. city, industrial area or regional areas), and data on the number of buildings by building class, location and average rental income is not available.

Consultation Question:

- What are the likely quantifiable costs associated with a decrease in net rentable floor space?

7.4 Quantitative assessment of benefits

To perform a quantitative assessment of benefits, the following information is required:

- the contribution of building components to the incidence of slips, trips and falls, given that the occurrences of slips, trips and falls are also influenced by biological and medical, behavioural and socio-economic factors;

- the contribution of the proposed changes to each building component to the incidence of slips, trips and falls in buildings;

[58] Under the existing code, the assumed typical dimensions of 180mm riser and 250mm going were costed to the proposed amendment, where the assumed typical dimensions of 180mm riser and 280mm going were used.

- the reduction in the number of injuries and deaths from slips, trips and falls that can be attributed to the proposed changes to each building component;

- the reduction in hospitalisation and fatality costs that result from the reduction in injuries and deaths; and

- the reduction in other types of costs (e.g. production losses, legal and compensation costs) that result from the reduction in injuries and deaths.

No research has been conducted to identify the contribution that individual building components make to the incidence of slips, trips and falls relative to other contributing factors or how specific changes to some building components can reduce the incidence of slips, trips and falls. While the Monash Report makes recommendations for changes to specific building components that could reduce the incidence of slips, trips and falls, it does not identify the extent of reduction that can be attributed to each proposed change.

With limited data, a range of assumptions (refer to Appendix B) were required to quantify the potential benefits of the proposed revisions. Assumptions made include the current number and cost of injuries and fatalities that could be attributed to the proposed building component subject to amendment, and the effectiveness of the proposed amendments in preventing injuries and fatalities in new buildings. The quantified potential benefits only takes into account the reduction in the costs of hospital separations due to injuries and the cost of fatalities. In addition, the benefits quantification can only be presented at an aggregate level (whole of Australia) as data on injuries and fatalities are not available at the State and Territory level.

A break-even analysis is also performed in Section 7.5. The breakeven analysis should be considered alongside the benefits quantified in this section, and provides an estimate of the reduction in the number of deaths and injuries that would need to occur in order to justify the costs imposed by the proposed BCA amendments. The analysis allows the assessment of the likelihood that the proposed BCA amendments (individually and collectively) are likely to represent a net benefit to the community.

7.4.1 Benefits calculation

The following steps were taken to calculate the potential avoided costs (i.e. benefits) related to each proposed revision:

- Step 1 – Estimate the current annual number of injuries and fatalities that can be attributed to the building components subject to amendment using data from a range of resources including the Monash Report, the Australian Institute of Heath and Welfare and the Victorian Injury Surveillance and Applied Research (VISAR) Hazard report;

- Step 2 – Calculate the costs of injuries and fatalities that can be attributed to the building components subject to amendment by making assumptions regarding the average cost of a hospital separation that results from a fall injury and the economic value of life. The average cost of a hospital separation that results from a fall is assumed to be $3,700[59] while the economic value of life is assumed to be $3.5 million[60];

- Step 3 – Calculate the proportion of new buildings impacted by each proposed amendment over the life of the regulations, compared to existing building stock taking into consideration the applicability of each amendment across the BCA classes;

- Step 4 – Assume an effectiveness rate for each proposed amendment in preventing injuries and fatalities from slips, trips and falls; and

- Step 5 – Calculate the potential costs that could be avoided under each proposed amendment by combining the results of Steps 1, 2, 3, and 4.

Table 7-7 shows the numbers and costs of injuries and fatalities that can be attributed to each of the building components subject to amendment based on the assumptions outlined above. The table indicates that the estimated total cost of injuries and fatalities for these building components is $344.5 million per annum (2008/09 dollars). Detailed assumptions and calculations are included in Appendix B.

Table 7-7: Estimated annual cost (2008/09 dollars) of injuries and fatalities related to building components subject to amendment

Proposed amendments	Number		Costs ($m)		Total cost ($m)
	Injuries	Fatalities	Injuries	Fatalities	
Handrail	3,620	36	13.4	126	139.4
Stair riser and going dimensions	7,501	46	27.8	161	188.8
Barrier for openable windows	290	1.5	1.1	5.3	6.35
Non-climbable zone	190	1.5	0.7	5.3	5.95
Single steps	1,072	0.0	4.0	0.0	4.0
Total	**12,673**	**85.0**	**47.0**	**140.1**	**344.5**

The extent to which the costs attributed to these building components could be prevented depends on the percentage of the total building stock that comprises new buildings subject to the amendments, and the effectiveness of

[59] Monash University Accident Research Centre, *The relationship between slips, trips and falls and the design and construction of buildings*, funded by the ABCB, 2008, p. xiii
[60] The average economic value of life is assumed to be $3.5 million according to guidance provided by the Office of Best Practice Regulation (http://www.finance.gov.au/obpr/docs/ValuingStatisticalLife.pdf).

each proposed amendment in preventing injuries and fatalities from slips, trips and falls in buildings.

The assumptions applied for each building component subject to amendment are presented in Table 7-8 and are described in further detail in Appendix B.

Table 7-8: Benefits attributed to the proposed amendments in Year 1

Proposed amendment	% of buildings in Year 1 subject to provision	Effectiveness rate (%)	Support for assumption on effectiveness rate	Total cost of injuries / fatalities ($m)	Benefits in Year 1($m)^
Handrail	1.4[61]	30	Academic article[62]	139.4	0.6
Stair riser and going dimensions	1.6	30	ABCB assumption	188.8	0.9
Barrier for openable windows	1.6	30	ABCB assumption	6.35	0.04
Non-climbable zone	1.4	30	ABCB assumption	5.95	0.02
Single steps	1.6	5	ABCB assumption	4.0	0.003
Total	**--**	**--**		**344.5**	**1.2***

^ The numbers in the benefits column are derived from the benefits calculations presented in Table B-1 in Appendix B, e.g. the benefit for barriers for openable windows is $35,760 and hence is shown as $0.04 million and the benefit for the non-climbable zone is $24,990 and is therefore shown as $0.02 million in the table above.

* Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

It should be noted that while the handrails and stair riser and going dimensions can prevent up to 30 per cent of injuries and fatalities individually, if both amendments are implemented together, they will not necessarily prevent 60 per cent of injuries and fatalities that occur on stairs. This is because some injuries/fatalities that occur on stairs would be preventable by having a handrail *or* by changes made to the stair dimensions. That implies that their effectiveness is not mutually exclusive and their combined effectiveness is not simply an addition of their individual effectiveness. The ABCB believes that if the two amendments are implemented together, the combined effectiveness could be 45 per cent in residential buildings. The

[61] Note that the percentages of buildings subject to the amendments in Year 1 vary because the handrail and non-climbable zone amendments apply to residential buildings while the other amendments apply across all building classes. For the handrail and non-climbable zone amendment, the number of new residential approvals is calculated as a percentage of residential stock while for the other amendments, it is number of new approvals (residential and non-residential) as a percentage of all building stock.

[62] Ishihara et al. (2002) found that of the 2,800 elderly respondents to a questionnaire concerning stair use, 34.2% reported being saved by a handrail when they nearly fell. The same investigation also found that handrails were particularly effective at preventing falls due to sub-standard illumination of stairwells, the effects of which are often exacerbated in the elderly by vision deterioration. (Monash Report, p. 25)

combined effectiveness of the two amendments has been factored into the calculation of the benefits for Year 1.

Assuming 10 years for the life of the regulations and given an assumed lifespan for buildings of 30 years, the benefits associated with buildings built during this 10 year period of regulation will accrue over 40 years (i.e. building built in year 10 will realise benefits until year 40), while the cost associated with the proposed amendments will stop incurring after year 10. The net present value of the benefits at a discount rate of 7 per cent for each proposed amendment over 40 years is presented in Table 7-9. The net present value of benefits at the discount rates of 3 per cent and 11 per cent are reported in Section 7.7 and Appendix B. The total net present value of the benefits for all the amendments is $106.2 million over the life of the regulations.

Table 7-9: Net present value calculation for benefits

Proposed amendment	Net present value ($m)
Handrail	45.1
Stair riser and going dimensions	90.2
Barrier for openable windows	2.6
Non-climbable zone	1.9
Single steps	0.3
Total	**106.2***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

Consultation Questions:

- Are the assumptions regarding effectiveness for each proposed amendment appropriate?
- Is it reasonable for the cost/benefit analysis to assume the life of the regulation as 10 years such that the associated costs will stop incurring in year 10 while the benefits will continue to accumulate until year 40?

7.5 Break-even analysis

In addition to the direct quantification of benefits, a break-even analysis is also performed to assess the likelihood that the reduction in injuries and/or deaths achievable from the proposed amendments would justify the costs of implementing the proposed changes. The economic value of life and average cost per hospitalisation separation due to a slip, trip or fall injury is assumed to be the same as the values used for the benefits' quantification in the section above.

Table 7-10: Breakeven analysis

Proposed amendments	Annual aggregate cost of proposed revision ($m)	No. of injuries/fatalities to be prevented	
		Injuries	Fatalities
Handrail	$2.0	541	1
Stair riser and going dimensions	$15.9	4,310	5
Barrier for openable windows	0	0	0
Non-climbable zone	$11.6	3,125	3
Single steps	0	0	0
Total	**$29.5**	**7,976**	**8**

The break-even analysis indicates that the estimated total cost of all proposed revisions in the proposed BCA amendment option can be justified if they prevent at least 7,976 hospitalised injuries or save eight lives annually. In considering this conclusion, it is important to note the following:

- in order for the costs of implementing all the proposed revisions to be justified, 7,976 injuries or eight deaths have to be prevented annually from falls and deaths that occur in *new buildings* constructed during the life of the regulations. A significant proportion of annual injuries and deaths that currently occur would be from accessing older buildings that are not subject to the proposed revisions. Slips, trips and falls occurring in older buildings would not be prevented by implementing the proposed revisions. However, over time the proportion of building stock constructed under the proposed revisions would increase, which suggests that the likelihood of the break-even point being reached would increase over time;

- the break-even analysis only takes into account the hospitalisation costs and fatality costs when calculating the number of injuries and deaths that need to be prevented in order for the options to deliver a net benefit to the community. If other costs (e.g. production losses or cost of pain and suffering) are also included in the cost per injury or cost per death, the number of hospitalised injuries and/or deaths that need to be prevented will decrease;

- the break-even analysis uses the average stay in a public hospital due to a fall as an approximation of the cost per fall injury. However, if the cost per fall injury is less than the average of $3,700 assumed (e.g. non-hospitalisation cost such as visiting a general practitioner or physiotherapist for minor injuries) then the number of injuries that need to be prevented will increase. The same applies for the number of deaths to be prevented. If the economic value of life is assumed to be lower/higher then the number of deaths that would need to be prevented would increase/decrease; and

- as mentioned in Section 7.3, building activity in 2008/09 was 17 per cent lower than for previous years. If a higher level of building activity was used, the aggregate cost impact would be greater and the number of injuries and/or deaths that need to be prevented would increase.

The break-even analysis shows the minimum number of injuries or fatalities that need to be prevented to justify the cost impost of the proposed BCA amendments option. In reality, the proposed BCA amendments option would prevent a combination of hospitalised injuries and fatalities but the break-even analysis does not present any specific combination that could be achieved. However, it can be interpreted from the break-even analysis that for every life saved as a result of the proposed amendments, 946 fewer hospitalised injuries would need to be prevented in order to achieve the break-even.

7.6 Evaluation of options

As shown in the table below, the all-inclusive option is estimated to impose a net cost of $67.4 million (NPV) on the community over a 10-year period. The net cost is due to high construction costs imposed by the non-climbable zone and stair riser and going dimension amendments not being met by corresponding level of benefits. This is especially so in the case of the non-climbable zone amendment, where the construction costs imposed over 10 years is estimated to be $66.8 million (NPV), compared to corresponding benefits of less than $1.9 million (NPV) over the same period.

The table also demonstrates that in Year 1, most of the proposed amendments are expected to result in a net cost to the community, with the exception of the barrier to openable windows and single steps amendments, which are not expected to impose any incremental costs to the community.

Over time, a greater proportion of the building stock will have been built under the proposed amendments, which means the benefits associated with each amendment are cumulative. Buildings built during the life of the regulations (10 years) will continue to generate benefits over the building lifespan (average of 30 years). Therefore, benefits related to buildings built during the regulatory period will be realised over the next 40 years, while the cost will stop incurring after year 10. For example, it is estimated that over a 10-year period, the handrail amendment would provide a net benefit, despite imposing a net cost in Year 1. However, the stair riser and going dimensions and the non-climbable amendment will only result in a net benefit over a longer time period (beyond the expected 10 year life of the regulations or over the next 40 years).

Consultation Question:

- Is it reasonable for the cost/benefit analysis to assume the life of the regulation as 10 years such that the associated costs will stop incurring in year 10 while the benefits will continue to accumulate until year 40?

Table 7-11: Evaluation of options

Proposed amendments	Net Present Value over 10 years ($m)			Year 1 ($m)		
	Costs	Benefits	Net benefits/(costs)	Costs	Benefits	Net benefits/(costs)
Handrail	11.5	45.1	33.6	2	0.6	(1.4)
Stair riser and going dimensions	95.3	90.2	(5.1)	15.9	0.9	(15)
Barrier for openable windows	0	2.6	2.6	0	0.04	0.04
Non-climbable zone	66.8	1.9	(64.9)	11.6	0.02	(11.58)
Single steps	0	0.3	0.3	0	0.003	0.003
Total	**173.6**	**106.2***	**(67.4)***	**29.5**	**1.2***	**(28.3)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

The Alternative Option that has been chosen is the combination of proposed revisions that will provide the greatest net benefit to the community. The table shows that the proposed amendments relating to barriers for openable windows and single steps should be adopted as both changes do not impose any incremental costs but have benefits associated with them. In addition, the handrail amendment should also be included in the Alternative Option as it results in a net benefit. Therefore, it is proposed that the Alternative Option should include the handrail, barrier for openable window and single step amendments. The net benefit from implementing these amendments is $36.5 million over the life of the regulations.

7.7 Sensitivity analysis

A sensitivity analysis has been conducted as the net present values of the aggregate costs, benefits and net benefits/costs of implementing the proposed amendments are likely to be sensitive to the assumptions made.

The aggregate construction costs imposed by the proposed amendments to the BCA and associated benefits can vary if the assumptions used to quantify these costs/benefits change. These assumptions include:

- the level of building activity which will affect the calculations of both costs, benefits and net benefits/costs;
- construction cost and building/design assumptions used in the Turner and Townsend cost analysis report to calculate incremental costs as a result of the proposed amendments which will affect calculation of costs and the resulting net benefits/costs; and

- the assumed average cost per hospital separation which will impact on the calculations of benefits and the resulting net benefits/costs for the proposed amendments.

The current stair riser and going dimension and private handrail non-compliance rates are based on a survey of current building practices, while the building/design assumptions used by Turner and Townsend are based on expert knowledge on building practices and are therefore not analysed further.

However further analysis is performed below to determine how the level of building activity, increased cost of construction and assumed cost of injuries and fatalities can impact on the net present value of the aggregate construction costs, benefits and net benefits/costs, of the amendments.

Consultation Question:

- What other variables should be considered when performing sensitivity analysis?

Sensitivity to variation in assumed building activity

As noted in Section 7.3.1, it appears that the global financial crisis impacted on the number of approvals in 2008/09. There were 17 per cent less than the average number of building approvals between 2004/05 and 2007/08. If the level of construction activity is assumed to be comparable to the average level of activity between 2004/05 to 2007/08 rather than that for 2008/09, then the NPV of the aggregate costs resulting from the proposed amendments would increase from $173.6 million to $203.2 million. The NPV of the benefits would increase from $106.2 million to $124.3 million and the NPV of the net costs would increase from $67.4 million to $78.9 million. This is shown in Table 7-12.

Table 7-12: Sensitivity analysis on the level of building activity

Proposed amendments	Cost ($m)		Benefits ($m)		Net benefits/(costs) ($m)	
	Original	Increased building activity	Original	Increased building activity	Original	Increased building activity
Handrail	11.5	13.5	45.1	52.8	33.6	39.3
Stair riser and going dimensions	95.3	111.5	90.2	105.5	(5.1)	(6.0)
Barrier for openable windows	0	0	2.6	3.0	2.6	3.0
Non-climbable zone	66.8	78.2	1.9	2.2	(64.9)	(76.0)
Single steps	0	0	0.3	0.4	0.3	0.4
Total	**173.6**	**203.2**	**106.2***	**124.3***	**(67.4)***	**(78.9)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

Sensitivity to variation in assumed cost impact

If construction was more costly than assumed by Turner & Townsend, then the aggregate costs would also vary. The Australian Industry Group Construction Outlook (May 2010) publication indicates that 33.3 per cent (up from 27.8 per cent) of construction companies surveyed reported major or moderate difficulty in sourcing building materials in the short term. If supply of construction materials is limited then costs are likely to increase. The sensitivity analysis performed in Table 7-13 shows that if construction costs are 10 per cent higher than assumed by Turner and Townsend, the NPV of the aggregate costs of implementing the proposed amendments would increase from $173.6 to $191 million. The NPV of the benefits would remain constant (the calculation of benefits is not dependent on construction costs) and the NPV of the net costs would increase from $67.4 million to $84.8 million.

Table 7-13: Sensitivity analysis on assumed construction costs

Proposed amendments	Cost ($m)		Benefits ($m)		Net benefits/(costs) ($m)	
	Original	Increased construction costs	Original	Increased construction costs	Original	Increased construction costs
Handrail	11.5	12.7	45.1	45.1	33.6	32.4
Stair riser and going dimensions	95.3	104.8	90.2	90.2	(5.1)	(14.6)
Barrier for openable windows	0	0	2.6	2.6	2.6	2.6
Non-climbable zone	66.8	73.5	1.9	1.9	(64.9)	(71.6)
Single steps	0	0	0.3	0.3	0.3	0.3
Total	**173.6**	**191.0**	**106.2***	**106.2***	**(67.4)***	**(84.8)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

Sensitivity to variation in estimated cost per injury

The calculation of the benefits assumes $3,700 for the average cost of a hospital separation. If alternative value of cost of injuries is used, the benefits calculated will differ. With the cost of health care increasing over the years, it is possible that costs associated with treating a slip trip or fall injury would be greater than expected, which would lead to higher realised benefits. The sensitivity analysis shows that if hospitalisation costs were to increase by 30 per cent, then the NPV of the aggregate costs would remain constant (the cost calculations are independent of the cost of injury), the NPV of the benefits would increase from $106.2 to $111.1 million and the NPV net costs would decrease from $67.4 million to $62.5 million.

Table 7-14: Sensitivity analysis on the cost of injury

Proposed amendments	Cost ($m)		Benefits ($m)		Net benefits/(costs) ($m)	
	Original	New cost of injuries and fatality	Original	New cost of injuries and fatality	Original	New cost of injuries and fatality
Handrail	11.5	11.5	45.1	46.4	33.6	34.9
Stair riser and going dimensions	95.3	95.3	90.2	94.2	(5.1)	(1.1)
Barrier for openable windows	0	0	2.6	3.2	2.6	3.2
Non-climbable zone	66.8	66.8	1.9	2.0	(64.9)	(64.8)
Single steps	0	0	0.3	0.4	0.3	0.4
Total	**173.6**	**173.6**	**106.2***	**111.1***	**(67.4)***	**(62.5)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

Sensitivity to variation in the discount rate

In accordance with OBPR requirements, the sensitivity of the outcomes of the option analysis to the discount rate selected has been considered. Table 7-15 below summarises the overall results for the recommended discount rate (7 per cent) and two alternative scenarios (3 per cent and 11 per cent).

Table 7-15: Sensitivity analysis on the discount rate

Discount rate	Proposed amendment	Cost ($m)	Benefits ($m)	Net benefit / (cost) ($m)
3%	Handrail	13.8	82.9	69.1
	Stair riser and going dimensions	114.2	169.2	55.0
	Barrier for openable windows	--	4.8	4.8
	Non-climbable zone	79.8	3.5	(76.3)
	Single steps	--	0.6	0.6
	Total	**207.8**	**198.0***	**(9.8)***
7%	Handrail	11.5	45.1	33.6
	Stair riser and going dimensions	95.3	90.2	(5.1)
	Barrier for openable windows	--	2.6	2.6
	Non-climbable zone	66.8	1.9	(64.9)
	Single steps	--	0.3	0.3
	Total	**173.6**	**106.2***	**(67.4)***

Discount rate	Proposed amendment	Cost ($m)	Benefits ($m)	Net benefit / (cost) ($m)
11%	Handrail	9.8	27.8	18.0
	Stair riser and going dimensions	80.9	54.5	(26.4)
	Barrier for openable windows	--	1.5	1.5
	Non-climbable zone	56.8	1.2	(55.6)
	Single steps	--	0.2	0.2
	Total	**147.5**	**(64.6)***	**(82.9)***

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

As shown above, the proposed BCA amendments related to stair riser and going dimension and non-climbable zone will result in a net cost regardless of the discount rate selected, and the overall results are also unchanged.

7.8 Conclusions

The cost benefit analysis in this section provides a quantitative assessment of the expected cost and benefit impacts at a State and national level, and a qualitative assessment of the other costs and benefits associated with the proposed revisions.

The analysis concluded the following:

- the proposed BCA amendments are expected to result in an aggregate increase in overall building costs of approximately $173.6 million (NPV) over the period of regulation, with potential benefits expected to be about $106.2 million (NPV) resulting in a net cost of $67.4 million (NPV);

- in comparison, the Alternative Option, which does not include the proposed stair riser and going dimension and non-climbable zone revisions, is estimated to cost $11.5 million (NPV) over the period of regulation, with total estimated benefits of $48.0 million (NPV) and an overall net benefit of $36.5 million;

- annually, 7,976 injuries or eight fatalities would need to be prevented in new buildings constructed to justify the costs of implementing all the proposed revisions;

- in comparison, 541 fall-related injuries or one fatality need to be prevented under the Alternative Option.

The overall analyses would suggest the Alternative Option is more cost effective than the all-inclusive package, delivering the greatest net benefit to the community. In addition, the Alternative achieves the objectives of the RIS; is backed by robust research and supported by the analysis in the RIS.

8 Business Compliance Costs

8.1 Introduction

The COAG *Best Practice Regulation* guide requires consideration of the compliance burden imposed on businesses. This is the additional (incremental) cost incurred by businesses when complying with regulations. Quantification of compliance costs using the Business Costs Calculator (BCC) is required for proposals that are likely to impose medium or significant compliance costs on business.

Compliance costs include:

1 Notification costs – requirement to report certain events;

2 Education costs – keeping abreast with regulatory requirements;

3 Cost of gaining permission – to conduct certain activities;

4 Purchase costs – requirement to purchase materials or equipment;

5 Record keeping costs – keeping up-to-date records;

6 Enforcement costs – cooperating with audits or inspections;

7 Publication and documentation costs – producing documents for third parties; and

8 Procedural costs – costs incurred that are of a non-administrative nature (e.g. requirement to conduct fire drills).[63]

Business, particularly the building industry, already incurs compliance costs under existing arrangements. We consider below the potential extent of any additional compliance costs under the proposed all-inclusive package of revisions or the Alternative Option.

8.2 Assessment of additional compliance costs

The proposed all-inclusive package of revisions and the Alternative Option may involve minimal change in compliance costs as a result of the education and familiarisation of industry practitioners to the new changes.

[63] COAG Best Practice Regulation, A Guide for Ministerial Councils and National Standard Setting Bodies, October 2007, p. 27.

Education and familiarisation

The proposed all-inclusive package of revisions and the Alternative Option could impose additional compliance costs on industry practitioners, businesses and building owners in the short term as they undergo a process of familiarisation and education with the changed requirements. Whilst it is envisaged that this process may take some time and effort, it is not likely that this would involve significant compliance costs to a business. Further, it is likely that the additional costs could be partially absorbed within ongoing costs associated with staff and professional development.

Consultation Question:

- Are there other compliance related costs or issues that require further consideration?

8.3 Conclusion

Based on this assessment, both the proposed all-inclusive package of revisions and the Alternative Option have been deemed as unlikely to have any significant compliance costs on businesses. It is not necessary to calculate the compliance costs on businesses using the BCC as required by the COAG *Best Practice Regulation Guide.*

9 Assessment of competition impacts

The COAG *Best Practice Regulation* guide requires that the competition impacts of proposed regulation be considered, when undertaking a RIS. A preliminary analysis can be conducted by working through the questions in the *Competition Assessment Checklist* set out in the guide. Where this preliminary analysis indicates there could be an impact on competition, a competition assessment should be undertaken as part of the RIS.

The checklist questions are:

- Would the regulatory proposal restrict or reduce the number and range of suppliers?
- Would the regulatory proposal restrict or reduce the ability of suppliers to compete?
- Would the regulatory proposal alter suppliers' incentives to compete vigorously?[64]

These questions are discussed below.

Do the options being considered restrict or reduce the number and range of suppliers?

It is unlikely that the proposed all-inclusive package of revisions or the Alternative Option will affect or restrict the number and range of suppliers of the materials for the proposed changes or restrict or reduce the number of businesses operating in the design and construction industry.

Both options do not restrict the use of any particular material for the construction of the building components that are affected. While the proposed arrangements may increase demand for handrails, it is unlikely to have a significant impact given that the proposed change applies only to private stairways.

Further, any additional costs for the construction of the new preventative measures would most likely be passed on to the building purchaser and not incurred by the builder or developer.

[64] COAG Best Practice Regulation, A Guide for Ministerial Councils and National Standard Setting Bodies, October 2007, p. 29.

Do the options being considered restrict or reduce the ability of suppliers to compete?

Neither the proposed all-inclusive package of revisions nor the Alternative Option restricts the use of any particular building material. The options only influence the design of the building components affected by the revisions. This is unlikely to have any adverse competitive impact on the ability of suppliers of design and construction services to compete.

Do the options being considered impact incentives to compete vigorously?

The proposed all-inclusive package of revisions and the Alternative Option do not impact or alter suppliers' nor builders' incentives to compete vigorously. There remains an incentive for practitioners to design the most cost effective solution to comply with the BCA Performance Requirements for the relevant building components.

Consultation Question:

- Is it reasonable to assume there will be negligible competition impacts?

Conclusion

Overall, it is unlikely that there will be any competition impacts associated with either the proposed all-inclusive package of revisions or the Alternative Option. Furthermore, because the proposed options constitute performance-based regulation, they provide flexibility to builders to meet the BCA Performance Requirements by proposing alternative building solutions.

10 Consultation

Principle 7 in the COAG *Best Practice Regulations* guide requires effective consultation with affected stakeholders at all stages of the regulatory cycle. Public consultation is an important part of any regulatory development process. Consultation should occur when the options for regulatory action are being considered. The COAG process recommends a best practice consultation process that adheres to seven principles:

1 *Continuity* – Consultation should be a continuous process that starts early in the policy development process.

2 *Targeting* – Consultation should be widely based to ensure it captures the diversity of stakeholders affected by the proposed changes. This includes Commonwealth, State, Territory and local governments, as appropriate.

3 *Appropriate timeliness* – Consultation should start when policy objectives and options are being identified. Throughout the consultation process, stakeholders should be given sufficient time to provide considered responses.

4 *Accessibility* – Stakeholder groups should be informed of proposed consultations, and be provided with information about proposals, via a range of means appropriate to those groups.

5 *Transparency* – Ministerial Councils need to explain clearly the objectives of the consultation process, the regulation policy framework within which consultations will take place and provide feedback on how they have considered consultation responses.

6 *Consistency and flexibility* – Consistent consultation procedures can make it easier for stakeholders to participate. However, this must be balanced with the need for consultation arrangements to be designed to suit the circumstances of the particular proposal under consideration.

7 *Evaluation and review* – Policy agencies should evaluate consultation processes and continue to examine ways of making them more effective.

This RIS has been prepared as part of the best practice consultation process and will be made publicly available to interested parties for comments and feedback. The ABCB's consultation processes discussed below, are consistent with best practice consultation processes and adhere to the seven principles set out above.

10.1 ABCB Consultation Process

The Consultation Protocol

The ABCB is committed to regular review of the BCA and to amend and update the BCA to ensure that it meets changing community standards. To facilitate this, the ABCB maintains regular and extensive consultative relationships with a wide range of stakeholders. In particular, a continuous feedback mechanism exists and is maintained through State and Territory building control administrations, industry and the senior national technical advisory group, the Building Codes Committee. These mechanisms ensure that opportunities for regulatory reform are identified and assessed for implementation in a timely manner.

All ABCB regulatory proposals are developed in a consultative framework in accordance with the Inter-Government Agreement. Key stakeholders are identified and approached for inclusion in relevant project specific committees and working groups. Thus, all proposals have widespread industry and Government involvement.

The ABCB has also developed a Consultation Protocol[65], which includes provisions for a consultation process and consultation forums. The Protocol explains the ABCB's philosophy of engaging constructively with the community and industry in key issues affecting buildings and describes the various consultation mechanisms available to ABCB stakeholders.

The ABCB's consultation processes are a range of programs that allow the ABCB to consult widely with stakeholders via:

- the proposal for change process;
- the release of BCA amendments for comments;
- regulatory impact assessments;
- impact assessment protocol;
- research consultations;
- ABCB approval that reports directly to ministers responsible for building; and
- international collaboration.

[65] Available on http://tinyurl.com/ABCBconsultationprotocol

The Protocol also ensures that the ABCB engages with stakeholders via a range of events and information series through:

- the Building Codes Committee with representatives from a broad cross section of building professions and all levels of government;
- its consultation committees;
- public information seminars;
- its biennial National Conference;
- its technical magazine, the ABRB;
- its 1300 service advisory line which provides information to clarify BCA technical matters; and
- the ABCB website.

The Impact Assessment Protocol

The ABCB Impact Assessment Protocol ensures that the impact assessment processes are accountable and transparent, and allow for significant stakeholder consultation and participation. The impact assessment processes include:

- Proposals for Change (PFC) which require a change-proposer to justify any projected amendment to the BCA, in accordance with COAG regulatory principles. All PCFs are considered by the ABCB's Building Codes Committee, which is comprised of industry representatives, Commonwealth, State, Territory and Local government officials and members of the research community;
- Preliminary Impact Assessments (PIA) which allow for early-stage impact analysis of proposed changes to the BCA. Although complementary to the PFC process, a PIA allows for a more thorough impact assessment to be carried out by the ABCB; and
- Regulation Impact Statements (RIS) which provide a comprehensive assessment of the impacts of proposed regulation.

10.2 Consultation to date

The review and consultation conducted to date on the proposed BCA amendments are summarised in the table below.

Table 10-1: Review and consultation process

Date	Description	Source	Comments
2003	Health and Safety Risks in Buildings	Atech Group	In 2003, the ABCB commissioned report found that the main health and safety risks in buildings (both commercial and residential) appeared to be from slips, trips and falls. The report recommended further work on identifying cost-effective building designs (or building components) that could reduce the incidence of slips, trips and falls.
2008	The relationship between slips, trips and falls and the design and construction of buildings (The Monash Report)	Monash University Accident Research Centre (MUARC)	In 2006, the ABCB commissioned research by MUARC to supplement the existing information to determine whether a relationship exists between the incidence of slips, trips and falls for the age group most at risk and the design and construction requirements for buildings. The Monash Report also ascertained whether current requirements in the BCA provide an acceptable minimum standard of safety and made recommendations.
2008	Recommendations from the Monash Report	National Technical Summit	The recommendations from the Monash Report were considered at the National Technical Summit of that year and by the ABCB's Building Codes Committee (BCC).
2008	Preliminary Impact Assessments (PIAs)	Building Codes Committee	Preliminary Impact Assessments (PIAs) based on the Monash Report recommendations were considered by the BCC and the development of a RIS was recommended to the Board for decision.
2008	ABCB 09/10 work program	Australian Building Codes Board	In November 2008, the Board agreed to move forward with the project and to have it included in the ABCB 2009/10 work program.
2010	Trips, Slips and Falls Project	Di Marzio Research Pty Ltd	The ABCB commissioned the report to help determine a current snapshot of typical riser and going stair dimensions and the provision of handrails used in private stairways.

Date	Description	Source	Comments
2010	Cost Analysis Report	Turner & Townsend	The ABCB commissioned the report to analyse the construction cost implications of the proposed changes to the BCA.

10.3 Public consultation period

As highlighted through the Consultation RIS, there are a number of issues that remain uncertain with respect to the proposed BCA amendments.

Therefore, through the public consultation phase, the ABCB is seeking information on a number of key questions:

- Are there other potential cost-effective measures that could be implemented to reduce slips, trips and falls in buildings?
- How cost-effective are current arrangements?
- Is it reasonable to assume for the purposes of this RIS, that there is an average of 10 single occupancy units per floor of a Class 2 or 3 building?
- Is it reasonable to assume that 5 per cent of single occupancy units located within a Class 2 or 3 building are double storey?
- Is it reasonable to assume that designers will design buildings using windows with higher sills rather than openable windows that require the use of Juliet balconies where a balustrade/barrier is required for openable windows?
- Is it reasonable to assume that the requirement for a non-climbable zone is unlikely to impose an incremental cost for Class 2 to 9 buildings because it is unlikely that buildings would have different balustrade designs above and below four metres?
- Is it reasonable to assume 5 per cent of single storey and 25 per cent of double storey Class 1 buildings would be affected by the non-climbable zone proposed changes?
- Is it reasonable to assume that the proposed amendment to the non-climbable zone provisions is unlikely to impose an incremental cost for Class 2 to 9 buildings?
- Is it reasonable to assume negligible cost impact on the proposed single step provisions?
- How often are inherent “dead zones” with regards to the proposed riser and going dimensions encountered on building sites? Is it reasonable to

assume building designers will design buildings with this in mind to avoid these “dead zones”?

- Are the cost estimates for the proposed BCA amendments provided by the Turner and Townsend report reflective of the marketplace?
- What are the likely quantifiable costs associated with a decrease in net rentable floor space?
- Are the assumptions regarding effectiveness for each proposed amendment appropriate?
- What other variables should be considered when performing the sensitivity analysis?
- Are there other compliance related costs or issues that require further consideration?
- Is it reasonable for the cost/benefit analysis to assume the life of the regulation as 10 years such that the associated costs will stop incurring in year 10 while the benefits will continue to accumulate until year 40?
- Is it reasonable to assume there will be negligible competition impacts?

10.4 Conclusions

The ABCB consultation processes are consistent with the seven principles associated with best practice consultation process. Examples of how the processes meet the seven principles include:

- Continuity – the requirement for a PIA under the Impact Assessment Protocol 2007 addresses this principle;
- Targeting – the ABCB has technical committees made up of a range of stakeholders from both industry and different levels of Government;
- Appropriate timeliness – the Impact Assessment Protocol 2007 ensures that impact assessments at every stage are available for comments by a range of stakeholders and the RIS is available for public comments over a period of three months to ensure that anybody who feels that they have something to contribute is given ample time to do so;
- Accessibility – the ABCB engages with stakeholders using various communication channels including websites, public information seminars, conferences and the production of a technical magazine;

- Transparency – the requirement that a consultation RIS be prepared for public comment ensures that the process of revising provisions is transparent;

- Consistency and flexibility – the Impact Assessment Protocol 2007 ensures that there is a consistent consultation framework and the requirement for PIAs ensure that the relevant stakeholders are consulted at the appropriate time in the review process; and

- Evaluation and review – the Impact Assessment Protocol 2007 was prepared as a response to the 2006 COAG *National Reform Agenda* and the Regulation Taskforce report *Rethinking Regulation*, where the ABCB undertook a review of its processes to ensure the rigour of its impact assessment and consultation processes and to further its role as a 'gatekeeper' of robust regulatory procedures.

11 Implementation and review

If approved, the measures are currently proposed for introduction in BCA 2012, scheduled for adoption on 1 May 2012, subject to the outcome of the consultation process. As a matter of policy, proposed changes to the BCA are released in advance of implementation to allow time for familiarisation and education and for industry to modify its practices to accommodate the changes.

It is expected that building control administrations and industry organisations, in association with the ABCB, will conduct information training seminars on the new measures prior to their introduction into the BCA.

There is no fixed schedule for reviewing provisions of the BCA. However, the ABCB maintains regular and extensive consultative relationships with a wide range of stakeholders. It relies on this process to identify emerging concerns.

12 Conclusions

The RIS analysis concludes the following.

Quantitative impacts

- The individual proposed BCA amendment is expected to impact on construction costs in the following manner:

  - the private handrail requirement will increase building costs for Classes 1 to 3 buildings (Class 4 is assumed to have minimal activity and hence negligible impact) by $11.5 million (NPV) with potential benefits of $45.6 million (NPV) and a net benefit of $33.6 million (NPV) over the life of the regulation (10 years);

  - the stair riser and going dimensions amendment will result in an increase in cost across all building classes of $95.3 million (NPV) with potential benefits of $90.2 million (NPV) and net cost of $5.1 million (NPV) over the life of the regulation;

  - the requirement for a balustrade/barrier for an openable window where the surface beneath is greater than one metre will have a negligible cost impact but will result in a net benefit of $2.6 million (NPV) over the life of the regulation;

  - the requirement for a non-climbable zone in balustrade/barriers where the surface beneath is more than one metre will result in an increase in construction costs for Class 1 buildings of $66.8 million (NPV) with potential benefits of $1.9 million (NPV) and a net cost of $64.9 million (NPV) over the life of the regulation; and

  - assuming the single step requirement will have a negligible cost impact this amendment will result in a net benefit of $0.3 million (NPV) over the life of the regulation.

- In aggregate, the proposed BCA amendment option will lead to an increase in overall construction costs of $173.6 million (NPV) with potential benefits of $106.2 million (NPV) and a net cost of $67.4 million (NPV) imposed on the community over the life (10 years) of the regulation;

- In comparison, the Alternative Option (combination of the handrail, barrier for openable windows and single step amendments) will lead to an increase in cost of $11.5 million (NPV) with potential benefits of $48.0 million (NPV) and a net benefit of $36.5 million (NPV) imposed on the community over the life (10 years) of the regulation;

Qualitative impacts

- Under the proposed BCA amendment option, 7,976 injuries or eight fatalities would need to be prevented in new buildings constructed annually to justify the costs of implementing all the proposed revisions;

- In comparison, 541 fall-related injuries or one fatality need to be prevented annually under the Alternative Option.

- The Alternative Option presents a net benefit to the community and requires fewer injuries/fatalities to be prevented compared to the proposed BCA amendment option.

Conclusions

Based on the analysis undertaken, it can be concluded that the Alternative Option is more cost effective than the proposed BCA amendment option, delivering the greatest benefit to the community. This finding reflects both the number of injuries and fatalities currently attributed to the building components subject to amendment, and the expected effectiveness of the proposed changes in preventing the injuries and fatalities from slips, trips and falls.

The proposed changes under the Alternative Option are also more closely aligned with objectives of the changes being proposed, namely they:

- will assist in providing people with safe, equitable and dignified access to buildings;

- address the identified market failures; and

- represent cost effective and transparent regulatory requirements.

Finally, the research undertaken in this area in recent years provides strong support for the proposed changes, both in terms of the demonstrated risks associated with current regulatory requirements and the specific nature of the changes proposed.

A Detailed cost assumptions/calculations

This Appendix describes the detailed approach and the assumptions used to estimate the likely cost impacts of the proposed BCA amendments. This analysis estimated the impact of the proposed changes at a State and national level using a combination of a specific data request from the Victorian Building Commission and ABS Building Approvals Data for all jurisdictions.[66]

A description of the specific steps and assumptions involved in estimating the impact of the proposed changes at a State and national level is provided below.

A.1 Victorian Building Commission data

Table A-1 below provides a summary of the total number of residential building permits issued across BCA Classes 1-2 in Victoria for 2008/09.[67]

Table A-1: Number of residential Victorian building permits (2008/09)

Building class	Number of building permits	Percentage of total permits
Class 1	40,863	98.15%
Class 2	770	1.85%
Total	**41,663**	**100.00%**

Table A-2 below provides a summary of the total number of non-residential building permits issued across BCA Classes 3-10 in Victoria for 2008/09.[68]

Table A-2: Number of non-residential Victorian building permits (2008/09)

Building class	Number of building permits	Percentage of total permits
Class 3	66	0.87%
Class 4	14	0.19%
Class 5	623	8.23%
Class 6	748	9.88%
Class 7	269	3.56%
Class 8	151	1.99%
Class 9	524	6.92%
Class 10	5,175	68.36%
Total	**7,570**	**100.00%**

[66] Australian Bureau of Statistics, *Building Approvals,* Cat. No 8731.0 (March 2010).
[67] Unpublished data sourced through specific data request to the Building Commission.
[68] Unpublished data sourced through specific data request to the Building Commission.

A.2 Australian Bureau of Statistics data

Tables A-3 and A-4 below outline the average number of building approvals for residential and non-residential buildings in each State/Territory over the period 2004-05 to 2008-09.[69]

Table A-3: Number of residential building approvals (2004-05 to 2008-09)

Jurisdiction	2004-05	2005-06	2006-07	2007-08	2008-09	Avg rate of increase	Percentage (2008-09)
NSW	39,943	34,160	31,402	31,302	23,861	-12.09%	17.96%
Vic	42,547	41,642	37,942	42,908	41,633	-0.54%	31.34%
Qld	39,316	38,033	41,516	45,052	28,954	-7.36%	21.79%
SA	11,143	11,458	10,818	13,380	12,009	1.89%	9.04%
WA	24,233	26,170	25,087	23,641	19,387	-5.43%	14.59%
Tas	3,078	2,634	2,940	2,938	3,167	0.72%	2.38%
NT	1,388	1,363	1,464	1,172	985	-8.22%	0.74%
ACT	2,259	1,867	2,246	2,339	2,867	6.14%	2.16%
Aust	**163,907**	**157,327**	**153,415**	**162,732**	**132,863**	**-5.11%**	**100.00%**

Table A-4: Number of non-residential building approvals (2004-05 to 2008-09)

Jurisdiction	2004-05	2005-06	2006-07	2007-08	2008-09	Avg rate of increase	Percentage (2008-09)
NSW	6,364	71,05	6,837	6,680	5,803	-2.28%	23.13%
Vic	7,000	7,475	7,841	8,146	7,570	1.98%	30.18%
Qld	5,195	5,755	6,343	5,595	5,402	0.98%	21.53%
SA	1,813	1,701	1,588	1,775	1,826	0.18%	7.28%
WA	2,337	2,700	2,795	3,028	2,880	5.36%	11.48%
Tas	530	605	643	712	716	7.81%	2.85%
NT and ACT	366	838	912	911	888	24.81%	3.54%
Aust	**23,605**	**26,179**	**26,959**	**26,847**	**25,085**	**1.53%**	**100.00%**

Note that data from the NT and ACT was combined due to the small jurisdiction sizes.

As shown above, for the purposes of this analysis it was assumed that residential building approvals related to Class 1-2 buildings, while non-residential building approvals related to Class 3-9 buildings.

The growth rates calculated in Table A-3 and A-4 will be used to calculate the projected values for the NPV analysis.

[69] Australian Bureau of Statistics, *Building Approvals,* Cat. No 8731.0 (2004-2009).

A.3 Estimating building activity for each BCA class

For the purposes of this analysis, it was necessary to separately identify the number of building approvals for Class 1-10 buildings. The Building Commission data reported above enabled a percentage figure indicating the proportion of permits in each class in Victoria to be identified, which are outlined in Table A-5 and Table A-6 below.

Table A-5: Number of residential Victorian building permits by BCA class (2008-09)

Building class	Number of building permits	Percentage of total permits
Class 1	40,863	98.15%
Class 2	770	1.85%
Total	**41,663**	**100.00%**

Table A-6: Number of non-residential Victorian building permits by BCA class (2008-09)

Building class	Number of building permits	Percentage of total permits
Class 3	66	0.87%
Class 4	14	0.19%
Class 5	623	8.23%
Class 6	748	9.88%
Class 7	269	3.56%
Class 8	151	1.99%
Class 9	524	6.92%
Class 10	5,175	68.36%
Total	**7,570**	**100.00%**

Note that there is a discrepancy in the number of Victorian Building Approvals granted in 2008-09 (as per ABS data) and the number of Victorian Building Permits (as per Building Commission data). This is due to the fact that while the Building Commission records all building activities of any value as Building Permits, only residential building activities greater than $10,000 in value and non-residential building activities greater than $50,000 in value are recorded as Building Approvals by the ABS. Despite this consideration, it is assumed that the proportion of activities in each building class will remain similar and therefore can be applied throughout this RIS.

These percentage figures were then applied to ABS data for other jurisdictions to achieve the breakdown outlined below.

Table A-7: Estimated building activity by BCA category (number of permits)

Jurisdiction	Residential (Class 1)	Residential (Class 2)	Non-residential (Classes 3-10)	Total (Classes 1-10)
VIC	40,863	770	7,570	49,203
NSW	23,420	441	5,803	29,664
QLD	28,418	536	5,402	34,356
WA	19,028	359	2,880	22,267
SA	11,787	222	1826	13,835
TAS	3,108	59	716	3,883
NT	967	18	888	4,740
ACT	2,814	53		
Australia	**130,405**	**2,458**	**25,085**	**157,948**

Note that data from the NT and ACT was combined due to the small jurisdiction sizes

Estimating aggregate impact of proposed BCA amendment option and the Alternative Option

The next step in the analysis involved extrapolating the construction cost estimates derived for the new safety requirements for handrails, stair risers and goings and non-climbable zones to a State and national level. This required identification of the relevant BCA Class(s) for each of the chosen buildings and applying the relevant percentage of affected buildings in each class to the estimated building numbers for that class of building. This analysis was performed on both a State/Territory level and at a national level, using the same methodology throughout.

A.4 Residential stair handrails

Table A-8 below identifies the assumed BCA class numbers for each type of building affected by new handrail requirements and the estimated cost impact proposed by BCA changes.

Table A-8: Estimated cost impact for assumed sample of buildings affected by new handrail requirements (Australia)

	Total number of buildings 2008-09	Number of storeys (Class 2 & 3 buildings only)	Number of Class 1 buildings with two storeys or number of double storey apartments in Class 2 & 3 buildings which do not comply with the proposed handrail requirement	Hardwood timber handrails		Anodised aluminium handrails		Steel with PVC sheathing handrails		Total handrails	
				Number of handrails	Cost ($)	Number of handrails	Cost ($)	Number of handrails	Cost ($)	Number of handrails	Cost ($)
Class 1	130,405	N/A	3,783	3,026	798,944	378	378,288	378	253,453	3,783	1,430,685
Class 2	2,458	5 (Low Range)	461	369	97,332	46	46,085	46	30,877	461	174,294
		10 (High Range)	922	737	194,664	92	92,170	92	61,754	922	348,588
Class 3	219	5 (Low Range)	41	33	8,663	4	4,102	4	2,748	41	15,513
		10 (High Range)	82	66	17,326	8	8,203	8	5,496	82	31,025
TOTAL	**133,082**		**5,289**	**4,231**	**1,116,928**	**529**	**528,849**	**529**	**354,329**	**5,288**	**2,000,105**

Note the following assumptions:

1 Despite this analysis relating to handrail requirements in residential buildings, Class 3 (generally categorised as 'commercial' throughout this report) is incorporated in this section due to the residential nature of the internal apartments/rooms in a guest house, motel, backpacker accommodation, etc.

