

Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations



Lee Wilson
July 2016, Edition 2.0

Emergency...



... Solutions

To comply with national legislation, as an employer it is your legal responsibility to ensure all staff and visitors in the workplace can evacuate safely in an emergency, this includes able bodied people as well as the mobility impaired.

It is paramount that the appropriate procedure and equipment is readily available, as an employer you can no longer rely on the intervention of the Fire Service.

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After researching the area of evacuation considerations for people with disability for many years, the quote below sums up the intent of this guidebook in just 31 words:

The focus on access into premises to enable disabled people to fully use a building, needs to be matched with arrangements for their safe egress in the event of a fire

(Scottish Government 2007)

I believe it is now time for:

- *People with disability to be able to discuss their needs during an emergency with their employers, without fear of reprisal;*
- *Employers to take responsibility for their staff, all staff, when planning for emergencies; and*
- *Facility managers and building owners to acknowledge the needs of their occupants and implement emergency procedures that consider everyone's abilities to safely evacuate.*



Lee Wilson 2016



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About the Author



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Lee has been employed in Federal and local government, as well in private consultancies specialising in risk management, building compliance and access for people with disability.

Lee is an Accredited Member of the Association of Consultants in Access Australia, a Chartered Building Engineer with the Chartered Association of Building Engineers and a Professional Engineer with the Society of Professional Engineers in the UK.

With academic qualifications in building surveying, project management, construction management, security risk management and performance-based building & fire codes, he has a unique understanding of the factors impacting upon a successful emergency evacuation. As a result, Lee is passionate about spreading the word about the need for an accessible means of egress from all buildings, for all occupants. He can be contacted via the following means:

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Further details

For more information about the guidebook please visit the author's personal website www.leewilson.com.au.

For information on the 'Accessible Exit Sign Project' and the use of the 'Accessible Means of Egress Icon' please visit www.accessibleexitsigns.com.

This guidebook has been developed with the support of Egress Group Pty Ltd, www.egressgroup.net.



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The Guidebook

The guidebook has developed from a post-graduate thesis into the current format. Whilst undertaking the research required for the thesis it became evident that:

- Building owners, building managers and employers need to take a holistic and proactive approach in ensuring they have met the needs of all building occupants and have plans in place for evacuation of their building; and
- A significant proportion of people entering these buildings could be exposing themselves to an unacceptable risk every time they enter – unless their needs have been considered and the necessary plans for their safe evacuation are in place.

This is the 2nd edition of the guidebook which has been updated in places, with additional content added. This version is now available as a free download from www.accessibleexitsigns.com.



Guidebook Objectives

The primary objectives of the guidebook are to:

- Help workplaces and employees work collaboratively to develop personal emergency evacuation plans.
- Provide guidance to employers and facility managers, so that they may identify opportunities to reduce risk and provide a safer built environment.
- Assist building occupants, including people with disability to identify strategies to:
 - Reduce their own risk exposure
 - Understand legislative requirements
 - Determine who is responsible for their personal safety and evacuation planning
 - Equip them with the knowledge and resources to ask the right questions about their own safety
 - Work with their employers to develop an individual personal emergency evacuation plan



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- Egress Group Pty Ltd for permitting the use of the ‘Accessible Means of Egress Icon’ (Copyright© Egress Group 2016 www.egressgroup.net).
- Michael Richards (www.coolcartooning.com). Cartoons appearing in this guidebook are the result of a collaboration between Lee Wilson and Michael Richards.
- Vinayaga Sarma at Victoria University, for guidance throughout my time as an undergraduate student and as a post-graduate student.
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Limitations

This guidebook does not specifically consider the emergency planning needs of people with disability within hospitals and other health care facilities. The considerations for these types of facilities are unique and are documented within ‘Australia Standard (AS) 4083, Planning for emergencies – Health care facilities’ (Standards Australia 2010c).

Proulx & Pineau discussed the “*major differences between the evacuation of hospital patients and that of autonomous, disabled occupants*” in 1996. They observed that hospitals have highly trained staff on hand to assist, whereas in an office environment or an apartment building a person with a disability may have to rely on a neighbour or colleague. In addition, they state that in a multi-level building the occupants, regardless of their abilities, are generally independent and self-sufficient, compared to a high level of dependency from those occupants in a health care building.

Due to these differences, it cannot be assumed that a well-developed evacuation strategy for a health-care would translate into an effective strategy for buildings with a different use (Proulx 2002). For these reasons, this paper does not consider the unique nature of evacuation considerations for occupants of such health care buildings.

Please also note that even though this guidebook discusses the Australian environment, particularly within Section 1, the concepts are relevant to any country.



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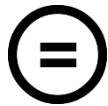
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The Accessible Exit Sign Project

The Accessible Exit Sign Project is an international awareness campaign that promotes the need for an accessible means of egress. The concept has been developed by Egress Group, an Australian company and the owners of the 'Accessible Means of Egress Icon'.

The intention of the Project is to promote universal access and egress for all building occupants. Everyone deserves a safe means of egress from a building during an emergency, including those that may face some extra challenges negotiating an egress route.

Egress Group believes it's time for a change. A change in attitudes, perceptions and legislation regarding exit signs in commercial spaces. They believe it's time for all buildings, facilities and modes of transport to show the accessible egress route, with clear, unambiguous signage showing the path to safety for all occupants.

This includes adopting the use of the 'Accessible Means of Egress Icon' as part of the certified design. The introduction of the 'Accessible Means of Egress Icon' on exit signage changes the current discriminatory approach to exit signs in buildings and present a fully inclusive design. The exit sign designs have been featured throughout this guidebook.

The example signs shown on the website can hopefully start discussions between industry stakeholders, disability groups, legislators, developers, and insurers etc., to look at better building design solutions that provide safer buildings, reduce risk and meet the needs of all occupants.

Appropriate exit signage to identify the accessible exits, refuge areas, evacuation lifts and location of evacuation chairs is a critical part of providing evacuation wayfinding information for all occupants.



Please visit www.accessibleexitsigns.com or www.egressgroup.net to learn more.

For a free White Paper with a performance-based solution template, which can be used to support the use of the signs, please visit www.universaldesignmeetstheexitsign.com.



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Signage companies around the world are encouraged to become licensed partners of the Accessible Exit Sign Project. By doing so you will not only present as an organisation that considers corporate social responsibility a priority, but you'll also have a unique product in the marketplace. You can then use the Icon on our designs, or you can design your own signs to suit your needs or local legislative requirements.

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'People with disability' is the only minority group anyone can join at any time

(Australian Network on Disabilities 2014)



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Disclaimer

Great care has been exercised in the preparation of this guidebook, however, the content of the document could contain technical inaccuracies, typographical errors and the information may not be appropriate to all situations.

This guide shall not be considered a substitute for sound technical advice or sound business judgment by the reader.

Information provided here is the author's views on accessibility and egress requirements within the built environment. It must be acknowledged that his views and interpretation of relevant legislation and standards could differ from other individuals or groups.

Readers requiring project guidance should engage a consultant familiar with their own particular factual situation for project advice. In no event shall the author be liable for any damages whatsoever, whether in an action of contract, negligence or other action, arising out of the use of the guidebook, in connection with the use of the guidebook, or reliance on any of the information provided.

Accessible signage used throughout this guidebook uses sans-serif style font, as well as Braille characters on some images. It is acknowledged that characters are shown for representative purposes only and any signage produced for buildings in Australia must comply with Specification D3.6 of the '*National Construction Code, Building Code of Australia Volume 1*', (BCA), including compliant Braille characters, (or other requirements specific to the relevant location when outside Australia).

Applicable legislation, the BCA, relevant Australian and overseas technical standards are amended and updated periodically. It must be understood that this could occur before this paper is updated.

Every Australian has the right to expect that reasonable provisions will be made to allow them to leave buildings safely in the event of an emergency.

Moreover, it is crucial for equitable, dignified, and independent access to buildings that people with disability can be confident that they will also be able to evacuate from a building in a safe, dignified and independent fashion in the event of an emergency.

(ABCB 2014d)



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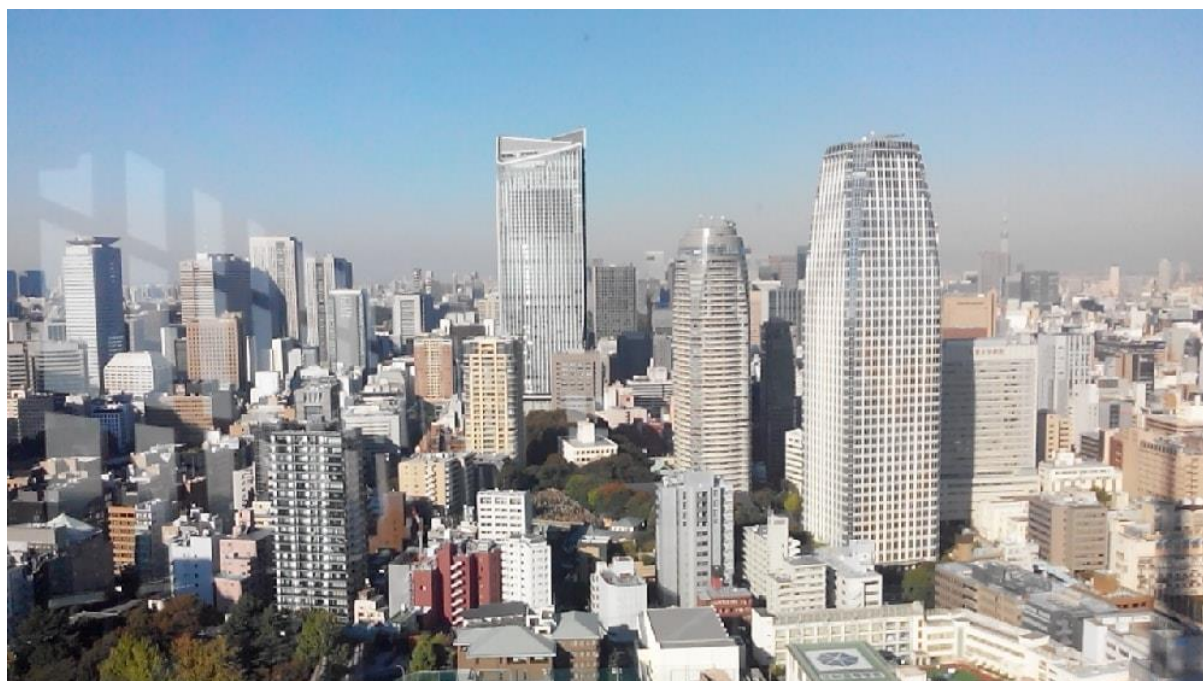




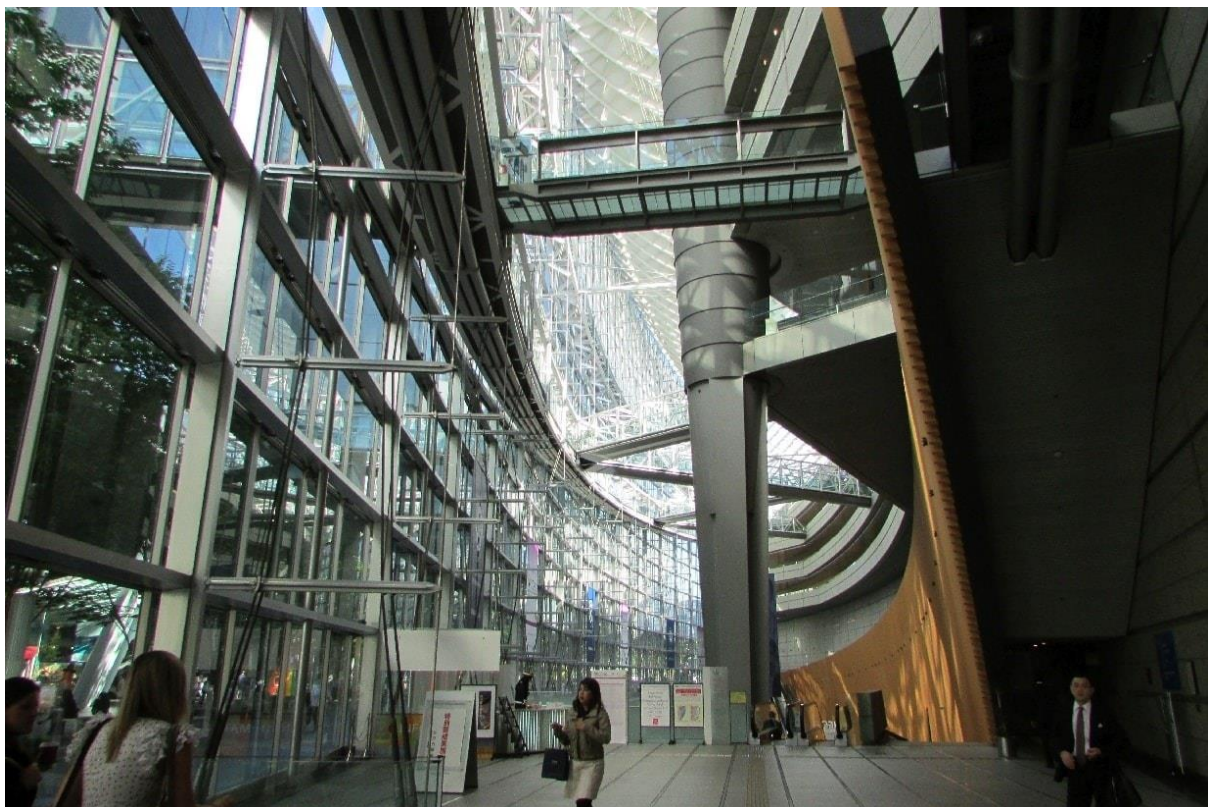
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Changing Places Transforming Lives

“Every time my son needs to go to the toilet, I have to lay him down on dirty public toilet floors with his head under the pan where someone else has just peed. I don’t like putting my handbag down on some floors; why on earth should I be expected lie my precious son on them.”

Standard accessible toilets do not meet the needs of all people with a disability or their carers. So Changing Places toilets have been introduced to provide suitable toilets for people with severe and profound disabilities who need features like an adult sized adjustable changing table, a ceiling hoist, and sufficient circulation space for a wheelchair and a carer.

A Changing Places toilet allows people with a severe or profound disability and their carers/family to enjoy the day to day activities many people take for granted.

The provision of a Changing Places toilet is a great step towards creating an inclusive built environment for all people with a disability.

Iconic locations like the MCG, the Melbourne Zoo have already built their Changing Place, and many more are under construction across Australia.

Changing Places invites you to ensure that all people with a disability can get out of their homes and be a real part of our communities.

A full information kit detailing the specifications, layouts and costs can be downloaded from the Changing Places website.

For more information visit www.changingplaces.org.au

Changing Places is supported by the Association for Children with a Disability (ACD), a not-for-profit organisation working to improve the lives of children with a disability and their families.





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*Evacuation planning
is a critical component
of life safety,
including evacuation
for persons with
disabilities*

Dave Yanchus,
United States Access Board



Section 1. The Gap in Legislation

This section analyses the Australian legal environment pertaining to how people with disability are considered in relevant legislation and guidance material. The concepts discussed are however relevant to any country.

1.1 The Existing Gap Exposing People with Disability

A gap exists in many countries legislative framework relating to the evacuation of people with disability under current disability discrimination, building and workplace safety laws.

This gap exists in the Australian legal system and exposes those members of the community with a disability, particularly those with sensory or mobility disabilities to the risk of being delayed in their ability to evacuate a building or being entrapped within a building that has been evacuated.

In 1997 the Australian Building Codes Board (**ABCB**) acknowledged this gap and recognised the need to improve the provisions for access and emergency egress for people with disability within commercial buildings. The ABCB published '*RD 97/01, Provisions for People with Disabilities*', a Regulatory Document which proposed an amendment to the Building Code of Australia. The proposed amendments included radical changes to the access provisions within buildings, including the requirement for accessible exits or places of safe refuge, or a combination of the two.

Most of the access provisions proposed at that time were subsequently introduced into 2011 edition of the Building Code of Australia (the '**BCA**'), Volume 1, part of the National Construction Code. The access provisions have generally remained unchanged in subsequent versions of the BCA, though are due for a review in 2019.

The Regulation Document *RD 97/01* included recommendations for egress provisions relating to places of safe refuge and enhanced notification systems (ABCB 2013b). Contrary to the access provisions adopted in 2011, the proposed emergency egress provisions detailed within *RD 97/01* had not been addressed until recent editions of the BCA introduced very limited exit provisions to aid people with disability.

Research commissioned by the ABCB in 2005 relating to the challenges of a vertical evacuation path highlighted that any new provisions to be introduced into the BCA would be "*very complex considering the numerous building, system and configuration scenario*" (ABCB 2013b).



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For these reasons, it is understood that the ABCB has adopted a strategy to stage the introduction of enhanced provisions into the BCA, the first stage of which occurred in 2013.

The current building regulatory environment equates to new buildings and refurbished areas of buildings being inclusive and accessible to all members of the community, with little consideration to how to get everybody out of the building during an emergency.



Figure 1: 'Now What?' Cartoon

It is my belief that there remains a substantial gap within the legal framework that is ultimately exposing a percentage of building occupants to an undue risk. This is due to a failure to fully consider the needs of all building occupants during an emergency situation, particularly those people facing a vertical evacuation path within a multi-storey building.

1.2 The Need for Better Considerations for People with Disabilities

In 2009 the Australian Bureau of Statistics (**ABS**) reported that there were four million Australians or 18.5% of the population with a disability (ABS 2009a). The following statistics released by the Australian Network on Disability (2014a) provides an insight into the statistics of Australian workplaces:

- 1 in 3 people have a disability or are likely to be close to someone with a disability.
- 2.1 million Australians of working age (15 to 64 years) have a disability.
- 3.4 million Australians (or 15% of the population) have a physical disability.
- 1 in 6 Australians is affected by hearing loss.
- There are approximately 30,000 Deaf Auslan (Australian Sign Language) users with total hearing loss.
- Vision Australia estimates there are currently 357,000 people in Australia who are blind or have low vision.



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- Over 700,000 Australians have an intellectual impairment.
- 10% of the population has dyslexia.
- More than 90,000 people have a mental health disorder.
- Almost 90 percent of disabilities are not visible.

This equates to a significant percentage of Australians who may have little consideration for their safe evacuation from a commercial building.



Figure 2: 'In Case of Fire, Do Not Use Elevator, Use Stairs' Cartoon

In comparison and to consider the issue from a global viewpoint, there are 36 million people with a disability in the United States of America (**U.S.**) alone, of which 19.4 million have difficulties walking or climbing stairs (Disabled World 2014b), which is equivalent to the entire Australian population in 2001 (ABS 2012b).

Consideration of the needs of all occupants is especially important for those facing a vertical egress path (i.e. via a stairway) and this is obviously an issue that needs to be considered worldwide, not just within Australia.

The use of passenger lifts during an evacuation is not generally possible, as lifts are pre-programmed to return to the ground floor during alarm-mode. They are therefore unable to be used for evacuation purposes.

To put this into perspective, in 2013 a New York high school left two students who use wheelchairs behind in a third-floor classroom while the remainder of the school buildings were evacuated. The evacuation was due to a fire and was not a fire drill (NBC New York February 2013).

Similar events have recently occurred in educational facilities in Nova Scotia, Canada (CBC News Nova Scotia January 2013) and Chicago, United States (CBS Chicago April 2012).



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Closer to home a student was reportedly left on Level 10 of the Swanston Street RMIT Academic Building in Melbourne during a fire evacuation in 2012 (James 2012). Though there is little evidence of this occurring in Australian workplaces, there are several reports of people with disability in the U.S., particularly those with mobility impairment, being left within buildings during evacuations and without the necessary alerts to warn them of the dangers (National Council on Disability 2005).

Worldwide, people with disability have increasingly moved into the mainstream of society (United States Fire Administration Federal Emergency Management Agency (**FEMA**) 1995, 2002) and deserve to be afforded the same level of safety as they go about their day to day activities as other occupants of buildings. After all, there are statutory obligations within Australia that require employers, building or facility management, building contractors and building designers to contribute to a workplace that is “*without risks to the health and safety of any person*” (Sections 20, 21, 22 and 23 of the *Work Health and Safety Act 2011*) (Australian Government 2011).

The practical and equitable provision of safe egress for all building occupants has been a complex issue to resolve, with a general lack of awareness, understanding and a failure to provide a holistic approach from all parties. The issue of discussing emergency egress within workplaces has previously been described as “*opening the proverbial can of worms*”, where employees with disabilities would rather keep quiet than cause any trouble or risk their own employment opportunities (The Northern Officer Group 1993). This is not an acceptable situation and needs more consideration with formulated action.

1.3 Disability Defined

Whilst the American Disability Act defines a disability as a person “*with a physical or mental impairment that substantially limits one or more major life activities*” (United States Equal Employment Opportunity Commission 2013), the Australian Disability Discrimination Act (**DDA**) defines disability more comprehensively.

‘Disability’, under the Australian DDA in relation to a person, means:

- *total or partial loss of the person's bodily or mental functions; or*
- *total or partial loss of a part of the body; or*
- *the presence in the body of organisms causing disease or illness; or*
- *the presence in the body of organisms capable of causing disease or illness; or*
- *the malfunction, malformation or disfigurement of a part of the person's body; or*
- *a disorder or malfunction that results in the person learning differently from a person without the disorder or malfunction; or*
- *a disorder, illness or disease that affects a person's thought processes, perception of reality, emotions or judgment or that results in disturbed behaviour;*



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It also includes a disability that:

- *presently exists; or*
- *previously existed but no longer exists; or*
- *may exist in the future; or*
- *is imputed to a person.*



Figure 3: 'Not all Disabilities Are Visible' Cartoon

In preparing this guidebook the definition of impairment provided by the Australian Emergency Management Institute (2013) is considered, which states an impairment is:

An illness, injury or congenital condition that causes, or is likely to cause, a long-term effect on physical appearance and/or limitation of function within the individual that differs from the commonplace. Some people may have more than one impairment.

1.4 International Law: UN Convention on the Rights of People with Disability

Australia signed the United Nations (**UN**) Convention on the Rights of People with Disability on 30 March 2007, which were subsequently ratified on 17 July 2008 (UN 2015a). Upon ratification, the Convention the Australian Government made the following declaration as a commitment to promote the equality of all people with disability (UN 2015b).

Australia recognizes that persons with disability enjoy legal capacity on an equal basis with others in all aspects of life. Australia declares its understanding that the Convention allows for fully supported or substituted decision-making arrangements, which provide for decisions to be made on behalf of a person, only where such arrangements are necessary, as a last resort and subject to safeguards;



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Australia recognizes that every person with disability has a right to respect for his or her physical and mental integrity on an equal basis with others. Australia further declares its understanding that the Convention allows for compulsory assistance or treatment of persons, including measures taken for the treatment of mental disability, where such treatment is necessary, as a last resort and subject to safeguards;

Australia recognizes the rights of persons with disability to liberty of movement, to freedom to choose their residence and to a nationality, on an equal basis with others. Australia further declares its understanding that the Convention does not create a right for a person to enter or remain in a country of which he or she is not a national, nor impact on Australia's health requirements for non-nationals seeking to enter or remain in Australia, where these requirements are based on legitimate, objective and reasonable criteria.

The Convention outlines a series of 'Articles' which outline the obligations of each country (or 'States Parties') to *“ensure and promote the full realization of all human rights and fundamental freedoms for all persons with disabilities without discrimination of any kind on the basis of disability”* (UN 2006).

The Articles cover an extensive range of areas, which have best been summarised by the ABCB (2014d):

- *Respect for inherent dignity, individual autonomy including the freedom to make one's own choices, and independence of persons*
- *Non-discrimination;*
- *Full and effective participation and inclusion in society;*
- *Respect for difference and acceptance of persons with disabilities as part of human diversity and humanity;*
- *Equality of opportunity;*
- *Accessibility;*
- *Equality between men and women;*
- *Respect for the evolving capacities of children with disabilities and respect for the right of children with disabilities to preserve their identities.*

Australia has also acceded to the Optional Protocol to the Convention and this came into force for Australia on 20 September 2009. The optional protocol is a separate instrument to the convention, which allows a UN Committee to receive complaints from individuals or groups who believe their country has breached the Convention *“after all domestic remedies have been exhausted”* (Australian Government Attorney-General Department 2015).



The Convention has some key statements worth repeating within this guidebook:

- Article 5 (Equality and non-discrimination) says:
 - *States Parties recognize that all persons are equal before and under the law and are entitled without any discrimination to the equal protection and equal benefit of the law*
 - *States Parties shall prohibit all discrimination on the basis of disability and guarantee to persons with disabilities equal and effective legal protection against discrimination on all grounds.*
 - *In order to promote equality and eliminate discrimination, States Parties shall take all appropriate steps to ensure that reasonable accommodation is provided.*

- Article 9 (Accessibility)
 - *To enable persons with disabilities to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to, inter alia:*
 - *Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces;*
 - *Information, communications and other services, including electronic services and emergency services.*

- Article 11 (Situations of risk and humanitarian emergencies)
 - *States Parties shall take, in accordance with their obligations under international law, including international humanitarian law and international human rights law, all necessary measures to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters.*

- Article 27 (Work and employment)
 - *States Parties recognize the right of persons with disabilities to work, on an equal basis with others; this includes the right to the opportunity to gain a living by work freely chosen or accepted in a labour market and work environment that is open, inclusive and accessible to persons with disabilities.*



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- *States Parties shall safeguard and promote the realization of the right to work, including for those who acquire a disability during the course of employment, by taking appropriate steps, including through legislation.*

The ABCB reported in their ‘*Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement*’ that “*the Committee responsible for dealing with complaints identified significant short coming relating to all Australians with disability*” (ABC Ramp Up, cited in ABCB 2014).

Additionally, the ABCB identified Item 23 of the United Nations 2013 report, ‘*Committee on the Rights of Persons with Disabilities, Concluding observations on the initial report of Australia, adopted by the Committee at its tenth session (2–13 September 2013)*’:

The Committee calls upon the State party in consultation with people with disabilities, to establish nationally consistent emergency management standards, that are implemented across all three levels of government; to ensure inclusivity across diverse disabilities and to cover all phases of emergency management preparation, early warning, evacuation, interim housing and support, recovery and rebuilding. It further recommends inclusion in National Plans of emergency response schemes for persons with disabilities (United Nations 2013).

1.5 International Law: The Universal Declaration of Human Rights

The Universal Declaration of Human Rights (**UDHR**), was adopted by the United Nations (**UN**) General Assembly on 10 December 1948 and was the result of the experience of the Second World War. With the end of that war and the creation of the United Nations, the international community vowed never again to allow atrocities like those of that conflict happen again.

World leaders decided to complement the UN Charter with a road map to guarantee the rights of every individual everywhere. The document they considered, and which would later become the Universal Declaration of Human Rights, was taken up at the first session of the General Assembly in 1946.

The Universal Declaration of Human Rights is generally agreed to be the foundation of international human rights law. The core principles of human rights first set out in the UDHR, such as universality, interdependence and indivisibility, equality and non-discrimination, and that human rights simultaneously entail both rights and obligations from duty bearers and rights owners, have been reiterated in numerous international human rights conventions, declarations, and resolutions.



1.6 Australian Legal Framework

In Australia, there is no one specific piece of Commonwealth legislation that mandates all evacuation provisions for people with disability. The current legislative framework in Australia pertaining to evacuation procedures includes:

- *Australian Human Rights Commission Act 1986*
- *Disability Discrimination Act (DDA) 1992*
- *Commonwealth Work Health and Safety Act 2011* (and/or applicable state-based occupational or workplace health and safety laws)
- *National Construction Code*, incorporating the *BCA Volume 1 and Volume 2* (adopted into each State or Territory's building laws)
- State and Territory based *Equal Opportunity Acts*

1.7 Australian Human Rights Commission Act 1986

The 'Australian Human Rights Commission Act 1986' (formerly called the 'Human Rights and Equal Opportunity Commission Act 1986') established the Human Rights and Equal Opportunity Commission (now known as the Australian Human Rights Commission) and gives it functions in relation to the rights of people with disabilities, the rights of children, civil and political rights, and religious beliefs.

1.8 Disability Discrimination Act 1992

The objectives of the DDA are to:

- Eliminate, as far as possible, discrimination against persons on the grounds of disability in the areas of work, accommodation, education, access to premises, clubs and sport, the provision of goods, facilities, services and land, existing laws and the administration of Commonwealth laws and programs; and
- Ensure, as far as practicable, that persons with disabilities have the same rights to equality before the law as the rest of the community; and
- Promote recognition and acceptance within the community of the principle that persons with disabilities have the same fundamental rights as the rest of the community.

Specifically, Section 23 of the DDA makes it unlawful to discriminate on the grounds of disability in providing access to or the use of premises where members of the public can enter or use. The DDA is a complaint based document, which requires people to make complaints against a property owner or occupier for any changes to occur. The difficulty with administering the complaints based system is that there was no prescriptive requirements or certainty of compliance provided under Section 23 of the DDA, it simply requires access to premises, but did not state how.



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The DDA was amended under Section 31 of the DDA in 2000, which allowed the Attorney General's Office to develop Disability Standards for premises, similar to those in place for Education and Public Transport.

The ratification of the '*Disability (Access to Premises - Buildings) Standards 2010* (the '**Premises Standards**') occurred on 1 May 2011, which sits under the DDA (Australian Government, Attorney General's Office 2011).

The Standards introduced progressive changes to provide greater and inclusive access into buildings for those members of the community with a disability. However, provisions for the emergency egress of those members of the community from the buildings that have now been made accessible were omitted from the Standard.

Likewise, the '*Disability Standards for Accessible Public Transport*' which details the access and mobility requirements for public transport facilities also provides no consideration for emergency egress of people with disability.

The DDA and the Premises Standards do not directly provide prescriptive requirements ensuring a safe and accessible path is provided out of the building once entered. Instead, one must look a lot closer at the DDA to find protection measures under Section 5 (direct discrimination), Section 6 (indirect discrimination), Section 15 (employment) and Section 17 (contract staff).

1.9 Occupational Health & Safety

Additional to the Federal DDA, occupational health & safety laws in Australia provide rights for safe occupation whilst working in a building or facility. Section 19 of the '*Commonwealth Work Health and Safety Act 2011*' states that a person conducting a business must ensure, so far as is reasonably practicable:

- *the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking; and*
- *the provision and maintenance of a work environment without risks to health and safety; and*
- *the provision and maintenance of safe plant and structures; and*
- *the provision and maintenance of safe systems of work; and*
- *the safe use, handling and storage of plant, structures and substances; and*
- *the provision of adequate facilities for the welfare at work of workers in carrying out work for the business or undertaking, including ensuring access to those facilities; and*
- *the provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking; and*



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- *that the health of workers and the conditions at the workplace are monitored for the purpose of preventing illness or injury of workers arising from the conduct of the business or undertaking.*

Whilst Section 20 mandates that the person with management or control of a workplace must ensure, so far as is reasonably practicable, that the workplace, the means of entering and exiting the workplace and anything arising from the workplace are without risks to the health and safety of any person. Additionally, it requires that buildings and structures are designed to be safe and without risks to the health of persons using it as a workplace, which would include the ability for safe evacuation from the workplace.

1.9.1 AS 3745-2010 Planning for Emergencies in the Workplace

The need for safe evacuation for people with disability was recognised in the recent update of 'Australian Standard (AS) 3745 -2002 Emergency control organisation and procedures for buildings, structures and workplaces, to the current AS 3745-2010 Planning for Emergencies in the Workplace' (Standards Australia 2010b).

Clause 4.2.6.2 of AS 3745-2010 states:

The evacuation arrangements for persons with a disability shall be considered in the development of the emergency response procedures.

Clause 4.2.11 of AS 3745-2010 also states:

When developing emergency response procedures, consideration shall be given to occupants and visitors who for one reason or another may need assistance or are unlikely to be able to act optimally in an emergency.

AS 3745-2010 now requires that:

- Evacuation arrangements for persons with a disability shall be considered in the development of the emergency response procedures;
- That the emergency procedures consider all occupants and visitors who may for any reason require assistance during an emergency.

The Standard also recommends that:

- *A current list of names, workplaces and other relevant information about occupants with a disability should be kept in the Chief Warden's control area.*
- *Suitable strategies should be discussed with those people with disability occupying the building and a Personal Emergency Evacuation Plan (PEEP) is developed for each of the persons.*
- *Should the use of lifts for evacuation during a fire emergency have regulatory*



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approval, procedural information should be included in the PEEP.

1.10 National Construction Code

The National Construction Code (**NCC**) “*is an initiative of the Council of Australian Governments (COAG) developed to incorporate all on-site construction requirements into a single code*” (ABCB 2011).

The NCC comprises the ‘*Building Code of Australia*’ (**BCA**) and the ‘*Plumbing Code of Australia*’:

- Volume One: BCA (primarily Class 2 to 9 buildings)
- Volume Two: BCA (primarily to Class 1 and 10 buildings)
- Volume Three: Plumbing Code of Australia

The BCA is published by the Australian Building Codes Board and has been updated and published since 1996, it has been published on an annual basis since 2004. The BCA is adopted by reference into each State or Territories building legislation.

1.10.1 BCA Objectives

The objectives of the BCA are to:

Enable the achievement of nationally consistent, minimum standards of relevant, health, safety (including structural safety and safety from fire), amenity and sustainability objectives efficiently (ABCB 2016).

1.10.2 BCA Performance Hierarchy (Prior to 01 May 2016)

The BCA performance hierarchy in BCA editions prior to BCA 2016 consists of the following parts represented in the diagram below adapted from ABCB (2015).

Australia's ratification of the United Nations Convention on the Rights of Persons with Disabilities in 2008 reflects the Australian Government's commitment to promoting and supporting the equal and active participation by people with disability in economic and social life.
(ABS 2012c)



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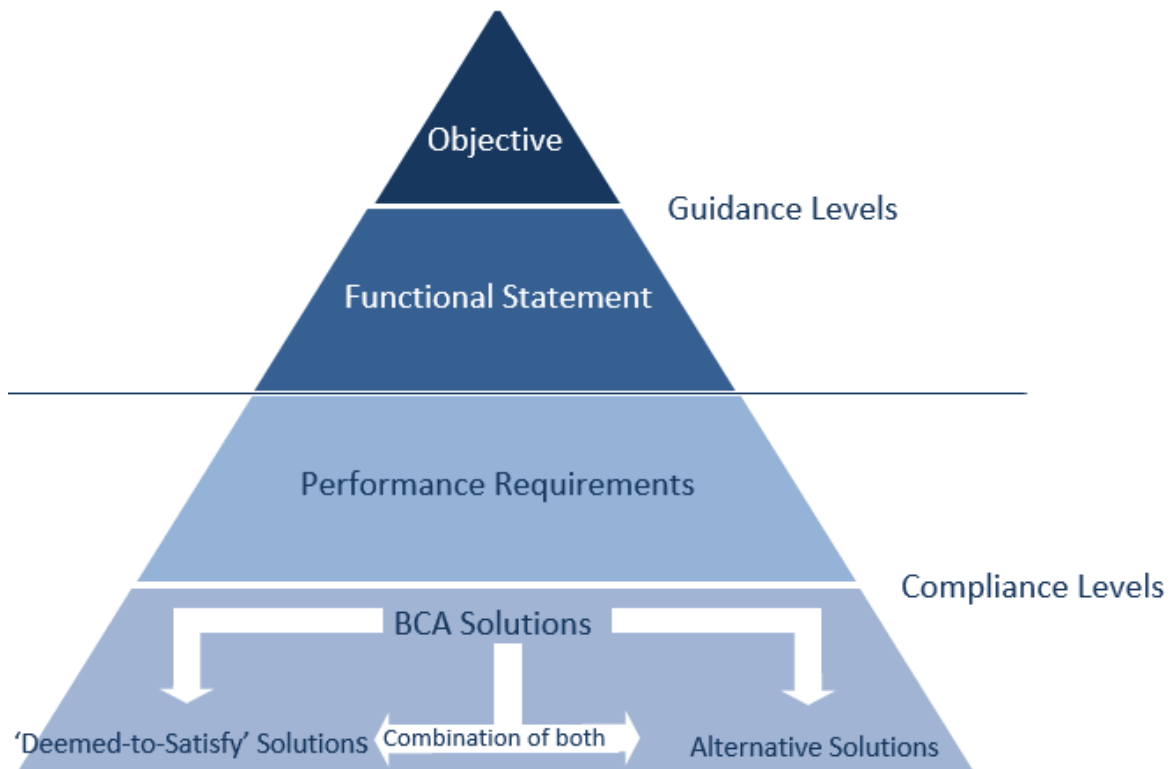


Figure 4: BCA 2015 Volume 1 Compliance Solutions Diagram

Where each part of the hierarchy is:

- Objectives – describe the community expectations for buildings.
- Functional Statements – describe how buildings are to achieve the objectives.
- Performance Requirements – outline the mandatory performance level that needs to be met for a building to meet the Objectives and Functional Statements.
- Building Solutions - BCA Volume One, pertaining to commercial buildings is a performance based document with mandatory 'Performance Requirements'. The BCA allows for the 'Performance Requirements' to be met via three compliance solutions (ABCB 2014a):
 - By meeting the prescriptive requirements (also known as the 'Deemed-to-Satisfy' provisions), which outline prescriptive requirements as to how to achieve compliance; or
 - By satisfying the relevant 'Performance Requirement' by using the 'Verification Methods' outlined within the BCA to assess a 'Performance Solution' (also known as an 'Alternative Solution').
 - A combination of both approaches.



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1.10.3 BCA Performance Hierarchy (Post May 2016)

The methodology in assessing and preparing performance-based building solutions was updated in BCA 2016. The performance hierarchy presented above was changed.

A 'Performance Solution' now means the same thing as an 'Alternative Solution'. A 'Performance Solution' now means *"a method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution."* Essentially, the two terms are interchangeable and now mean the same thing.

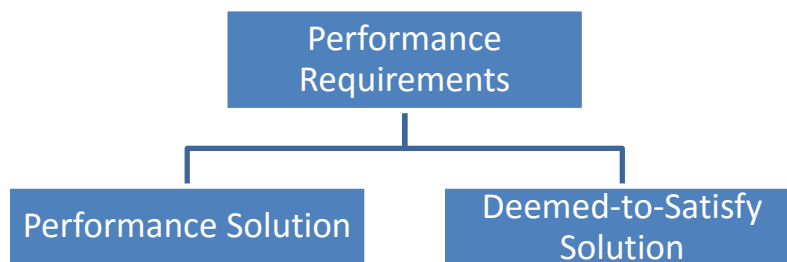


Figure 5: BCA 2016 Volume 1 Compliance Solutions Diagram

The Performance Requirements can only be satisfied by a Performance Solution or a Deemed-to-Satisfy Solution, or a combination of both.

1.10.4 Current BCA 2016 Provisions

The BCA fails to consider all provisions for safe evacuation for persons with a disability. In 2011 the NCC was updated to mirror the Access Code within the *'Disability (Access to Premises - Buildings) Standards 2010'* under the DDA, ensuring greater access provisions.

The 2013 update of the BCA included some minor additional controls for people with disability (ABCB 2013a) but omits consideration for those members of the community who have difficulty or are unable to negotiate a stairway as a safe evacuation route.

The 2014 update of the BCA included no additional provisions for safe egress, other than some general requirements for non-slip surfaces on ramps, stair treads, stair nosing strips and stair landings and the ability to use photo-luminescent exit signs under certain circumstances (ABCB 2014c).

The only update in the 2015 version of the BCA was to be more accommodating when installing Braille and tactile exit signs and allowing a description of the storey / level where the signs are required (ABCB 2015). This amendment to Clause D3.6 in 2015 now allows some flexibility in how a floor level is described on each exit sign. No changes were made to BCA 2016 for evacuation of people with disability.



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This need was previously identified by The Parliament of the Commonwealth of Australia in the paper 'Report of the Inquiry into Draft Disability (Access to Premises – Buildings) Standards' (2009) which made a number of recommendations prior to ratifying the Draft Standards.

One such recommendation, Recommendation 16 stated:

The Committee recommends that the Australian Building Codes Board undertake further research to identify deemed-to-satisfy provisions for emergency egress for people with a disability with a view to making changes to the Building Code as soon as possible.

To date, this recommendation has not been fully addressed and the following is a summary of the provisions introduced into the 2013 version of the BCA:

- Door handles on required exit doors, forming part of an exit or on a path to a required exit must comply with the door access provisions of 'AS 1428.1-2009, Design for Access and Mobility Part 1: General requirements for access - New building work' (BCA Clause D2.21(a)(i)(ii)).
- Braille and tactile signage indicating the level of the building is now required on all exit doors provided an exit sign (BCA Clause D3.6(a)(ii)).
- An exit door is no longer permitted to have a step within the door threshold and now requires a threshold ramp or step ramp to be provided on all exit doorways leading to an open space or road (BCA Clause D2.15(c)).
- A handrail complying with the handrail profile provisions of AS 1428.1, Clause 12, must be provided to all stairways or ramps within a required exit pathway (BCA Clause D2.17(a)(vi)).

Whilst in BCA 2014 saw the introduction of slip-resistant ratings under BCA Table D2.14 and in BCA 2015 the wording of BCA Clause D3.6(a)(ii) was updated.

Evacuation of people with disability is required under the Performance Requirements of the BCA (see Section 7.3.5), though the BCA does not address this requirement under the prescriptive 'Deemed-to-Satisfy' provisions. The BCA fails to provide guidance in the form of 'Deemed-to-Satisfy' provisions to cater for all people with disability, particularly those with a mobility restriction facing a vertical evacuation path.

1.10.5 BCA 2015, BCA 2016 and BCA 2019 Provisions

As part of the staged implementation of 'Deemed-to-Satisfy' provisions adopted by the ABCB, the following regulatory proposals were discussed in the ABCB 'Directions Report' and intended to be included in the 2015 version of the BCA (ABCB 2013b):

- Enhancing existing audible emergency alarm systems with visual warning in accessible areas



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- More intuitive building design to assist people that are blind or have low vision in locating an exit
- Improving the accessibility of exits for people with mobility impairments

Unfortunately, whilst revising this guidebook (for the 2nd Edition) it has become evident that BCA 2016 included no changes to disability egress provisions.

The BCA has now moved to three yearly editions commencing from the BCA 2016 edition and it is a shame that the ABCB didn't provide further improvements to the egress provisions prior to the commencement of this first three-year cycle. It will now be 2019 before an opportunity presents again for further amendments (and some 22 years after the ABCB published 'RD 97/01, Provisions for People with Disabilities').

For note, the author recently gave a presentation to the Victorian Access Consultants Network on 15 April 2016 on this topic, which can be viewed at this web link - <http://www.slideshare.net/LeeWilson8/victorian-access-consultant-network-meeting-presentation-15-april-2016>. The presentation is titled 'Safer Evacuations for All: NCC 2016 & Beyond'. It discusses simple strategies for considering universal design when planning for evacuation and emergencies in buildings. The presentation also reviews the Australian National Construction Code / BCA requirements from 2011 through to the current 2016 and considers what might be in place in 2019.

1.10.6 BCA Performance Requirements

The specific BCA Performance Requirements pertaining to general accessways within buildings for people with disability are:

DP1 - Access must be provided, to the degree necessary, to enable:

(a) people to:

- I. approach the building from the road boundary and from any accessible carparking spaces associated with the building; and
- II. approach the building from any accessible associated building; and
- III. access work and public spaces, accommodation and facilities for personal hygiene; and

(b) identification of accessways at appropriate locations which are easy to find

The specific BCA Performance Requirements pertaining to emergency egress and people with disability are:

DP4 - Exits must be provided from a building to allow occupants to evacuate safely, with their number, location and dimensions being appropriate to:

(a) the travel distance; and

(b) the number, mobility and other characteristics of occupants; and



- (c) *the function or use of the building; and*
- (d) *the height of the building; and*
- (e) *whether the exit is from above or below ground level.*

DP5 - *To protect evacuating occupants from a fire in the building exits must be fire-isolated, to the degree necessary, appropriate to:*

- (a) *the number of storeys connected by the exits; and*
- (b) *the fire safety system installed in the building; and*
- (c) *the function or use of the building; and*
- (d) *the number of storeys passed through by the exits; and*
- (e) *fire brigade intervention.*

DP6 - *So that occupants can safely evacuate the building, paths of travel to exits must have dimensions appropriate to:*

- (a) *the number, mobility and other characteristics of occupants; and*
- (b) *the function or use of the building.*

DP7 - *Where a lift is intended to be used in addition to the required exits to assist occupants to evacuate a building safely, the type, number, location and fire-isolation must be appropriate to:*

- (a) *the travel distance to the lift; and*
- (b) *the number, mobility and other characteristics of occupants; and*
- (c) *the function or use of the building; and*
- (d) *the number of storeys connected by the lift; and*
- (e) *the fire safety system installed in the building; and*
- (f) *the waiting time, travel time and capacity of the lift; and*
- (g) *the reliability and availability of the lift; and*
- (h) *the emergency procedures for the building.*

EP3.3 - *Signs or other means must be provided to warn occupants against the use of a lift during a fire*

Furthermore, EP3.2 could be considered when a required emergency lift is controlled by the fire brigade:

EP3.2 - *One or more passenger lifts fitted as emergency lifts to serve each floor served by the lifts in a building must be installed to facilitate the activities of the fire brigade and other emergency services personnel.*

EP3.2 only applies to a building with an effective height of more than 25 metres or Class 9a buildings in which patient care areas are located on a level that does not have direct access to a road or open space.

EP4.2 - *To facilitate evacuation, suitable signs or other means of identification must, to*



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the degree necessary—

- (a) be provided to identify the location of exits; and*
- (b) guide occupants to exits; and*
- (c) be clearly visible to occupants; and*
- (d) operate in the event of a power failure of the main lighting system for sufficient time for occupants to safely evacuate.*

1.10.7 ‘Performance / Alternative Solutions’ to meet BCA Performance Requirements

Buildings are also becoming more and more reliant on fire engineering to satisfy the BCA Performance Requirements under performance-based building solutions and the 2013 edition of the BCA has allowed the use of passenger lifts to provide a form of evacuation under a ‘performance based’ solution.

An ‘Alternative Solution’ (prior to BCA 2016) was defined as *“a building solution which complies with the Performance Requirements other than by satisfying the ‘Deemed-to-Satisfy’ provisions of the BCA”* (Victorian Building Commission 2013).

Under the current edition of the BCA (BCA 2016), a ‘Performance Solution’ is defined as *“a method of complying with the Performance Requirements other than by a Deemed-to-Satisfy Solution.”*

The Australian Building Codes Board has been quoted as stating that the use of a performance-based approach to compliance *“provides practitioners with a strong degree of flexibility to determine the most appropriate means for demonstrating compliance with the relevant Performance Requirements.”* This, therefore, allows some level of creativity in how compliance (or a compliant building solution) can be achieved and could see the introduction of new materials, technologies or methodologies, which could also see some efficiencies, better outcomes and cost savings, whilst still meeting the relevant Performance Requirement (ABCB 2014a).

When considering the use of an ‘Alternative Solution’ or ‘Performance Solution’ as part of an overall egress solution to a building, ISO 2011 says that a fundamental objective of any fire engineered solution for evacuation is that there shall be *“alternative, safe and intuitive evacuation routes away from the scene of a fire.”*

1.10.8 ‘Evacuation Lifts’ and ‘Performance / Alternative Solutions’

Conventional passenger lifts can be very unsafe places to be during a fire. The heat of a fire can actually activate the call buttons to a level of fire and a lift shaft can develop a ‘chimney effect’ during a fire, channelling toxic fumes and smoke to upper levels of the building (FEMA 1999b). Statutory signage in Australia reinforces this with warning signage stating *“Do not use lift if there is a fire”* (ABCB 2015). This was not the case around the world prior to the early 1970’s when the use of passenger lifts remained active during a fire. At that



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time passenger lifts could allow a car full of occupants to arrive at a level of the building engulfed in flames, with tragic consequences (Allen 2003). Since then lifts have been fitted with fail-safe devices which return the lifts to an entry level, usually the ground floor of the building.

Over the last four decades, there has been a growing consensus that tall buildings must consider the use of specially designed and constructed evacuation lifts as part of the overall egress strategy of a building.



Figure 6: US Style 'Do Not Use Elevator Use Stairway for Exit' Sign

It has been widely acknowledged that the use of an evacuation lift will speed up fire evacuation and will provide a critical component of an accessible means of egress for those occupants with disability (Bazjanac 1974, Bazjanac 1997, Pauls, 1977, Gatfield 1991, Fox 1991, cited in Klote et al 1993, Pauls, Gatfield & Juillet 1991, Allen 2003). There has however been apprehension during this time in using evacuation lifts due to concerns over how they are to be operated, who should operate them, reliability of power supplies, exposure to water from sprinklers, reliability and vulnerability of control systems, control of smoke and human behaviour in using such a lift, with the potential of entrapment in the lift between levels of the building (Pauls, Gatfield & Juillet 1991).

More recently, the use of evacuation lifts is becoming more commonplace and necessary as buildings get taller. In 2003 it was reported that the number of high-rise buildings in Singapore had tripled since 1970 and increased fifteen-fold in Hong Kong over the same time frame (Allen 2003). Skyscrapers are increasingly getting taller and taller and Bukowski (2008) believes that buildings have now reached a height where it is no longer reasonable to expect occupants to use the fire stairs as part of the means of egress, as well as being beyond the capabilities of emergency services personnel having to carry equipment up the stairs. It would, therefore, be a much more efficient approach to provide evacuation lifts to move people quicker down the building. Evacuation lifts have been used successfully in many buildings for safe evacuation and were used in the evacuation of the World Trade Center where 27% of people used a lift for part of their escape route (Charters 2008).



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Nonetheless, AS 3745-2010 states that passenger lifts and escalators should not be relied upon as a means of evacuation from fire unless their suitability for that purpose has been nominated through a regulatory approval process (which would essentially be a building approval with a fire engineered solution).

The amendment to AS 3745-2010 in 2014 also included an additional requirement when considering the suitability of an evacuation lift as part of a building approval.

In developing the regulatory approval, a team including a fire safety engineer, a mechanical services engineer, a lift engineer, an emergency planning consultant and an access consultant should jointly produce a strategy document that would be both part of the documentary evidence and of the emergency plan.

At present, there is little guidance on how to accomplish this, other than a non-mandatory Information Handbook produced by the Australian Building Codes Board (ABCB 2013a) and the new Performance Requirement DP7 introduced into BCA 2013.

ISO 2011 could also be considered when developing 'Performance Solutions' or 'Alternative Solutions', which provides additional guidance and the following principles:

- The building should support successful evacuation for every occupant whatever their own abilities, to be able to evacuate to the maximum degree possible. It is however acknowledged that in existing buildings or those with a vertical degree path it may not be possible to independently evacuate and assistance may be required to exit the building.
- The concept of protection and evacuation of all occupants should be incorporated at an early stage of design development.
- A vertical evacuation path is more stressful for occupants, particularly those with mobility impairments.
- The fire engineered solution must consider which occupants (based on characteristics and abilities) can be evacuated from the building and which occupants would need to be moved to a safe refuge.
- The fire engineered solution must consider the ability for any staged or partial evacuation, dependant of fire characteristics and the triggers for a vertical evacuation.
- The ability to use all passenger lifts in new buildings to evacuate occupants.
- The ability to upgrade passenger lifts in existing buildings to evacuate occupants.

It is also important to note that Fire Engineering Reports will generally include the requirement of developing emergency evacuation plans and procedures in accordance with AS 3745-2010 as part of the support for the fire engineered solution. This could include specific references to the evacuation of people with disability, but may not include specific arrangements on how this is to be achieved.



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In some cases, they only provide comments such as people with mobility limitations must wait for fire brigade intervention in the lift lobby or vicinity of the exit stairs.

This is very problematic when the Fire Engineer conditions a Fire Engineering Report this way with reference to AS 3745. The building certifier is unable to verify compliance in most cases prior to occupation, especially when the emergency plans are developed after the occupation of the building.

The BCA, however, does already require 'Emergency Lifts' with a fire-resisting shaft and stand-by power supply provided in some buildings, but only when the building is greater than 25 metres in effective height or a health-care building, such as a hospital (BCA, Clause E3.4). It is understood that the intent of emergency lifts is to ensure that the fire brigade can mobilise personnel and equipment quicker to the level of fire (Klote et al 1993). It is also reasonable to assume that the firefighters could utilise this lift for the assisted evacuation of the occupants who are unable to negotiate the fire stairs, and one could argue that this is inferred in the Part E03 Objectives (Lift Installations) which states "*...facilitate access for emergency services personnel to carry out emergency procedures and assist in the evacuation of occupants.*"



Figure 7: Fire Fighter Controlling an Evacuation Lift Cartoon

The BCA emergency lift provision also requires a building with an effective height of more than 75 metres to have a rating of at least 600 kg within the emergency lift, which would allow for the rapid evacuation of a large number of people with disabilities, and any personal life-support equipment if the lift were to be used to evacuate occupants.

This sees Australia in a unique situation where a *passenger lift* could be required for general day to day use, as an *emergency lift* for fire brigade personnel to operate and an *evacuation lift* for evacuation of occupants, though of course, one lift could achieve all three functional requirements (ABCB 2013a).



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1.10.9 Accessibility in Australian Standards

The Australian Standard AS 1428 suite of Standards is the main accessibility standards used within the built environment in Australia. The standards provide guidance on the requirements for people with disability.

There are five parts to the suite, though it is important to note that only Part 1 and Part 4.1 have been referenced within the BCA, the remaining three parts are considered best practice under the DDA.

- *AS 1428.1-2009 Design for access and mobility - General requirements for access – New building work*
- *AS 1428.2-1992 Design for access and mobility - Enhanced and additional requirements - Buildings and facilities*
- *AS 1428.3-1992 Design for access and mobility - Requirements for children and adolescents with physical disabilities*
- *AS/NZS 1428.4.1:2009 Design for access and mobility - Means to assist the orientation of people with vision impairment - Tactile ground surface indicators*
- *AS 1428.5-2010 Design for access and mobility - Communication for people who are deaf or hearing impaired*

Additionally, at the time of writing there is also a sixth part to the standards being developed – ‘*Australian Standard AS 1428.4.2 Design for access and mobility – Wayfinding*’, with an accompanying handbook. This draft of AS 1428.4.2 was recently released for public comment.

Consideration of ‘*AS 1735.12-1999 Lifts, escalators and moving walks Part 12: Facilities for persons with disabilities*’ is also required for any passenger lifts and evacuation lifts.

The objectives of the access standards are to provide guidance to industry on the minimum design requirements for new building work to enable access for people with disability.

The use of international reference material, including ISO 2011, may also be considered when developing ‘Alternative Solutions’ and some provisions of the Standard can be considered as best-practice. The Standard has been developed with several sections clearly adapted from the Australian suite of Standards. The purpose of the Standard is to:

Define how the built environment should be designed, constructed and managed to enable people to approach, enter, use, egress from and evacuate a building independently, in an equitable and dignified manner and to the greatest extent possible.



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1.11 ABCB Emergency Egress Regulation Impact Statement (RIS)

The ABCB released the *Emergency Egress for Occupants with Disability, Consultation Regulation Impact Statement (RIS)* in September 2014 (ABCB 2014d). The document quoted the important finding from a review by the House of Representatives Standing Committee on Legal and Constitutional Affairs:

Every Australian has the right to expect that reasonable provisions will be made to allow them to leave buildings safely in the event of an emergency. Moreover, it is crucial for equitable, dignified, and independent access to buildings that people with disability can be confident that they will also be able to evacuate from a building in a safe, dignified and independent fashion in the event of an emergency.

The term “**every Australian**” have significant implications.

Furthermore, the ABCB also provided the following response to the above:

Therefore, not providing egress from buildings for people with disability is considered unlawful and discriminatory unless a case of unjustifiable hardship can be demonstrated.

The choice of the word ‘unlawful’ is very important. It highlights the issue of evacuation for people with disability and confirms the ‘gap’ in legislation discussed earlier within this guidebook.

However, the Final Decision of the RIS released by the ABCB in March 2015 had some surprising outcomes (ABCB 2015):

- The National Coronial Information Systems Database reported only three fatalities in non-residential buildings over five years.
- None of these fatalities were people with disability.
- The Metropolitan Fire Brigade reported only two fire fatalities since 2000 involving people with disability, but both were in non-residential buildings and were occupied illegally at the time.
- A total of 23 stakeholders responded to the RIS, including some industry organisations, such as HIA, FPA, the Association of Consultants in Access Australia, Property Council of Australia and Vision Australia.
- The RIS presented five proposed changes to the ‘Deemed-to-Satisfy’ provisions of the BCA. The five proposal were:
 - visual alarms installed in accessible areas of buildings;
 - tactile alarms in all bedrooms in small boarding house type buildings and in accessible hotel rooms;
 - co-location of fire-isolated exit within six metres of a passenger lift;
 - accessible egress paths; and
 - accessible features in fire-isolated and external exit stairs.



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- The proposed changes to the ‘Deemed-to-Satisfy’ provisions of the BCA (as listed above), being ‘Option 1’ of the RIS, were rejected.
- The rationale for rejecting these proposed changes was on the basis of there being no cost/benefit.
- The ABCB’s commissioned research found that the *“cost of implementing Option 1 is however considered large and the intangible benefits are unlikely to outweigh the costs.”*
- Whilst ‘Option 2’ of the of the RIS proposed that a non-regulatory handbook is developed to provide guidance to industry on emergency egress for people with disability.
- To quote the ABCB, *“Under this option the proposals outlined in Option 1 would be released as a handbook for reference and use on a case-by-case basis by State, Territory and Local Governments and the building industry.”*
- The final sentence of the RIS concluded that based on COAG best practice regulation requirements the RIS recommends that the status quo remains (in other words, there will be no changes...).

It is now over 15 months since the release of the Final Decision to the RIS and the status quo well and truly remains in place. The recently introduced BCA 2016 provided no improvements to the egress / evacuation provisions for people with disability. Additionally, there is no indication from the ABCB as to when the Option 2, non-regulatory handbook on the topic will be released to help guide industry.

Whilst the ABCB believes that *“from a life safety perspective, the risk to life is very small”* there is still a risk, a risk that is not being managed when a building only has the minimum ‘Deemed-to-Satisfy’ provisions. This risk, the needs of all occupants, and some concepts to provide a safer building are discussed in this guidebook.

1.12 Americans with Disabilities Act 1990

The Americans with Disabilities Act (**ADA**) 1990 has similar requirements to the DDA in Australia. It mandates that no person with a disability will be restricted from accessing goods and services based on their disability, and employers cannot restrict major life activities such as eating and sleeping.

The ADA is considered to be years ahead of the current provisions in Australia and includes a requirement that all emergency evacuation plans must include measures for the safe evacuation of people with disability. This could include the requirement for an accessible means of egress via an evacuation lift or assisted egress with the provision of a safe refuge, which the Australian DDA or BCA does not consider.



1.13 The ‘Social Model of Disability’

There has always been a tendency within society to ‘disenable’ people with disability.

Throughout history, people with disability have been ignored, hidden and cursed. When made visible, they have been subjects of exhibitions and objects of ridicule. Society have been ‘dealing’ with the ‘problem’ of people with disability by placing them in institutions or prisons and by sterilising women and girls as an acceptable treatment (People with Disability Australia 2014a).

Fortunately, times have changed dramatically and the human rights and disability rights movements have made significant grounds particularly within the last 40 years. However, there is still the potential for people to be ‘disenabled’ by their work environment, rather than by their own abilities. The first reference to this phenomenon was discussed in a 1975 publication ‘*Fundamental Principles of Disability*’ which argued that the “*problems faced by disabled people were caused by society's failure to take account of their needs, not by their impairments*” (The Guardian 2011).

The Northern Officer Group, based in Sheffield in the United Kingdom commented on this issue in their 1993 paper and gave the example of an architect who uses a wheelchair. In the example, the architect is not restricted from her ability to work due to her physical impairment or because she uses a wheelchair, but rather being unable to perform as an architect due to the workplace having no access or egress provisions to meet her needs. Another example provided considers a deaf worker who is not in danger during an emergency because she is deaf, but because her colleagues do not understand or have not acknowledged her needs.

According to the social model of disability (WHO 2001, People with Disability Australia 2014b), ‘disability’ is socially constructed. In contrast, the ‘medical model’ views ‘disability’ as a problem of the person, directly caused by a disease, trauma, or other health problem, which needs to be dealt with by medical professionals.

People with disability are seen “*in need of being fixed or cured*” under the ‘medical model’ viewpoint. This presents a negative approach with people with disability to be looked upon as charity cases and to be pitied. In contrast, the social model sees ‘disability’ as:

The result of the interaction between people living with impairments and an environment filled with physical, attitudinal, communication and social barriers.

It, therefore, carries the implication that the physical, attitudinal, communication and social environment must change to enable people living with impairments to participate in society on an equal basis with others.



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People with Disability Australia believe this model:

- Is now the internationally accepted way to view and address ‘disability’, consistent with the United Nations Convention on the Rights of Persons with Disabilities.
- Seeks to change society in order to *“accommodate people living with impairment; it does not seek to change persons with impairment to accommodate society.”*
- Supports the view that people with disability have a right to participate on an equal basis with others.
- Presents impairment as a medical condition that leads to disability.
- Presents disability as the result of the interaction between people living with impairments, and the barriers in the physical, attitudinal, communication and social environment.

1.14 Risk

As discussed earlier in this guidebook, the DDA is a ‘complaints-based’ piece of legislation, as opposed to ‘compliance-based’ legislation, such as State and Territory building legislation (including the adoption of the BCA).

Since the adoption of the *‘Disability (Access to Premises - Buildings) Standards 2010’* in early 2011 the DDA now includes some guidance as to the steps to ensure compliance in relation to access to premises. However, consideration for the evacuation of all occupants of a building, including those with a disability remains outside the DDA and BCA.

This gap in legislation pertaining to emergency planning and evacuation of people with disability presents a risk for facility managers, owners of commercial buildings and employers. The environment in the U.S. is far more litigious and there are examples of individuals suing for negligence and breaches of the ADA.

David Comstock, an attorney in the U.S. specialising in fire litigation (as well as being a fire district chief) in his article published in 2005 cited an incident where a shopper using a wheelchair was left within the store during an evacuation. During the evacuation of the building the lifts were inoperable and the only other egress paths were via stairways. As a result, the store employees left the shopper alone and exposed to the emergency threat. The court ruled that the department store should have had knowledge of this person being within their store and therefore had a duty to help her. Additionally, the court also ruled that although she wasn’t injured during the incident, the fact is that she could have been, and this presented a breach of the ADA.

It is highly likely that it is only a matter of time before a similar incident occurs in Australia. The Association of Consultants in Access, Australia Inc. highlighted the need for consideration of emergency egress for all in their 2007 submission to the DDA Transport Standard Review, in which they said:



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There are no provisions in the standards regarding emergency egress, especially from buildings and railway stations for people with disabilities, in particular for people who use a wheelchair. E.g. A recent train breakdown on Sydney Harbour Bridge saw a person in a wheelchair left on the train and the response from the rail operator was “we’ll get back to you in 2-3 days”.

1.14.1 A Near Miss Case Study: 570 Bourke Street Melbourne

To prove just close we have come to an incident in Australia where people with disability have been left or exposed to an unnecessary risk we only have to look back to a fire in the Melbourne central business district in 2007. It was just after noon on Thursday 6th December 2007 when an electrical substation in the basement level car park of 570 Bourke Street, Melbourne exploded sending toxic smoke throughout the building. As a result of the explosion, the building lost all power and a fire started.

The explosion also cut power to a large number of businesses in the surrounding area. The resultant electrical blackout within the building trapped 15 occupants in passenger lifts inside 570 Bourke Street and up to 100 more occupants in the neighbouring office building at 600 Bourke Street. Although most of these occupants were freed within minutes, including a person with asthma, six people were trapped for more than one hour.

One occupant working on the 29th floor of the building reported that he was in a lift when the alarm sounded. However, the lift kept moving and let him out at the foyer, which was full of smoke.

At least 14 fire trucks attended the scene along with up to 12 ambulances. Emergency personnel secured a 50-metre area surrounding the buildings. Paramedics treated 48 people for smoke inhalation and shock. A further six people experiencing respiratory problems were taken to a hospital.

There were a number of people with disabilities working in the building at the time and firefighters carried these people down the stairs. In total, more than 4,000 workers were evacuated from the 31-storey building, with reports up to 6,000 people were evacuated in total including this building and the neighbouring building. An ambulance spokesman said *“the fire could have been devastating. In buildings of this size, with these large numbers, it could have been quite a lot worse.”*

An occupant of the building was quoted as saying:

We didn't know if it was a drill or not, as there been had a mock emergency several days earlier, but when we heard the chief fire warden shaking and puffing over the phone (saying) “This is the chief fire warden. This is not a drill. Please evacuate the building. Everybody go now...” we knew it was real (ABC 2007, The Age 2007, The Sydney Morning Herald 2007, Herald Sun 2007)



1.15 Other Benefits of Enhanced Evacuation Measures to Society

1.15.1 An Ageing Population

An important consideration will be the age demographics of society in future years. It has been forecast that those aged 65 years and over would account for 14% of Australia's population in 2011 and would increase to 20% of the population in 2030 (ABS 2012d), which potentially will see an increase in the number of persons with a disability. This is comparative to international population projections prepared by the United Nations which predict the number of people over 65 is set to double within just 25 years.

Research has also found that between the years of 1980 and 2010 the number of people aged over 65 years per 100 adults, aged between 25 to 64, had been consistent at 16 people per 100, this is expected to increase to 26 people per 100 by 2035 (The Economist 2014).

The number of people aged 85 years and over in Australia is projected to increase rapidly, going from 344,000 in 2007 to 1.7 million in 2056. Given these recent trends, it is also fair to assume that in the future people will be working longer. A recent analysis of 43 countries by researchers from Harvard University found that between 1965 and 2005 the average legal retirement age increased by less than six months, but in contrast life expectancy increased by nine years, with many European countries now linking the legal retirement age to life expectancy data (The Economist 2014).

Similarly, closer to home the Australian Government announced plans in the May 2014 budget to keep people in the workforce until they are 70 years old, before being eligible for the age pension (The Sydney Morning Herald 2014).

The elderly often experiences diminished visual acuity, depth perception, reduced hearing, loss of the sense of smell, as well as a higher prevalence of people with mobility impairment. The likelihood of people experiencing a severe disability increases with age. They will also be prone to dementia and other age-related difficulties such as Alzheimer's disease, impaired memory, and cognitive difficulties giving this age group higher risk occupancy characteristics (FEMA 1999d, Simkins 2005).

It is clear that more consideration will need to be given to the needs of this ageing workforce, with a higher prevalence of people with sensory and mobility impairment and the likelihood of people experiencing significant disability increases with age (FEMA 1999d).

1.15.2 Lifestyle Trends

At this point, it is also important to note that the ABS reports that the number of adults classified as obese or overweight has increased from 56% in 1995 to 61% in 2007-08, globally, 2.8 million people die each year as a result of being overweight or obese. In 2008,



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over one-third of adults over 20 years of age were overweight (ABS 2010a, ABS 2012a). These figures could increase further without changes to lifestyles and given the current trends in Australia and other western countries.

It could be argued that the shift in demographics and trend towards unhealthy eating habits has been recognised within the updated 2010 version of AS 3745 which includes those people that are “*easily fatigued, easily experience acute anxiety or those that easily experience extreme confusion*” under the heading ‘Occupants and visitors with a disability’ (Clause 4.2.11). By definition, this could include those people who have a health issue such as obesity, women in the later stages of pregnancy, those less fit, or the elderly, as well as younger children (ABCB 2013a).

1.15.3 Good Access and Good Egress

Good access into buildings provides additional benefits for the general population. The provision of ramps and passenger lifts allows people with disability who rely on a mobility device (i.e. a wheelchair, walking frame or the like) to negotiate changes in levels that would have been difficult or not possible without accessible features being provided. This approach to inclusive building design allows parents pushing prams and strollers, delivery people and employees moving equipment the ability to navigate the built environment with ease and without having to negotiate stairs.

Likewise, the provision of accessible egress paths is seen as inclusive for all occupants, rather than exclusive (i.e. escape stairs) and assists other building occupants who may have difficulty evacuating a building. It is now widely acknowledged that providing better evacuation paths for people with disability also assist parents with small children, many elderly people (Wagner 2006) and women in later stages of pregnancy (ISO 2011).

An example of this concept was evident during the 2001 terrorist attack on the Pentagon where equipment that had previously been installed to assist people with low or no vision during evacuations assisted all occupants when they were forced to flee the building through smoke-filled corridors (Center for Independence of the Disabled 2004, cited in National Council on Disability 2005).

The collapse of the New York World Trade Center Towers in 2001 reinforces this notion that increased provisions for evacuation of people with disabilities will increase safe evacuation for all building occupants. Reported difficulties in the tower evacuation included mobility impairments, illness, incorrect footwear and the conflict between firefighters going up the stairs whilst occupants were going down.

It is estimated that approximately 1,000 of the 9,000 surviving occupants had some form of impairment which restricted their ability to safely evacuate including pregnancy, asthma, heart conditions, advanced age or recent surgery (Charters 2008).



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Survivors also reported passing aged and overweight people within the stairways who could not keep the same pace as the other people evacuating the Towers (Horovitz 2001, Gerber, Norwood & Zakour, cited in Norwood 2011).

There are no “the disabled”, and there is no “one size fits all.” People that are most vulnerable have the same range of personal traits, interests, and desires as everyone else.

(Australian Emergency Management Institute 2013)



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Section 2. Emergency Evacuation Disability Categories

2.1 Categorising Disability

People with disability cannot be simply ‘pigeon holed’ into a specific category, in reality, people often have more than one disability and can have multiple disabilities in combinations (Australian Institute of Health and Welfare 2009).

Some people may not believe it is desirable at all to categorise individuals, but it is necessary to do so within a defined context, for a range of purposes. This could be for a number of reasons associated with social security, evaluation in managed health care, and population surveys at local, national and international levels.

For example, the World Health Organisation has developed an ‘*International Classification of Functioning, Disability and Health*’ (or **ICF**), which provides a “*unified and standard language and framework for assessment of people with disability*” (WHO 2001). Though the ICF meets the needs for that specific context, there is little in the way of an established framework for the built environment, which considers:

- the particular nature of each person’s impairment; or
- a person’s ability to participate in an evacuation; or
- what activity limitations a person with disability may experience when attempting to vacate a building; or
- how the environmental factors can be improved, including physical, social and attitudinal factors.

The following sub-sections review the applicable categories used within Australia statistical research and compare those to the categories developed in the U.S. for evacuation purposes. The last sub-section then presents a system of categorising disability for use in Australia for emergency egress purposes.

The new approach to categorising the disabilities in terms of emergency egress considers the requirements outlined in AS 3745-2010, but also adopts a risk adverse approach and proposes that ‘emergent limitations’ also be considered.



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Emergent limitations would include those issues arising during and directly from the emergency, such as loss of a hearing aid or other assistive technology, a physical injury, people experiencing confusion or emotional issues and the like.

2.2 Australian Disability Categories

Whilst the DDA itself does not 'categorise' disability types within Australia, a survey undertaken by the ABS (2009b) suggest the following four broadly defined groups:

Sensory

- loss of sight (not corrected by glasses or contact lenses)
- loss of hearing where communication is restricted, or an aid used
- speech difficulties, including loss.

Intellectual

- difficulty learning or understanding things.

Physical

- shortness of breath or breathing difficulties that restrict everyday activities
- blackouts, fits or loss of consciousness
- chronic or recurrent pain or discomfort that restricts everyday activities
- incomplete use of arms or fingers
- difficulty gripping or holding things
- incomplete use of feet or legs
- restriction in physical activities or in doing physical work
- disfigurement or deformity.

Psychological

- a nervous or emotional condition that restricts everyday activities
- mental illness or condition requiring help or supervision
- head injury, stroke or other brain damage, with long-term effects that restrict everyday activities.

In addition to the above, the Australian Institute of Health and Welfare (**AIHW**) (2009) has grouped disabilities into five groups:

- Intellectual
- Psychiatric
- Sensory / speech
- Acquired brain injury (**ABI**)
- Physical / diverse disabilities



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2.3 AS 3745-2010 Considerations

We can also consider Clause 4.2.11 of AS 3745-2010, which says that consideration must be given to occupants and visitors, who:

- are accompanied by an assistant;
- have a guide dog or a companion animal;
- use alternative forms of information and communication;
- have a vision impairment, or a hearing impairment;
- have an ambulatory impairment;
- use a wheeled mobility appliance such as a wheelchair or a scooter;
- are easily fatigued; or
- easily experience acute anxiety or extreme confusion in an emergency.

2.4 U.S. NFPA Disability Categories

The U.S. National Fire Protection Association (**NFPA**) '*Emergency Evacuation for People with Disabilities Guide*' (2007) has five disability categories that have been recognised in the '*U.S. Fair Housing Act Design Manual*' (NFPA 2007). The NFPA Guide says that most accessibility standards and design criteria are based on these five categories.

- Mobility Impairments
- Vision Impairments
- Hearing Impairments
- Speech Impairments
- Cognitive Impairments

It is, however, my view that the approach adopted by NFPA to categorise those people with additional needs during an emergency is based on 'accessibility design criteria'. An alternate approach adopted in this guidebook is to look at the potential building occupant characteristics and the perceived needs of each individual during an emergency.

2.5 U.S. Fire Administration, FEMA Categories of Impairment

The U.S. Fire Administration, FEMA, lists five categories within their guidance publication '*Orientation Manual for First Responders on the Evacuation of Disabled People*'.

- Vision Impairments
- Dog Guides
- Hearing Impairments
- Cognitive Impairments
- Mobility



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2.6 U.S. Congress Office of Compliance Categories

Whilst the U.S. Office of Compliance (2008) believes there to be four categories of disability:

- Hidden
- Obvious
- Temporary
- Emergent

Within these four categories they define 10 types of disabilities:

- **Mobility:** Limitations that interfere with walking stairs, a mobility device is used (i.e. wheelchair, canes, crutches, walkers).
- **Exertion:** A reduced stamina, fatigue or tiring easily due to a variety of temporary or permanent conditions.
- **Respiratory:** An inability to breathe triggered by stress, exertion, or exposure; cardiac conditions, asthma, emphysema or a reaction to dust, smoke or the like.
- **Cognitive:** Confusion when dealing with unfamiliar or unusual activities, a loss of sense of direction.
- **Low Vision:** Difficulties in seeing visual cues for mobility and egress.
- **Blind:** Unable to see the visual cues for mobility and egress. Loss of independent mobility, which may include a separation from a personal assistant or service animal.
- **Hard of Hearing:** An inability to hear alerts notifications or emergency instructions. May require alternatives to spoken instructions.
- **Emergent disabilities:** This includes accidents and injuries, sprains, broken bones, or a loss of assistive technology.
- **Medical:** Medical nature such as diabetes, epilepsy, haemophilia, hypertension, kidney dysfunction, or pregnancy; recent surgery, accidents, or injuries (sprains, broken bones).

The U.S. Congress approach to categorising disability has considered the potential for all medical conditions and emergent disabilities and limitations. This is critical when considering the potential restrictions and loss of abilities a person may experience in an emergency, particularly one of the scale of the September 11 attacks.

2.7 Multiple Disabilities

For the benefit of developing robust, efficient and reliable emergency evacuation plans it is important to consider each person's ability to evacuate a building. Disabilities can manifest in different ways to differing degrees and the functional implications of these variations are important for emergency planning (NFPA 2007). Strategies must be developed to ensure all occupants of a building are alerted to the building's alarm and to ensure all occupants have an evacuation route to an exit from the building.



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As mentioned above, people with disability cannot be ‘pigeon-holed’ into one specific category as the reality is people with disability often have multiple impairments or medical conditions. Of the five ABS disability groups, the most common group identified in the 2009 research was a physical disability, which accounted for 71% of working-age people with disability, followed by sensory and speech disability (21%) and psychological disability (17%) (ABS 2012a).

Research undertaken by AIHW (2009) using ABS data found that 51% of all people with disability had two or more disabilities (an estimated 10% of the population in 2003) and this increased to 62% for people aged 65 and over. The research concluded that the more disabilities a person had, the more likely they were to require assistance with daily activities of self-care, mobility and communication.

The study found that the highest proportions of people with three or more disabilities were those related to people with an acquired brain injury (64%), intellectual disability (61%), psychiatric (49%) and sensory and speech (33%).

AIHW also identified that 71.3% of the total people with severe, moderate or mild employment restrictions received no employment support or special arrangements. From this study, it is fair to assume that a percentage of people with multiple disabilities are capable of working in paid employment in Australian workplaces.

This assumption is confirmed by ABS data (2012a) that reported that in 2009 there was a 55% labour force participation rate of people with disability and only 20% of those who were not in the workforce had an employment restriction preventing them from working (with access to childcare, workplace flexibility, suitable hours or lack of vacancies being the cause).

2.8 Australian Emergency Evacuation Planning Disability Categories

With regard to existing ‘grouping’ of disability types discussed above the following disability categories are suggested when developing emergency evacuation plans:

- Category 1: Mobility Impairments
- Category 2: Vision Impairments
- Category 3: Hearing Impairments
- Category 4: Speech, Language and Communication Disorders
- Category 5: Cognitive Impairments, Psychiatric Impairments and Mental Health
- Category 6: Respiratory Impairments
- Category 7: Temporary and other Emergent Impairments
- Category 8: Emergent Emotional Issues
- Category 9: Use of Service and Assistance Animals



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2.9 Methodology in Categorising

It is acknowledged that these groupings may not be consistent with other groups suggested by AIHW or the ABS in Australia, or the NFPA in the U.S., but they have been categorised based on the perceived needs of each individual during an emergency.

Categories 7 and 8 have been proposed with regard to the reference in AS 3745-2010 which requires consideration to be given to those occupants and visitors *“who for one reason or another may need assistance or are unlikely to be able to act optimally in an emergency”*.

It is difficult to plan for any temporary limitations or emergent disabilities and for these reasons all proposed plans should consider the Categories 7 and 8 as general considerations for the entire population of a building. Recent research suggests that emergency plans should *“facilitate the evacuation of every occupant, and not only of those traditionally designated as disabled”* (Pauls 1989, Aitken 1993, Sime 1987, cited in Proulx 2002).

This approach has been considered to be a ‘macro approach’, whereby evacuation solutions are considered for the entire population of a building (Proulx 2002). Conversely, the ‘micro approach’ only consists of finding solutions just for the specific people with disability and each solution would be different from the solutions for people without disability.

Though Category 9 is not considered to be a ‘disability’, those occupants using a service or assistance animal must be given specific attention to ensure a person’s needs are fully assessed.

2.10 General Considerations for all Categories

The Australian Network on Disability (2014b, 2014c, Australian Emergency Management Institute 2013) provides some basic concepts to consider for effective and equitable communication with people with disability:

- Talk naturally and don’t be embarrassed
- Avoid questions about someone's disability.
- Be patient and considerate and aware others may need longer to communicate a message.
- Wait until any offer to assist is accepted.
- Offer an apology if you feel you’ve caused embarrassment.
- Only refer to a person's disability when necessary and appropriate.
- Avoid terms that imply being victimised, such as being courageous, brave, or special.
- People may need written information provided in different formats including Braille, large print, audio, or video.
- Use a normal tone of voice, at a normal speed.
- Shake hands with a person even if they have limited dexterity / hand use or wear a



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prosthetic arm or hand. Using the left-hand to shake is acceptable.

- Look and speak directly to the person with disability, not just their companions.
- Treat adults as adults and don't talk down.
- Offer a pen and paper if you can't quite understand verbal discussions.
- Do not use stereotypes, such as "*the crippled*", "*the Deaf*", or "*the blind*".
- Use 'person first' terminology, such as a 'person with disability', 'person with hearing loss' or the like.
- Always be aware of the person's dignity and desire for independence.

2.11 Category 1: Mobility Impairments



Mobility impairments can be due to a number of medical reasons, including multiple sclerosis, arthritis, cerebral palsy, quadriplegia, paraplegia, stroke, or other health conditions.

According to the 2009 ABS data, there are over 555,000 Australians using a mobility aid.

Of these, 242,000 use a walking frame, over 126,000 use a manual wheelchair and a further 50,000 use either a scooter or electric wheelchair (ABS 2009b).

People with mobility impairment have the same rights as other members of society in terms of access into buildings. The DDA now sets minimum requirements for access into buildings and has mechanisms in place to deal with complaints regarding barriers to goods, services, education and facilities.



Figure 8: Photo of the Tokyo Skytree Tower with Tourists on Observation Deck



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If an individual using a wheelchair or another mobility aid is to be evacuated, then the building management, or controller of the evacuation, must be sensitive to both the psychological and physical dependence that a person may have to their own wheelchair. For these reasons, if a person is to be transferred from their wheelchair to an evacuation device (i.e. an evacuation chair) they must firstly be willing to transfer into the evacuation device.

It has also been suggested that there must be someone tasked with the responsibility of following with the wheelchair so that once they reach a safe place the transfer can take place back into the individual's chair (Proulx & Pineau 1996). If this were to occur, ideally the person carrying the wheelchair should remain within visible sight of the person being assisted. However – the priority in any 'real' evacuation must be life safety and carrying a wheelchair would ultimately slow a person's own evacuation down.

The following should be considered when assisting a person that is a wheelchair user (FEMA 2002, Australian Emergency Management Institute 2013):

- When giving directions consider the path of travel (i.e. any stairs, kerbs, steep inclines etc.), distance, or weather conditions.
- Relax and speak naturally and do not feel concerned about using inappropriate expressions commonly used in discussions (i.e. *"it's just a short run over there"*).
- When communicating with a person who uses a wheelchair:
 - do not touch the chair, lean on it without permission, this is the individuals personal space
 - talk directly to them, not their companion
 - where possible, sit down and communicate on the same level
 - use correct terms and do not use the words 'handicapped', 'wheelchair bound', 'crippled' or similar.

Loy & Batiste (2004) add that employers should ensure that the paths of egress are clear and free of any physical barriers, such as boxes, supplies, or other furniture.

2.12 Category 2: Vision Impairments



Consideration must be given to the percentage of the community with vision impairment (low vision and those that are blind). People with low vision or those who are blind may still have some visual perception remaining (Proulx & Pineau 1996) and it is, therefore, important to consider how a building can be better equipped.

As mentioned earlier in this guidebook, Vision Australia has estimated that there are currently 357,000 people in Australia who are blind or have low vision (Australian Network on Disability 2014a).



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Yet even though emergency egress is critical for both people with or without a disability, our current wayfinding strategies in buildings, including exit signage is generally only able to be identified by visual means (Rutherford & Withington 1998).

During an emergency, the senses people with vision impairment rely upon could be overwhelmed by the events unfolding around them, it is, therefore, critical to consider enhanced safety measures for these people (FEMA 1999c).

One survivor of the attacks on the World Trade Center who is blind used a combination of his guide dog, associates and past experience in the participation of the building evacuation drills to safely exit the building. He is quoted as saying *“I knew the evacuation procedures, I attended all the building fire drills, I knew the exit routes. So when the attacks hit, I had a sense of preparedness, self-sufficiency, and the confidence to take a leading position in evacuating myself and others to safety”* (Isaacson-Kailes, cited in National Council on Disability 2005).

The following should be considered when assisting a person that is blind or has low vision (FEMA 1995, Emergency Management Ontario 2007, Australian Network on Disability 2014):

- Announce your presence.
- Speak naturally to the person.
- Offer assistance, but let the person explain what assistance is required.
- Describe what actions will happen before they do.
- After exiting to a safe place outside the building do not leave the person in unfamiliar territory (as was the complaint of many evacuees from the first World Trade Center bombing).
- If a person is blind or has low vision describe the layout of the building to them, and announce obstacles like stairs, ramps or the like.
- Let the individual hold your arm or shoulder if they wish. If requested by the individual, offer a person with vision impairment your elbow, to guide them.

2.13 Category 3: Hearing Impairments



There are approximately four million Australians who have some degree of hearing loss ranging from mild loss to profound deafness, with around 30,000 being profoundly deaf.

People with a hearing impairment or those that are deaf will have differing levels of hearing loss, which vary greatly at different frequencies.

The use of a hearing aid or other sound amplification device may help some of these people with residual hearing.



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A hearing aid will however only amplify the sound and will not make it clearer for the user; this is particularly relevant in a disaster or an emergency where the noise of people, equipment or machinery, air pressurisation systems or other background noises may interfere with the clarity of what is being amplified within the hearing aid.

Other people may utilise Auslan sign language, read lips, or follow other visual cues (or combinations of all of these).

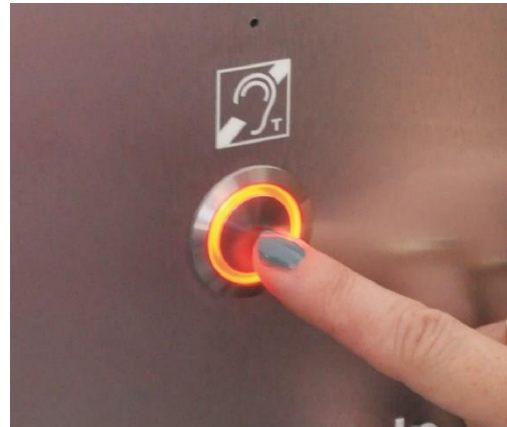


Figure 9: Photo of a Refuge Hearing Loop System, by Baldwin Boxall

It's been proposed that people with a hearing impairment are the most affected in their ability to receive notification of an emergency (FEMA 1995) and are therefore most at risk. The key to people with hearing impairment surviving an emergency evacuation are mechanisms for early detection so that they can quickly respond to alarm cues (FEMA 1999a). This is a significant issue when you consider that the ABC 2009 census found 1 in 6 Australians is affected by hearing loss.

The U.S National Association for the Deaf (cited in Moore 2003) believe that people that are deaf or with a hearing impairment experience fear and frustration during an emergency and can make poor safety decisions when they are ill-informed about the extent or nature of the emergency. Moore (2003) believes that any designer of an emergency communications system must consider the needs of people with hearing disabilities to ensure the system accommodates all of their needs.

The following should be considered when assisting a person with a hearing impairment (FEMA 1995, Emergency Management Ontario 2007):

- Flick the light switch as you enter the work area to get the person's attention.
- Establish eye contact, stand in the light, face to face and do not chew gum.
- Communicate in close proximity.
- Speak clearly and naturally, without raising your voice or slowing down the speed of your voice.
- Use facial expressions and hand gestures.
- Check for confirmation you have been understood.
- Offer pen and paper if possible as a form of communication.
- Be patient.
- Provide the person with a flashlight for signalling, if the power goes out.



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2.14 Category 4: Speech, Language and Communication Disorders



There are many people with differing disabilities who for various reasons might struggle with spoken communication. This could include a range of difficulties from mild to profound difficulties, where the person relies on other non-spoken communication methods.

People with Disability Australia reference data provided by AIHW (2014c) which found 1.3% of the population have difficulty communicating, whilst 16% of the population has difficulties in swallowing. A further 1 in 7 users of disability services (over the age of 5 years of age) have little to no functional speech and over 40% require communication assistance.

Alternate methods of communication could include written words, picture boards, speech generating devices, hand gestures (including the use of sign language). All of these methods would be suitable during an emergency (Australian Emergency Management Institute 2013). Loy, Hirsh & Batiste (2006) also suggests the use of alpha-numeric pagers or other communication devices for people with speech impairments. There is also an increase in mobile technology and smartphone applications capable of being used for this purpose.

Though this section is predominantly discussing the proportion of the population who have difficulty communication by speech, it is also opportune to include those occupants of a building who may not understand visual signage and public audible announcements.

This group is considered to include building occupants who may not speak or understand English (Cameron 2003). Mandelblit (2004) raises this point by identifying non-English speaking people may not register the warning triggers during an evacuation and may require additional assistance evacuating a building. He, therefore, suggests that multi-lingual evacuation messages will benefit the situation, though symbols in internationally recognised designs should also be considered.

Some caution should be shown when developing exit signage using the 'International Symbol of Access' blue and white wheelchair symbols.

This could cause confusion between signage identifying the locations of accessible features in a building, such as accessible entrances or accessible toilets.



Figure 10: Exit Sign with 'International Symbol of Access'



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2.15 Category 5: Cognitive and Psychiatric Impairments, Mental Health



A cognitive disability has been defined as the deficiency of neuropsychological functions related to degeneration or injury within a specific area of the brain, a slower than normal rate in cognitive developmental maturation, or delayed cognitive processes (ISO 2011, NFPA 2007).

The Australian Emergency Management Institute (2013) also defines it as a disability that affects a person's ability to process information. This may be due to an intellectual disability a person was born with or acquired through a brain injury (i.e. a stroke, or head injury). It may also be caused by alcoholism, depression, Alzheimer's, some psychiatric conditions, Parkinson's disease, and chronic fatigue syndrome (NFPA 2007). People with cognitive impairment or learning disability will vary greatly in their abilities and needs. Those building occupants will have an inability to process the evacuation information which will result in decreased ability, and a potential time delay, to process or understand the information and cues received by their senses.

For obvious reasons, the evacuation plan must consider any occupants with a higher risk profile for evacuation, such as those with a cognitive disability. Alternative methods of practising emergency evacuation drills are recommended for people with mental and psychiatric impairments and those that may experience anxiety (Loy, Hirsh & Batiste 2006). Individuals with cognitive impairments may become confused (Madsen et al 2001) and long-term training, repetitive drills, familiarity with egress routes and keeping an egress route simple in design are the best approach for this group (Proulx & Pineau 1996, Scottish Government 2007). It's also been recommended that visual information explaining the evacuation procedures, such as a video or a photographic explanation of the escape route would also be beneficial.

Exit doors painted in bright consistent colours may aid occupants who have cognitive impairments or those who may be confused and anxious (Davis, cited in the Security Director's Report 2005, Scottish Government 2007).

Simple floor plans or evacuation diagrams of the building showing the location exit routes to usable circulation paths should be available in alternative formats such as single-line, high-contrast plans. These plans should be given to any visitors when they enter any public use building so they can find the exits in an emergency. Signs in alternative formats should be posted at the building entrances stating the availability of the floor plans and where to pick them up (NFPA 2007).

The following should be considered when assisting a person with a learning disability (FEMA 1995, FEMA 2002):



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- Be patient.
- Break down instructions into simple steps.
- Do not talk about a person in front of him or her.
- Simple signals, symbols or pictographs should be used.
- Their visual perception of written instructions or signs may be confused.
- A person's speech may not be as developed as their ability to understand, therefore, be considerate in what you say.
- Treat any adults as adults, who happen to have a learning or cognitive disability and do not talk down to them or treat them as children.
- They may have a limited sense of direction, so will need to be accompanied.

Furthermore, the use of a writing style called 'easy read' is encouraged. This format features simple sentences and illustrations and was developed primarily for people with learning disabilities.

Having mental illness does not necessarily imply any loss of intellectual functioning. Some symptoms and medications associated with mental illness may affect a person's ability to concentrate, process, or remember information (Australian Human Rights Commission 2010). Mental illness is much more prevalent than many people realise. It has been estimated that an estimated 45% of all Australians (between 16 and 85 years old) will experience a mental illness at some point in their life and that one in five Australian adults will experience a mental illness in any given year (Australian Human Rights Commission 2010). A 2007 survey conducted by the ABS found that 2.3 million people, or 20% of the population aged between 16 and 85, had a mental disorder in the twelve months prior to the survey (Australian Emergency Management Institute 2013).

Mental illness is a general term that refers to a group of illnesses including, but not limited to:

- mood disorders (such as depression and bipolar disorder)
- anxiety disorders
- psychotic disorders (such as schizophrenia and some forms of bipolar disorder).
(Australian Human Rights Commission 2010)

The following should be considered when assisting a person with a mental illness (Australian Emergency Management Institute 2013):

- Only send relevant information
- Keep this info clear, concise, short, sharp and accurate
- Use uncomplicated sentences with clear language
- Be positive in language use (i.e. survivor – rather than victim)
- Repeat information if required, and stop if the person needs time



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2.16 Category 6: Respiratory Impairments



Loy & Batiste (2004) best define respiratory impairments as conditions *“that affect the respiratory system and result in laboured breathing, asthma attacks, and heightened sensitivity to ordinary substances (e.g., latex, chemicals, cleaners)”*.

Examples include general allergies, asthma, chemical sensitivity, chronic obstructive pulmonary disease, and tuberculosis.

Building occupants with emphysema, asthma or other respiratory conditions need to be considered during an emergency evacuation.

FEMA (1995) reported that those people with respiratory conditions who evacuated the World Trade Center after the 1993 bombing had experienced the *“grim reality of extreme exertion required to escape down the many flights of stairs in unfamiliar and smoke filled stair towers.”* Prior to the evacuation, these people had not considered themselves to have a disability of any condition that would warrant additional considerations. Similar reports have been made following the 2001 attacks on the World Trade Center Towers.

Loy & Battiste recommend the following accommodations to benefit employees with respiratory impairments during an evacuation:

- Conditions will be exacerbated by smoke, dust, fumes, chemicals, and toxic fumes generated during a fire. All occupants, not just those with respiratory conditions will benefit from products such as emergency evacuation hoods, masks, and respirators. JAN (2011) recommend including the provision of respirator masks within designated areas of refuge as a general accommodation for all occupants.
- Employees with respiratory impairments may have breathing difficulties when walking distances and may find descending stairs difficult.
- Evacuation devices can be provided to assist those that have difficulty evacuating.

2.17 Category 7: Temporary and other Emergent Impairments



This category includes accidents and injuries, sprains, broken bones, or a loss of assistive technology. Power (cited in the Security Director’s Report 2005) poses the scenario whereby a bomb goes off in a building and causes the whole workforce to become temporarily deaf. While this might be an extreme example, it is worth considering all possible causes of an emergency event and the resulting impact and possible injuries it may cause occupants.

After all, who could have predicted the September 11 attacks on the World Trade Center?



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David (cited in the Security Director's Report 2005) adds that evacuation equipment, such as evacuation chairs provided for those occupants with a mobility disability could also be used to evacuate those occupants suffering a temporary disability, an injury caused by the emergency (i.e. broken leg), an individual suffering a heart condition brought on by extreme stress or a pregnant women going into labour.

2.18 Category 8: Emergent Emotional Issues



The notion of people panicking during an emergency is a misconception. There have been reports of building managers holding back on carrying out evacuation drills for fear that people will panic. The same fear is valid for a real event, but panic is a mistaken belief where *“panic has never been shown to have an important influence on the behaviour of occupants during a fire. In fact, panic rarely occurs even during a serious fire”* (Proulx 2002).

There are countless stories of heroic actions from survivors of the September 11 terrorist attacks, including two men who carried a lady strapped into an evacuation chair down 68 floors (Horovitz 2001). The common belief now from psychologists and emergency investigators is that a disaster will generally bring total strangers together and most people will selflessly help others. Recent events have shown that people will not act inappropriately during an evacuation, especially true if people have fore-warning, know what options are available and have information about those options (Pauls, Gatfield & Juillet 1991).

In fact, altruism could be argued as being more common place during an emergency than in normal life. That being said, there is no way to predict the human behaviour of all building occupants and there could be some people that find the psychological trauma or physical strain of an evacuation too much to handle emotionally and these people will need emotional support during the stress of a building evacuation.

2.19 Category 9: Use of Service and Assistance Animals



In Australia, and in many other countries, there are laws to ensure that service animals and their owners are granted access into buildings under the DDA. The laws relating to service animals is seen as a complex area (Disability Aid Dogs 2013b), particularly when the use of assistance animals has increased to include their use with people with autism, for medical alert, cancer alert, diabetics and/or epilepsy (Disability Aid Dogs 2013a).

Section 9 of the DDA essentially classifies assistance animals into three types:

- Assistance Animals for the visually impaired



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- Assistance Animals for the hearing impaired
- Assistance Animals for other disabilities

Under the DDA a person cannot treat a person “*less favourably because of the fact that the aggrieved person possesses, or is accompanied by*” such an animal. A person using a service animal should advise those controlling their workplaces emergency management of their preferred arrangements for their animal during an emergency (NFPA 2007). Unfortunately, there have been accounts in the U.S. of the fire departments directing that service animals are restricted from evacuating down stairways with their owners (Isaacson-Kailes 2002), which is not an ideal or acceptable situation.

The following should be considered when assisting a person with a guide dog (FEMA 1995, FEMA 2002, Australian Emergency Management Institute 2013, Australian Network on Disability 2014):

- Do not pet or offer the animal food.
- Plan for the dog to be evacuated with the owner.
- If for any reason you need to assist the individual and take the dog from them, do so by the lead, not by the harness.
- When walking with the person with a service animal it is acceptable to ask them the best way to walk with them, so as to avoid interfering with the animal.
- As a rule, if a service dog is wearing its harness he is considered to be on duty.
- It’s also recommended to familiarise any service animal with the egress route from a workplace to accustom it to any arrangements.
- Assistance may also be required to calm or transport a guide dog that has been affected by an emergency.

Worldwide, there are more than 44 million people with dementia today and 135 million predicted by 2050

(Alzheimer’s Australia 2014)



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Section 3: Evacuation Planning

Section 3. Evacuation Planning

3.1 Evacuation and Disability

It has been proposed that ‘evacuation’ did not become a prominent topic of discussion until the attacks on the World Trade Center in 2001, even though it has long been considered a required safety measure within any building (Pauls 2002). Evacuation planning for building occupants with disability is especially important for people who may not be able to use a stairway independently, detect auditory alarms, or recognise dangers during an emergency (Loy & Batiste 2004).

Research indicates that the needs of people with disability are not being considered, are often omitted from emergency management plans and are not being provided information on how to safely evacuate their workplaces (Loy, Hirsh & Batiste 2006). Evacuation plans ultimately rely on human intervention resulting in a risk of not being implemented unless the plans are repeatedly reinforced (ABCB 2013a).

NFPA (2013) believe that the key elements of emergency preparedness include:

- An early warning system, including alarm or voice communication system
- Adequate means of egress (exit routes)
- Occupant familiarity with emergency plans through knowledge and practice



Figure 11: Photo of Melbourne Airport Emergency Assembly Point



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3.2 Safe Egress Success Factors

The success of evacuation procedures depends on the occupants' familiarity with the arrangements (Proulx & Pineau 1996, Proulx 2002) through procedures must be simple as occupants will not commit the necessary time for complicated procedures. Whilst communication and appropriate training are considered "*vital to ensure success*" (Scottish Government 2007) and "*during an emergency what occupants need most is useful information*" (Pauls, Gatfield & Juillet 1991, cited in Proulx 2002).

The following actions have been identified to develop an effective emergency evacuation plan for people with disability (McGuire, cited in Logli 2009):

- Learn the building layout
- Identify people with disability in the workplace
- Review evacuation equipment
- Train the staff
- Coordinate with local law and emergency personnel

Considerations proposed by Bruyère & Stothers (2002) include firstly identifying who will need assistance and then ensuring that effective and reliable communications strategies are in place.

3.3 Principles of Safe Egress

It has been stated that the underlying factor in providing protection from smoke and fire within a building is safe egress (FEMA 1995). Safe egress can be defined as the efficient relocation of occupants to an area of safety, usually outside the building. FEMA suggests that the steps for safe egress are:

- Detection of the fire before it restricts the movement of occupants
- Notification that a danger exists and that the evacuation to a predetermined location should commence
- Movement of people via fire protected egress routes to a building exit

Proulx & Pineau (1996) believe that evacuation planning for occupants with disabilities begins with a design between two strategies, 'protect-in-place', or 'everybody-out'. The strategy should be developed as early as possible with consideration to the future occupant characteristics and building characteristics (Proulx 2002).

Occupant characteristics include:

- Profile – gender, age, ability, limitations
- Knowledge and experience – familiarity, evacuation training



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- Condition – alone or with others, active or passive, alert, on medication, drugs or alcohol
- Role – visitor, employee or owner (Proulx 2002)

Building characteristics includes:

- Occupancy – use of building
- Architecture – number of floors, areas, locations of stairs and exits, balconies, shape of the building and complexity in wayfinding
- Activities in the building – working, sleeping eating, watching entertainment such as in a cinema, theatre or the like, shopping
- Fire safety features – fire safety plan, refuge areas, evacuation elevators, sprinklers, smoke control systems, fire alarm and detection, trained staff on site (Proulx 2002).

3.4 Strategies for Safe Egress

Internationally it has been recognised that there are five main strategies for evacuating a building (ABCB 2013a):

- Simultaneous full evacuation (i.e. everybody-out)
- Phased full evacuation (i.e. everybody-out, in a staged or cascading approach)
- Phased partial evacuation (i.e. compartments evacuated, in a staged or cascading approach)
- Protect in place for everybody affected (i.e. in a safe place)
- Protect in place for those unable to use the egress path (i.e. in a refuge area)

The ‘everybody-out’ approach entails a total evacuation of the building, whilst the ‘protect-in-place’ option allows for people to move to a safe refuge, protected by fire-rated building components in a smoke-safe compartment where they can wait out the emergency, communicate with building management either and wait for assistance if required.

The debate over the two options continues some many years later, with supporters of both options. With new developments and advances in the use of evacuation lifts the approach being adopted by the ABCB appears to be the ‘everybody-out’ approach (ABCB 2013a). This is consistent with the approach presented by Pauls in 2002, who stated: *“High-rise buildings should be designed and managed to facilitate a total evacuation scenario.”*

3.5 Accessible Means of Egress

It has been argued that accessible entrances are generally the best route out of a building for all occupants. However, this may not always be the case. During an emergency, the occupants without a disability could also head directly for that exit and potentially clog the exit for those occupants with a disability (who have no alternative exit path) (Holt and



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Christensen, cited in Wagner 2006). In contrast, it could also be argued that occupants with a disability could impede the evacuation for those occupants without disability (California Employment Law 2011). Ultimately, the best solution would be to adopt a holistic and inclusive approach to developing an emergency evacuation plan, with all exits provided an accessible means of egress leading to a safe place outside the building.

An accessible means of egress has best been defined as a “*continuous and unobstructed way of egress travel from any point in a building or facility that provides an accessible route to an area of refuge, a horizontal exit, or a public way*” (Department of Justice 2010).

Parts of the accessible means of egress can include one or more of the following components (ICC 2009b):

- Accessible routes, including horizontal exits, and ramps
- Internal and external exit stairs
- Evacuation lifts
- Platform lifts
- Refuge Areas

In Australia, the current situation is that people with disability are not always provided an accessible means of egress, and this is generally limited to being able to exit through what is an accessible entrance. This restricts some occupants from the ability to safely evacuate the building unless they are on an entry level.

As stated earlier in this guidebook, the ABCB has proposed a staged implementation of enhanced ‘Deemed-to-Satisfy’ provisions to address this need, but the changes introduced into the BCA in 2013, 2014 and 2015 have been minimal with little improvement overall (these have been limited to non-slip surfaces on ramps and stairs, ramped door thresholds, exit signage, door controls and one handrail in fire isolated stairs).

In making these changes there have been other issues created that must be addressed in the future amendments to the BCA. Clause D2.15 of BCA 2013 has now required any exit door discharging from an accessible building to an open space or roadway to have an accessible path provided through the doorway in the form of a threshold ramp or step ramp. However, consideration for egress from other storeys of the building and the continuation of the accessible means of egress from the exit door to a safe area outside the building must be provided in the future.

At the moment a person with a mobility impairment cannot continue their evacuation and will be put into a compromising position of having to stop and wait for assistance whilst potentially obstructing exit landings and the path for other occupants evacuating the building.



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3.6 Independent Means of Egress ‘v’ Assisted Means of Egress

The International Building Code (IBC) details the requirements for means of egress and areas of refuge. The IBC requires at least one accessible means of egress for every accessible space and at least two accessible means of egress are required where more than one means of egress is required. These requirements increase to providing three accessible means of egress when buildings have 500 or more occupants and increases again to four accessible means of egress when there are over 1,000 occupants (International Code Council (ICC) 2010).

An accessible means of egress under an IBC solution allows the use of exit stairways and evacuation lifts (when provided) in conjunction with horizontal exits or assisted evacuation, which could include waiting in an area of refuge. From this one can surmise that if an evacuation lift is provided, all occupants have some ability to independently evacuate a building – but when an evacuation lift is not provided, a person who cannot negotiate an escape stairway must wait in a safe place, ideally a fire rated safe refuge for assisted evacuation. It’s important to note that the IBC does not require refuge areas when a building is sprinkler protected on the basis that activation of a required sprinkler system would start to extinguish the fire, whilst the sprinkler system would also notify emergency personnel and alert the occupants (ICC 2010). Furthermore, a smoke detection system would also activate the occupant warning system.

Buildings have existing accessible features to assist access and movement throughout accessible parts of a building, including colour contrasting doorways, handrails etc., and extending these systems to evacuation routes can reduce the need for assisted evacuation (Scottish Government 2007).

3.7 Assisted Evacuation: Fire Fighter Intervention

In the U.S, as in Australia, there are requirements for developing emergency procedures plus the provision of fire safety equipment within buildings which is verified during the certification of the building. In Australia the BCA requires buildings to be provided with appropriate fire equipment to ensure occupant safety during normal occupation of a building (i.e. sprinklers, smoke detection and alarm systems etc.), and during an evacuation (i.e. exit signage, emergency lighting, fire isolated passages, smoke control systems, fire isolated stairs, stair pressurisation systems etc.).

Individuals with disabilities may have specific needs and concerns, all employees will benefit for knowing workplace safety features and emergency procedures

(JAN, cited in Bruyère & Stothers 2002)



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There is an expectation that the fire brigade is responsible for evacuating people with disability, particularly those people who have difficulty evacuating via a stairway. But this is not always the case overseas (Communities and Local Government 2008) with many countries requiring evacuation of people with disabilities to be administered by the building management. In addition, it may not be possible for the fire brigade to reach the area (as was the case in the World Trade Center where many people and their companions waited for rescue, only to die in the collapse of the towers).

In contrast, ISO 2011 states that firefighters have two principal functions, to fight fires but also to rescue those people who are trapped in buildings and for whatever reason cannot independently evacuate. As people with disability are now increasingly participating in employment the Standard also recommends that firefighters receive training on how best to rescue people with disability from a building using equipment and procedures that will not cause further harm or injury to the person they are rescuing. Fortunately, it is understood that the approach in Australia by all fire brigades includes life safety, and therefore, evacuation of any occupants with a disability.

3.8 Needs of People with Disabilities

Typically, dependent on the use of a building, a building could have occupants with a diverse range of ages, sizes, awareness and familiarity, cognitive skills, sensory and mobility abilities. It's, therefore, critical that any plan has the capability to communicate to those with hearing impairments, and those who are blind or with low vision (Logli 2009) with measures to assist those people who may find evacuating via an escape stairway challenging, difficult or not possible.

3.9 Have the Needs of People with Disabilities Been Met?

It is evident from the research undertaken to prepare this guidebook that there are clear indicators that the needs of people with disability are still not being met (Loy, Hirsh & Batiste 2006). There is no available data identified to measure how successful the needs are being met within Australian workplaces. Therefore, our attention must once again turn to the U.S. and consider the research undertaken following the terrorist attacks in 2001.

This research shows that there have been some improvements made in the U.S., but there is still a lot of room for improvement:

- A survey undertaken in 2001 in the U.S. discovered that 50% of people with disability said they had no plans made to safely evacuate their workplaces and were far more anxious about their personal safety (National Organization on Disability 2001, Suttell 2003).
- A survey commissioned by the National Organization on Disabilities in Washington DC in the U.S. during 2004 found that 68% of respondents had indicated that plans



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were now in place to safely evacuate employees with disabilities, compared to only 45% in a similar survey conducted in 2001 (Mandelblit 2004).

- Davis (cited in the Security Directors Report 2005) reports that a survey of companies showed that 50% of companies admitted that their evacuation plans did not account for people with disability.
- A survey undertaken by the British Research Establishment for the Communities and Local Government in 2008 found that all respondents believed that the building owner, employer or facilities management team were responsibility for the evacuation of people with disability.
- There are still accounts as recent as last year in the press of people being left behind in areas of a burning building whilst other occupants safely evacuate.

3.10 So Who is Responsible?

Within Australian, AS 3745-2010 applies to all buildings, structures or workplaces occupied by people (with the exception of residential domestic dwellings, unless the dwelling is also a workplace). The Standard makes is very clear the *“consideration shall be given to occupants and visitors who for one reason or another may need assistance or are unlikely to be able to act optimally in an emergency.”*

To satisfy AS 3745-2010, each building must have an Emergency Planning Committee formed with the responsibility of developing an emergency plan. This would include the need for evacuation arrangements for people with disability, and any other occupants or visitors who may for any reason require assistance during an emergency.

The arrangements required under AS 3745-2010 are comparable to the Regulatory Reform (Fire Safety) Order in England and Wales, with similar legislation in Scotland and Northern Ireland) and required under British Standard *‘BS 9999:2008 Code of Practice for fire safety in the design, management and use of buildings’*. BS 9999:2008 states that those with responsibility for the management of premises must provide adequate means for emergency escape for all building occupants, which would include employees, visitors, contractors, clients and the like (Wallace 2012).

3.11 Terrorism – The ‘New Normal’

Australia has the luxury of being an island nation, with a stable political environment far removed from the recent events in other countries around the world. In some ways, we live in isolation from other less stable environments, where our neighbours experience extremes weather, tsunamis, earthquakes, conflicts, poverty and famine. Australia remains in a lot of ways, quite literally, a ‘lucky country’.

However, around the world, in similar westernised nations this level of security and sense of safety is being challenged.



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Terrorism is the new threat within any large assembly building or public space and has been repeatedly been described as the “new normal”, including by the New York governor Andrew Cuomo (Reuters 2016, The Sydney Morning Herald 2016b, News.com.au 2016a, Huffington Post 2016).



Figure 12: Photo of a Crowd in Front of a Stage at a Concert

It’s now important to discuss these issues and highlight how this might impact on people with disability, or those injured and acquiring a disability (either permanently or temporarily) during an emergency (referred to as an ‘emergent limitation’). Such was the case in Brussels, Belgium on 23 March 2016, when at 8am there were two explosions in the Zaventem airport. It was reported that 11 people were dead and 55 injured. Shortly after, at 9.11am at Maalbeek Station, there was a third explosion with reports of 15 people dead and a further 55 people injured (The Australian 2016). This death toll later increased to 34 in total. Many of the dead and wounded at the airport were badly injured in the lower leg area as the bombs had been placed in suitcases and placed at low levels (The Sydney Morning Herald 2016). These events triggered security alerts across Europe.

Late in 2015 saw one of the most tragic events of recent times in Europe and what could be seen as the start of racial unrest in France.

At approximately 9:40pm a black Volkswagen Polo pulled up outside the Bataclan concert hall on Friday 13 November, and three heavily armed gunmen got out. Less than three hours later they were dead, having killed 90 people at the venue and critically injured many others (BBC News 2015).

During the attack many people attempted to escape, others took refuge in small rooms, toilets and offices. Others found their way to the roof and awaited the arrival of the police. Others just simply stayed still, lying on the floor amongst the injured and dead. Horrifically, there were reports of people using wheelchairs being targeted by the terrorists (The Independent 2015, BBC News 2015).



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This was just one incident on 13 November 2015 which left 130 people dead in Paris. Other militants blew themselves up near the Stade de France stadium, and others opened fire into cafe terraces.

The anti-Muslim sentiment is now on the rise in France and other areas of Europe, where an influx of refugees from Syria has been blamed for an increase in the number of terrorist attacks, most linked to ISIS, also referred to the Islamic State, or ISIL (the Islamic State of Iraq and the Levant) (news.com.au 2015).

Just this month (15 July 2016), another event captured the world's press on Frances Bastille Day, being a national holiday. A large rental truck was driven for 2 km along the palm-fringed Promenade des Anglais seafront in Nice, which was closed to traffic at the time as thousands of people had assembled for the firework show. The driver run over and killed 84 people (Reuters 2016).

In response to these events, a profound statement was recently made by Security Analyst, Dr Tobias Feakin, Director - National Security Programs, Head of International Cyber Policy Centre at the Australian Strategic Policy Institute. In an interview on the Triple J radio show, '[Hack](#)', he gave a warning that these recent events are going to continue, and would become more normal. A question came in from a caller, who asked "*What does ISIS want?*", Dr Feakin's response was chilling, and a transcript is provided below:

Essentially what they want at its core is to have this construction of the caliphate to secure that base to create an Islamist state where people live under the extremist law that they provide and from that base then spread the ideology that they propose.

So if anyone was under any illusion that allowing ISIS their own ground to hold and spread from wouldn't mean eventually they would be striking international targets they would be completely misguided.

So their aim has always been to, if you like, convert most of the rest of the world to their ideologies, so it's unattainable and clearly out of the realms of plausibility that that would be allowed and that's why international engagement has occurred, that's why airstrikes are taking place to constrain the space that they actually have.

But the reaction to that from ISIS has been that they then strike out internationally because they are being constrained so heavily in their domestic sphere, so all its done in many respects is speed up a campaign that they'd been planning already. But that doesn't lessen the seriousness of it and the fact that you know, things like this, unfortunately, are going to happen over the coming years, but now we need to ask ourselves the question how do we begin to turn off the ideological ability to influence young individuals in any country, be they in Europe, be they here in Australia, unless we switch off that ideology element to this then we are going to lose the battle.



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And if I may, I don't think phrasing this as clashes of civilisation, clashes of religions, help anyone apart from ISIS, it's totally counterproductive.

I strongly believe that Australia does not plan for worse case scenarios in buildings and in public spaces. If we as a nation did plan, we would not be considering any 'cost/benefit' of providing safe refuge areas in buildings, or the extra cost of providing flashing exit signs or vibrating alarms. These would be provided as a matter of course.

A few years ago when we thought about terrorism we would generally think about the events on 11 September 2001 and the attacks on the world trade centre, but times have changed. Social media encrypted messaging services, VPN (virtual private networks) and the ease of networking large numbers of people over the internet has changed how terrorists behave, and how they recruit new people to their cause. The world is changing. Europe is changing, Britain has left the EU, borders are being protected and refugees from war-torn areas are being turned away.

Australia is thousands of kilometres away from these events, but we have seen cases of local radicalised individuals (i.e. the Lindt Café siege, or the fatal shooting of a police civilian worker, outside the New South Wales Police Force headquarters in Parramatta). I have to trust that our intelligence and security forces will continue to protect us and we will never see a terrorist attack on our soil in the magnitude of those overseas.

He described social media has having a "virus" effect on vulnerable targets. "What I worry more about now is the homegrown recruitment. Where people see that message, they contract the virus, they become radicalised and decided to kill people at home," Mr O'Neill said. "That will only increase."

(Mr O'Neill, Georgetown Group, a US firm specialising in security, news.com.au 2016)



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Section 4. Personal Emergency Evacuation Plans (PEEPs)

The ABCB (2013b) recognised that a Personal Emergency Evacuation Plan (**PEEP**) is a *“necessary and effective measure to assist people with disability respond to an emergency”*. A PEEP considers the needs of each individual and the characteristics and egress provisions within the specific building. A PEEP is an essential document for each employee with a disability. During the terrorist attacks on the World Trade Center in September 2001 people using wheelchairs were left waiting on the levels where they were employed while the remainder of the occupants evacuated via fire escape stairwells (Wagner 2006, Gerber, Norwood & Zakour, cited in Norwood 2011). Despite 125 evacuation chairs being purchased for specific building occupants following the 1993 bombing of the Center, only two people are known to have successfully evacuated the towers in 2001 using these chairs (Gerber, Norwood & Zakour, cited in Norwood 2011).

It is evident from all accounts that greater planning and consideration for each person’s individual mobility needs are required. The development of a PEEP could have improved the success of the evacuations from both Towers for these people.

4.1 Workplace PEEPs

When developing an evacuation plan it is important to consider the characteristics and abilities of all building occupants. A good approach is to ask a new employee to complete an evacuation questionnaire, with generic questions where a respondent can provide as much information as they wish about their own needs during an evacuation. A copy of an evacuation questionnaire is provided in Appendix A. This is provided as an example only, for commercial use please contact the author.

The Scottish Government (2007) suggest the following principles when preparing and implementing a PEEP:

- The same rules should apply to all occupants, regardless of their abilities, or disabilities
- See the person, not the disability as everyone is different with different needs
- People with disability should be actively involved in all stages of the development and review of a PEEP, which is a consistent approach in all literature



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- In an emergency ask, don't assume when determining what assistance is required

Unfortunately, it is common for many organisations to develop emergency plans for people with disability with their needs lumped into one plan or PEEP. A generic type plan will not address everyone's unique needs (Davis, cited in Suttell 2003).

Though it is understood that a PEEP is particularly essential for those people with mobility difficulties who are unable to use a stairway (Wallace (2012), a PEEP should be developed for all occupants of a building that may have some difficulty, or experience a delay in being alerted to the building being in alarm / evacuation mode, or those that may have challenges negotiating an evacuation route. This is not just limited to those people with a mobility impairment.

FEMA (1995) reinforces the principles presented by the Scottish Government and suggests there are two key points to consider when developing evacuation plans for people with disability:

1. *Every person with a disability has unique abilities and limitations and accommodations should be tailored to their needs.*
2. *It is crucial that the person be included in the decision on which equipment and procedures will work for them to provide them with the confidence that they will be protected.*

Dartmouth College supports this notion by stating that when developing a plan, an individual's needs should be determined on a case-by-case basis due to the number of variations with each person and building (2005). It is important to incorporate these needs into each person's individual PEEP. Each PEEP must be tailored to the individual's needs and their own functions and capabilities, rather than having a plan based on the medical condition of the individual.

Individuals with similar medical conditions often require different levels of assistance during an evacuation (Davis cited in the Security Director's Report 2005). Davis also says that companies must work directly with each individual to empower them to help address the gap between the current evacuation plan and their own unique needs. This is consistent with the considerations proposed by FEMA.

It is unclear how successful the use of PEEP in Australian workplaces are, or the percentages of employees who even have one, but there are some obvious problems with the implementation of the workplace emergency planning Standard (AS 3745-2010) in Australia:

- It is also debatable how successfully the implementation of a PEEP strategy is into each workplace.
- The template for a PEEP provided as an appendix to AS 3745-2010 is general,



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provides little guidance and may not satisfy all situations, types of disabilities or the specifics of each workplace.

- By using the word 'should' in the statement "*Suitable strategies in an emergency or evacuation should be discussed with those occupants from the facility who have a disability and a Personal Emergency Evacuation Plans (PEEP) developed for each of those persons*", it is included as a recommendation only by definition.
- It is highly likely that a survey of Australian workplaces would identify similar results to those found overseas, that indicate a lack of confidence in emergency planning for employees with disability.

4.2 Development of a PEEP

Wallace (2012) believes that an integral part of the development of a PEEP is a risk assessment to identify any hazards that an employee may be exposed to. The risk assessment should be reviewed periodically and any necessary controls put in place to mitigate the risk.

The minimum components of a PEEP are:

- A planned route to safety
- Identify who is to provide assistance
- Any necessary equipment to aid evacuation (i.e. evacuation chairs)
- The training needs of individuals tasked with providing assistance
- Regular training and emergency drills including all provisions and equipment required within a PEEP

A PEEP must also consider the needs of each person once they are in an area of safety outside the building. After the evacuation from the World Trade Center in 1993, there were reports that some people who were assisted in their evacuation were left on their own outside in a winter ice storm amid the building rubble of the bombing (Bruyère & Stothers 2002, FEMA 2002).

A copy of a template PEEP is provided in Appendix B. This is provided as an example only, for commercial use please contact the author.

4.3 PEEP Matrix

A PEEP Matrix for the nine disability categories has been developed to assist with emergency evacuation planning. The PEEP Matrix is provided in Appendix D.

The PEEP Matrix outlines relevant controls and considers the following sections:

- Section 6 - Enhanced Measures for Safe Evacuation of People with Disability



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- Section 7 - 'Accessible Means of Egress' Design Considerations
- Section 8 - Emergency Occupant Warning System Considerations

Please also note that an Occupational Therapist familiar with the needs of the person being the subject of the PEEP may need to liaise with the person, their carer, or personal care assistant, to determine an individual's evacuation needs.

PEEP Matrix									
Category	1	2	3	4	5	6	7	8	9
PEEP Consideration <input checked="" type="checkbox"/> = needs considerations	Mobility	Vision	Hearing	Speech/ Language	Cognitive/ Psychiatric/ Mental Health	Respiratory	Temporary, Emergent & Physical	Emergent Emotional	Service Animals
General									
Working after-hours?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provided copy of evacuation plans & procedures?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provided plans & procedures in alternate format?		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				
Buddy Support team identified and trained?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Egress evacuation familiarisation walk-through conducted?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Familiarisation to include the use of communications equipment for emergency management (warden phones, refuge systems etc)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Participation in emergency evacuation drill?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 13: Appendix D PEEP Matrix – Extract Page

4.4 PEEP Buddy System 'v' PEEP Buddy Support Team

A popular term used in the development of PEEPs is the 'buddy system'. The buddy system relates to co-workers being assigned to a person with a disability and tasked with the responsibility of helping that person during an evacuation. The U.S. Office of Compliance (2008) includes the following tasks of a buddy assigned to assist self-identified persons with disabilities:

- Communicating the nature of the emergency to the person with disability
- Assisting persons with disability reach an area of rescue assistance, staging area or to escort them outside
- Remaining with people with disability until relieved

There is, however, some debate as to how successful a buddy system can be, given the potential for the person assigned being in a separate part of the building, to have left the workplace, arrived late, being out of the office, the buddy forgets, the buddy is scared and leaves, or they themselves could be injured during the emergency (McGuire, cited in Logli 2009, Communities and Local Government 2008, FEMA 1995).



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This could result in non-trained co-workers attempting to help the person, the person being delayed in their evacuation or possibly being left behind waiting for emergency services to assist.

Whilst FEMA (1995) suggest at least two buddies, Loy and Battiste (2004) extend the term to include a group buddy system for all employees that involves employees working in teams who can locate each other, keep together and work within their team during an evacuation. By extending the concept of a 'buddy' to a 'Buddy Support Team' (or a 'Personal Support Network' as suggested by Isaacson-Kailes (2002)), the likelihood of a successful evacuation of the person is far greater than reliance on one individual.

By establishing a PEEP 'Buddy Support Team' (or a **PEEP BST**) it encourages camaraderie within the team, instils confidence to the individual with a disability and ensures that there is a greater awareness of that individual's PEEP arrangements. Awareness of any 'Buddy Support Team' arrangements can be included into induction procedures for any new team members, whereby the new staff member can be asked if they wish to be a member of the BST.

PEEP BST members can also be tasked with support responsibilities, such as being responsible for carrying a person's wheelchair, oxygen bottle, or other necessary equipment. For obvious reasons the person being the subject of the PEEP should be able to select responsibilities for the support team and FEMA (1995) recommends that a person actually selects real friends/colleagues as buddies.

The U.S. based National Clearinghouse for Educational Facilities (2008) recommend that a person is assigned to assist with removing debris that could obstruct the evacuation path, which could also be a consideration of any PEEP. It could also be beneficial to attach written instructions to any specific equipment that must remain with the person being the subject of the PEEP (Dartmouth College 2005).

4.5 Visitor 'Group or Generic Emergency Evacuation Plan'

The requirement for developing and implementing a PEEP for an employee can easily be accomplished within a workplace, but it is more complex and difficult to manage those people visiting a building, particularly a first time visitor to a public assembly building (ABCB 2013b, Phythian 2013). This presents many challenges for a building owner or facility manager, as the provisions of AS 3745-2010 include the same considerations for a visitor to a building as for an employee within the building.

A person responsible for a building must, therefore, have mechanisms and strategies in place to ensure that any persons not inducted or familiar with the emergency management controls within a building can safely evacuate the building. These should be documented within a Group (or General) Emergency Evacuation Plan (or '**GEEP**') (Phythian 2013).



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The example presented earlier in this report (under 'Risk') shows that when the needs of a visitor are not considered there can be significant risks for that person when left in the building (i.e. physical harm) and for the building owner / business owner (i.e. litigation, bad press, loss of business, loss of reputation etc.). This requirement is reinforced under Clause 4.2.13 of AS 3745-2010 which states that the needs of those people not familiar with the emergency response procedures shall be considered.

Strategies suggested in the Scottish Governments guide (2007) that can be included within a GEEP include:

- Groups of visitors: The group organiser is an important role and must be considered
- Public assembly buildings, shopping centres and the like:
 - Standardise the plan
 - Group organiser is an important role
 - Security, staff or porters implement standardised GEEP in emergency
- Sleeping accommodation:
 - Check in procedure should offer a suitable evacuation plan
 - Provide additional information in accessible rooms
 - Have the information available in a range of formats (Braille, large print etc.)
 - Where a high level of physical assistance would be required consider offering an alternate room with an easier egress route
- Reception Desks: Provide a sign at reception stating "*We operate a system of assisted evacuation for visitors with disabilities. Please tell our receptionist your requirements.*"

The U.K. based Northern Officer Group (1993) suggests that all staff with responsibilities in the building's emergency plan attend training on disability awareness and methods of assistance. This would include all fire wardens and security staff. Any GEEP must have the ability to meet the needs of any person with disability, with staff on hand to provide assistance, act as their 'buddy', and guide them to a place of safety or refuge area for a staged evacuation.

A copy of a template GEEP is provided in Appendix C. This is provided as an example only, for commercial use please contact the author.

People with disabilities are a part of the world's diversity

(Australian Emergency Management Institute 2013)



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Section 5: Evacuation Planning for People with Disability

Section 5. Evacuation Planning for People with Disability

5.1 Steps to Development of an Evacuation Plan for People with Disabilities

Loy and Battiste (2004) suggest that an emergency evacuation plan for people with disability can be developed using the following three steps:

- Step 1 - Plan Development
- Step 2 - Plan Implementation
- Step 3 - Plan Maintenance

5.2 Step 1 - Identifying those with Additional Needs and Protecting Privacy

5.2.1 Protecting Privacy

In America asking a person outright about a disability is a breach of the ADA and may also be a breach of the Rehabilitation Act (HR Briefing 2002, Fair Employment Practices Guidelines 2001). The U.S. Equal Employment Opportunity Commission (EEOC) has developed a fact sheet to guide industry in developing emergency evacuation procedures and explains how much medical information can be collected from an employee. The factsheet cautions employers that even though they may ask employees with known disabilities about their need for assistance during an evacuation, employers should not assume that all people with obvious disabilities will require assistance (EEOC 2013).

EEOC have also suggested sending a memo to all employees asking whether they may need extra assistance during an evacuation (HR Briefing 2001), but this could also be incorporated into other staff surveys (California Employment Law, March 2011). This advice is just as applicable in Australia.

Similar laws exist in Australia and a person with a disability is not legally required to inform an employer of their disability, unless it affects their ability to perform their role (Australian Government 2013). Employees with a non-visible disability may choose to not disclose their disability to their employer as the disability may not affect their performance. Some people with a mental illness will not inform their employer because they fear repercussions or discrimination.



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An employee only has to inform their employer about the medications they are taking if there are possible side effects that might affect their work or safety at work.

5.2.2 Identifying those with Additional Needs

In Australia an employer can only ask a person with a disability questions that relate to:

- *any adjustments needed to ensure a fair and equitable interview and selection process*
- *if or how the disability may impact on the inherent requirements of a job or safety in the workplace*
- *any adjustments that may be needed to adequately perform the inherent requirements of the job* (Australian Government 2013).

Any other questions about a person's disability are inappropriate, including questions about how the person acquired their disability or any other specific details of the person's disability (Australian Government 2013). So questions about how the person will evacuate the building and what additional equipment or assistance will be required must be done in line with the DDA and Privacy Act.

It is important to have mechanisms to identify those building occupants, including temporary employees, contractors, visitors, customers and regular employees who may have additional needs when considering their ability to safely evacuate a building (FEMA 1995). But what is the best way?

Logli (2009) and Suttel (2003) discuss the notion of people 'self-identifying' their own disability when it may not be obvious or visible (i.e. heart conditions, cognitive or sensory etc.), additionally, occupants may not consider themselves to even have a disability in terms of their own ability to evacuate a building (i.e. obesity, poor fitness levels, respiratory conditions etc.). By self-identifying their own additional needs a person can play an active part and provide input into their own evacuation strategy and assist in developing their PEEP.

However, in some cases, people with disability may not be so forward in disclosing their disability, or may not be aware yet of their own disability. For these people, any emergency evacuation plan must have some contingencies, or general accommodations for those people who may not have been identified, have a temporary disability or acquire an emergent disability during the evacuation (and would, therefore, be without a PEEP).

Facility managers, security staff and employers within the building need to ensure that any supplementary precautions, procedures and electronic systems are identified and implemented within a PEEP to assist evacuation of people with disability. Additionally, there must be sure steps developed to identify any persons with additional needs and mechanisms to ensure that these people are aware of the emergency procedures



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(Mandelblit 2004).

A suitable approach could be to provide a questionnaire form within a new employees' induction starter kit so that they all new employees receive the same form, then any new starter may complete the form and provide it to their line manager so that necessary accommodations can be developed under a PEEP arrangement. A proposed questionnaire has been presented in Appendix A for this purpose (for commercial use of the questionnaire please contact the author). The University of Wisconsin-Madison in the U.S. (2014) also suggest periodically surveying existing employees to determine if the needs are being met in an emergency.

5.3 Step 2 - Plan Implementation

It is critical to include employees with disability in the emergency evacuation planning process (Loy & Battiste 2004, Dion 1997 cited in Proulx 2002). The Northern Officer Group in the U.K. (1993) believe that people without a disability are often responsible for developing emergency plans for people with disability when they lack sufficient information about disability.

After the evacuation plan is finalised it should be made available to all relevant personnel in various accessible formats. At the implementation stage, an evacuation drill should be performed to ensure all employees are trained and familiar with the specifics of the plan.

Awareness of plans and how these plans are communicated to occupants is a critical component of any emergency plan for all building occupants, not just for those with a disability and *"if you're not communicating... it doesn't matter how good your plan is"* (Curtin, cited in Logli 2009). Logli suggests that methods to relay information about a plan can be via emails, pamphlets, telephone hotlines and practice evacuation drills. Additional opportunities include company intranets, induction documents, notice boards and evacuation plans displayed throughout a building. The emergency evacuation procedures must also be provided in various formats, including Braille, large print and audio Wallace (2012).

5.4 Step 3 - Plan Maintenance

The final step is plan maintenance. The evacuation plan should be practised routinely and the provisions within the plan tested to see if they are still effective and current. FEMA (1995) suggests using some innovative techniques to complete periodic training, including audio-visual aids and role playing as well as conventional evacuation drills. This would also assist occupants with cognitive difficulties who may respond well to this form of training. Evacuation drills can take the form of three methods according to FEMA, walk through procedures, announced planned drills or surprise drills.



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Any evacuation plan should also include mechanisms to identify new hazards and report them to relevant personnel. Any equipment used to assist evacuation for people with disability, such as evacuation chairs, must also be inspected and maintained on a routine basis (Loy & Battiste 2004).

Inspections to ensure egress routes are maintained safe and clear of obstructions are also required (California Employment Law, March 2011). In Australia, this was considered an 'essential safety measure' maintenance requirement under Part I of the BCA until being removed in BCA 2014 and is now mandated by State and Territory legislation. This maintenance requirement calls for regular inspections of paths of travel to exit doors, fire isolated exits, exit doors, exit door signage, discharge paths from exit doors, the condition of exit doors and the like.

Disability will affect the lives of everyone at some point in their life, it is time society changed to acknowledge this

(Disabled World 2014a)



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Section 6. Enhanced Measures for Safe Evacuation of People with Disability

The PEEP Matrix provided in Appendix D outlines relevant controls and considers the following sections:

- Section 6 - Enhanced Measures for Safe Evacuation of People with Disability
- Section 7 - 'Accessible Means of Egress' Design Considerations
- Section 8 - Emergency Occupant Warning System Considerations

6.1 Passenger Evacuation Lifts

6.1.1 Evacuation Lift Definition



Of the new technologies to assist evacuation, the most promising is the ability to now design and operate passenger lifts safely and reliably during a building fire (Bukowski 2008). These lifts are commonly referred to as 'evacuation lifts'.

An evacuation lift is defined as a *"lift that can be used during an emergency, for self or assisted egress"* (ISO 2011).

As noted previously, passenger lifts have been used successfully for safe evacuation in many buildings and were used extensively in the evacuation of the World Trade Center where 27% of people used a lift for part of their escape route (Charters 2008).

Figure 14: Emergency Evacuation Lift Sign Example

6.1.2 Codifying the use of Evacuation Lifts

The use of evacuation lifts is a relatively new area with countries reacting very slowly to codify the requirements when using such lifts.

The IBC first documented the use of an evacuation lift in 2012, with Australia following quickly after introducing a new Performance Requirement (DP7), though it could be argued



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the Australian approach was rushed and implemented without any industry guidance other than a Handbook (ABCB 'Lifts Used During Evacuation Handbook Non-Mandatory Document').



Figure 15: Photo of an Emergency Evacuation Lift Sign on Wall

6.1.3 Evacuation Lifts complementing Fire-Isolated Stairs

It is clear that the use of evacuation lifts provides opportunities for all occupants to evacuate a building. Pauls (2002) however suggests that they are only 'part' of an egress solution and the use of fire escape stairs should also continue. This is consistent with the ABCB approach outlined in the 2013 'Directions Report on Egress for All Occupants' (ABCB 2013b), which proposed fire stairs to be co-located with evacuation lifts. Pauls cites a NIST 1992 research exercise on a 13-storey building, with 2,980 occupants, using five 56-inch-width (1,422mm) stairways and five 16-passenger evacuation lifts, where the following results were achieved when evacuating the building:

- Stairs alone – 14 minutes
- Evacuation lifts alone – 29 minutes
- Combined usage – 12 minutes

This view of using both fire-isolated escape stairs and evacuation lifts is consistent with the findings of research undertaken involving survivors of the 9/11 attack on the World Trade Center. The research identified that even though the North Tower was less than 1/3 occupied at the time of the attack there was still congestion in the stairs. The research and subsequent computer modelling suggest that if the building has been fully occupied a further 7,592 people would have died in that Tower alone. The researchers believe that once a building reaches a critical height and population the use of stairs alone as a form of evacuation will not be sufficient (RoSPA Occupational Safety & Health Journal October 2008).



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Furthermore, subsequent research undertaken post 9/11 by the United States National Institute of Standards and Technology (NIST) over a three-year period recommended an increased use of passenger lifts during emergencies in high-rise buildings (Buildings, February 2008).

Charters (2008) also raises the hypothesis that there are three types of building evacuations: simultaneous, phased and zoned or progressive horizontal evacuation. He argues that the use of lifts during a simultaneous evacuation within anything other than a high-rise building would not add any benefit. However, in a phased evacuation in an office building, there would be significant benefits in using the passenger lifts. Furthermore, the use of lifts in zoned or progressive horizontal evacuations is also seen as providing great benefit as separate compartments (i.e. not in the area of fire origin) could continue to safely evacuate building occupants (such as in shopping centres, airports and hospitals).

6.1.4 Evacuation Lift Considerations

ABCB commissioned research found that the use of an evacuation lift relies on the implementation of building management procedures, whereby trained assistance or intervention by designated occupants during an evacuation is critical to any proposed use of a lift (ABCB 2013a). For these reasons, the non-regulatory handbook on the use of lifts for evacuation is considered a better approach than adopted the prescriptive provisions into the BCA.

In Australia, passenger lifts are generally considered unsuitable as a means of evacuation due to a number of factors, including firefighter intervention, the passage of heat, flames or smoke within the lift shaft and control, usage and management of the lifts during an emergency (ABCB 2013a). As a result, the BCA requires signage installed on each lift landing stating *“Do not use lifts if there is a fire”* (ABCB 2015). As such, if an evacuation lift is being provided as part of an ‘Alternative Solution’ for the building it must consider providing clear and correct information about the use of the lift during a fire (Proulx 2002), with removal and replacement of the current BCA warning signage.

It is clear that Australia is in its infancy in terms of the use of lifts for evacuation purposes compared to other regions such as United Arab Emirates and China that have proven evacuation systems using express or ‘lifeboat’ evacuation lifts directly from refuge floors. Ultimately *“any proposed evacuation plan by lift or escalator should form part of the integrated evacuation strategy”* Chalmers (2008).

6.2 ‘Carry Down Techniques’

Some experts in the field of emergency evacuation for people with disabilities have sanctioned the use of ‘carry down techniques’, whereby a person is carried down or up a set of stairs whilst remaining within their wheelchair.



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One such expert, being a wheelchair user themselves and a designer and manufacturer of wheelchairs believes that there is no manual chair that cannot be carried down a flight of stairs (The Northern Officer Group 1993, FEMA 1995, FEMA 2002).

However, the Scottish Government (2007) has more recently stated that even though it is still considered a reasonable approach to carrying a person within their chair using a two, three or four people lifting technique that some wheelchairs are not suitable for 'carry down techniques'. Some caution, therefore, needs to be displayed when considering this option and it should not even be considered without consulting with each individual being the subject of a PEEP and undertaking an extensive manual handling risk assessment.

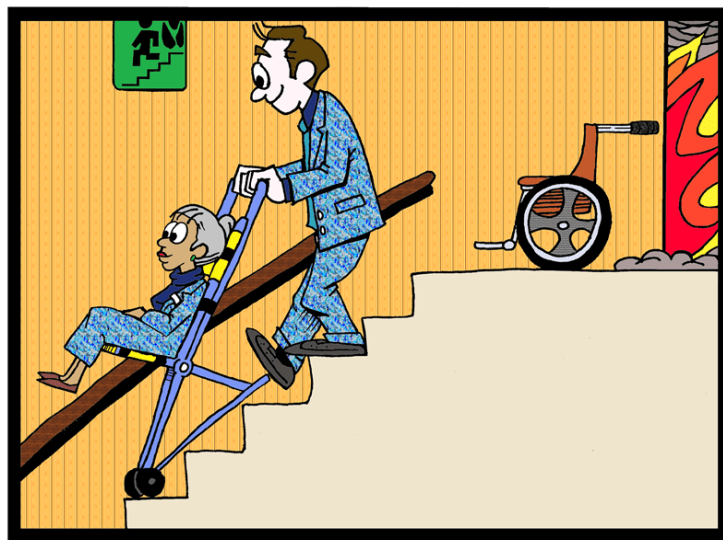


Figure 16: Emergency Evacuation Chair Cartoon

For that reason, other evacuation devices such an evacuation chair should be considered if an evacuation lift is not viable. It's also noted that FEMA (2002) also provides details of a number of carry techniques for carrying a person without their wheelchair. These include the cradle technique and swing/carry chair technique.

These techniques are not encouraged and should be replaced with the use of an evacuation chair.

6.3 Evacuation Chairs

6.3.1 Proven Success in the use of Evacuation Chairs

The 1993 bombing of the World Trade Center highlighted many problems with the safe evacuation of people with disability. Subsequently, following the evacuations at that time a number of products and systems were purchased for the Towers to assist in evacuation and life safety (Madsen et al, 2001).



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A very small number of these products proved successful in 2001 when occupants with mobility impairments were assisted to safety in evacuation chairs operated by co-workers down the fire isolated stairs. In one such example, the evacuation of a mobility impaired person from the 69th floor in the 1993 bombing took over six hours as there were no plans in place for his evacuation. With the development of a PEEP and assistance from co-workers, the same person evacuated the building in 90 minutes during the 2001 attacks (NFPA 2007, Madsen et al, 2001).

This is possibly the best example of the use of an evacuation chair, and a testament to the spirit of people evacuating the building on a day, when *“ordinary people did extraordinary things”* (Madsen et al, 2001). It took four co-workers to get him down the stairs, rotating responsibilities as they did so. 15 minutes after exiting the tower the building collapsed.

In another example provided by Loy, Hirsh & Batiste (2006) a worker on the 68th floor was evacuated to safety in an evacuation chair because her employer had made that investment after the 1993 bombings, and had implemented a PEEP. An important item to consider in this case is that the person made a conscious decision to evacuate and participate in the evacuation process, including leaving her \$8,000 electric wheelchair behind.



Figure 17: Emergency Evacuation Chair Sign Example

6.3.2 Research on the use of Evacuation Chairs

The survey undertaken by the British Research Establishment for the Communities and Local Government (2008) had some interesting responses to the two questions on the use of evacuation chairs.

In response to the first question on whether they were *“ok about using an emergency evacuation chair,”* the majority of responders indicated that they were not happy to do so and commented that they are uncomfortable and hard to use. Some stated that not only are the chairs uncomfortable but the experience of transitioning into an evacuation chair and being carried down a stairway can be an undignified and embarrassing experience.

The responses to the second question somewhat contradict the consensus to the first question. When asked to comment on the statement *“evac-chairs and other similar devices are a good way of evacuating disabled people”*, a large proportion of responses indicated that the use of an evacuation chair is *“not completely unacceptable”* and that they would use them in an emergency.



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6.3.3 Risk, Litigation and the Use of Evacuation Chairs

Risk can be a double-edged sword when considering the evacuation of people with disability. There is the risk of not doing anything at all, and then the risk of doing something (and the fear of doing it wrong).

There has been a reported case in a Canadian school (CBC News Nova Scotia January 2013) where staff members offered to carry a student with cerebral palsy down the stairs during evacuations but have been advised not to due to health and safety rules. In this case, an evacuation chair would have been a simple solution. The views and approach of the staff in this Canadian school are very similar to the views of people in many other workplaces.

Before the availability of evacuation chairs, it is understood that workplaces, where people with a mobility disability have worked, have had arrangements in place whereby co-workers carry the person down the fire stairs (Hall 1989).

There is now no reason for these drastic actions when the availability of an evacuation chair is a better solution for the person to be evacuated and their co-workers assisting in the evacuation.

With the introduction of evacuation chairs into buildings to assist evacuation it has now become feasible for those people with a mobility disability, as well as those under extreme stress, are aged, pregnant or severely injured to be evacuation down the stairs to safety (Suttell 2003).



Figure 18: Photo of an Evac+Chair Evacuation Chair in Use

Research undertaken by the British Research Establishment for the Communities and Local Government in 2008 surmised that *“all evacuation strategies studied within the research assume that people with severe mobility impairments will be carried out by hand, or by using special devices.”*

Evacuation devices, such as an evacuation chair could be used to provide an effective method of evacuating building occupants (California Employment Law, March 2011, JAN 2011). It is, however, foreseeable to experience some hesitation from industry to provide evacuation chairs within buildings for fear of potential litigation for incorrect use or accidents occurring during an evacuation. However, a legal opinion was provided in the U.S.



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by the Library of Congress, who quotes the Office of the General Counsel in a US Office of Compliance presentation (2008):

- *If an operator is injured while PROPERLY using the evacuation chair, they will be covered under worker's compensation*
- *If the rescuers drop a person while using the evacuation chair, the rescuers are protected against civil liability*

Documented training is a critical risk mitigation strategy once evacuation chairs are provided. As the use of evacuation chairs increases the awareness of their purpose, use and importance must be communicated to all employees in a building. Isaacson-Kailes (cited in Norwood 2011) suggests that all staff working in an office be trained in the use of the chairs, not just a few select people.

It is also important to note that ISO 21542:2011 cautions that the transfer process from a person's own wheelchair to an evacuation chair could present a risk of injury to the person, particularly when they use a colostomy bag, catheter or oxygen tube. The transfer could also be seen as an undignified act and infringe on the individual's independence. ISO 21542:2011 nonetheless state that an evacuation chair is a suitable evacuation option for people using a wheelchair. It highlights that attempting to carry a person within their own chair down a fire escape stairway presents a significant manual handling risk, even with training, for those providing assistance and for the person within the wheelchair. Any evacuation chair should, therefore, be capable of:

- Being safely and easily operated
- Carrying people of high weight (up to 150kg)
- Descending, but also ascending a stairway
- Travelling over extended distances, including external to the building and over rough terrain
- Being used in narrow spaces, including a fire escape stairway (ISO 2011).

6.3.4 AS 3745-2010 and Evacuation Chairs

The use of evacuation chairs in Australia is growing and they are becoming more commonplace. Their use has been considered for many types of buildings, including large public assembly buildings where they have successfully been used for evacuation and for moving people suffering a variety of medical conditions with the need to move people through a stairway to a treatment area (i.e. in theatres and sports stadiums).

In Australia AS 3745-2010 currently says "*Consideration should be given to the use and suitability and storage arrangements of stairway evacuation devices for people who use wheelchairs or who otherwise would need to be carried down the stairway.*"



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Figure 19: Photo of an Emergency Evacuation Chair Sign with Braille and Tactile Text

6.3.5 Distribution and Location of Evacuation Chairs

There has been discussion over recent years as to a suitable quantity and distribution of evacuation chairs within a building. Ultimately this is a decision to be made by the building owner and/or the occupants, in terms of risk management and any foreseeable cost/benefit. Bruyère & Stothers (2002) recommend that an evacuation chair is provided on each floor for every person who would need one during an evacuation and it has been common practice to provide these within the refuge area or near the fire escape stairwell.

The recommended number of evacuation chairs has also been suggested to be one chair for up to 2% of the building occupants, plus one chair per known person with disability per floor (Way, cited in Suttell 2003). Based on ABS data (cited in ABCB 2013a), quoting 0.6% of the population using a wheelchair, 2.5% of the population using a mobility aid and 10.5% of the population with a mobility disability, this distribution of evacuation chairs might be a little low. Consideration as to the use of the building is also a critical factor in determining the required number.

6.3.6 Evacuation Chairs, Training, PEEPs and Emergency Management

It is important to note that safe planning for evacuations does not end with the provision of evacuation devices within suitable locations of the building. The use of the evacuation devices must be incorporated into an individual's PEEP and the use of the equipment must be practised by staff during fire drills.

There are reports of users of wheelchairs in the World Trade Center either forgetting about their own device under their desk and not having any exposure to their designated evacuation chair since the initial demonstration after the earlier bombing in 1993 (Isaacson-



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Kailes 2002, Byzek & Gilmer, cited in National Council on Disability 2005). It is also recommended that the persons own wheelchair remain with the person being evacuated (Emergency Management Ontario 2007).

A recent survey undertaken by a leading UK evacuation chair company identified that 40% of the companies that owned evacuation chairs did not know how to use them during evacuation training (Wallace 2012) and key staff had moved on leaving a knowledge gap.

Mandelblit (2004) emphasises that the use of any evacuation devices to evacuate those employees and visitors with a mobility disability from a high rise building will require integration with the security and emergency procedures.

The use of evacuation chairs is generally only to be used on direction from a Fire Warden or emergency services personnel. Any use of evacuation chairs must be adopted into emergency evacuation procedures and all training, such as evacuation drills must include their use and the devices must be subject to an inspection and maintenance regime (Loy & Battiste 2004).

6.3.7 Maintenance, Inspection and Testing

Once evacuation chairs are provided within a building the building owner and occupiers take on a responsibility to maintain, inspect and test the chairs on a routine basis. In the future, this could even be a condition of the occupation of the building and stipulated as a condition on the building's occupancy permit / certificate.

This is particularly relevant for buildings approved by the local Council which require evacuation chair provision, or fire engineered buildings that have referenced AS 3745-2010 and the need to provide chairs as part of the evacuation strategy in the Fire Engineering Report. This approach is comparable to the current essential safety measure requirements for other building fire and life safety equipment (i.e. sprinkler system, smoke detection system, occupant warning systems etc.). Up until BCA 2013 these requirements were included in Part I of the BCA, but have since been removed in BCA 2014 and now believed to be adopted into each State or Territories legislative framework.

It could be common place in the future for building surveyors to include these as an essential safety measure for the building, along with other emergency management controls considered within the Fire Engineering Report. Only time will tell on that matter.

Within Australia, there is currently no standard that considers this maintenance, inspection and testing requirement. Internationally, the situation is also similar. In 2009 the American National Standards Institute identified the need to provide standards pertaining to the use of stairway evacuation devices, including consideration for the placement, usage, maintenance, operation and storage requirements for these devices. This is equally relevant within Australia where the awareness and the use of evacuation devices is slowly growing.



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6.3.8 Effectiveness of Evacuation Chairs

Evacuation chairs are now becoming a recognised part of an overall solution to evacuation planning for all occupants. A university in the United Kingdom has been quoted as saying the following after they purchased 50 evacuation chairs for use in their buildings (Smoke Control 2009):

a stairway evacuation device was identified to us as a way of fulfilling our health and safety and equity and diversity commitments, as it allows us to offer a safe means of emergency escape for all.

This may become the norm in the future as more risk adverse organisations see the use of an evacuation chair part of a person's PEEP or part of their general accommodations for all building occupants in a GEEP.



Figure 20: Photo of Evac+Chair Evacuation Chair Options

Research completed by Adams and Galea in 2010 (Hemmingfire.com 2012) tested the effectiveness of a range of evacuation devices to evacuate a hospital and compared the devices used. The research tests measured the time taken by four female nurses to evacuate a ward of 28 non-ambulant patients down 11 levels in a building and the results were compared. The research project involved a comparison of devices, including carry chairs, evacuation chairs, stretchers and drag sheets and found the results were 'shocking' in some cases, with the use of evacuation chairs being the quickest.

There are however some negative aspects raised in terms of the use of an evacuation chair and one such issue is how effective they are to use in fire-isolated stairways. Proulx & Pineau (1996) believe it is unlikely that a person can be evacuated using an evacuation chair whilst other people use the stairway to evacuate due to the width of fire stairs. They



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suggest that those occupants with a mobility disability should wait in an ‘*appropriate waiting area*’ whilst others have evacuated and the stair is free. This view is consistent with the more recent approach documented by Aberdeen Disability Advisory Group (2014) who also suggest that a person unable to descend a fire stair “*can wait in the refuge until the building is vacated and then go down the stairs in their own time.*”

As a closing note on the use of evacuation chairs, interestingly, the London Legacy Development Corporation, in their *Inclusive Design Standards developed for the London Olympics* (2013) states that “*the use of evacuation ‘evac’ chairs is deemed inappropriate by many disabled people and emergency evacuation must be by lift.*” In an ideal world, this might be the case, but the reality is, many smaller multi-storey office buildings do not have lifts and most buildings with lifts are not safe to use during a building fire. The fact is, there is a need for evacuation chairs.

6.4 Evacuation Sleds and Sheets

There are also a number of types of evacuation sleds and sheets that have been successfully used for evacuation of buildings, particularly health care and aged care facilities. Some caution should be exercised before even considering the use of such devices for uses outside the health care industry. Hewitt (cited in Fuller 2008) expresses caution:

People-handling can be incredibly complex and whilst the use of transfer and lifting aids to move and handle people may be an everyday task for someone in a care situation, in other buildings staff will not get enough repetition to ensure that the correct procedures and postures are adopted and there is therefore a very high risk of getting it wrong.....

In many buildings it will be completely unrealistic to expect staff to be fully trained... or to have the physical abilities themselves for the duration of the process.

For these reasons, the use of sleds and sheets are not recommended for general use buildings.

6.5 Evacuation Windows and Balconies

Windows and balconies have been proposed as a suitable option for evacuation of people with a mobility disability (California Employment Law 2011). The proposal discusses the ability for fire brigade appliance trucks to be able to reach seventh-floor windows and suggests that paths to these windows are kept clear and windows are selected based on whether they have ledges that are able to stand or sit on. Any fire protected balcony areas could also be considered a waiting / refuge area.



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This is not considered a suitable option due to the nature of the evacuation, including the stress experienced by the person and the need to be carried by a firefighter and therefore dismissed as a viable option. It is however considered and discussed here as a situation could occur where this may be the only option for saving lives.

6.6 Smoke Masks & Smoke Hoods

6.6.1 When to Provide Smoke Masks



According to the United States Fire Administration (being part of the U.S. Department of Homeland Security), *“Many home fires, deaths occur when residents are trying to get to exits. Toxic smoke and heat between them and an exit can cause people to become disoriented, even in buildings in which they are familiar”* United States Fire Administration 2015).

United States Fire Administration add that in terms of emergency escape masks *“There are a variety of fire/emergency escape devices, commonly called “smoke hoods” or “smoke masks,” marketed to assist civilians in safe egress from fire emergencies.*

Figure 21: Photo of a Chinese Hotel Room Smoke Hood

They provide head, eye and respiratory protection from particulate matter, eye irritants, carbon monoxide and other toxic gases commonly produced by structural fires.”

Smoke hoods, smoke masks or emergency escape masks as they are sometimes called, will provide an extra level of assurance for someone evacuating a building or those waiting in a refuge area for assistance.

6.6.2 Air Quality in Fires

It is widely acknowledged that during a fire there is the potential for people in the immediate vicinity to breathe smoke and air that may be high in toxins, including hydrogen cyanide (HCN). HCN is a predominant toxicant found in fire smoke (Fire Smoke Coalition 2015). If any readers witnessed the videos of people evacuating the Address Hotel in Dubai on New Year’s Eve (31 December 2015) they would have seen the extent of smoke travel and leakage into the fire escape stairs. Many people experienced difficulties during their evacuation due to the effects of the smoke.

When considering if it is worth providing smoke hoods at home, in a public place, or in an accommodation building, the statistics below can be considered. Though this is American research statistics, it is worth considering this information given that the U.S. has much better data on fires and a higher occurrence of fires than we see in Australia.



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The Fire Smoke Coalition, a United States organisation comprising firefighters and the medical community have provided the following very relevant quotes:

- *In the United States, residential fires are the third leading cause of fatal injury and the fifth most common cause of unintentional injury death, yet the majority of fire-related fatalities are not caused by burns, but by smoke inhalation.*
- *Despite the amount of fires in the U.S. decreasing each year, the amount of civilians dying in fires is actually increasing. For example, in 2009, 1,348,500 fires were attended by public fire departments, a decrease of 7.1 percent from the year before; however, 3,010 civilian fire deaths occurred, which is an increase of 9.3 percent (United States Fire Administration 2009).*
- *In fire smoke, hydrogen cyanide can be up to 35 times more toxic than carbon monoxide, (Tuovinen & Blomqvist 2003) an underappreciated risk that can cause severe injury or death within minutes (Guidotti 2006, Eckstein & Maniscalco 2006).*
- *In a review of major fires over a 19-year period, cyanide was found at toxic-to-lethal levels in the blood of approximately 33 percent to 87 percent of fatalities (Alari 2001).*



Figure 22: Photo of a Japanese Hotel Room Smoke Hood

6.6.3 The Near Miss Case Study Revisited

In the first Section of the guidebook, the emergency in 2007 at 570 Bourke Street in Melbourne was discussed. The explosion caused a fire and sent toxic smoke throughout the building, and 15 occupants were trapped in the passenger lifts, over 14 fire trucks attended the scene along with up to 12 ambulances and 48 people were treated for smoke inhalation and shock.



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A further six people experiencing respiratory problems needed treatment at a local hospital. In such cases, the use of smoke hoods could help people evacuate safely without experiencing the effects of toxic smoke, particularly important if they have some mobility limitations that could restrict their ability to evacuate from the building quickly.

6.7 Other Potential Devices for Evacuation

The following sub-sections are provided to highlight other devices that have been developed and produced and are now commercially available for use in buildings. These products are particularly designed where occupants face a vertical egress route.

The emotionally stirring images of building occupants of the World Trade Center Towers facing the extreme heat, smoke and flames within the buildings who chose to jump from the building will continue to haunt many witnesses to the event, and are likely the motivation for many companies seeing opportunities for new business. The following devices do however sit outside the Australian Regulatory system.

6.7.1 Evacuation Parachutes

Following the attack on the World Trade Center Towers in 2001, several companies emerged selling emergency escape parachutes (Prigg 2013). One such company in Panama say they have developed the world's first parachute for high-rise building evacuation as a 'last result' for building occupants facing a life or death situation. The company has offices in America, Dubai and Singapore (MailOnline 2013) and claims that the parachute is a "*personal evacuation insurance system in buildings over 11 floors (30 m)*" and is "*tested and approved by the Federal Aviation Administration TSO (Quality Control System).*"

It is unlikely this device will provide a good solution for a safe evacuation for any building occupant and any use of a parachute would not be suitable for most people with any mobility or sensory impairment. A firefighter and experienced base jumper reported that untrained people would not survive a jump from a burning building due to extreme heat, wind turbulence and plumes of smoke (ABC News 2010). Therefore, the concept is not viable.

6.7.2 Evacuation Chutes

The question could be hypothetically raised; in a life or death situation would someone willingly slide down a chute rather than risk perishing in a fire as tragically seen from the World Trade Center Towers? Evacuation chutes have been used overseas and rely on friction to slow the descent of the person inside either a solid or flexible tube chute (FEMA 1995). However, the use of escape chutes is only permitted in the U.S. to provide escape routes in special structures such as some towers and special manufacturing environments and are not permitted or recommended for commercial and public buildings (NPFA 2013).



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6.7.3 Controlled Descent Devices

Controlled descent devices involve a person wearing a harness or using a special chair which allows the user to control their own descent and speed down a wire cable outside of a building. These are currently in use in the U.S., but are also only permitted to provide escape routes in special structures such as some towers and special manufacturing environments and are not permitted, nor recommended for commercial and public buildings.

6.7.4 Rooftop Helipads

The use of helicopters has been a proven method of evacuation for people in high-rise buildings, but this has generally been dependent on a helipad being provided on the rooftop, or at least a flat area for people to assemble.

This topic made it into the media in 2014 when the Los Angeles Mayor Eric Garcetti changed a 40-year-old rule allowing the construction of skyscrapers with spires instead of flat roofs. Garcetti was quoted as saying the requirement was *“one more stupid rule in Los Angeles”* (Los Angeles Times 2014a).

The flat roof law known as Regulation 10, came into effect in 1974 after two skyscraper fires in Brazil which saw horrific scenes of people jumping from buildings to avoid the flames. The two fires, in the Andraus Building and the Joelman Building, made headlines worldwide, 188 people were killed in the Joelman Building, but fatalities were limited in the Andraus building where 350 of the 450 people rescued were lifted off the roof by a fleet of helicopters.

As a result of these events, the Los Angeles law was introduced and applied to buildings greater than 75 feet tall and was intended to provide safer buildings and ultimately save lives. This became a reality in 1988 when five people were rescued by helicopters from the top of First Interstate Bank Building, on fire at the time. The benefits of flat roofs have not been limited to Los Angeles, where earlier in 1980 the MGM Grand Hotel fire in Nevada resulted in over 1,000 people being rescued from the roof of the hotel by military helicopters. In Puerto Rico in the same year, helicopters rescued people from the rooftop of the burning Dupont Plaza Hotel (Los Angeles Downtown News 2014, Los Angeles Times 2014b, NY Times 2014, Memoria Globo 2013).

Tokyo is another such city with a similar skyline with approximately 80 buildings with a helipad, which is reportedly more than any other city in the world. The reason why they are so prevalent in Tokyo and neighbouring Osaka (with 43 helipads) is primarily for emergency evacuation of the buildings during an earthquake. In the early 1990's Japan commenced asking developers to voluntarily build helipads on buildings over 45 meters where the fire ladders were unable to reach the top storey (Bloomberg 2016). This is evident in the photo below (and that shown on page xiv).



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Figure 23: Photo of the Tokyo Skyline with Flat Roofs

The recent change to legislation in Los Angeles considered the Fire Departments directives at that time which instruct people trapped in a burning building to ‘shelter in place’ and not head for the roof, which is a common approach around the world.

Disaster brings out the best in people

(Bryn, cited in Pauls, Gatfield & Juillet 1991)



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Section 7. 'Accessible Means of Egress' Enhanced Design Considerations

The ability to provide enhanced safety measures for those occupants with a disability should be carefully considered as early as practicable. The following sections outline design considerations that should be explored with each building developer/owner to identify opportunities to build in such provisions at the concept stage. By doing so, the developer/owner has:

- The potential to reduce costs further down the project
- Verify spatial demands for evacuation provisions as early as possible
- In complex projects, it could be possible to future proof the design during design development and approvals stages (subject to changes in legislation)
- The potential during the life of the building to reduce risk of:
 - Complaints under the DDA or litigation (which could see all members of the project design/certification team share some level of liability)
 - Undesirable incidents during an evacuation

ISO 21542:2011 includes equitable exit and evacuation routes as a key accessibility issue and includes concepts for emergency planning, which include removal of steps, obstacles, provision of fire protected lifts, good signage, good lighting, visual contrasts and fire protected evacuation routes. Similar provisions exist in the ADA Accessibility Guidelines (Department of Justice 2010) and Australia appears to be several years behind other western countries in this area.

7.1 Fire Isolated Stairways / Ramps

The current requirements within fire isolated stairs or ramps are limited to the provision of contrasting nosing strips and one handrail in an accessible profile (Clause 12 of AS 1428.1), but do not require other accessible features within a fire isolated stairway (such as Tactile Ground Surface Indicators and two handrails both with handrail extensions).

The ABCB proposal to amend the 2015 version of the BCA to include all access provisions for all stairways and ramps, including those being fire isolated, was a radical shift towards 'inclusive egress' design and would have greatly increased the level of safety for those people who are blind or who have low vision when evacuating a building.



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The proposed changes included the provision of a handrail on both sides of the stairway and tactile ground surface indicators within the stairway, but these proposed changes didn't get adopted into the BCA (as discussed in Section 1.11).

As there are limited mandatory access features in exit stairs in Australia (and overseas), it is worth considering some best practice principles of wayfinding and stair identification documented in international standards, such as tactile mapping the egress route via markings on handrails, or the use of photo-luminescence wall, stairway edges, stairway landings and nosing strips that have been adopted overseas, and as required as in the International Building Code (ICC 2009b).

Another interesting point raised by Gerber, Norwood & Zakour (cited in Norwood 2011) is that people with vision impairment have reported difficulties exiting buildings via a fire escape stair which has inconsistent flights of stairs, with different configurations of landings and numbers of steps. A consistent approach to the design of fire escape stairs in a building is, therefore, an obvious benefit for all occupants, not just people that have a vision impairment, especially if the emergency lighting became inoperative.

7.2 Fire Escape Stair Width

Statistical data around the modernised world clearly shows that people are generally getting larger. Bukowski (2008) believes that previous data supporting an 1100mm wide egress path is now insufficient. He proposes a 1400mm minimum width in fire stairs where they are the primary means of egress and 1100mm where an evacuation lift is provided.

At the moment the minimum clear width of an escape stairway in Australia is 1000mm (BCA, D1.6(b)(i)). The International Building Code (ICC 2009b) and ADAAG (Department of Justice 2002) requires a 48-inch-width (1219/1220mm respectively) (in a non-sprinkled building) and connection to a refuge area with an enlarged landing or accessed from another area of refuge. In contrast, ISO 21542:2011 recommends that escape stairways have a minimum clear width between handrails of 1500mm, with an increased landing size of a minimum depth of 1500mm to facilitate carrying a person on a stretcher.

This requirement was no doubt influenced by the extensive research undertaken by Pauls both before and after the events in September 2001. Pauls (2002) reported that the belief that a traditional 44-inch-width (1,117mm) is sufficient for two-abreast movement and is, in fact, incorrect. Provision of anything less restricts movement at changes of directions where crowding and delays were experienced. It also restricts the ability for emergency services to ascend the stairs with equipment, whilst a counter flow of people is descending. Pauls concluded that a 56-inch-width (1,422mm) of the stairway, with a 48-inch (1,219mm) clearance between two handrails, should be the preferred option.



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Pauls also raised an interesting point as to the economic impact of the spatial impact of such stairs and reports on a 20-storey building scenario: *"27% increased width of stairs, with 37% better flow performance would impact less than 0.1% of building area, with the wider width only required to the six lowest levels."*

7.3 Stair Handrails

The use of photo-luminescence signage and markings in stairways is discussed above, but the provision of two compliant accessible handrails in a stairway is another beneficial safety feature. Currently, the BCA only requires one handrail that complies with the access standards, being the correct height and profile in an exit stair (unless the stair is also a general use stair, then it would be provided with a handrail on both sides by default under the access provisions).

Reports from the 1993 evacuation of the World Trade Centre found that people experienced difficulties in the three stairs of Tower 1. These stairs did not have outer handrails that extended the full-length of the flights, whilst the inner handrails had full-length handrails with horizontal extensions and terminations into newel posts. During the evacuation people that were moving slower and experiencing difficulties were told to move to the right, thereby using the non-continuous handrails and at least one fall was attributed to the handrail arrangements (Pauls 1994). It was pleasing to see that the ABCB *'Directions Report on Egress for All Occupants'* proposed such a change (2013b), hopefully, this will be adopted in Australia in the near future, given that this is now adopted into the International Building Code (IBC 2009b).



Figure 24: Photo of Single Internal Handrail in Exit Stair



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7.4 Stair Nosing Strips

An important feature within any exit stair are the contrasting nosing strips along the edge of each stair tread. The ABCB has recognised the importance of highlighting the stair edge for people as they descend a stair. As shown on the cover image to this guidebook, if these nosing strips aren't provided it could make the edges of the stair treads difficult to see under differing light conditions.

In 2011 the BCA was amended to include this requirement and all fire-isolated stairs (and general use stairs) now require compliance with AS 1428.1, which says that each nosing strip must be 50mm to 75mm deep, extend for the full width of the path of travel and have a minimum luminance contrast of 30% to the background.

The ABCB commissioned the Monash University to undertake research in this area in 2008, which concluded that *"slips, trips and falls in buildings constitute a large and costly public health problem, which is expected to grow in coming years due to the ageing of the Australian population and the increase in housing density, with associated trends to multi-storey dwellings."* The research paper also presented the findings of Pauls research in 1998, which found that the number of falls outnumbered the number of fire-related injuries by one or two orders of magnitude and injuries related to stairways outnumber civilian injuries from fire by a factor of approximately 35. From this it is clear to see why it is so important to reduce the risks of slips, trips and falls as a person moves through an exit stair.

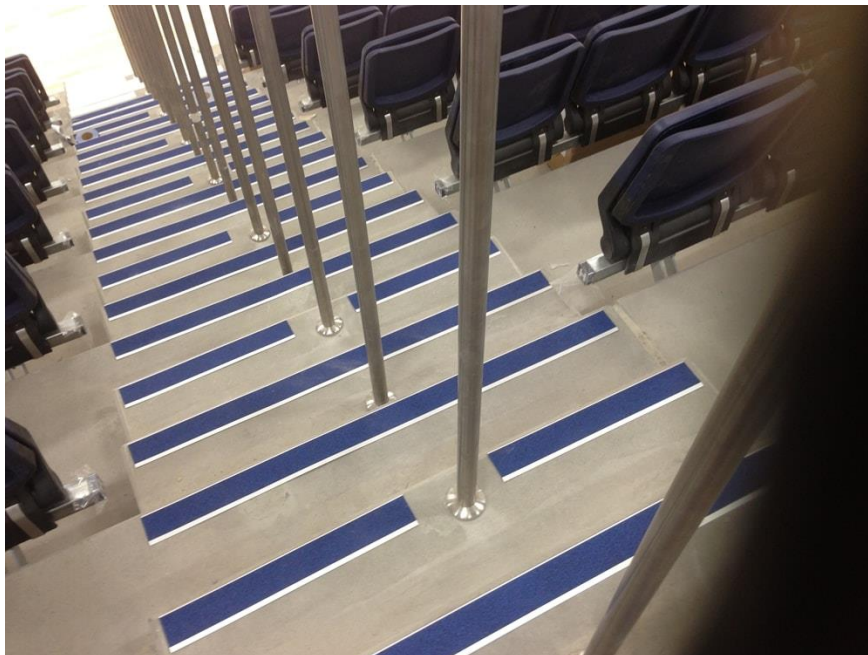


Figure 25: Photo of Stair Nosing Strips in a Seating Stand, by Safety Stride



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When we consider additional risk factors contributing to incidents in stairs, Monash University stated that due to decreased vision and balance, older people are more prone to falling on stairs. They go on to quote Templer's work in 1992 who found that 70% of the accidents he examined occurred on the top or bottom three steps of a stairway, with nearly 60% of those cases occurring on either the last or second last step.

There's strong evidence to support the case for improved safety features when descending a stairway. In various studies conducted in the U.S. and U.K., between 73% and 80% of stair accidents were found to occur during stair descent (Jackson and Cohen 1995, Templer 1989, Roys and Wright 2003, cited in (Monash University 2008)). The primary causes of accidents during descent were ranked by Templer in the following order: Catching the heel on the stair nosing; the foot slipping off the stair nosing, overstepping and missing the step completely, under stepping and locking the heel against the riser, structural failure, and unintentional use or being unaware of presence of steps (Monash University 2008).

Well contrasting, slip-resistant stair tread nosing strips, in conjunction with a compliant handrail at both sides, will greatly reduce these risks.

7.5 Refuge Areas

An area of refuge within a building can be known as a safe refuge, staging area, area of rescue assistance, refuge floor, refuge points, or an area of evacuation assistance and can include enclosed balcony areas or enclosed rooms (Proulx & Pineau 1996, Proulx 2002), but for the purposes of this guidebook they will be referred to as Refuge Areas.



Figure 26: Refuge Area Sign Example

7.5.1 Definition of a Refuge Area

In Australia, AS 3745-2010 defines an area of safe refuge as an area 'where occupants and visitors may wait for their delayed independent evacuation, or assisted evacuation by Emergency Services or other nominated personnel'. Internationally, there are differing definitions:

- In the IBC an area of refuge is defined as fire-rated spaces on levels above or below the exit discharge levels where people unable to use stairs can go to register a call for assistance and wait for evacuation.
- A better definition in terms of occupant safety has been provided in the now superseded British Standard BS 5588-8:1999:
area that is enclosed with fire-resistant construction (other than any part of it that is an external wall of the building) and separated directly by safe route to a storey exit, evacuation lift or final exit, thus constituting a temporary safe



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place for disabled people to await assistance for their evacuation

- In contrast, the ISO 21542:2011 definition also dictates that the refuge must be 'robustly and reliably protected from heat, smoke and flame during a fire' and that "*people can temporarily wait with confidence for further information, instructions, and/or rescue assistance.*" It also states that the path of travel to and from the refuge area must not encroach into the pathway down the fire escape stairway.
- British Standard BS 8300 (2009) says that a refuge is a place of 'relative' safety where people "*whose abilities or impairments might result in delayed evacuation can await assistance.*"

The IBC and ADA *Standards for Accessible Design* (2010) provide the opportunity to utilise an area of safe refuge as part of the accessible means of egress. In Australia, as there is no current requirement to provide an accessible egress route, the use of areas of safe refuge have been limited to buildings generally being the subject of a fire engineered solution.

7.5.2 Design of a Refuge Area

The use of a 'safe' refuge area is a concept that has mixed support. From an equity perspective, why should someone have to wait in a building being evacuated, while the building is on fire when others can reach safety? Who deemed the area to be 'safe' and what is an acceptable time to wait?

Those who oppose refuge areas support the 'everybody-out' approach with full evacuation for all occupants, which necessitates consideration of evacuation lifts in multi-storey buildings.

The acceptance of such a 'safe' area, therefore, needs the buy-in from building occupants who would use the refuge area and their willingness to accept and use a refuge during a fire (Proulx 2002).

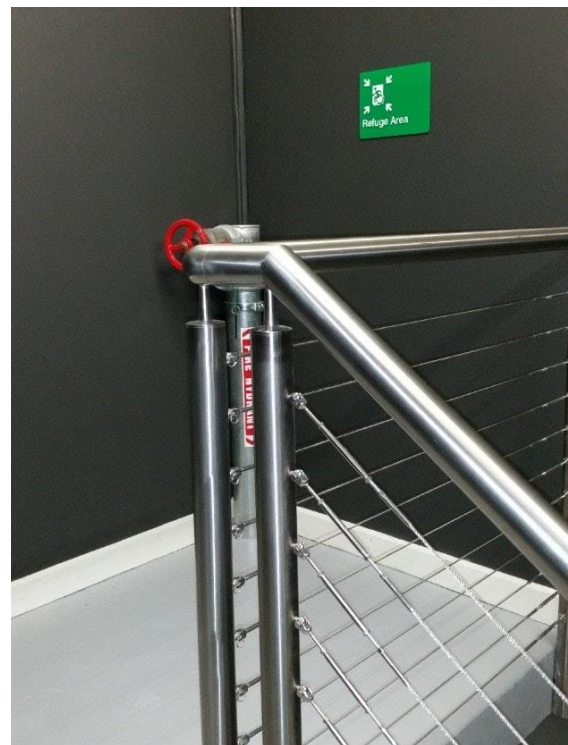


Figure 27: Photo of a Refuge Area Sign in an Apartment Building (in Australia)

The design aspects of the refuge area are crucial to this success and accessible exit signage, communications systems, information and location are critical considerations. Seating in larger refuges it also necessary for those that find standing for extended periods of time difficult.



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Cousins (2009) discusses the use of refuge areas and the minimum requirement within Britain for any safe refuge to comply with the safety criteria defined within the BS 5588.

To summarise the criteria under the now superseded BS 5588 and ISO 21542, a refuge area must be:

- Provided on every level of the building
- Include sufficient space for people using wheelchairs (with a minimum size of 900mm x 1400mm, though FEMA (1999b) recommends a minimum of 1.5 square metres and the International Building Code only 762mm x 1219mm (ICC 2009b))
- Have appropriate lighting and signage
- Constructed within fire resisting compartment and adjoin fire escape stairways
- Located on route to an exit or evacuation lift
- Fitted with an accessible, suitably located, reliable two-way communication system with a direct line to the building emergency control room.
- These provisions are generally replicated in the International Building Code (ICC 2009b).



Figure 28: Photo of the Omnicare Disabled Refuge System, by Baldwin Boxall

Additional recommendations from ISO 21542 include:

- Considered to be a suitable location for the storage of evacuation equipment, including a stairway evacuation chair, robust work gloves (for clearing evacuation paths for wheelchair users), manual fire alarm call point and smoke hoods.
- The communication system should facilitate communication with information in visual and audible formats for those occupants with a speech or hearing impairment.

These enhanced features of a refuge communication system are evident in the Figure above, showing a system by UK company Baldwin Boxall with an integrated hearing augmentation induction loop system. This unit also features tactile text in photo-luminescence colour, Braille text and a large button to activate the system.

Furthermore, The Northern Officer Group (1993) suggest that the refuge area could be a secondary protected area with direct access to the fire stairs. They also believe it is important to maintain a visual line of sight between the escape route, being the fire stairs and the waiting area.



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The 2003 NFPA Construction Code (cited in Communities and Local Government 2008) also requires illuminated exit signs on all doors leading to a refuge and illuminated exit signs with additional tactile signage at the area of refuge (signage is discussed in more detail in the 'Enhanced Exit Signage' section).

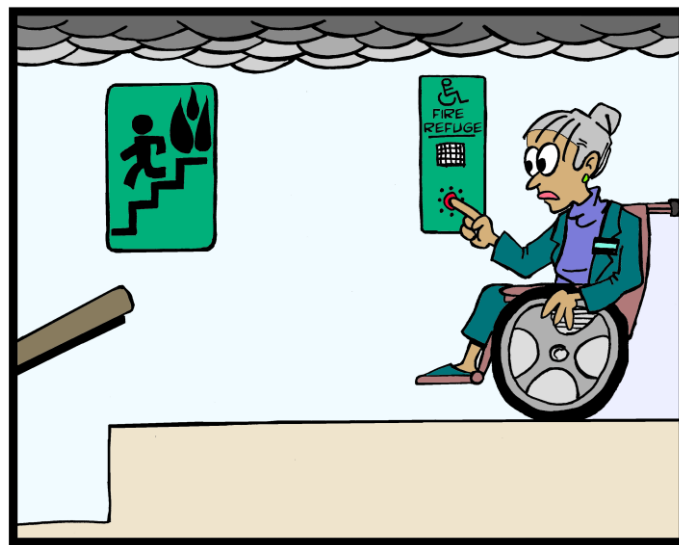


Figure 29: Refuge Area Communications Cartoon

However, as with the different definitions of a refuge area, there are also different fire resistance requirements for refuges across countries (Aberdeen Disability Advisory Group 2014).

7.5.3 Smoke Control in a Refuge Area

The effects of smoke and toxic fumes moving through the building can be disastrous and debilitating. The design of a Refuge Area as part of a fire engineered solution should consider the effects of smoke movement and the feasibility of using a smoke control system for the area (Klote 1993).

This could be associated with a fire-rated escape stairway or an emergency evacuation lift shaft. The design must address fluctuations in pressure due to opening and closing of doors, as well as any potential for broken windows and introduced wind pressures.

7.5.4 Intent and Effectiveness of Refuge Areas

There could be some confusion as to the intent of provision of safe refuges. As the IBC requires, they are to be provided when an accessible means of egress cannot be provided by way of an evacuation lift. In such cases, a person must await assistance, whether from a co-worker under a PEEP or from fire brigade intervention.



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Examples of a suitable safe refuge include a fire compartment such as a fire isolated lobby, corridor or stairway, or an open area such as a rooftop, balcony or the like if it is considered to be a suitable fire-protected room and has its own exit route. A refuge is only there to provide a barrier from the effects of the fire and passage of heat, flames and smoke whilst a person awaits assistance. A safe refuge should only ever be considered a holding or staging area for a relatively short period of time. They should never be considered areas where people with disabilities are left alone indefinitely until rescued by the fire brigade or until a fire is extinguished (Communities and Local Government 2008).

Being left behind whilst other building occupants evacuate via a fire isolated stairways must be highly stressful to any person with a mobility impairment that is forced to remain behind. Being able to wait within a well located, fire isolated safe refuge, and with a method of communication could alleviate some of the stress and anxiety of the situation, but in many buildings, a safe refuge may not be as safe as believed when not designed for that purpose.

There is also some apprehension in adopting this approach, with people with disability being considered *"packages to be plonked or parked to await the fire service"* and a need to address this moral issue by allowing people with disability the opportunity to decide for themselves whether they stay or evacuate (Alaouff, 2009). It's also acknowledged that some of this apprehension is due to an understanding by the building occupants as to how 'safe' the refuge area actually is. It's known that the New York firefighters ascending up the stairs during the September 11 attacks on the World Trade Center took over one hour to reach the 30th floor.

This, therefore, raises doubts as to how 'safe' a refuge area would be if the compartment was not fire-rated for an equivalent (or longer) period it would take firefighters to reach the area (Fuller 2008).

Many users of wheelchairs were expected to wait within the World Trade Center designated safe refuges to be rescued, but some broke the rules and escaped using evacuation chairs with the assistance from inexperienced helpers (Isaacson-Kailes 2002), while most of those who did what was expected and wait to be rescued actually died (Byzek & Gilmer, cited in Isaacson-Kailes 2002, Loy, Hirsh & Batiste 2006, Fuller 2008).

The incidents at U.S. and Canadian schools discussed previously highlights that the use of safe rooms and refuge areas within fire isolated stairways for people with disability to wait for assistance is not always effective.

It is important to acknowledge that a secondary benefit to the provision of a safe refuge on each level within a stairway is that it will provide a resting place for those people with limited endurance during an evacuation where a sustained effort is required.

A safe refuge serves an important purpose within a multi-storey building, especially as a contingency should an evacuation lift fail, but ultimately the effectiveness of a safe refuge is dependent on the features of the design, types of fire exposure, temperature conditions



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and the reliability and performance of the smoke control system (Communities and Local Government 2008). Whilst the effective use of a safe refuge is dependent on individual PEEP arrangements and building emergency management plans.

7.5.5 Refuge Area Two-Way Communication Systems

Communication within a safe refuge should be an essential part of the overall design of any safe refuge. Provision of an effective and reliable communications system would prevent situations such as the example of a lady who uses a wheelchair being left in a 17th floor safe refuge for 45 minutes with no communication, and this resulted in her crawling down the stairs to get to safety (McGuire, cited in Logli 2009).

Suitable forms of communications in an emergency include early warning and intercommunication / occupant warning systems, visual and tactile signals, telephones, two-way radios, paging systems, public address systems and the use of runners (AS 3745-2010, Clause 4.2.3.3).

JAN (2011) suggest that any communication system within a safe refuge area also be provided with a text phone (or 'TTY') or another similar system for people to send a written text message when they are not able to communicate verbally, as well as audible and visual indicators (ICC 2009a).



Figure 30: Photo of a Refuge Communication System, by Baldwin Boxall

The British Standard BS 5588 also required a communication system so that the occupant of any refuge area can independently communicate with fire officers and/or the facility managers whilst they wait for rescue. BS 5839 Part 9 dictates that all communication equipment must be mounted at an accessible height.

For effective communication, the volume of the alarm sounders should be reduced in refuge areas, and this would generally need to be documented as part of a fire engineered solution.

The British provisions are considered above and beyond any current BCA requirements, though the use of a two-way communication system within a place of safe refuge and a fire control centre (within a tall building over 25m in height) was proposed in the '*RD 97/01 Regulation Document*', though never implemented.



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7.5.6 Use of Refuge Areas in Australia

The use of areas of safe refuge had been proposed in the ABCB Regulation Document RD 97/10, but the ABCB has omitted the provision of safe refuges from any proposed amendments to BCA 2015. The rationale for the omission is on the basis that feedback received from the 'RD 97/01, Provisions for People with Disabilities' indicated that a more equitable egress solution, such as the use of evacuation lifts, is preferable (ABCB 2013b). The ABCB does, however, comment in the 2013 paper that the use of refuges may be considered in the future regulatory proposal, but not for BCA 2015.

The current view is to develop 'inclusive egress' solutions that provide an evacuation strategy for all occupants, rather than being 'exclusive', which require some occupants to wait in an area of safe refuge for firefighter assistance. This is consistent with the 'macro approach' presented by Proulx (2002), where evacuation solutions are considered for all occupants of a building,

Refuge areas may also be considered under an 'Alternative Solution' where those people with mobility restrictions can wait until they are safely evacuated. Wallace (2012) advised that refuge points have been incorporated into the design of many commercial buildings now and are vital for those people who may be unable to use stairways unassisted, whilst they wait to be safely evacuated. However, BS 9999 clearly specifies that refuge points (or areas) should only be used as temporary areas.

7.6 Refuge Floors

Refuge floors provide large numbers of building occupants a safe place to rest as they evacuate a building, or as they move to another fire stair within the building. Refuge floors are now commonplace in Asia, with Chinese building codes requiring a refuge floor on every 15th storey of a building (Vanney 2014), these areas are then serviced by evacuation lifts or exit stairs. Eureka Tower in Melbourne has two refuge levels with express lifts providing a means of egress from those levels.

Additionally, in combination with refuge floors, a number of buildings have sky bridges linking between neighbouring buildings. The most famous of these is the Petronas Twin Towers in Kuala Lumpur, Malaysia. The twin towers are linked by a bridge at the 41st and 42nd floors.



Figure 31: Tokyo City Sky Bridge Between Buildings



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Both refuge floors and sky bridges are very common in some countries, particularly in Hong Kong where refuge floors are required on all building exceeding 25 storeys, with at least 50% of the floor area available as a refuge area (Hong Kong Building Authority 1996).

7.7 Evacuation Exit Signage

Accessible exit signage should be provided to direct people to parts of an accessible means of egress, including Evacuation Lifts, refuge areas and exits. Signage in refuge areas, Evacuation Lifts and fire escape stairs should also include accessible signage directing people to evacuate the building as soon as possible, unless they are providing assistance to others. This signage should also provide directions for use of communication equipment and the availability of other alternate methods of evacuation, such as in escape stairs advising people of any Evacuation Lifts on the same floor (ICC 2009b).

7.7.1 Conventional Exit Signage

It has been found that only 38% of people register the presence of an emergency exit sign during an emergency (Galea 2012). Standard exit signage with a running man logo or the words "EXIT", whether illuminated or non-illuminated, may not provide assistance to a person with low vision during an emergency. If the person is unfamiliar with the building they may simply retrace their steps back towards their point of entrance via the accessway, which leads them into an unsafe area or an unprotected (i.e. non-fire rated) path of travel. Galea (2012) however surmises that signage will only effective is people can actually see them and register them.

Within Australia, the BCA has certain requirements for the provision of emergency lighting and exit signage above exit doors and directional exit signage to direct people to the exit. The BCA requirements at present could be seen as being less stringent than is required overseas, where exit doors and egress routes have additional mandated requirements, including other wayfinding provisions, tactile markings and exit signage and stair signage. Stair signage stating what level the person is on and how many levels of the buildings above or below the exit level they are on is of great benefit for people with vision impairment.

7.7.2 Enhanced Exit Signage

The needs for enhanced signage provision has been recognised by the ABCB and recent changes introduced to the BCA in 2013 have provided for accessible exit signage to be installed underneath each required exit sign. The BCA currently says that all 'required' exit doors have an accessible exit sign with tactile and Braille wording stating "Exit", and a description of the floor in which they are on (the ability to describe the level was an amendment to BCA 2015).



Figure 32: Exit Door Sign Example



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However, this has some reliance on occupants being somewhat familiar with the building, knowing of exit door locations, as well as knowing the levels of exit to a safe place outside the building. The BCA does not require tactile mapping or other wayfinding strategies to lead people to the exit doors. This predicament essentially mirrors the arrangements in Canada in 1995, which was highlighted as an issue 18 years ago (Proulx & Pineau 1996).



Figure 33: Photo of Directional Exit Floor Mounted Sign in China

Tactile, Braille and audible directional signage and tactile mapping with a workplace for employees that are blind or have low vision has been considered best practice and would also benefit all occupants if egress paths were smoke filled (JAN 2011).

When audible directional signage is also provided it allows a person with a hearing impairment to receive the transmitted messages on a portable receiver (FEMA 1995).

More recently, the use of '*intelligent dynamic signage*' has been proposed by Galea (2012) which include standard exit signs with flashing diodes dynamically pointing to the path of egress direction. This type of system is connected directly to the fire indicator panel and intelligent software provides real-time information by altering the exit signs to provide the best possible egress route. These dynamic signs can also be illuminated with flashing diodes to form a red cross indicating that the exit is not suitable for use.

The proposed changes to BCA 2015 (forming part of Option 1 in the RIS) included the requirement for a maximum distance of 6m between a lift or bank of lifts used as part of the evacuation strategy and a required exit (i.e. the fire-isolated stairway) (ABCB 2015). If this were to occur there are opportunities to provide enhanced signage and wayfinding strategies for a person that is blind or has low vision so they can elect to take the stairs rather than waiting to use an evacuation lift.

Furthermore, the BCA has also introduced the ability to use photo-luminescent exit signs in lieu of typical hard wired electrical exit signs as a 'Deemed-to-Satisfy' design solution (ABCB 2014c).

Adoption of an approach similar to that specified within ISO 16069 (Safety Signs – Safety way guidance systems) will undoubtedly improve the ease at which exit paths can be identified, as would the introduction of flashing diodes to help identify exit signs.

ISO 16069 considers such design factors as continuity, visual reinforcement, location, visibility and colour, and avoidance of confusion at decision points within the path of egress.



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The enhanced measures are discussed in greater detail under the 'Wayfinding' section of this document.

7.7.3 Accessible Exit Signage

Accessible exit signage showing the accessible means of egress must be considered by the ABCB in future editions of the BCA. This is an equitable and inclusive approach.

Any proposed changes to the BCA exit signage provisions must include directional accessible signage, directing occupants to the nearest required accessible means of egress as part of the evacuation strategy of the building. Fire engineers could consider this prior to adoption into the BCA as a best practice initiative and part of the fire engineered solution for the building. This could include an accessible means of egress via an evacuation lift, refuge, or accessible path of travel which includes ramps and other access provisions of AS 1428.1-2009. Examples of the proposed directional accessible exit signage developed for this purpose are shown below.



Figure 34: Existing 'Running Man' Exit Sign (Modified Tactile Design)

The incorporation of the international recognised 'Running Man' with the new proposed 'Accessible Means of Egress Icon' provides an inclusive view as to the evacuation of a building, where both people without disability and people with disability may safely travel to an exit.



Figure 35: Proposed 'Accessible Means of Egress Icon' Exit Sign



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Figure 36: Proposed 'Running Man' and 'Accessible Means of Egress Icon' Exit Sign

Note – Images appear under Licence from Egress Group Pty Ltd. The Accessible Mean of Egress Icon, Registered Designs 355564 & 355657, is © ® ™ Egress Group Pty Ltd 2016.

7.8 Wayfinding

The principles of wayfinding allow a person that is blind or has low vision to “*benefit from a well-designed environment that presents a predictable set of physical circumstances*” (AS/NZS 1428.4.1). At the moment in Australia, these principles have partly been implemented by way of the general AS 1428 suite of accessibility standards, but there are acknowledged gaps within these standards.

As a result, a new standard, Australian Standard ‘AS 1428.4.2 Design for access and mobility – Wayfinding’ is being developed to detail “*how to provide wayfinding solutions for people of all abilities*” (Standards Australia 2011). The standard will provide design solutions to enhance the current minimum BCA ‘Deemed-to-Satisfy’ provisions. It will be a matter of time until we can confirm if the needs of all people during an emergency evacuation of a building via designated egress routes have been considered within the new standard.

When it comes to the design of an accessible egress route to an exit it should be simple in design and non-confusing for occupants, particularly those who may be experiencing stress during an emergency and for those with reduced mental or cognitive abilities.

Exit doorways should be in contrasting colours with simple intuitive opening mechanisms. Ideally in bright colours for ease of identification (Davis, cited in the Security Director’s Report 2005).

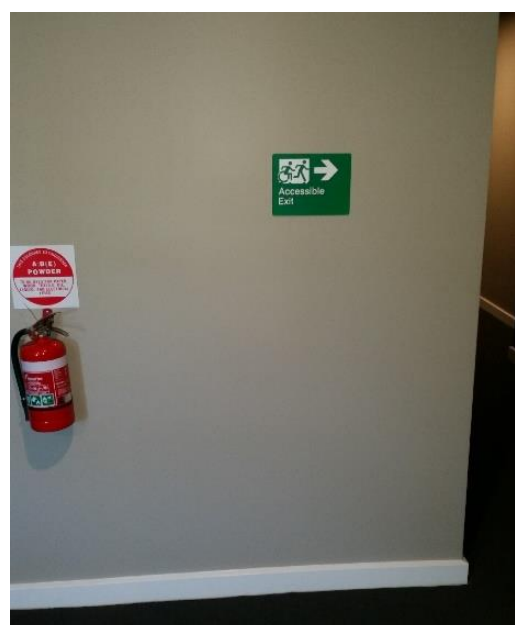


Figure 37: Photo of a Directional Accessible Exit Sign (Leading to a Refuge Area)



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Improving circulation and orientation with logical egress routes will not only benefit those occupants with vision impairment but all occupants (Fuller 2008). Evacuation routes should be clear to identify on emergency diagrams, without superfluous information to confuse occupants.

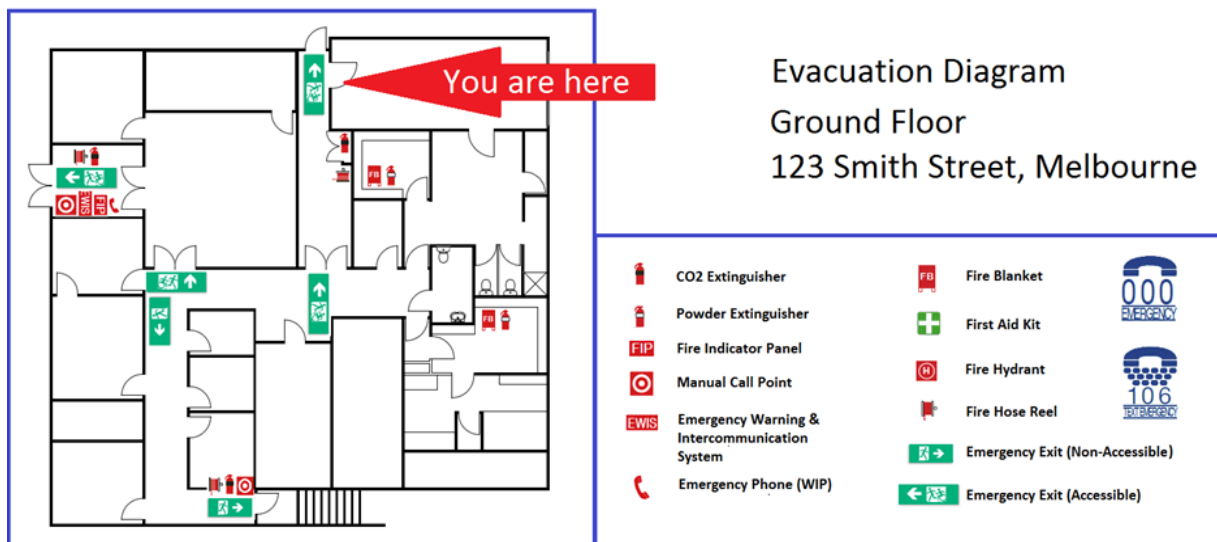


Figure 38: Example Emergency Evacuation Diagram

The best practice concepts of ISO 16069 should be considered when determining what can be provided to assist building occupants find a safe egress route and to increase the success of an evacuation.

ISO 16069 provides a uniform design specification for building occupants in all countries. Building occupants, firefighters and other emergency services authorities are then able to recognise a safe egress route and follow the directional information.

The approach adopts graphical information, including the use of the internationally accepted 'Running Man' exit sign, directional arrows, guidance lines on walls at a low level, exit stairway wall guidance lines, floor markings, door markings, hazard markings, handrail markings, contrasting stair nosing strips, door frame markings and door handle markings. The use of photo-luminescence markings and colour contrast forms a critical part of the standard, and adoption of these enhanced provisions will "*considerably aid someone with reduced visions*" (Phythian (2013)).

The addition of the proposed accessible exit signs outlined above could further enhance the wayfinding strategies within the standard to include the accessible means of egress (i.e. for those using a mobility aid or those with difficulty negotiating stairs). It could also identify a non-accessible route that has no provisions for egress for people with mobility restrictions using the existing exit sign design.



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Implementation of enhanced wayfinding strategies, including photo-luminescence markings and the use of the 'accessible exit sign' would help identify the path of travel to an exit door when an exit sign is not visible.

It has been known for some time that smoke development within a fire compartment, or corridor or the like will eventually cause any exit sign installed above an exit door to be non-visible as the smoke builds up (Rutherford & Withington 1998). Extension of the use of photo-luminescence wayfinding markings into the fire escape stairways will also assist people to identify stair edges, handrails and walls. During the evacuation of the World Trade Center towers in 1993 people using the stairs opened fire doors bounding the stair compartment to let light into the space, but inadvertently allowed smoke to enter the stairs (Pauls 1994).

Technology in new materials is advancing at an incredible rate, and we now also have the ability to provide dynamic wayfinding information through LED systems embedded directly into floor coverings or within exit sign light fittings for emergency purposes. Dutch carpet company Desso has worked with Philips to create a 'digital carpet' called Luminous Carpets™.

This floor covering utilises LED lights laid beneath the carpet with a specially designed translucent subsurface. The LED lights can then be pre-programmed to display electronic messages, wayfinding symbols or dynamically updated during emergencies to inform people of evacuation information or to an alternate exit route, in real time. Similar opportunities exist in the use of digital signage to provide wayfinding information (Sourceable 2016).

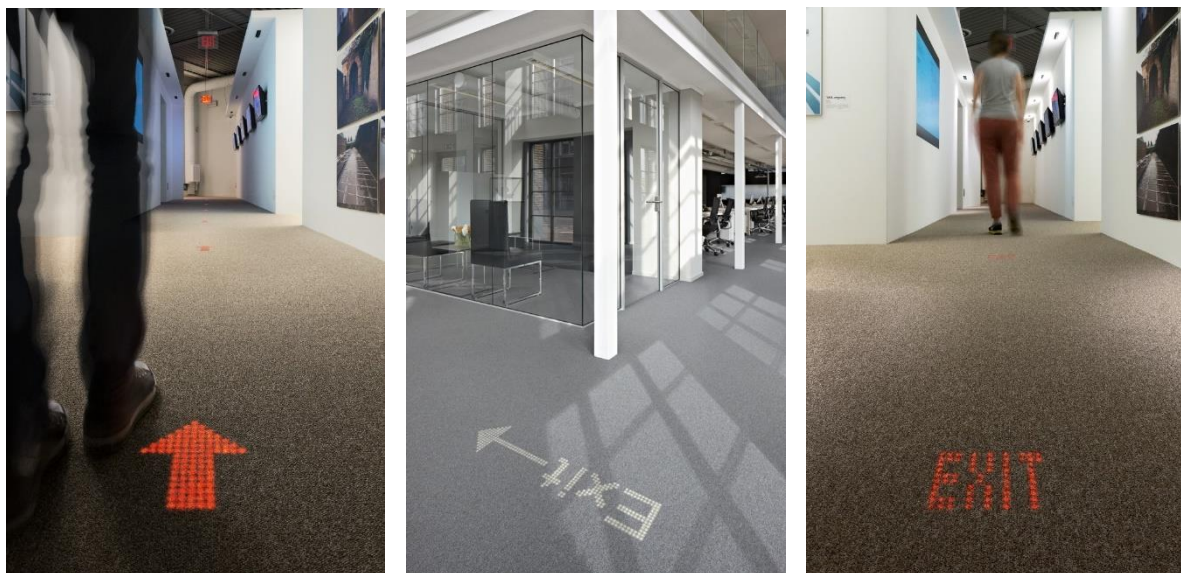


Figure 39: Photos of the Philips and Desso Luminous Carpets™ System



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7.9 Torches

There have been reports of lights going out in fire escape stairs and this makes it obviously difficult to negotiate a stairway, unless photo-luminescence markings are provided, but also impossible for people with a hearing impairment or those that are deaf to communicate. Provision of flashlights as part of a PEEP or GEEP could provide the necessary light for a person to lip-read or use sign language (Gerber, Norwood & Zakour, cited in Norwood 2011).

7.10 Door Force Restrictions on Smoke and Exit Doors

To improve the level of accessibility in egress paths the proposed changes to BCA 2015 included provisions for all exit doors to comply with the current access provisions relating to doors within a path of travel (ABCB 2013b).

This would include accessible door controls, and would assume to include a reduced force to open each exit door. This is not generally practical in a building with smoke and fire doors providing an essential component of a building's fire safety integrity.

At the moment, in areas of general access such doors are exempt from the requirement to meet a 20N door force (Standards Australia 2009a).

The same approach has been adopted in the International Building Code (ICC 2009) with general doors limited to a door force of 22N of force with fire doors exempt.

This would then require some level of human intervention under a PEEP or GEEP arrangement to assist any building occupant who had limited strength, dexterity or ability to open a doorway with a door force greater than 20N of force.



Figure 40: Photo of an Accessible Exit Sign (Installed on a Fire Door)



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7.11 Accessible Exit Door Circulation Spaces

As discussed in the last section, the proposed changes to BCA 2015 sought to improve the level of accessibility in exit doors on egress paths. This would also include accessible door controls, door widths and circulation spaces for wheelchair users around all exit doors. Additionally, all exit doors would then need to discharge to accessible ramps when there is a change of level, whereas the current provisions accept a stairway outside an exit door (ABCB 2015).

In practical terms, the use of an accessible exit door would benefit everyone and would assist with independent egress. This is, of course, assuming that the person had sufficient strength to open any fire or smoke doors as discussed above. This is important for those employees working back in the office after hours on their own, which FEMA (1995) believe is the most dangerous time as most office fatalities occur in fires outside normal hours.

Alternative arrangements to off-set the door force and circulation space restrictions could include ensuring a Floor Warden to assist by opening and closing the door as required. This would need to be adopted into any PEEP / GEEP arrangements.



Figure 41: Accessible Exit Door Cartoon



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7.12 Visual and Luminance Contrast of Exit Doors

Further improvements to the level of accessibility in exit doors under the proposed changes to BCA 2015 included applying the same requirement for a luminance contrast of doors in accessible parts of the building (ABCB 2013b). This would assist those people with low vision to identify an exit door, who may miss other visual cues (such as an exit sign over the doorway).

A recommended approach to satisfying the requirement for contrasting exit doors that visually stand out from their background is the adoption of a colour coding approach to identify exit doors. This approach has been known to assist those occupants with a cognitive impairment (JAN 2011), particularly when colour coding egress routes with a consistent approach (Scottish Government 2007).

A best practice option would be to also provide photo-luminescent door frame markings on the latch-side of any exit door, photo-luminescent door handle markers to help identify the 'D' lever exit door handle and photo-luminescent strips on any push-bars on exit doors.

7.13 Security Cameras

Security cameras positioned within egress paths can provide the building Emergency Control Organisation the opportunity to view the movement of building occupants during an evacuation. Pauls (2002) even commented that this had been a proposal for changes to NFPA building codes but had been rejected. None the less, it provides a great opportunity to monitor evacuation of a building, collect data and for lessons to be learnt.

By providing video monitoring systems in egress paths, stairways can be monitored in real time and the flow of building occupants moving through the stairways can be redirecting to other stairways if blockages and delays (for reasons discussed in previous sections) are experienced (Bukowski 2008). Consideration should, therefore, be given to their provision in larger complex buildings, particular those over 25 metres in height and with a fire control room.

7.14 Digital Displays

Rapid advances are being made in digital signage around the world. People are used to seeing and interacting with digital signs, often with touch screen capabilities, in shopping centres and other large public spaces. When not being used for information, these signs have the capability to display other visual information, usually for advertising.

These signs offer great potential to be repurposed during emergencies to display other information that can quickly over-write previous advertising. Digital signage has been described as one of the *"most highly effective visual tools for use in emergency response*



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because the important message gets delivered quickly, via a highly visible medium” (Mvix 2016). Display location boards, advertising signs, or television screen displayed in already prominent locations in public spaces offer an effective method of complementing any existing emergency planning and evacuation procedures.

Mvix, specialists in digital signage have also stated that “Emergency digital signage systems not only offer some of the most tangible benefits in delivering what could be the most timely life-saving messages, but these digital messaging displays can also be pre-programmed with special content that only activates in real-time when an emergency is taking place.”

They add that digital information combined with special software offers a highly flexible solution to deliver real-time information during an emergency. It is not unfeasible to expect that in the near future this information could be pre-recorded, held on a computer system and linked directly to a fire protection system with evacuation modelling software. Such a system could provide emergency information and interact with exit signage to dynamically direct people out of the public space under various scenarios, dependent on the place of origin of the emergency.



Figure 42: Photo of Shopping Centre Digital Signs

The drawback with such a system is they are based on visual information, so any information provided in a visual manner must be reinforced with an audible equivalent, or providing written captions (also referred to as same language subtitles) which explain the scenario and emergency procedures.

Digital signage offers some potential for use by people with low vision, or for the Blind community, but the technology is new and emerging, but has great potential to interact and communicate to smartphone apps that could:



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- scan QR codes to download evacuation directions
- receive GPS location information
- communicate with a network of Bluetooth beacons strategically places around a public space
- convert this information relayed to their smartphone to the spoken word

It is not the inability to walk that keeps a person from entering a building by themselves, but the stairs that are inaccessible that keeps a wheelchair-user from entering that building

(People with Disability Australia 2014b)



Section 8. Emergency Occupant Warning System Considerations

8.1. Locations of Manual Call Points (or 'Break Glass' Alarms)

AS 1670.1-2004 requires that manual call points, or 'break glass' alarms, be located in a *"clearly visible and readily accessible location"*, yet the standard does not reference AS 1428.1-2009. In terms of mounting locations, as the time of writing, Clause 4.3.3 of the Draft AS 1670.4-2015 states that *"emergency call points shall be mounted between 750 mm and 1300 mm above floor level and have a clear space of 600 mm in a semi-circle in front of the emergency call point."*

However, best practice would dictate that any specification for any building's fire detection and alarm system includes reference to ensuring the manual call point locations comply, in that they are located 900-1100mm above the finished floor level and more than 500mm from any internal corner.

8.2. Building Occupant Warning Systems

Building Occupant Warning Systems are known as Mass Notification Systems in the U.S. This is a term used in the ADA and can best be described as how to get the public, including those covered by disability discrimination laws out of a building quickly and safely (Fire Safety Engineering 2005a). A mass notification system must have the ability to transmit a human voice that can provide specific messages to the occupants of the building, dependent on the emergency situation at hand (Moore, 2010).

In Australia, the terms commonly used are a Sound Systems and Intercom Systems for Emergency Purposes (**SSIS**), Emergency Warning and Intercommunication Systems (**EWIS**) and Occupant Warning Systems (**OWS**). These systems, when required within a building have the ability to provide a verbal address to one or more areas of the building via a public address system and to communicate to multiple Fire Wardens within the building using the Warden Intercommunication Points (the emergency red phones or **WIPs**).

There is also the ability to interconnect these systems into a hearing augmentation system, whereby a person with a hearing impairment could turn on their 'T' switch to receive amplified communications. There is a provision within AS 1428.5 which states that an Audio



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Frequency Induction Loop System (**AFILS**) system must be ‘fully adaptable’ to an EWIS system. This is, however, an obscure unknown reference, being a non-mandatory standard and not being referenced in the BCA. This would be considered a best practice option for any building using an OWS/EWIS/SSIS.

8.3. Audible Alarms

It has been argued that people respond better to an alarm system that advises the occupants of the evacuation and need to vacate the building using instructions communicated by voice, rather than having to decipher different alarm tones (Engineering Systems July 2006). Standard audible alarms generally only used in some Australian commercial buildings provide this ability when used in conjunction with an Occupant Warning System.

Nevertheless, these will be of little benefit for a person who has a profound hearing loss or is deaf. For these reasons, Logli (2009) suggests the best methods of alerting building occupants to the need to evacuate would include a combination of audible alarms and other visual / sensory cues to alert those vision and hearing impaired occupants.

8.4. Exit Point Sounders

The provision of exit sounders (otherwise known as an egress beacon) at building exits can help guide all building occupants, including those with a vision impairment, to the nearest exit during periods of low visibility, or smoke conditions caused by fire (David, cited in the Security Director’s Report 2005, ISO 2011). The sounders generally emit a range of sounds covering virtually the full audible spectrum making them suitable for people with sight or hearing impairments (Fire Safety Guidelines February 2005). They have been successfully in situations where conventional exit signage has been replaced with a fire engineered solution, including the use of multi-frequency sounders to guide occupants to the nearest exit (Fire Safety Guidelines January 2005).

Rutherford & Withington identified the need for additional considerations for identification of exits and the potential use of exit point sounders in their paper in 1998. In this paper, they discussed the effectiveness of conventional exit signs in a compartment with smoke development eventually causing the exit sign to be covered by smoke and suggest that exit point sounders be provided to help people that are blind or have low vision or those with reduced vision during the identify the exit location.

The tests undertaken in their research found that exit point sounders could prove effective, although conventional sounders placed over exit doors “*would be impossible*” to locate without consideration to ‘the science behind sound localization’ and the frequencies of the sounders, which can help to communicate the egress route to people making their way to a safe place.



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8.5. Visual Warning Devices

Visual alarms or visual warning devices (**VSD**) such as flashing lights have been used for many years in environments where there is a high level of noise such as in buildings with an industrial use. With the introduction of disability discrimination laws in many countries, the adoption of this fire safety provision for the use of people with disabilities is now common place (Fire Safety Engineering 2005a & 2005b, British Standards 2009, ICC 2009a, Department of Justice 2002). The use of visual notification information can be used to complement any mass notification system (Moore, 2003).

Suggested measures include flashing alarms (Management Services November 2004) or strobe lights (California Employment Law, March 2011) throughout a building in visible locations. The Fire Safety Engineering magazine discussed this back in 2005 and predicted a growing use of visual alarms but also questioned a standard approach for their use, including quantity, brightness and colour. Mandelblit (2004) also suggested visual alarms in the form of strobe annunciation ‘as a natural solution’, but the ADA Accessibility Guidelines (2012) restricts this to five flashes per seconds as certain visual alarms have the potential to trigger a fit in people who have photosensitive epilepsy (Aberdeen Disability Advisory Group 2014).

When considering the locations of visual alarms, they should be provided in areas where people will be alone (i.e. accessible sanitary compartments, washrooms, other isolated areas, such as meeting rooms), or in noisy environments such as industrial areas, amusement arcades, nightclubs etc.) (ISO 2011, Proulx & Pineau 1996).

This requirement has not yet been adopted into the BCA – other than for Public Transport Buildings under the Part H2.14(a), which has been referenced as a requirement from the *Disability Standards for Accessible Public Transport 2002 (DSAPT)*. The DSAPT states “*provision must be made for people with vision impairment to locate the exit path in an emergency*” and visual alarms are required under Section 18.2.3 of AS 1428.2-1993 restricting the flashing frequency to 1 Hz and to comply with AS 2220.1-1989 (since superseded by AS 1670). AS 2220.1-1989 and AS 1670.1-2004 required visual alarms to be installed in areas with “*high ambient noise levels or in areas where audible signals are inappropriate*” (above 95dB).

BCA Clause H2.14(a) also references the requirements for general warning systems (Section 18.2.1) and audible alarms (Section 18.2.2). BCA H2.14(b) reinforces the DSAPT requirements for people with vision impairment by stating “*in the event of an emergency, provision must be made for people with vision impairment to locate the exit path in an emergency.*”

That being said, an Australian Standard has been developed that has yet to be adopted into the BCA – ‘AS 1603.11-2010, *Automatic fire detection and alarm systems - Visual warning devices*’. AS 1603.11-2010 states the intended use of a VWD is to:



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provide a visual warning to hearing-impaired persons, persons employed in high ambient noise environments, and environments such as hospital wards where aural alarms could have adverse effects, or as an instructional reinforcement to aural alarms.

The enhanced measures proposed for the 2015 version of the BCA included changes to the current ‘smoke detection and alarm systems’ provisions within all buildings. The current provisions have an emphasis on the use of sounders to alert building occupants, which have been acknowledged as not being appropriate for those occupants who are deaf or have a hearing impairment. The relevant sections of the BCA must be changed to provide ‘smoke detection and warning systems’ with an emphasis on visual alarms in common areas and in accommodation buildings in accordance with AS 1603.11-2010, with a flashing frequency of 1 Hz to 3 Hz (though FEMA 199c accepts up to 5Hz in the U.S.). However, as discussed in Section 1.11 this extra safety measure was not adopted into the BCA.

8.6. Visual Notification Information

To complement any audible alarm system, the use of alternate methods is desired. This could be in the form of scrolling signboards, television screens, computer monitors, pagers and mobile phones (Moore 2003). The use of mobile phones, computer screens and pagers are discussed in more detail in the next sections. Moore describes this as the “*only truly viable way to provide content rich information and instructions to the hearing impaired.*”

When using a display screen to communicate emergency information, whether on TV screens or computer monitors the information provided must be in the best format for people to read. This includes such considerations as background colours, text colours, overhead lighting, the speed at which the text scrolls or moves and the complexity of the language used. To ensure that any people with intellectual disability or cognitive disability are able to read the text it should be in easy read language. If a programmable message type VWD is selected as part of the emergency evacuation strategy, then AS 1603.11-2010 Section 2.4 provides guidance in this area, including lighting levels, luminance contrast levels and flashing rates.

8.7. Vibrating Devices

Vibrating devices should be considered for those with hearing impairments (California Employment Law 2011, JAN 2011, Aberdeen Disability Advisory Group 2014, British Standards 2009).

This is an area that has been somewhat overlooked within Australian and international building codes and standards. It is of particular relevance where there is the potential for occupants who have a hearing impairment to be accommodated overnight or when visiting



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or working in areas where other forms of warning may not be effective. However, this was also identified as a potential amendment to the 2015 version of the BCA which proposed tactile warning systems in accommodation buildings. This low-cost initiative would have been a very positive step to providing a safer sleeping environment for members of the Deaf community.

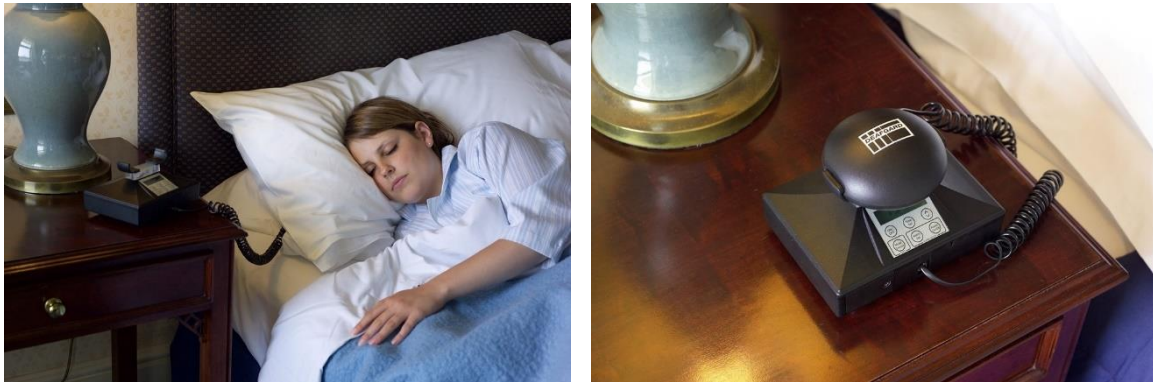


Figure 43: Photos of the Deafgard Vibrating Pillow Alarm

The use of vibrating pagers and vibrating pillows would prove an effective solution to enhance existing occupant warning systems for people with a hearing impairment (Management Services November 2004, FEMA 1999b). An example is shown above, the Deafgard from Fireco in the UK is a portable device which alerts people in an emergency. It has been designed for the Deaf and hard of hearing, and has a vibration pad and flashing light which wakes people up to the sound of the alarm. The vibration pad is placed underneath a pillow or mattress and when a building alarm sounds it activates the pad which vibrates, powerful lights on the Deafgard unit then flash and the screen displays “**FIRE**” (Fireco 2016).

8.8. Mobile Phone and Pagers

As discussed in the previous section, a vibrating pager system can be an effective form of communication within any building. Such systems have already proved an effective method of communicating in many buildings, including the U.S. Library of Congress for those people who are limited in their ability to respond to available alarm cues (Office of Compliance 2008). The system is managed by the Police Communications Centre which sends a message to evacuate and then sends a second message when it is safe to return back into the building. A similar approach was implemented into the Public Works and Government Services Canada building in the early 1990’s (Proulx & Pineau 1996). FEMA also provides evidence in their 1995 guidelines that the use of vibrating pagers has been commonplace in many government buildings in the U.S for many years now.

The use of radio pagers that receive text messages has also been used as part of facility evacuation procedures (EMS Group 2006).



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More recently mobile phones have been used to alert people to an emergency using short text messages sent to a subscriber's mobile phone. RMIT University in Victoria has successfully developed an Emergency SMS system that can send a 160-character text message instantly to all students who have entered a valid mobile phone number into their University records (2014).

On a significantly larger scale, the country of Japan operates an earthquake and tsunami warning system which provides an early warning of seismic activity via television, internet and text messages (MIT Technology Review 2011). The system now sees "*mobile phone alarms ringing seconds before buildings even begin to shake*" (The Telegraph 2013). These types of systems provide great opportunity to get concise messages out to the masses quickly and efficient.

8.9. Network Computer Solutions

Logli (2009) and Wallace (2012) suggest using more high-tech mechanisms including a computer networked based 'Emergency Notification System'. This concept was also identified in 2004 by Mandelblit as a possible solution in the form of pop-up email warning displays on network computers and handheld devices, which in today's terms would include smartphone devices and tablet PC's.

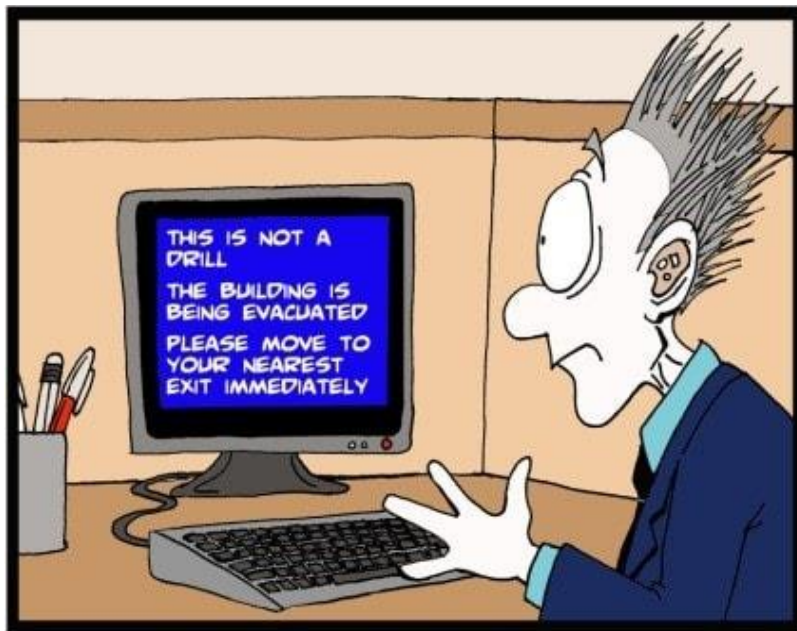


Figure 44: 'Computer Screen Displaying Emergency Evacuation Message' Cartoon

NIST (cited in Moore 2003) extend this concept to including flashing computer screens to act as an 'obstructive alert'. This must then be followed by additional information. NIST also suggest that the principles of good information include 5 main factors: content, style, channel, frequency, and source.



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8.10. General Accommodations

Some general accommodations can be made to improve the level of safety during an evacuation. Jan (2011) include providing writing instruments, communication systems, respirator masks, work gloves to protect hands when pushing a wheelchair through debris on a path to an exit in the egress path. Furthermore, good housekeeping is recommended to remove physical barriers such as boxes, furniture or the like from egress routes.

People with disabilities are entitled to the same level of protection in an emergency as everyone else – no more, no less

(FEMA 2002)



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Section 9. Universal Design

The following Section has been reproduced from the White Paper ‘*Universal Design Meets the Exit Sign*’. A free copy of the White Paper can be downloaded from www.universaldesignmeetstheexit.com.

9.1. What is Universal Design?

Universal design is a design movement that is steadily growing as awareness increases.

At the end of the 20th century, the world is very different than 100 years ago. People are living longer and surviving better. Potential consumers of design who may be functionally limited by age or disability are increasing at a dramatic rate. These populations are no longer an insignificant or silent minority.

The current generation of children, baby boomers entering middle age, older adults, people with disabilities, and individuals inconvenienced by circumstance, constitute a market majority. All of these constituencies and indeed, all consumers, deserve to be recognized and respected. Facilities, devices, services, and programs must be designed to serve an increasingly diverse clientele.

The demographic, legislative, economic, and social changes that brought us to this point are increasing the momentum that will propel us into a 21st century that will need to be more accommodating of individual differences. Universal design provides a blueprint for maximum inclusion of all people (Universal Design History 2015a).

This section provides a definition of universal design, considers its reference in the UN Convention on the Rights of Persons with Disabilities and provides an overview of the development of the universal design movement. The 7 Principles of Universal Design are also presented and discussed in terms of building evacuations.

9.2. Universal Design: A Definition

Universal design has been described by the late Ron Mace, one of the founders of the universal design movement as “*the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design*” (Universal Design History 2015b).



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9.3. Universal Design in the UN Convention

In 2006, the UN Convention on the Rights of Persons with Disabilities was adopted by the UN General Assembly.

The convention has since been ratified by France, Germany, UK, New Zealand, Australia, Canada and many other countries (United Nations 2015a).

The convention aims to *“promote, protect and ensure the full and equal enjoyment of all human rights by persons with disabilities.”*

Universal Design has also been defined in the Convention on the Rights of Persons with Disabilities:

“Universal design” means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. “Universal design” shall not exclude assistive devices for particular groups of persons with disabilities where this is needed (United Nations 2015c).

9.4. Universal Design Movement

The United States Civil Rights Movement began in the 1960s, which subsequently inspired the Disability Rights Movement which continues to influence legislation throughout the 1970s, 1980s, and 1990s. These new laws prohibited discrimination against people with disabilities and provided access to education, places of public accommodation, telecommunications, and transportation (Universal Design History 2015a).

Similarly, the barrier-free movement started in the United States in the 1950s and commenced a process of change in public policies and design practices in response to demands by veterans with disability and advocates for people with disabilities. At this time, physical barriers in the environment were recognised as a significant hindrance to people with mobility impairments.

9.5. The 7 Principles of Universal Design

The 7 Principles of Universal Design were developed in 1997 by a working group in the North Carolina State University. The group was led by Ron Mace and consisted of architects, product designers, engineers and environmental design researchers. The purpose of the Principles is to *“guide the design of environments, products and communications.”*

The Center for Universal Design (CUD) was then formed by the North Carolina State University to provide national information, technical assistance, and a research centre formed to evaluate, develop, and promote accessibility and universal design in the built



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environment and in products. The Center states that their mission “*is to improve environments and products through design innovation, research, education and design assistance.*”

The 7 Principles are:

- Principle 1: Equitable Use
- Principle 2: Flexibility in Use
- Principle 3: Simple and Intuitive Use
- Principle 4: Perceptible Information
- Principle 5: Tolerance for Error
- Principle 6: Low Physical Effort
- Principle 7: Size and Space for Approach and Use

A note from The Center for Universal Design at North Carolina State University:

The 7 Principles are reproduced below to establish a context with the intent of this paper. It must be noted that the Principles of Universal Design were conceived and developed by The Center for Universal Design at North Carolina State University.

Use and application of the Principles in any form by an individual or organization is separate and distinct from the Principles and does not constitute or imply acceptance or endorsement by The Center for Universal Design of the use or application. The Principles are Copyright ©1997 NC State University, The Center for Universal Design.

The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. These seven principles may be applied to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments.

The Principles of Universal Design are presented here, in the following format: name of the principle, intended to be a concise and easily remembered statement of the key concept embodied in the principle; definition of the principle, a brief description of the principle's primary directive for design; and guidelines, a list of the key elements that should be present in a design which adheres to the principle. (Note: all guidelines may not be relevant to all designs).

9.5.1 PRINCIPLE ONE: Equitable Use

The design is useful and marketable to people with diverse abilities.

Guidelines:

- 1a. Provide the same means of use for all users: identical whenever possible;



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equivalent when not.

- 1b. Avoid segregating or stigmatising any users.
- 1c. Provisions for privacy, security, and safety should be equally available to all users.
- 1d. Make the design appealing to all users.

9.5.2 PRINCIPLE TWO: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Guidelines:

- 2a. Provide choice in methods of use.
- 2b. Accommodate right- or left-handed access and use.
- 2c. Facilitate the user's accuracy and precision.
- 2d. Provide adaptability to the user's pace.

9.5.3 PRINCIPLE THREE: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Guidelines:

- 3a. Eliminate unnecessary complexity.
- 3b. Be consistent with user expectations and intuition.
- 3c. Accommodate a wide range of literacy and language skills.
- 3d. Arrange information consistent with its importance.
- 3e. Provide effective prompting and feedback during and after task completion.

9.5.4 PRINCIPLE FOUR: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Guidelines:

- 4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- 4b. Provide adequate contrast between essential information and its surroundings.
- 4c. Maximize 'legibility' of essential information.
- 4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- 4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.



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9.5.5 PRINCIPLE FIVE: Tolerance for Error

The design minimises hazards and the adverse consequences of accidental or unintended actions.

Guidelines:

- 5a. Arrange elements to minimise hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- 5b. Provide warnings of hazards and errors.
- 5c. Provide fail safe features.
- 5d. Discourage unconscious action in tasks that require vigilance.

9.5.6 PRINCIPLE SIX: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:

- 6a. Allow the user to maintain a neutral body position.
- 6b. Use reasonable operating forces.
- 6c. Minimize repetitive actions.
- 6d. Minimize sustained physical effort.

9.5.7 PRINCIPLE SEVEN: Size and Space for Approach and Use

Appropriate size and space are provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Guidelines:

- 7a. Provide a clear line of sight to important elements for any seated or standing user.
- 7b. Make reach to all components comfortable for any seated or standing user.
- 7c. Accommodate variations in hand and grip size.
- 7d. Provide adequate space for the use of assistive devices or personal assistance.

9.5.8 7 Principles and Universally Usable Design

Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability.

Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.



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9.6 Universal Design: Not a Synonym for Compliance

According to the Centre for Excellence in Universal Design in Ireland, the term Universal Design has been used incorrectly as a synonym for compliance with accessibility design standards (National Disability Authority 2015).

They argue the two areas differ greatly, whereas equal rights and disability legislation prohibit discrimination on the basis of disability, accessibility design standards provide a minimum level of compliance with applicable legislation.

They raise two key factors when considering Universal Design:

- It is not just applicable to the needs of people with disabilities, but everyone, regardless of their age, size, ability or disability.
- Universal Design is not a list of specifications, but an approach to design that considers the varied abilities of users.

In terms of universal design and evacuation planning, there are a number of measures that can be implemented to ensure a building is safe for all occupants, not only when the building is being used in its normal state, but when there is an emergency and a need for evacuation.

9.7 Universal Design and Building Evacuations

A critical factor to the success of meeting the objectives of the convention is by adopting universal design principles.

When we consider the needs of people during an emergency in any form of transportation, facility or building, universal design must be considered. During an evacuation, the anatomy of a building changes, alarms are activated, passenger lifts cannot generally be used and people use egress paths that may differ from their normal path into the building.

For these reasons, designing a universally accessible means of egress into the building at an early concept stage is the best approach. This approach must consider universal design concepts.

9.8 Universal Design Meets the Exit Sign

9.8.1 A Truly Universal Design

The Accessible Exit Sign Project changes this approach and provides the opportunity to present a fully inclusive design of exit signage, which adopts the principles of universal design discussed in the Universal Design section in Part 3 of this paper.



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The use of the 'Accessible Means of Egress Icon' within signage strategies provides a clear, pictorial message for occupants, to identify those exits that are accessible, and those which are not accessible.

9.8.2 The Problem with Existing Exit Signs

Undoubtedly existing exit signs in use around the world do not provide for all occupants.



Figure 45: Photo of a Typical Japanese Style Running Man Exit Sign

They are not consistent across nations, they do not always provide Braille and tactile information, and generally fail to consider people with disability and their needs. One must, therefore, ask if we are currently considering the Principles of Universal Design in terms of emergency egress / exit signs in all buildings, facilities, modes of transport and the like.

There are 7 Principles of Universal Design. At least 5 of them are applicable to exit signs.

9.8.3 Equitable Use of Exit Signs

The use of the 'Accessible Means of Egress Icon' considers the first Principle of Universal Design. When the Icon is used on exit signs and other emergency signs used to identify the accessible means of egress it provides the same means of use for all users.



Figure 46: Photo of Inclusive Design Exit Sign



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Everyone has access to identical information and everyone knows what exit they may use and what path to take. The design of The Accessible Exit Sign Project type signs avoids segregating or stigmatising any users by causing people with disability to be unsure of their egress path.

When the Icon is used for example on a single storey building then there is no reason why all exit signs could not incorporate the Icon and all exits could not be accessible. When this occurs there is no segregation, all signs would incorporate the Icon and everyone could use the nearest exit.

The Accessible Exit Sign Project signs provide for a safer building and the design would be appealing to most building occupants, particularly those with young children pushing prams, the elderly, the young, even delivery people needing a level or ramped entrance/exit.

9.8.4 Simple and Intuitive Use

The use of the 'Accessible Means of Egress Icon' considers the third Principle of Universal Design, in that the designs are consistent with user expectations and intuition, accommodate a wide range of literacy and language skills and present evacuation information in a consistent way.

9.8.5 Perceptible Information

The use of the 'Accessible Means of Egress Icon' considers the fourth Principle of Universal Design. The design provides adequate contrast between essential information and its surroundings and when used on accessible wall signage can provide different modes (pictorial and tactile) for clear presentation of essential information. When installed part of a holistic wayfinding strategy its use can also differentiate non-accessible and accessible elements with easy to understand information.

9.8.6 Tolerance of Error

The use of the 'Accessible Means of Egress Icon' considers the fifth Principle of Universal Design by removing the risk of poor decision making and sending a person with mobility limitations to an exit path or exit door that they cannot negotiate their way through. By directing people to a suitable accessible exit, and where possible, this should always be the case, it removes the potential for people to be put into an unsafe situation.

9.8.7 Size and Space for Approach and Use

The use of the 'Accessible Means of Egress Icon' considers the seventh Principle of Universal Design by providing the ability, as part of a holistic wayfinding strategy to provide signage at an accessible height for all people to see, feel, and read tactile and Braille information. As



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stated earlier in this paper its been found that only 38% of people register the presence of an emergency exit sign during an emergency and that standard exit signage with a running man logo or the words “EXIT”, whether illuminated or non-illuminated, may not provide assistance to a person with low vision during an emergency. Providing mid-level exit signs at an accessible height range could help address this issue. It would also allow people to become accustomed to their environment.

History has shown that planning for emergency evacuation dramatically increases the chance for successful evacuation

(Loy, Hirsh & Batiste 2006)



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Section 10. Conclusions

I strongly believe that a large proportion of Australian workplaces do not fully consider the needs of people with disability within their employer's emergency management plans. I believe there is a need to provide greater guidance to industry and the disability sector to protect the safety of those persons with a disability whilst in their workplaces and when visiting public buildings.

Likewise, there is a risk for any visitor to a building, particularly those using a passenger lift to visit a level of the building other than one provided a horizontal evacuation route, that they may be left on that level whilst everybody else evacuates. The current legislative environment doesn't do enough to protect such situations and it could be argued that people with disability are exposed to great risk every time they enter a multi-storey building.

Isaacson-Kailes (2002) recommends all people with disability be assertive and proactive to ensure that their needs are included in emergency planning. Employees with a disability should also meet with the building manager or employer and confirm what arrangements are in place. She urges the disability community to 'wake-up' and think about emergency preparedness and be actively included in the decision-making process regarding evacuation procedures and equipment that will work for each individual.

Personally, I believe that more consideration for people with disability must be made across all sectors. This must be done to future-proof buildings for the coming 'grey workforce' with people working longer and living longer. As discussed within this Guide the proportion of the Australian population over 65 will increase from 14% in 2011 to 20% in 2030 (ABS 2012d). The number of people aged 85 years and over in Australia is also projected to increase rapidly, going from 344,000 in 2007 to 1.7 million in 2056. In the future, there will likely be a higher prevalence of people with disability in the workplace, with higher rates of diminished sight, hearing and other senses.

Furthermore, current lifestyle trends in society are creating an obesity epidemic, where the ABS has reported that the number of adults classified as obese or overweight has increased from 56% in 1995 to 61% in 2007-08 and in 2008, over one-third of adults over 20 years of age were overweight (ABS 2010a, ABS 2012a).

It is evident from the research undertaken that to address the gap in legislation a more holistic approach must be taken by government regulators, managers of workplaces and facility managers. This approach must consider workplace management controls, the human



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behavioural aspects and the physical attributes of a building (Bretherton 2003).

Legislative changes must be made to close this gap. This would need to consider adopting an all-inclusive approach to the provision of accessible means of egress for all occupants' where risks can be reduced. This includes reducing the risk of harm to occupants of buildings, but also the risk to those responsible for providing safe buildings and safe workplaces.

The following section outlines recommendations for consideration to prepare workplaces and public buildings for the needs of people with disability and those with other limitations, whilst reducing risk, providing good governance and securing a safe and equitable workplace for all.

it's up to us as people with disabilities to individually and collectively prepare for disasters.

If we just rely on employers, building managers, or fire inspectors to make sure things are in place, it may or may not happen.

It is not safe to assume that people with disabilities have been included in evacuation plans.

(Isaacson-Kailes 2002)



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Section 11. Recommendations

The following recommendations are made for anyone considering improving the effectiveness, reliability and level of safety of any evacuation system, including building regulatory bodies.

11.1. Human Behavioural Aspects

We need to develop strategies to improve social and attitudinal factors in terms of an inclusive approach to accessible means of egress. Bretherton (2003) recommends that this includes management practices, fire drill for occupants and consideration for the use of areas of refuge and evacuation lifts.

11.2. This Guidebook

Australian legislators and industry stakeholder consider adopting the principles presented in the proposed this guidebook.

The PEEP example provided in AS 3745-2010 be reviewed and updated, or removed and replaced with a reference to the PEEP template provided in this guidebook as best practice.

Standards Australia considers cross referencing this guidebook in AS 3745-2010 as a design and industry reference.

11.3. AS 3745-2010, Planning for emergencies in facilities

The word 'should' in Clause 4.2.11 of AS 3745-2010 is replaced with the word 'shall' to reflect a mandatory requirement:

Suitable strategies in an emergency or evacuation shall be discussed with those occupants from the facility who have a disability and a Personal Emergency Evacuation Plans (PEEP) developed for each of those persons.

The word 'should' in Clause 4.2.17 of AS 3745-2010 is replaced with the word 'shall' to reflect a mandatory requirement:

Consideration shall be given to the use and suitability and storage arrangements of stairway evacuation devices for people who use wheelchairs or who otherwise would



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need to be carried down the stairway.

11.4. Future Editions of the Building Code of Australia

The term ‘*accessible means of egress*’ (or an equivalent term such as ‘*accessible evacuation route*’) should be referenced and defined within the BCA.

The requirement for accessible egress should be adopted into the Performance Requirements of the BCA (this was previously recommended by Bretherton in 2003 as a new Performance Requirement DP10).

The ABCB should consider the following concepts for ‘Deemed-to-Satisfy’ provisions in future editions of the BCA:

- Accessibility concepts discussed within this guidebook.
- Recommended BCA amendments made within Appendix C of Bretherton’s work ‘*Everybody Out – Emergency Evacuation of Persons with a Disability*’ (2003). Bretherton previously made detailed recommendations for proposed changes to the BCA, including a rewrite of the relevant ‘Deemed-to-Satisfy’ provisions of the BCA with new provisions for the following:
 - Refuge areas - fire separation, doorways, door controls, exit travel distances, wheelchair spaces in each refuge, the number of wheelchair spaces required, and the size calculated based on the number of occupants.
 - New provisions for egress for people with disability – including egress provided by way of accessible exits, evacuation refuges, evacuation lifts, or a combination of exits and evacuation lifts. The exact requirements were proposed to be determined by the ‘Construction Type’ of the building.
 - Signage – refuge areas, evacuation lifts, accessible exits, exit doors, including directional signage.
- The ABCB’s ‘*Lifts Used During Evacuation Handbook Non-Mandatory Document*’.

11.5. Accessible Exit Signs

The current BCA exit signage provisions should be amended to include signage to identify the accessible means of egress, including the relevant Performance Requirements (Bretherton 2003). Any proposed changes should consider all building user groups and the concepts discussed in sections of this guidebook.

The proposed changes to the BCA should also include the provision of directional accessible signage, directing occupants to the nearest component of any required accessible means of egress (i.e. refuge, evacuation lift etc.).



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It must be acknowledged that the current use of the 'Running Man' image does not consider those people with a mobility impairment who deserve the same rights as any other building occupants, including knowing where the accessible means of egress is provided. A more inclusive approach should be adopted to cater for everyone.

The actual design of the running man was created in 1982 and has since been accepted into standards in Australia, Britain, Norway and many parts of Asia, and adopted into the current edition of ISO 7010. It could be argued that the reliance on this sign to designate exits is out-dated and discriminatory, with many countries mandating legislation for disability rights after the year of design (1982) and adoption of the 'Running Man' (1987).

Figure 47: Photo of an Accessible Exit Sign installed on a Wall

Examples of the proposed accessible signage developed by the author for this purpose are provided throughout this guidebook. The incorporation of the internationally recognised 'Running Man' with the new proposed 'Accessible Means of Egress Icon' provides an inclusive view as to the evacuation of a building, where persons without disability, or with a disability, including those with a mobility impairment, may safely travel to an exit from the building.

Bretherton (2003) had previously recommended that the BCA should consider the requirement for signage to identify the locations (and availability) of emergency evacuation lifts and refuge areas. This approach must, however, be extended to include accessible considerations, such as tactile and Braille font.

This guidebook has presented proposed designs for these evacuation features, as well as Emergency Evacuation Chairs, which utilise the proposed 'Accessible Means of Egress Icon' providing a clear pictogram design that is easily distinguished without any ambiguity.

The use of accessible signage shown throughout this guidebook has now been developed into an awareness campaign as part of the 'Accessible Exit Sign Project' www.accessibleexitsigns.com.



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11.6. Fire Safety Engineers

Fire Safety Engineers should consider the principles discussed in this guidebook, including the use of accessible exit signs and use them in any fire engineered solutions.

Fire Safety Engineers should work closer with disability access consultants when developing any Fire Engineering Report that has impacts for the evacuation of occupants, including the use of evacuation lifts.

11.7. Australian Standard AS 1428 Access Standards

The current suite of Australian Standard AS 1428 Access Standards is referenced in Part D1 and Part D2 of the BCA extended to include consideration and reference to the equitable and dignified accessible means of egress from a building, with consideration to the concepts discussed within this guidebook, including accessible signage using the 'Accessible Means of Egress Icon'.

11.8. Non-Regulatory Handbook

The ABCB needs to develop a non-regulatory handbook as discussed in the Final Decision to the RIS in March 2015 (as Option 2 to the RIS). This needs to be implemented with a public awareness campaign to increase the level of awareness across all sectors. So that project stakeholders can ask the right questions at the beginning of any project and get guidance on how to make an improvement to the design, regardless of what the current BCA requires. Such a handbook will provide consistency, and present simple to adopt design scenarios that consider the needs of all occupants.

11.9. Architects, Building Designers, Services Consultants and Best Practice

Building designers consider the recommendation of the ABCB (2013b), *'Directions Report on Egress for All Occupants'* and future-proof buildings by considering the enhanced provisions proposed to be implemented at the next opportunity.

Further consideration should be given the concepts discussed within this guidebook.

Australia considers current enhanced safety provisions for people with disability that are in overseas Standards and adopts new egress provisions.

Consideration needs to be given to the ability to connect the Occupant Warning Systems into a hearing augmentation system, whereby a person with a hearing impairment could turn on their 'T' switch on their hearing aid to receive amplified emergency information communications.



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11.10. Universal Design



Figure 48: Photo of a Busy Train Station with People Moving

We need to start considering the benefits of universal design when designing buildings.

Including universal design at the design stage of any building can help to provide a much safer and easier to manage building, particularly when the alarm bells sound.

Many of these concepts are discussed within this guidebook, and can include:

- Installing alarms that notify occupants of any emergency in visual and audible formats.
- Announcing audible emergency information in different languages.
- Ensuring accessible paths are available to a safe place outside the building.
- Designing out access barriers at the concept design stage (such as steps, heavy doors, narrow corridors, spatially restrictive turns in corridors and so on).
- Installing accessible exit signs in a clear and simple format (with tactile and Braille components) that provide wayfinding information leading people to suitable exits.
- Adopting best practice wayfinding strategies in evacuation routes (such as low-level signage, colour coded exit pathways and exit doors, glow in the dark signs and lines on floors showing the evacuation routes and so on).



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Appendix A: PEEP Employee Induction Questionnaire

Appendix A – PEEP Employee Induction Questionnaire



Employee Induction Questionnaire Personal Emergency Evacuation Plan



Confidential when Completed

Employer:

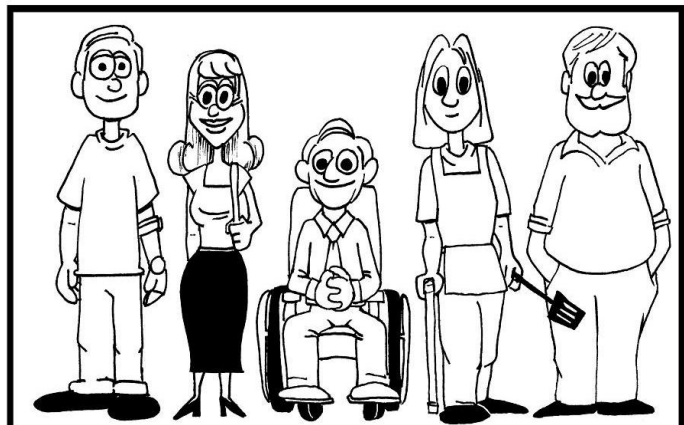
We are committed to the provision of a safe working environment and the need for safe evacuation for all building occupants, including people with disability. This is recognised in *AS 3745-2010 Planning for Emergencies in the Workplace* and in the development of our own procedures. Our emergency planning procedures consider all building occupants and visitors who for one reason or another may need assistance or may not act optimally in an emergency. These people may include people:

- Anyone who might experience confusion during an emergency, including the aged and those with a cognitive disability
- Anyone who would be easily fatigued during an evacuation, including those who self-disclose a condition (including respiratory, or obesity)
- Those accompanied by an assistant or carer
- Anyone using a mobility device, such as a wheelchair, walking frame, electric scooter or the like
- Accompanied by a guide dog or assistance animal
- With an ambulatory disability
- People who may have difficulty receiving information and effective communication
- People who might experience acute stress, anxiety or emotional issues in an emergency

The information provided in this questionnaire will help us to meet your needs in terms of information and assistance and we look forward to working with you to develop a Personal Emergency Evacuation Plan (PEEP) if required.

For the Employee:

The completion of this questionnaire will assist the building Emergency Control Organisation (ECO) and your employer to work with you to develop a Personal Emergency Evacuation Plan (or a PEEP). This should be completed on commencement of work within your workplace.





As your employer, we have a legal responsibility to provide you with a safe working environment, including providing a safe means of egress during an emergency in the building. We, therefore, ask that you take a few minutes to complete this questionnaire, which will assist us to work with you to develop a PEEP. Please note that on request this questionnaire can be delivered orally if preferred and is available in other print formats. Once the PEEP has been developed it will remain in place during your employment, but can be reviewed at any time on request.

Employee Details

1. Name:
2. Job Title:
3. Phone Number:
4. Workplace Supervisor:

Employment Location

5. Building:
6. Address:
7. Level:
8. Room No:
9. Nearest Lift:
10. Nearest Fire Stair:

11. Will you be working in other parts of the building?

Yes No Not Sure

Comments:

.....

.....



Employment Hours

12. Will you be working outside normal business hours within the building?

Yes No Not Sure Comments:

13. Will you ever be working alone in the building, including after-hours?

Yes No Not Sure Comments:

Evacuation Procedures

14. Have you been provided with a copy of the building's evacuation procedures?

Yes No Not Sure

Comments:
.....

15. Do you know where the evacuation plan showing exits and fire equipment is located on your level of the building?

Yes No Not Sure

Comments:
.....

16. Are you familiar with where the fire equipment (i.e. hose reels, fire extinguishers, fire blankets etc.) are located on your level of the building?

Yes No Not Sure

Comments:
.....

17. Do you require the evacuation procedures in an alternate format?

Yes No

Comments:
.....



19. If so, what format would you prefer?

- | | | |
|-------------|------------------------------|-----------------------------|
| Auslan | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Large Print | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Braille | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| CD | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Mp3 | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Easy read | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Other | | |

Comments:

.....

Wayfinding

20. Have you been taken on a familiarisation tour of the egress routes from your work areas?

- Yes No Not Sure

Comments:

.....

21. Do you know where exit signage is on the paths to exits

- Yes No Not Sure

Comments:

.....

Emergency Alarms

22. Can you discern the building alarms in the building?

- Yes No Not Sure

Comments:

.....

23. Have you heard the alarms being tested in your current work area or a previous place of employment?

- Yes No Not Sure

Comments:



25. If you cannot discern the alarms, would another device be suitable to alert you of an emergency? If so, what would you prefer?

- Vibrating pager Yes No
 Visual alarm Yes No
 Text messages Yes No Mobile number:

Comments:

26. Could you raise the alarms in your work area if you had to?

- Yes No Not Sure Comments:

Evacuating the Building

27. Could you move quickly to an exit door on your level during an emergency?

- Yes No Not Sure

Comments:

.....

28. Do you use a mobility device?

- Yes No Not Sure

Comments:

.....

.....

29. Could you use the stairway do go down to the exit level of the building if you had to?

- Yes No Not Sure

Comments:

.....

Assistance during the Evacuation

30. Would someone need to provide assistance during the evacuation from your normal workplace?

- Yes No Not Sure

Comments:

.....



31. If you do require some assistance to evacuate, can we contact you shortly to work with you on some strategies to document within a Personal Emergency Evacuation Plan (PEEP)?

Yes No Not Sure

Comments:
.....

32. If you do require some assistance, is a person designated to assist you, or do you have you a person in mind that can help, such as a co-worker?

Yes No Not Sure

Comments:
.....

33. If so, who?

34. Are the arrangements for assistance written into their job description?

Yes No Not Sure

Comments:
.....

35. It's also beneficial to have more than one person nominated on a PEEP to provide assistance. Is there anyone else who could provide assistance?

(1)

(2)

(3)

(4)



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Appendix A: PEEP Employee Induction Questionnaire*

Updating your Information

36. To ensure we have the most up to date information please acknowledge that you will advise your supervisor or fire warden of any changes to your circumstances so that the PEEP can be updated and adjusted (if required).

I understand and agree

Comments:

Signed:

Dated: / / 20.....

Thank you for taking the time to complete this questionnaire.



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix B: PEEP Template

Appendix B – PEEP Template



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Appendix B: PEEP Template

Personal Emergency Evacuation Plan

Confidential when Completed



This Personal Emergency Evacuation Plan (or PEEP) will assist the building Emergency Control Organisation (ECO) and your employer to ensure:

- Suitable strategies have been discussed with those people with disability occupying the building and a PEEP has developed for each of the persons, in full consideration of each person’s unique needs.
- Procedural information is provided within the PEEP identifying egress routes, evacuation equipment and any level of required assistance.

As your employer, we have a legal responsibility to provide you with a safe working environment, including providing a safe means of egress during an emergency in the building. We, therefore, give the commitment to work with you to develop your own personalised PEEP. Please note that on request this PEEP can be made available in other print formats as required.

A copy of this PEEP will be held by:

- You
- Your Manager
- Chief Warden and Floor Warden
- Security Office
- Fire Control Room

Once the PEEP has been developed and implemented it will remain in place during your employment. This plan must be reviewed on an annual basis (at a minimum), when any significant changes occur or, on request at any time.

Employee Details

1. Name: Job Title:
2. Phone Number: Mobile Number:
3. Workplace Supervisor:
4. Designated Assistant (if applicable):



Employment Location

5. Building:
6. Address:
7. Building Level:
8. Room No:
9. Nearest Lift:
10. Nearest Evacuation Lift:
11. Nearest Fire Stair:
12. Chief Warden:, Phone:
13. Floor Warden:, Phone:
14. Security Office:, Phone:

Evacuation Procedures

15. Date provided a copy of the building's evacuation procedures:
...../...../ 20.....
16. Date shown the evacuation plan showing exits and fire equipment located on level/area of the building normally working within:
...../...../ 20.....
17. Date shown where the first response fire equipment is located on level/area of the building normally working within (i.e. hose reels, fire extinguishers, fire blankets etc.):
...../...../ 20.....



19. Evacuation procedures provided in an alternate format (large print, Braille, or audio)

...../...../ 20..... (cross out if not applicable)

20. Hours when you will be working alone on level/area of the building normally working within:

.....

Alarm Notification

21. General building alarms within the building can be identified by you when activated?

Yes No

22. Other notification methods to be used to alert you of an emergency:

Vibrating pager	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Visual alarm	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Text messages	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Other	Please nominate	

Wayfinding

23. Date taken on a familiarisation tour of the egress routes from your work areas:

...../...../ 20.....

The tour should include identification of any enhanced wayfinding measures, such as tactile and Braille signage on the path (i.e. handrails, door signs etc.) and where photo-luminescence markers, lines and signage is provided.

24. Date escorted to the nearest Evacuation Lift or Refuge Area and shown signage for each area and communication methods:

...../...../ 20.....

Instructions must include how the Fire Brigade or Wardens will control the use of the lift.



Buddy Support Team

25. This Buddy Support Team has given the commitment to support you in your evacuation. The team includes the following people:

Team Leader: You

Team Member 1:

Phone No. Mobile No.

Signature: Date:

Team Member 2:

Phone No. Mobile No.

Signature: Date:

Team Member 3:

Phone No. Mobile No.

Signature: Date:

Team Member 4:

Phone No. Mobile No.

Signature: Date:

Team Member 5:

Phone No. Mobile No.

Signature: Date:

Team Member 6:

Phone No. