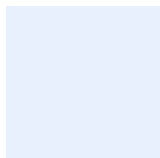


**aurecon**

**Project: Addendum to the Final  
Decision RIS for Trips, Slips  
and Falls Peer Review – Final  
Report**

**Project No. 226607**  
**Prepared for: ABCB**  
**Report ref: Final 02**  
6 December 2011



# Document Control Record

Document prepared by:

Aurecon Australia Pty Ltd  
ABN 54 005 139 873  
Level 1, 15 Barry Drive  
Turner ACT 2612  
GPO Box 320  
Canberra City ACT 2601  
Australia

**T** +61 2 6112 0100  
**F** +61 2 6112 0106  
**E** canberra@aurecongroup.com  
**W** aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control				aurecon		
<b>Report Title</b>		Project Addendum to the Final Decision RIS for Trips, Slips and Falls Peer Review – Final Report				
<b>Document ID</b>		final report rev 02.docx	<b>Project Number</b>		226607	
<b>Client</b>		ABCB	<b>Client Contact</b>		John Davies	
<b>Rev</b>	<b>Date</b>	<b>Revision Details/Status</b>	<b>Prepared by</b>	<b>Author</b>	<b>Verifier</b>	<b>Approver</b>
0	28 November 2011	Draft Report	TW	TW	JG	JG
01	5 December 2011	Final Revision	TW	TW	JG	JG
02	6 December 2011	Final	TW	TW	JG	JG

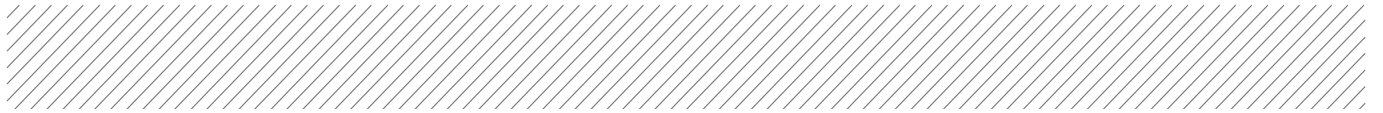
Approval			
<b>Author's Name</b>	Terry Whiteman	<b>Approver's Name</b>	Jason Gillard
<b>Title</b>	Associate	<b>Title</b>	Associate

# Addendum to the Final Decision RIS for Trips, Slips and Falls Peer Review – Final Report

Date | 6 December 2011  
Reference | Final 02  
Revision | 02

Aurecon Australia Pty Ltd  
ABN 54 005 139 873  
Level 1, 15 Barry Drive  
Turner ACT 2612  
GPO Box 320  
Canberra City ACT 2601  
Australia

**T** +61 2 6112 0100  
**F** +61 2 6112 0106  
**E** canberra@aurecongroup.com  
**W** aurecongroup.com



# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	Context and scope	3
1.2	Resource documents	3
<b>2</b>	<b>Openable Windows</b>	<b>4</b>
2.1	Description	4
2.2	Comments on costs	4
2.3	Comments on benefits	7
<b>3</b>	<b>Non-climbable Balustrades</b>	<b>8</b>
3.1	Description	8
3.2	Comments on costs	8
3.3	Comments on benefits	10
<b>4</b>	<b>Comments on evaluation of costs and benefits</b>	<b>11</b>



# 1 Introduction

## 1.1 Context and scope

Aurecon has been commissioned by the Australian Building Codes Board (ABCB) to peer review the document titled *Addendum to the Final Decision RIS Amendments to Two Proposals* in relation to slips, trips and falls. This addendum comprises a paper and spread sheets describing the amended proposals for Openable Windows and Non-climbable Balustrades and a summary of the costs and benefits for their possible inclusion into the forthcoming 2012 National Construction Code (NCC) Public Comment Draft.

It is noted that Handrails were also included in the Addendum document as an amended proposal, but no costs and benefits data were supplied in the Addendum document and accompanying spread sheet. On the basis of these data exclusions, it is assumed that no peer review is required for Handrails.

In a broad sense, the peer review is intended to ensure that the content of the Addendum under consideration is technically robust and is factually and numerically correct. The extent of the peer review tasks that comprise this commission are as follows:

- Review of the data sources, unit costs and total costs that form the basis of the Addendum proposals for Openable Windows and Non-climbable Balustrades
- Review of the economic modelling process used in the spread sheets for conformity to existing ABCB economic analysis guidelines
- Review the data, formulae and calculations in the spread sheet for correctness
- Preparation of the report that covers the material issues identified in this peer review.

The peer review does not include redrafting the Addendum and revising the spread sheets to take account of the material matters contained in this report.

## 1.2 Resource documents

Documents have been obtained directly from the ABCB website that have informed this peer review. In addition, where necessary the ABCB has been approached directly to provide documents not on the ABCB website, but nevertheless available in the public domain. An industry recognised cost construction handbook has been used to estimate detailed prices.

In addition to the *Addendum to the Final Decision RIS Amendments to Two Proposals* that forms the ABCB's content of this review, the documents used in this peer review are as follows:

- ABCB, *Final Regulation Impact Statement RIS, Proposal to revise the Building Code of Australia to reduce the risk of slips, trips and falls in buildings*, June 2011
- ABCB, *Economic Analysis Manual Version 2008-1*, 2008
- Monash University Accident Research Centre, *The Relationship between Slips, Trips and Falls and the Design and construction of Buildings*, April 2008
- Rawlinsons, *Australian Construction Handbook Edition 29*, 2011
- Turner & Townsend, *Cost Analysis Report (Rev4)*, July 2010

# 2 Openable Windows

## 2.1 Description

The addendum proposal is that a barrier would not be required on openable windows where the distance from floor level to the surface below is less than two metres. For barriers above the two metre level, the following specifications were added to the proposal to provide for an effective barrier:

- a window opening of less than 125mm, achieved through a fixed or lockable device; or
- a screen of sufficient strength.

Where a lockable or removable device or screen is used, the current BCA provision of an 865mm minimum sill height would however still apply in case the device or screen is inadvertently unlocked or removed.

The above proposal differs from the *Final Decision RIS* that presented a proposal, “barrier for openable windows”, which required a one metre barrier where the distance from floor level to the surface below is greater than one metre and less than four metres.

The resulting net costs and benefits discounted over time (i.e. Present Value (PV) Cost and PV Benefits respectively) when the addendum proposal for openable windows is compared to the *Final Decision RIS* proposal provides the basis for the determination of the economic decision criteria of Net Present Value (NPV).

## 2.2 Comments on costs

Addendum text that warrants attention has been restated verbatim followed by peer review comment(s).

### **Addendum text page 3 paragraph 4**

*In the final decision RIS the one metre barrier was considered capable of being addressed in the design stage, with no impact on construction costs. The amendment as indicated above will add \$26 million to construction costs, with the barriers sourced from window locks (80%) and screens (20%).*

### **Comments**

Specifically the reference to the additional construction costs (i.e. \$26 million) should state that this cost is in Present Value terms aggregated over the 10 year assessment period.

### **Addendum text page 3 table 1 – Cost of locks and / or screens for openable windows**

The annual number of new dwelling units comprising of new houses and apartments etc constructed is an important aggregate in the analysis since it used as the basis for calculating the number of houses, and in turn, houses with two or more storeys used to multiply the costs of locks and screens for in scope houses. The ABS 8752.0 Building Activity, Australia, data for the past 5 years to from June Qtr 2006 to March Qtr. 2011 (original series) was reviewed and Addendum values for new houses and apartments accurately compares assuming values are rounded up.

The following comments are provided against line items in the Addendum’s table 1:

Item	Value	Parameter	Comment
<b>Houses</b>	103,200		<p>The Addendum value for houses is confirmed. The ABS 8752.0 Building Activity, Australia, for the period April 2006 to March 2011 records new houses comprising 70% of the total dwelling units completed over the 5 year period to end March 2011 resulting in a total of 103,150 new houses per annum (rounded up to 103,200 per annum as in the Addendum) assuming the use of the ABS original series for Building Activity.</p> <p>For the purposes of determining new house completions per annum, semi-detached townhouses and terraces have been classified as apartments rather than new houses.</p>
<b>Two or more storey houses</b>	20,640	20%	<p>There are no ABS statistics that identify or estimate the proportion or number of new houses constructed each year with 2 or more storeys. Both the ABS 8752.0 Building Activity, Australia, and ABS 8731.0 Buildings Approvals, Australia, were reviewed and did not contain any appropriate data.</p> <p>In the absence of ABS data, the Addendum value of 20% that is sourced from the Victorian Building Commission is considered an appropriate proportion for 2 storey houses to total new houses annually.</p>
<b>Windows</b>	123,840	6	Value confirmed.
<b>Windows not locked or screened</b>	61,920	50%	Value confirmed.
<b>Unit cost of locks</b>		\$30	Rawlinsons (2011) average pricing for higher window security locks range in cost from \$100 to \$150. However the \$30 value for locks as proposed in the Addendum is based on minimum regulation requirements and is accepted.
<b>Unit cost of screens</b>		\$100	Window screens have several categories such as security, insect or sun and the elemental cost differs substantially. There is no determined mention of the category of screen to be used in the Addendum proposal. Security screens are considered the appropriate screen type with a recommended average price of \$130/m <sup>2</sup> as in Rawlinsons.
<b>Cost of window locks</b>	\$1,486,080	80%	Total costs of window locks will need to be recalculated based on above.
<b>Cost of window screens</b>	\$1,238,400	20%	Total costs of window screens will need to be recalculated based on the above.
<b>Total cost for houses</b>	<b>\$2,724,480</b>		Total cost will need to be recalculated if above comments are accepted.



Item	Value	Parameter	Comment
<b>Apartments</b>	44,600		<p>The Addendum value for apartments is confirmed. The ABS 8752.0 Building Activity, Australia, for the period April 2006 to March 2011 records other residential (i.e. new apartments, units, townhouses etc.) comprising 30% of the total dwelling units completed over the 5 year period to end March 2011 resulting in a total of 44,584 new apartments per annum (rounded up to 44,600 per annum as in the Addendum) assuming the use of the ABS original series for Building Activity.</p> <p>For the purposes of determining a new apartment completions per annum, semi-detached townhouses and terraces have been classified as apartments.</p>
<b>Windows</b>	89,200	2	Value confirmed
<b>Windows not locked or screened</b>	17,840	20%	Value confirmed
<b>Unit cost of locks</b>		\$30	Rawlinsons (2011) average pricing for higher window security locks range in cost from \$100 to \$150. However the \$30 value for locks as in the Addendum proposal is based on minimum regulation requirements and is accepted.
<b>Unit cost of screens<sup>(e)</sup></b>		\$100	Window screens have several categories such as security, insect or sun and the elemental cost differs substantially. There is no determined mention of the category of screen to be used in the Addendum proposal. Security screens are considered the appropriate screen type with a recommended average price of \$130/m <sup>2</sup> as in Rawlinsons.
<b>Cost of window locks</b>	\$428,160	80%	Total costs of window locks will need to be recalculated based on above.
<b>Cost of window screens</b>	\$356,800	20%	Total costs of window screens will need to be recalculated based on the above.
<b>Total cost for apartments</b>	\$784,960	20%	Total cost will need to be recalculated if above comments are accepted.
<b>New houses and apartments – total cost p.a.</b>	\$3,509,440		Total house and apartment cost will need to be recalculated if above comments are accepted.
<b>PV Costs – 10 years</b>	<b>\$26,374,257</b>		Total PV costs will need to be recalculated if above comments are accepted.





## 2.3 Comments on benefits

The spread sheet titled “Benefits” calculates a benefit stream based on fatalities and injuries prevention for the openable windows proposal. The following comments on the data items in the Addendum spread sheet are provided:

- ABCB
  - Number of Injuries – 290 (assumed per year); hardcoded and consistent with Final RIS
  - Number of Fatalities – 1.5 (assumed per year); hardcoded and consistent with Final RIS
  - Unit cost per Injuries – \$4,664 per injury based on a 3.7 ALOS @ \$1,260 per day. This hospital cost per day is consistent with the Final RIS cost per day which has escalated the MUAC estimate of \$1,000 a day to current 2011 prices using CPI Hospital and Medical Services sub group data (ABS 6401.0) .
  - Unit cost per Fatality – a value of \$3.8m per fatality is used. It is consistent with the Final RIS value of \$3.8m.
  