2 The number of buildings is based on the number data obtained from the Building Commission and ABS, as outlined previously.

3 The assumed level of buildings that will be affected by the proposed handrail requirements was set at 15% for Classes 1-3, as confirmed by *Research Report: Trips, Slips and Falls Project prepared for Australian Building Codes Board* by Di Marzio Research Pty Ltd.

4 Only buildings with two or more storeys require handrails. Building Commission data indicated that 19.3% of Class 1 buildings were of two or more storeys (as demonstrated below). This proportion was applied to other State and Territory jurisdictions.

Table A-9: Proportion of buildings with one or more storeys (Victoria)

	Number of buildings with one storey	Number of buildings with two or more storeys	Total number of buildings	Proportion of buildings with two or more storeys
Class 1	43,523	10,435	53,958	19.34%

5 ABCB provided the average number of storeys in Class 2 and 3 buildings. It was assumed on a low and high basis to provide a range of costs associated with amendments to handrail requirements in each building class. No indication of the incidence of number of storeys was provided, so an aggregate average of 50% of buildings in the 'low' category and 50% of buildings in the 'high' category was applied.

6 ABCB provided an assumption of 10 apartments per storey in Class 2 and Class 3 buildings.

7 ABCB provided an assumption that 5% of apartments in Class 2 and 3 buildings are double storey.

8 Costs involved in using each type of handrail material were derived from information provided by Turner & Townsend.[70] ABCB provided an assumption that all buildings would already be fitted with a 4 metre handrail, hence only an additional 4 metre handrail would be required. The cost of each type of handrail material on a 4 metre basis was obtained from the information provided by Turner & Townsend. Table A-10 below outlines this process. ABCB provided an assumption as to the incidence in which each material is used.

[70] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 2.

Table A-10: Costs and incidence of the use hardwood timber, anodised aluminium and steel with PVC sheathing

Type of material	Cost per 4m handrail ($)	Incidence
Hardwood timber	264.00	80.00%
Anodised aluminium	1000.00	10.00%
Steel with PVC sheathing	670.00	10.00%

A.5 Stair risers and goings (residential and non-residential)

Table A-11 below identifies the assumed BCA class numbers for each type of residential building affected by new stair riser and going requirements and the estimated cost impact proposed by ABCB changes.

Table A-11: Estimated cost impact of stair riser and going requirements by BCA class (residential buildings) (Australia)

	Total number of buildings 2008-09	Number which do not comply	Timber stairs				
			Range	Number of storeys	Number of flights	Number of Class 1 buildings/ number of double storey apartments in Class 2 & 3 buildings	Cost ($)
Class 1	130,405	116,061	Low	2	1	38,687	2,553,332
			Medium	2	1	38,687	2,533,332
			High	2	1	38,687	2,533,332
Class 2	2,458	2,188	Low	5	1	2,734	180,469
			Medium				
			High	10	1	5,469	360,939
Class 3	219	195	Low	5	1	243	18,739
			Medium				
			High	10	1	487	37,479
TOTAL	**133,082**	**118,443**				**124,994**	**8,257,623**

Note the following assumptions:

1 Despite this analysis relating to stair riser and tread/going requirements in residential buildings, Class 3 (generally categorised as 'commercial' throughout this report) is incorporated in this section due to the residential nature of the internal apartments/rooms in a guest house, motel, backpacker accommodation, etc.

2 The number of buildings is based on the number data obtained from the Victorian Building Commission and ABS, as outlined previously.

3 The assumed level of new buildings that will be affected by the proposed stair riser and going amendments was set at 89% for Classes 1-2, based on findings from the *Research Report: Trips, Slips and Falls Project prepared for Australian Building Codes Board* by Di Marzio Research Pty Ltd. This is the greater of two figures indicating non-compliance against the proposed amendment for stair risers (55%) and stair treads/goings (89%) as it is assumed that both facets of a step require compliance for the step to be deemed suitable.

4 The average number of storeys in each building class was assumed on a low, medium and high basis to provide a range of costs (savings) associated with amendments to stair risers and goings in each building class. No indication of the incidence of number of storeys was provided, so an aggregate average of 33.3% of buildings was applied to each number of storeys in cases where low, medium and high ranges were provided, and an aggregate average of 50% of buildings was applied in cases where only low and high ranges were provided.

5 ABCB provided an assumption of 10 sole occupancy unit per storey in Class 2 and Class 3 buildings.

6 ABCB provided an assumption that 5% of sole occupancy units in Class 2 and 3 buildings are double storey and therefore would need to comply with new residential stair riser and tread/goings requirements.

7 ABCB provided an assumption that both timber stairs are used in residential buildings (i.e. private stairways). Timber stairs provide a varying range of increased costs per flight depending on building class, as outlined in Turner and Townsend and Table A-12 below.

Table A-12: Costs associated with the use of in-situ concrete by BCA class

Construction material	Building class	Cost per flight (18 steps) ($)
Timber	Class 1	$66.00
	Class 2	$66.00
	Class 3	$77.00

Table A-13 below identifies the assumed BCA class numbers for each type of non-residential building affected by new stair riser and going requirements and the estimated cost impact proposed by ABCB changes.

Table A-13: Estimated cost impact of stair riser and going requirements by BCA Class (non-residential buildings) (Australia)

Class	Total no. of buildings 2008-09	Non-compliant buildings	In-situ concrete					
			Range	No .of Storeys	No. stairwells	Total no of flights	No. of buildings	Cost ($)
2	2,458	2,040	Low	5	1	4	1,020	338,646
			Medium					
			High	10	2	18	1,020	1,523,907
3	219	182	Low	5	1	4	91	35,224
			Medium					
			High	10	2	18	91	158,510

Class	Total no. of buildings 2008-09	Non-compliant buildings	In-situ concrete					
			Range	No .of Storeys	No. stairwells	Total no of flights	No. of buildings	Cost ($)
4	47	39	Low	2	1	1	13	1,082
			Medium	2	1	1	13	1,082
			High	2	1	1	13	1,082
5	2,065	1,714	Low	5	1	4	571	253,714
			Medium	10	2	18	571	1,141,711
			High	20	2	38	571	2,410,280
6	2,478	2,057	Low	2	1	1	686	76,114
			Medium	2	1	1	686	76,114
			High	2	1	1	686	76,114
7	892	740	Low	3	1	2	247	68,106
			Medium	5	1	4	247	136,211
			High	10	2	18	247	612,952
8	500	415	Low	2	1	1	138	19,081
			Medium	2	1	1	138	19,081
			High	2	1	1	138	19,081
9	1,736	1,440	Low	2	1	1	720	79,947
			Medium					
			High	5	2	8	720	639,573
10	17,148	14,233	Low	N/A		N/A		
			Medium	N/A		N/A		
			High	N/A		N/A		
TOTAL	**27,543**	**22,861**					**8,628**	**7,687,612**

Note the following assumptions:

1 Despite this analysis relating to stair riser and tread/going requirements in non-residential (commercial) buildings, Class 2 (generally categorised as 'residential' throughout this report) is incorporated in this section due to the commercial nature of the common areas in such buildings, e.g. stairwells, hallways, etc.

2 The number of buildings is based on the number data obtained from the Victorian Building Commission and ABS, as outlined previously.

3 The assumed level of new buildings that are affected by the proposed stair riser and going requirements was set at 83% for Classes 3-10, based on findings from the *Research Report: Trips, Slips and Falls Project prepared for Australian Building Codes Board* by Di Marzio Research Pty Ltd. This is the greater of two figures indicating non-compliance for stair risers (49%) and stair treads/goings (83%) as it is assumed that both facets of a step require compliance for the step to be deemed suitable.

4 The average number of storeys in each building class was assumed on a low, medium and high basis to provide a range of costs (savings) associated with amendments to stair risers and goings in each building class. No indication of the incidence of number of storeys was provided, so an aggregate average of 33.3% of buildings was applied to each number of storeys in cases where low, medium and high ranges were provided, and an aggregate average of 50% of buildings was applied in cases where only low and high ranges were provided.

5 ABCB provided an assumption that in-situ concrete stairs are mainly used in non-residential buildings. In-situ concrete stairs provide a varying range of increased costs per flight depending on building class, as outlined in Turner and Townsend and Table A-14 below.[71]

Table A-14: Costs associated with the use of in-situ concrete by BCA class

Construction material	Building class	Cost per flight (18 steps) ($)
In-situ concrete	Class 1	$83.00
	Class 2	$83.00
	Class 3	$97.00
	Class 4	$83.00
	Class 5	$111.00
	Class 6	$111.00
	Class 7	$138.00
	Class 8	$138.00
	Class 9 (Av)	$111,00
	Class 10	$97.00

Note that an average of the costs associated with stair riser and going requirements in Class 9 has been calculated as an average of Class 9a ($138.00), Class 9b ($83.00) and Class 9c ($97.00).

[71] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 3.

A.6 Non-climbable zones

Table A-15 below identifies the assumed BCA class numbers for each type of building affected by proposed non-climbable zone requirements and the estimated cost impact proposed by ABCB changes.

Table A-15: Estimated cost impact of non-climbable zone requirements (Australia)

	Total number of buildings 2008-09	Total number that do not comply	Range (total length of balustrade)	Number that do not comply	Cost ($)
Class 1 (single storey)	105,186	5,259	Low (10m)	1,753	876,549
			Medium (20m)	1,753	1,753,099
			High (30m)	1,753	2,629,648
Class 1 (double or more storey)	25,219	6,305	Low (10m)	2,102	1,050,800
			Medium (20m)	2,102	2,101,600
			High (30m)	2,102	3,152,400
TOTAL	**130,405**	**11,564**		**11,564**	**11,564,096**

Note the following assumptions:

1 The number of buildings is based on the number data obtained from the Victorian Building Commission and ABS, as outlined previously. ABCB indicated that while the proposed revisions apply to all building classes, it can be assumed that mainly Class 1 buildings will be affected by this proposed change. This is because it is unlikely in current practice that designers of high rise buildings will have different balustrade/barrier designs above and below the current four metre threshold when the non-climbable provisions kick in.

2 Only Class 1 buildings with two or more storeys are assumed to be affected by the proposed changes to non-climbable zone requirements. ABCB provided an assumption that 5% of Class 1 single storey and 25% of Class 1 double (or more) storey buildings would be affected by the proposed changes to non-climbable zone requirements.

3 Victorian Building Commission data indicated that 19.3% of Class 1 buildings were of two or more storeys (and therefore 80.66% of Class 1 buildings were single storey), as outlined previously.

4 ABCB provided a low (10m), medium (20m) and high (30m) range which would require adjustment under the proposed changes. No indication of the incidence of each area was provided, so an aggregate average of 33.3% was applied to each area size.

5 The cost of the proposed change was taken as $50 per metre as provided by Turner and Townsend.[72] The increase in cost by Turner and Townsend is based on a design change from horizontal wire balustrades to vertical wire balustrades. This cost was applied to a range of balustrade lengths (low, medium, high) to calculate a total cost of the proposed change.

[72] Turner and Townsend, *Cost Analysis Report*, 2010, report commissioned by the ABCB, p. 7.

A.7 Net present value (NPV) of estimated impacts

Table A-16 below shows the NPV and associated sensitivity analysis for the all-inclusive package of proposed measures and all combinations of possible Alternative Options.

Table A-16: Net Present Value of additional construction costs over life of regulations ($)

Rate	Handrail	Stair riser and going dimensions	Non-climbable zone	All inclusive package
3%	$13,799,059	$114,172,069	$79,782,633	$207,753,762
7%	$11,545,305	$95,250,018	$66,752,002	$173,547,325
11%	$9,826,108	$80,851,025	$56,812,044	$147,489,177

Note the following assumptions:

1 Assumed 10-year regulatory life.

2 An annual discount rate of 7%.

3 The annual cost of each proposed revision is grown by a factor of the average annual rate of growth of building approvals in Tables A-3 and A-4.

B Detailed benefits assumptions/calculations

B.1 Cost of hospital separations and fatalities – assumptions and calculations

Table B-1: Cost of hospital separations and fatalities by proposed amendment

Amendment	Current annual injury/fatality costs attributed to slips, trips and falls occurring under building component
Handrail	Cost of injuries: • Table 9.8.4.1 in the MUARC report p. 94 showed the frequency of falls related hospitalisation separations by cause from 1999/00 to 2004/05. Over the 6-year period, 57,153 hospital separations result from falls on and from stairs and steps. On average, 9,526 of such falls occur per annum. • Table 9.8.5.1 in the MUARC report p. 95 indicated that 38 per cent of fall related hospital separations occur in the home (BCA Class 1). The handrail amendment is only applicable to private handrails in Class 1, 2 and 3 buildings. Furthermore, the MUARC report p. 89 also states that hospital separations over represent the number of actual hospitalised fall injury by 10 per cent. Therefore, the handrail amendment could potentially reduce a maximum of 3,620 falls per annum over the next 10 years. • The cost of an average hospital separation is assumed to be $3,700 (3.7 days at a cost of approximately $1,000 per hospital day) in the MUARC report p. xiii. Therefore the total cost of injuries is estimated to be $13.4 million per annum. • It should be noted that there is an overlap in the number of falls that could be prevented through the handrail amendment or stair dimension amendment. That is, they are not mutually exclusive. It is not possible to determine the overlap. • It has been assumed that if the handrail and stair dimensions amendments are implemented together, both amendments will be able to prevent 45 per cent of injuries. Cost of fatalities: • Table 10.2.5 in the MUARC report pp. 177-78 showed that from 2001 to 2005, 179 stairs and steps fatalities occur at home or at a residential facility. This translates to 36 deaths per annum. The economic value of life is assumed to be $3.5 million according to guidance provided by the Office of Better Practice Regulation (http://www.finance.gov.au/obpr/docs/ValuingStatisticalLife.pdf) • Therefore the cost of fatalities is estimated to be $126 million per annum. • It should be noted that there is an overlap in the number of deaths that could be prevented through the handrail amendment or stair dimension amendment. That is, they are not mutually exclusive. It is not possible to determine the overlap.

Amendment	Current annual injury/fatality costs attributed to slips, trips and falls occurring under building component
	• It has been assumed that if the handrail and stair dimensions amendments are implemented together, both amendments will be able to prevent 45 per cent of deaths.

Stair dimensions	<u>Cost of injuries:</u>
	• The number of hospital fall injuries on and from stairs and steps that could be prevented through the implementation of the stair dimension amendment is calculated in a similar manner as for handrails.
	• Taking into account:
	  • that the stair dimension amendment applies to all building classes;
	  • a 10 per cent adjustment for over representation of hospital injuries;
	  • subtracting the number of falls that can be attributed from single steps;
	  • the stair dimension amendment could potentially prevent a maximum of 7,501 falls on and from stairs per annum.
	• The cost of an average hospital separation is assumed to be $3,700 (3.7 days at a cost of approximately $1,000 per hospital day) in the MUARC report p. xiii. Therefore the total cost of injuries is estimated to be $27.8 million per annum.
	• It should be noted that there is an overlap in the number of falls that could be prevented through the handrail amendment or stair dimension amendment. That is, they are not mutually exclusive. It is not possible to determine the overlap.
	• It has been assumed that if the handrail and stair dimensions amendments are implemented together, both amendments will be able to prevent 45 per cent of injuries.
	• However the number of falls that could be prevented through the stair dimension amendment and through the single step amendment is mutually exclusive as the falls that can be attributed to single steps have been subtracted from the overall number of fall on and from stair and steps.
	
	<u>Cost of fatalities:</u>
	• Table 10.2.5 in the MUARC report pp. 177-78 showed that 230 stairs and steps fatalities occur across all BCA building classes over a 5-year period from 2001 to 2005, equating to 46 deaths per annum. The economic value of life is assumed to be $3.5 million.
	• Therefore the cost of fatalities is estimated to be $161 million per annum.
	• It should be noted that there is an overlap in the number of deaths that could be prevented through the handrail amendment or stair dimension amendment. That is, they are not mutually exclusive. It is not possible to determine the overlap.
	• It has been assumed that if the handrail and stair dimensions amendments are implemented together, both amendments will be able to prevent 45 per cent of deaths.

Amendment	Current annual injury/fatality costs attributed to slips, trips and falls occurring under building component

Single step	Cost of injuries:
	• The number of hospital fall injuries on and from stairs and steps that could be prevented through the implementation of the single step amendment is calculated in a similar manner as for handrails.
	• Taking into account that:
	  • the single step amendment applies to all building classes;
	  • Jackson and Cohen (1995) stated that 25 per cent of stair and step falls occur on stairs with one or two risers;
	  • it has been assumed that half of the 25 per cent of falls occur on single steps;
	  • making a 10 per cent adjustment for over representation of hospital injuries;
	  • the single step amendment could potentially prevent a maximum of 1,072 falls on and from stairs per annum.
	• The cost of an average hospital separation is assumed to be $3,700 (3.7 days at a cost of approximately $1,000 per hospital day) in the MUARC report p. xiii. Therefore the total cost of injuries is estimated to be $4 million per annum.
	Cost of fatalities:
	• There is a lack of data showing deaths attributed to single step falls, as such it has been assumed that single step falls are more likely to result in injuries than deaths, therefore no cost of fatalities has been estimated.

Barrier to openable window	Cost of injuries: • The Victorian Injury Surveillance and Applied Research (VISAR) Hazard (edition no. 59) report indicated that over a 3-year period from 2000 to 2003, Victoria recorded 216 falls from windows. This translates to 72 falls per annum on average. • According to ABS, Victoria makes up 24.8 per cent of the population of Australia. (http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0). Extrapolating the falls data to the whole of Australia using the population data gives 290 window falls per annum. • Assuming that the cost of an average hospital separation is $3,700, the cost of injuries is estimated to be approximately $1.1 million per annum. Cost of fatalities: • The barrier for openable windows amendment is largely to contribute to the prevention of children from falling to their deaths. • The Australian Institute of Heath and Welfare (2001)[73] reported that over a 20-year period from 1979 to 1998, 62 children under the age of 14 died as a result of falls from or out of buildings or other structures. The average number of deaths per annum is 3.1. The report does not differentiate if the deaths are a result of falls from windows or from verandahs/balconies. It has been

[73] Australian Institute of Heath and Welfare 2001, *Child injuries due to falls*, p. 4.

Amendment	Current annual injury/fatality costs attributed to slips, trips and falls occurring under building component
	assumed that there is a 50/50 split. Therefore the number of deaths per annum due to children falling out of windows is estimated to be approximately 1.5. Hence the cost of fatalities is estimated to be $5.25 million.
Non-climbable zone	<u>Cost of injuries:</u> • The Victorian Injury Surveillance and Applied Research (VISAR) Hazard (edition no. 59) report indicated that over a 3-year period from 2000 to 2003, Victoria recorded 140 falls from verandahs and balconies. This translates to 47 falls per annum on average. • According to ABS, Victoria makes up 24.8 per cent of the population of Australia. (http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0). Extrapolating the falls data to the whole of Australia using the population data gives 190 window falls per annum. • Assuming that the cost of an average hospital separation is $3,700, the cost of injuries is estimated to be approximately $0.7 million per annum. <u>Cost of fatalities:</u> • The non-climbable amendment is largely to contribute to the prevention of children from falling to their deaths. • The Australian Institute of Heath and Welfare (2001)[74] reported that over a 20-year period from 1979 to 1998, 62 children under the age of 14 died as a result of falls from or out of buildings or other structures. The average number of deaths per annum is 3.1. The report does not differentiate if the deaths are a result of falls from windows or from verandahs/balconies. It has been assumed that there is a 50/50 split. Therefore the number of deaths per annum due to verandahs/balconies is estimated to be approximately 1.5. Hence the cost of fatalities is estimated to be $5.25 million.

[74] Australian Institute of Heath and Welfare 2001, *Child injuries due to falls*, p. 4.

B.2 Benefits – assumptions and calculations

Table B-2: Benefits from prevented hospital separations due to injuries and fatalities

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
Handrail	• The handrail amendment applies to private handrails in private dwellings. • In 2009, there were 8.321 million private dwellings in Australia.[75] • In 2009, 132,863 residential approvals were recorded.[76] • The percentage of new residential dwellings is 1.6 per cent in 2009. • The number of residential approvals over the last 5 years declined at an average of 5.11 per cent per annum. Taking account the level of building activity and forecasting forward to 2011 (Year 1 of the regulation), this results in a percentage of new building of 1.4 per cent for 2011.	Effectiveness = 30% • The handrail amendment is assumed to prevent up to 30 per cent of falls and fatalities on and from stairs and steps. • However, if the handrail and stair dimension amendments are implemented together, there will be an overlap in the ability of the amendments to prevent falls and fatalities, that is some falls/fatalities could be prevented from either having a handrail in place or a change to the stair dimensions. • Therefore, while the individual amendment could potentially prevent up to 30 per cent of falls/fatalities, it does not imply that together, they could prevent up to 60 per cent of such mishaps.	Ishihara et al. (2002) found that of the 2,800 elderly respondents to a questionnaire concerning stair use, 34.2% reported being saved by a handrail when they nearly fell. The same investigation also found that handrails were particularly effective at preventing falls due to sub-standard illumination of stairwells, the effects of which are often exacerbated in the elderly by vision deterioration. (MUARC, p. 25)	<u>Injuries prevented:</u> • Cost of injuries $13.4 million • Effectiveness = 0.30 • New building stock = 0.014 • Benefits = $13.4 million x 0.30 x 0.014 = $56,280 <u>Fatalities prevented:</u> • Cost of fatalities = $126 million • Effectiveness = 0.30 • New building stock = 0.014 • Benefits = $126

[75] ABS, Australian Social Trends, Data Cube: Housing, Cat. No. 4102.0, Table 1.
[76] ABS, Building Approvals, Cat. No. 8731.

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
		• It has been assumed that if the handrail and stair dimensions amendments are implemented together, they could potentially prevent up to 45 per cent of the falls which is higher than the individual effectiveness rate. The additional 15 per cent (above the individual effectiveness rate) represents when both the handrail and stair dimensions amendments are required to prevent the fall. The decrease in 15 per cent (from the additional of both the individual effectiveness rates – 60 per cent) represents the overlap, where the fall or fatalities could be prevented from just having a handrail or a change in the stair dimensions. • The extent of the overlap in effectiveness however is not known and therefore not quantifiable.		million x 0.30 x 0.014 = $529,200 <u>Total benefits:</u> • Sum of injuries and deaths prevented = $56,280 + $529,200 = $585,480
Stair dimensions	• The stair dimensions amendment applies across all building classes. However, no data exists on the total building stock in	Effectiveness = 30% The same explanation applies to the stair dimensions amendment as for the handrail amendment.	Consultation question: Is the effectiveness rate assumption reasonable?	<u>Injuries prevented:</u> • Cost of injuries $27.8 million • Effectiveness =

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
	Australia. • The ABS reported that in 2009, 157,948 building approvals were recorded[77] of which 84 per cent were for residential dwellings (132,863) and 16 per cent were for commercial buildings (25,085). • In 2009, the ABS also reported that there were 8.321 million private dwellings in Australia.[78] • Using both sets of data, it is estimated that there were 9.91 million buildings in Australia. • The percentage of new building stock is 1.6 per cent in 2009. • The number of non-residential approvals over the last 5 years declined at an average of 1.53 per cent per annum. Taking account the level of building activity and forecasting forward to 2011 (Year 1 of the regulation), this results in a percentage of new building of			0.30 • New building stock = 0.016 • Benefits = $27.8 million x 0.30 x 0.016 = $133,440 <u>Fatalities prevented:</u> • Cost of fatalities = $161million • Effectiveness = 0.30 • New building stock = 0.016 • Benefits = $161million x 0.30 x 0.016 = $772,800 <u>Total benefits:</u> Sum of injuries and deaths prevented = $133,440 + $772,800

[77] ABS, Building Approvals, Cat. No. 8731.
[78] ABS, Australian Social Trends, Data Cube: Housing, Cat. No. 4102.0, Table 1.

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
	1.6 per cent for 2011.			= $906,240
Single step	• The single step amendment applies across all building classes. However, no data exists on the total building stock in Australia. • The percentage of new building in 2009 is 1.6 per cent as shown above. • The number of non-residential approvals over the last 5 years increased at an average of 1.53 per cent per annum. Taking account the level of building activity and forecasting forward to 2011 (Year 1 of the regulation), this results in a percentage of new building of 1.6 per cent for 2011.	Effectiveness = 5%	Consultation question: Is the effectiveness rate assumption reasonable?	<u>Total benefits = injuries prevented:</u> • Cost of injuries $4 million • Effectiveness = 0.05 • New building stock = 0.016 • Benefits = $4 million x 0.05 x 0.016 = $3,200
Barrier for openable window	• The barrier for openable window amendment applies across all building classes. • The percentage of new building in 2009 is 1.6 per cent as shown above. • The number of non-residential approvals over the last 5 years	Effectiveness = 30%	Consultation question: Is the effectiveness rate assumption reasonable?	<u>Injuries prevented:</u> • Cost of injuries $1.1 million • Effectiveness = 0.30 • New building stock = 0.016 • Benefits = $1.1

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
	increased at an average of 1.53 per cent per annum. Taking account the level of building activity and forecasting forward to 2011 (Year 1 of the regulation), this results in a percentage of new building of 1.6 per cent for 2011.			million x 0.30 x 0.016 = $10,560 <u>Fatalities prevented:</u> • Cost of fatalities = $5.25 million • Effectiveness = 0.30 • New building stock = 0.016 • Benefits = $5.25 million x 0.30 x 0.016 = $25,200 <u>Total benefits:</u> Sum of injuries and deaths prevented = $10,560 + $25,200 = $35,760
Non-climbable zone	• Even though the amendment applies across all building classes, it is likely that only Class	Effectiveness = 30%	Consultation question: Is the effectiveness rate assumption reasonable?	<u>Injuries prevented:</u> • Cost of injuries $0.7 million

Amendment	% of new building	Effectiveness of amendment in preventing slips, trips and falls in new buildings	Support for effectiveness assumption	Benefits from prevented injuries and fatalities per annum (in 2011 – Year 1 of the regulation)
	1 buildings will be impacted. • In 2009, there were 8.3 million private dwellings in Australia.[79] • In 2009, 132,863 residential approvals were recorded.[80] • The percentage of new building is 1.6 per cent in 2009. • The number of residential approvals over the last 5 years declined at an average of 5.11 per cent per annum. Taking account the level of building activity and forecasting forward to 2011 (Year 1 of the regulation), this results in a percentage of new building of 1.4 per cent for 2011.			• Effectiveness = 0.30 • New building stock = 0.014 • Benefits = $0.7 million x 0.30 x 0.014 = $2,940 <u>Fatalities prevented:</u> • Cost of fatalities = $5.25 million • Effectiveness = 0.30 • New building stock = 0.014 • Benefits = $5.25 million x 0.30 x 0.014 = $22,050 <u>Total benefits:</u> Sum of injuries and deaths prevented = $2,940 + $22,050 = $24,990

[79] ABS, Australian Social Trends, Data Cube: Housing, Cat. No. 4102.0, Table 1.
[80] ABS, Building Approvals, Cat. No. 8731.

B.3 Benefits net present value calculation

Table B-3 below shows the NPV and associated sensitivity analysis for the all-inclusive package of proposed measures.

Table B-3: Net Present Value of benefits over life of regulations (savings) ($)

Rate	Handrail	Stair riser and going dimensions	Barrier for openable windows	Non-climbable zone	Single step	All inclusive package*
3%	82,887,711	169,176,015	4,802,878	3,537,890	597,373	197,985,936
7%	45,140,011	90,241,310	2,561,935	1,926,708	318,649	106,343,282
11%	27,773,371	54,458,591	1,546,070	1,185,449	192,297	64,597,787

*Note: the estimated total benefit takes account of the fact that the benefits attributed to the handrail and stair riser and going dimensions are assumed not to be additive.

Note the following assumptions:

1 Assumed 10-year regulatory life and an average building lifespan of 30 years. The total benefits over the life of the regulations are realised over 40 years (i.e. building built in year 10 will realise benefits until year 40), while the cost associated with the proposed amendments will stop incurring after year 10

2 Discount rate of 7 per cent is taken to be the average rate.

3 The annual benefit of each proposed revision is grown by a factor of the average annual rate of growth of building approvals in Tables A-3 and A-4. After year 10, no additional buildings have been factored into the cost benefit analysis.

4 It has been assumed that the benefits from the stair riser and going dimensions and the handrail dimensions are not additive.