



## **REGULATION IMPACT STATEMENT**

### **For Consultation**

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# **Assessment of the need for fire hose reels in new residential buildings in the National Construction Code**

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**May 2013**

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This Regulation Impact Statement (RIS) accords with the requirements of *Best Practice Regulation: A Guide for Ministerial Councils and National Standard Setting Bodies*, as endorsed by the Council of Australian Governments in 2007. Its purpose is to inform interested parties and to assist the Australian Building Codes Board in its decision making on proposals to revise the requirements for fire hose reels in Class 2 and Class 3 buildings and Class 4 parts of buildings.

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# The Australian Building Codes Board

The Australian Building Codes Board (ABCB) is a joint initiative of all levels of government in Australia, together with the building industry. Its mission is to oversee issues relating to health, safety, amenity and sustainability in building. The ABCB promotes efficiency in the design, construction and performance of buildings through the National Construction Code, and the development of effective regulatory and non-regulatory approaches. The Board aims to establish effective and proportional codes, standards and regulatory systems that are consistent between States and Territories. For more information see [www.abcb.gov.au](http://www.abcb.gov.au).

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## Introduction

In 2010, the Building Codes Committee (BCC) considered a Proposal for Change (PFC) which proposed the removal of fire hose reels in all commercial buildings. The basis of this proposal was that fire hose reels were infrequently used, hazardous to untrained occupants, and expensive to install. The BCC agreed that further investigation was required and requested the ABCB Office consider the suitability of fire hose reels in buildings as part of the quantification of performance project.

In 2011, the ABCB Office undertook an evaluation of the fire hose reel provisions. This evaluation concluded that although fire hose reels are effective when used correctly, alternative fire safety technology may provide both a greater likelihood of use and efficiency. This was particularly emphasised when considering residential buildings, as the nature of occupants meant they were more susceptible to being untrained and unaware of correctly operating fire hose reels.

In April 2013, the ABCB office commissioned ARUP to conduct a qualitative fire risk assessment to determine if the provision of portable fire extinguishers installed to Australian Standard (AS) 2444, could provide an acceptable level of fire safety when compared with the current requirements. ARUP in their report concluded that the provision of portable fire extinguishers can provide an equivalent or higher level of life safety to occupants.

This Regulation Impact Statement (RIS) assesses the costs and benefits of fire hose reels in new residential buildings, noting the findings of a thesis conducted in 2009 on the “value of hose reels in residential buildings” and the ARUP “qualitative fire risk assessment”.

### **Consultation Question:**

- The scope of this proposal has been limited to Class 2 and Class 3 buildings and Class 4 parts of buildings. Do you consider this to be appropriate or should the scope be modified? Please give reasons why.

## Nature and Extent of the Problem

The nature of the problem relates to occupants of Class 2 and Class 3 buildings and Class 4 parts of buildings being able to access and operate suitable first fire attack measures to assist in safe evacuation during the developing stages of fire.

The problem involves human behaviour during fire events and the probability of occupants identifying and using current fire safety technology correctly while recognising the appropriate time to evacuate if attempts of suppression fail.

Currently fire hose reels are required by the National Construction Code Volume One as a first fire attack system provided for use by occupants. Fire hose reels are required to be installed where a building contains an internal fire hydrant or where the floor area of a fire compartment is greater than 500m<sup>2</sup>. Due to current industry practice the majority of new residential buildings<sup>1</sup> contain fire hose reels.

Although effective when used correctly, the value of hose reels in buildings has been questioned on several occasions. In 2009 the ABCB endorsed a student scholarship that tested the hypothesis *“Fire hose reels in residential apartment buildings present a number of fire safety issues and thus do not provide significant value to warrant the costs associated with their installation and maintenance”*<sup>2</sup>. The following sub-hypothesis were tested and the below table provides a summary of the key conclusions.

**Table 1 – Thesis Findings**

Sub Hypothesis	Conclusion
Occupants are less likely to use fire hose reels to undertake fire fighting than other first fire attack systems.	The research demonstrated that this hypothesis is correct. A significant proportion of the population believe that fire hose reels are provided for the fire brigade and trained fire wardens only. Many of the occupants surveyed were also unaware of the location of the fire hose reels.
Occupants are as successful or more successful, in fighting fire using other first fire attack systems such as fire extinguishers as compared to fire hose reels.	The research indicated that this statement is likely to be true. A correlation between levels of prior training and use of first fire attack systems and confidence in fighting fires using those systems was observed. The level of confidence in fighting small fires was shown to be greater when using fire extinguishers as compared to a fire hose reel.

<sup>1</sup> Note: Excludes Class 1a buildings.

<sup>2</sup> Freeman, M. 2009. *“The Value of Fire Hose Reels in Residential Buildings”*. Unpublished Thesis report-UWS

Sub Hypothesis	Conclusion
The use of fire hose reels increases the risk to occupants to a greater degree than other first fire attack systems.	This hypothesis was not confirmed however it can be said that use of fire hose reels increases the risk to other occupants of the building as use of the fire hose requires the Sole Occupancy Unit (SOU) door to be ajar and compromises the first line of defence that is intended to protect the majority of building occupants. When using other first attack systems (such as fire extinguishers), the SOU bounding construction is not compromised.
Fire hose reels are not the most cost effective first fire attack system.	The research demonstrated that this hypothesis is correct. A cost benefit analysis conducted as part of the thesis found that installation of fire extinguishers in lieu of fire hose reels would create a considerable cost saving to industry.

The thesis concluded that fire hose reels are not the most appropriate first fire attack system for occupants in Class 2 residential buildings. Noting the similarity of occupants of Class 3 buildings and Class 4 parts of buildings, generally occupants have a preference for fire extinguishers as a first response to fire events.

**Consultation Question:**

- Do you agree with the conclusions of the thesis? Please provide justification to support your response.

**Risks of inappropriate fire hose reel use**

In April 2013, the ABCB Office commissioned ARUP to undertake a qualitative fire risk assessment<sup>3</sup>. The report identified a number of associated risks with fire hose reel use focusing on Class 2, and Class 3 buildings and Class 4 parts of buildings.

The risks identified included:

1. The time required to reach a fire hose reel is longer statistically than that to reach a portable fire extinguisher if provision and location of portable extinguishers complies with AS 2444.
2. The fire is likely to be relatively larger and potentially more hazardous to occupants when water is discharged from a fire hose reel when compared with the extinguishant discharged from a portable fire extinguisher due to the longer time required for bring a fire hose to the fire site.

<sup>3</sup> ARUP “Qualitative Fire Risk Assessment Report”, 2013

3. An occupant is more likely to retreat to safety from the room of fire origin earlier when using a portable fire extinguisher for fire fighting because the extinguishant will eventually run out, whereas a fire hose reel has a continuous water supply which may result in the occupant developing a false sense of security and/or undue responsibility to contain the fire.
4. If the fire is within a sole occupancy unit (SOU), the use of a fire hose reel to fight the fire therein will render the SOU entry door ajar. With the SOU entry door being kept open by the hose, the common corridor on the fire floor may potentially be contaminated by smoke from the SOU of fire origin, affecting occupants in the common corridor who may at the time be investigating the fire, trying to assist to fight the fire, or attempting to evacuate, and exposing more occupants to smoke and other life threatening conditions. This issue is avoided if fire extinguishers are used.
5. The majority of fires scenarios in residential buildings revealed in the past fire incident statistics is associated with cooking fires or electrical faults for which using water as a fire extinguishant is not appropriate. Use of a dry chemical extinguisher is able to effectively suppress electrical fires as well providing a degree of suppression qualities to cooking fires.

### The behaviour of occupants during fire events

Limited research exists which examines the use of fire hose reels in the event of fire, however anecdotal evidence suggests that a large proportion of occupants in residential buildings are untrained in operating fire hose reels. A survey<sup>4</sup> conducted found 87% of residents in a Class 2 building had never received formal training in operating a fire hose reel where 56% of occupants had received training in fire extinguisher use. 72% of responses also advised they were not confident in using a fire hose reel compared to 40% who were not confident in using a fire extinguisher.

#### **Consultation Question:**

- Do you agree with these findings? Please provide justification to support your response.

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<sup>4</sup> Freeman, M. 2009. "The Value of Fire Hose Reels in Residential Buildings". Unpublished Thesis report-UWS.

## Objectives

The Objective relates to the safety of occupants in new Class 2, and Class 3 buildings and Class 4 parts of buildings.

- To enhance the safety of occupants of new Class 2, and Class 3 buildings and Class 4 parts of buildings through measures to respond effectively to fire events.
- To provide a built environment that contains the minimum necessary fire safety technology that achieves an adequate level of protection in the event of fire.

## Options

Two choices are presented for consideration:

### Status Quo

The status quo is the default option for decision makers in considering the option to address the problem. Where the incremental impacts of the option results in more costs than benefits, or would be ineffective in addressing the problem or achieving the objectives, the RIS would recommend the status quo.

### Option 1

- To require additional fire extinguishers in Class 2 and Class 3 buildings and Class 4 parts of buildings and remove the fire hose reel requirements.

The NCC would be amended to remove the requirements for fire hose reels in all new Class 2 and Class 3 buildings and Class 4 parts of buildings except in alpine areas and instead require additional type ABE fire extinguishers.

#### **Consultation Questions:**

- Are there alternative cost-effective measures that could be implemented?



## Impact Analysis

This chapter analyses the quantitative impacts of Option 1.