- Stakeholder
  - Number of Injuries – 520 (assumed per year); hardcoded and consistent with Final RIS
  - Number of Fatalities – 1.5 (assumed per year); hardcoded and consistent with Final RIS
  - Unit cost per Injuries – \$4,664 per injury based on a 3.7 ALOS @ \$1,260 per day. This hospital cost per day is consistent with the Final RIS cost per day which has escalated the MUAC estimate of \$1,000 a day to current 2011 prices using CPI Hospital and Medical Services sub group data (ABS 6401.0) .
  - Unit cost per Fatality – a value of \$3.8m per fatality is used. It is consistent with the Final RIS value of \$3.8m.

# 3 Non-climbable Balustrades

## 3.1 Description

The final decision RIS presented a proposal, “non-climbable zone”, which required all balustrades between one and four metres from floor level to the surface below, to include a non-climbable zone: no horizontal elements between 150mm and 760mm of the balustrade. Subsequent to the above, the ABCB further decided that the non-climbable zone:

- would not be required for balustrades with a floor to ground distance of up to two metres;
- would be required for balustrades with a floor to ground distance of between two and four metres, while allowing innovation of balustrades with some horizontal elements that include a provision to impede climbing by children, such as an inwardly kinked top rail; and
- would continue to be required for balustrades with a floor to ground distance over four metres.

The resulting net costs and benefits discounted over time, namely PV Cost and PV Benefits, when the addendum proposal for non-climbable balustrades is compared to the final decision RIS proposal provides the basis for the determination of the economic decision criteria of NPV.

## 3.2 Comments on costs

**Addendum text table 2 – Cost of the example: fabricating a “kink” feature on balustrade posts**

It is noted that the non-climbable balustrade proposal is only directed to new houses and not new apartments. The following comments are provided against line items in the Addendum’s table 2:

Item	Value	Parameter	Comment
Houses	103,200		<p>The Addendum value for houses is confirmed. The ABS 8752.0 Building Activity, Australia, for the period April 2006 to March 2011 records new houses comprising 70% of the total dwelling units completed over the 5 year period to end March 2011 resulting in a total of 103,150 new houses per annum (rounded up to 103,200 per annum as in the Addendum) assuming the use of the ABS original series for Building Activity.</p> <p>For the purposes of determining a new house completions per annum, semi-detached townhouses and terraces have been classified as apartments rather than new houses.</p>

Item	Value	Parameter	Comment
<b>Two or more storey houses</b>	20,640	20%	There are no ABS statistics that identify or estimate the proportion or number of new houses constructed each year with 2 or more storey. Both the ABS 8752.0 Building Activity, Australia, and ABS 8731.0 Buildings Approvals, Australia, were reviewed and did not contain any appropriate data.  In the absence of ABS data, the Addendum value of 20% that is sourced from the Victorian Building Commission is considered an appropriate proportion for 2 storey houses to total new houses annually.
<b>Balustrades</b>	20,640		Assumption that each new two or more storey will contain only one balcony on average is plausible.
<b>Balustrades</b>	5,160	25%	It is assumed that the share of wire balustrades is around 33% rather than the Addendum value of 25%.
<b>Posts per balustrade (average)</b>		10	The mentioned figure does not describe the fully valued effect as proposed for in the text. Has the inwardly cranked anti climb rail been accounted for in the proposal pricing.
<b>Posts - cost per post</b>		\$30	The side notes to the table contain the number of Posts (10) used in the summation but this does not mention the type of material, the interim spaced standards or structural fixing posts. The pricing will differ with the type of material used in the whole construction of the balustrade and its separate intrinsic elements. For example aluminium balustrades for a 2m length could be fitted at a cost of \$500; this could then in theory equate to a proportionate value of around \$10/post. For the purposes of this proposal it is assumed that steel posts will be used and the \$30/post is confirmed.
<b>Posts - additional fabrication cost</b>	\$309,600	20%	This value represents the net additional percentage costs for the inwardly cranked (kinked) steel post fabrication when compared to the cost of a straight steel post. The additional fabrication will result in an estimated higher cost of 20% that aligns to the Addendum proposal value.
<b>PV cost - 10 years</b>	<b>\$2,326,716</b>	80%	Total PV costs will need to be recalculated if above comments are accepted.



### 3.3 Comments on benefits

The spread sheet titled “Benefits” calculates a benefit stream based on fatalities and injuries prevention for the non-climbable balustrade proposal. The following comments on the data items in the Addendum spread sheet are provided:

- ABCB
  - Number of Injuries – 290 (assumed per year); hardcoded and consistent with Final RIS
  - Number of Fatalities – 1.5 (assumed per year); hardcoded and consistent with Final RIS
  - Unit cost per Injuries – \$4,664 per injury based on a 3.7 ALOS @ \$1,260 per day. This hospital cost per day is consistent with the Final RIS cost per day which has escalated the MUAC estimate of \$1,000 a day to current 2011 prices using CPI Hospital and Medical Services sub group data (ABS 6401.0) .
  - Unit cost per Fatality – a value of \$3.8m per fatality is used. It is consistent with the Final RIS value of \$3.8m.
  
- Stakeholder
  - Number of Injuries – 520 (assumed per year); hardcoded and consistent with Final RIS
  - Number of Fatalities – 1.5 (assumed per year); hardcoded and consistent with Final RIS
  - Unit cost per Injuries – \$4,664 per injury based on a 3.7 ALOS @ \$1,260 per day. This hospital cost per day is consistent with the Final RIS cost per day which has escalated the MUAC estimate of \$1,000 a day to current 2011 prices using CPI Hospital and Medical Services sub group data (ABS 6401.0) .
  - Unit cost per Fatality – a value of \$3.8m per fatality is used. It is consistent with the Final RIS value of \$3.8m.



## 4 Comments on evaluation of costs and benefits

This peer review has been undertaken using the ABCB's *Final Regulation Impact Statement RIS* to confirm base data for each proposal in the Addendum. Clarification has also been sought directly from ABCB officers in instances where further understanding of the final RIS data was required. The cooperation of ABCB officers on this matter is acknowledged.

Where relevant to the Addendum proposals, the modelling and assumptions used in the spread sheets conform to the ABCB Economic Analysis Manual. It is noted that the costs and benefits stream for the NPV calculations are correctly in real or current prices and recorded over a 10 year assessment period.

For both the openable window proposal and the non-climbable balustrade proposal and taking into account subsequent discussions with ABCB officers, Aurecon confirms in the main the accuracy and consistency of Addendum data and spread sheet calculations with the final RIS.

Three material matters have been identified in this review namely:

- The price of suitably strong security screens at \$130m2 (rather than \$100m2) is recommended
- The market share of wire balustrades at 33% (rather than 25%) is recommended

If these two matters are deemed by the ABCB to have validity, then the Addendum proposals for the openable windows and the non-climbable balustrade proposal will need to be revised.



**Aurecon Australia Pty Ltd**

ABN 54 005 139 873

Level 1, 15 Barry Drive  
Turner ACT 2612

GPO Box 320  
Canberra City ACT 2601  
Australia

**T** +61 2 6112 0100

**F** +61 2 6112 0106

**E** [canberra@arecongroup.com](mailto:canberra@arecongroup.com)

**W** [arecongroup.com](http://arecongroup.com)

Aurecon offices are located in:

Angola, Australia, Bahrain, Botswana,  
China, Ethiopia, Hong Kong, Indonesia,  
Lesotho, Libya, Malawi, Mozambique,  
Namibia, New Zealand, Nigeria,  
Philippines, Singapore, South Africa,  
Swaziland, Tanzania, Thailand, Uganda,  
United Arab Emirates, and Vietnam.