Costs and benefits are formally assessed through a cost benefit analysis. Where significant costs and benefits are quantified, evidence is provided to support key parameters and assumptions.

The following key parameters and assumptions have been used:

- An internal fire hydrant is installed so at least one fire hose reel is required to be installed per storey.
  - NCC Volume 1 2013 E1.4
- The ratio of fire extinguishers required to compensate for fire hose reels is 2:1.
  - ARUP Qualitative Risk Assessment 2013
- The number of new Class 2 and Class 3 buildings and Class 4 parts of buildings is 4,645 annually.
  - Victorian data extrapolated across Australia.
- Due to the differences in rise in storeys the following has been assumed:
  - 50% of all new Class 2 and Class 3 buildings and Class 4 buildings are 3 storeys.
  - 30% of all new Class 2 and Class 3 buildings and Class 4 buildings are 8 storeys.
  - 20% of all new Class 2 and Class 3 buildings and Class 4 buildings are 15 storeys.

A sensitivity analysis has also been undertaken to indicate the robustness of the outcomes to changes in key parameters and assumptions.

## Assessment of Costs

### Status Quo

The cost to install an individual fire hose reel is \$840.00 (Rawlinsons, 2011). Additional costs are expected due to the common practice of installing fire hose reels in cabinets. The prices of such cabinets can vary in price from \$475.00 for a recessed cabinet to \$675.00 for a wall mounted fire hose reel and hydrant cabinet (Rawlinsons, 2011). For the purpose of this cost benefit analysis, the total price to install an individual fire hose reel is conservatively estimated at \$1315.00<sup>5</sup> (fire hose reel installed in a recessed cabinet).

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<sup>5</sup> Note: This analysis recognises that not all fire hose reels are housed in cabinets. It has been assumed 25% of all hose reel installation will be wall mounted and as such cabinet costs have been discounted for this proportion.

### Option 1

Option 1 will require two 2.5kg portable ABE fire extinguishers to be installed per storey in lieu of a fire hose reel (assuming only one hose reel is provided per floor). The cost to install an individual type ABE 2.5kg extinguisher is approximately \$100, therefore this would result in a total cost of \$200 per storey.

Table 2-4 summarises the total annual cost of installing fire hose reels and fire extinguishers in all new Class 2 and Class 3 buildings and Class 4 parts of buildings.

**Table 2- Net Present Value costs of fire hose reels**

Fire hose reels	
Hose reel wall mounted and connection to hydrant point 19 mm diameter x 36 m long	\$840
Cabinet	\$475
Expected number of hose reels housed in cabinets in new residential buildings annually	24,039
Expected number of hose reels wall mounted in new residential buildings annually	8,013
Total Annual Cost	\$38,342,205
Present Value Cost*	\$288,150,576

\* A discount rate of 7% over 10 years was used to calculate the Present Value.

**Table 3- Net Present Value Costs of Fire extinguishers**

Fire extinguishers	
2x Dry chemical, capacity 2.50 kg wall mounted with bracket	\$200
Expected number of fire extinguishers in new residential buildings annually	64,104
Total Annual Cost	\$6,410,400
Present Value Cost*	\$48,175,645

\* A discount rate of 7% over 10 years was used to calculate the Present Value

**Table 4- Summary of Costs**

Summary of Costs		
Option	Annual Cost	Present Value Cost
Status Quo	\$38,342,205	\$288,150,576
Option 1	\$6,410,400	\$48,175,645
Cost saving of Option 1	<b>+\$31,931,805</b>	<b>+\$239,974,931</b>

\* A discount rate of 7% over 10 years was used to calculate the Present Value

### Consultation Question:

- Are the costs an accurate reflection of industry practice?

## Maintenance

Ongoing maintenance and replacement costs were investigated as part of this analysis. The market rate for maintenance was estimated by a supplier to be \$21 for maintaining 1 x fire hose reel as-if it were part of a system and including its share of the testing related to water supply, and \$20 for maintaining 2 x 2.5kg ABE fire extinguishers. As the difference in maintenance cost is immaterial, these costs have not been considered further in this analysis.

In regards to replacement costs, if maintained correctly, both fire extinguishers and fire hose will have a life expectancy exceeding 10 years. As such replacement costs have also not been considered further.

### Consultation Question:

- Are the costs associated with maintenance an accurate reflection of industry practice?

## Assessment of Benefits

The fire prevention benefits of both fire extinguishers and fire hose reels will be equivalent when used correctly, however, available evidence suggests there are risks associated with untrained occupants operating fire hose reels which are not evident in fire extinguisher use.

The risks include –

- The risk of injury or death to untrained building occupants through incorrect use of a fire hose reel (e.g. the fire hose reel is used on the incorrect class of fire).
  - ABE fire extinguishers are suitable across multiple classes of fire, including fires resulting from electrical faults- a known major cause of fire in new residential buildings.
- The risk of injury or death to untrained building occupants through engaging in fire fighting for too long (i.e. due to untrained building occupants inability to identify when a fire has passed its infancy and the unlimited water supply associated with a fire hose reel).
  - Fire extinguishers have a limited amount of extinguishant which results in a behavioural response by occupants to evacuate the building.
- The risk of injury or death to occupants in other parts of the building through smoke spill from a sole-occupancy unit into public corridors as a result of the entry door of a sole-occupancy unit being left ajar by a fire hose.
  - Fire extinguishers do not obstruct the sole-occupancy door. This allows the user to fight the fire while containing the smoke from common corridors.

Although the risks associated with fire cannot be eliminated, it is expected that fire extinguishers will provide a more appropriate means of first fire attack.

## Sensitivity analysis

A sensitivity analysis has been conducted on the net present values by varying the parameters around the major assumptions.

The aggregate construction costs imposed by the amendments to the NCC and associated benefits can vary if the assumptions used to quantify these costs/benefits change.

These include:

- **Installation costs:** Fire hose reel installation costs may vary particularly between States and Territories, where labour rates vary. Therefore a variation of  $\pm 10\%$  will be assessed.
- **Number of new buildings:** Datasets to obtain a national figure of new Class 2 and Class 3 buildings and Class 4 parts is not available. Victorian data has been used and extrapolated to estimate the number of new buildings. This number may vary.
- **Discount rate:** A discount rate of 3% and 11% will also be assessed.
- **Number of fire extinguishers required:** Option 1 requires fire extinguishers to be installed in accordance with AS2444. Depending on the design of the building, the number of extinguishers may vary. Therefore a variation of 1 and 3 extinguishers required will be assessed.

**Table 5- Net Present Value Sensitivity Analysis**

Parameter	Net Present Value		
	Hose reels	Fire extinguishers	Cost saving of Option 1
<b>Discount rate</b>			
Low (3%)	\$336,878,789	\$56,322,473	+\$280,556,316
High (11%)	\$250,644,817	\$41,905,090	+\$208,739,727
<b>Installation cost</b>			
Low (-10%)	\$259,335,518	\$43,357,557	+\$215,977,961
High (+10%)	\$316,965,633	\$52,992,569	+\$263,973,064
<b>Number of new buildings</b>			
Low (-10%)	\$259,336,424	\$43,358,080	+215,978,344
High (+10%)	\$316,964,727	\$52,993,209	+263,971,518
<b>Number of fire extinguishers required in lieu of a fire hose reels</b>			
Low (1)	\$288,150,576	\$24,087,822	+\$264,062,754
High (3)	\$288,150,576	\$72,263,467	+\$215,887,109

Under all examined levels of the key parameters, Option 1 offers considerable cost savings.

## Consultation

Consultation is the cornerstone of the Australian Building Codes Board's commitment to create a contemporary and relevant construction code that delivers good societal outcomes for health, safety, amenity and sustainability in the built environment. The ABCB recognises the value of engaging constructively with the community and industry in order to achieve this.

As highlighted through the Consultation RIS, there are a number of issues that remain uncertain with respect to the proposed NCC amendments. Therefore, through the public consultation phase, the ABCB is seeking information on a number of key questions as detailed throughout this report.

Comments are invited by close of business 9 August 2013 and can be emailed to [abcbris@inet.com.au](mailto:abcbris@inet.com.au) with the subject title "Fire Hose Reel RIS".

## Conclusion

The problem relates to occupants of Class 2 and Class 3 buildings and Class 4 parts of buildings being able to access suitable first fire attack measures to assist in safe evacuation during the developing stages of fire.

The problem involves behavioural issues and the probability of occupants both recognising first fire attack measures while using them appropriately. A survey conducted found the majority of occupants in a Class 2 building are not formally trained in operating a fire hose reel and lack the confidence in operating the equipment should the need arise. For fires which may be suitable for occupant intervention, fire extinguishers are therefore favourable as they provide a suitable level of protection and increase the likelihood of use.

In the absence of fire hose reels, ARUP observed the problem can be avoided if fire extinguishers were installed in accordance with AS2444.

One option was considered in addition to retaining the Status Quo- to require additional fire extinguishers in Class 2 and Class 3 buildings and Class 4 parts of buildings and removed the fire hose reel requirements.

Option 1 offers improved fire prevention outcomes by reducing risks associated with untrained building occupants fighting fire. The quantified benefit of this option was observed to be a Net Present Value of \$239,974,931 due to the reduced installation costs.

Option 1 would result in substantial cost savings and provide an acceptable level of fire safety to residents. Therefore the ABCB Office supports the adoption of Option 1, which would be implemented in NCC 2014.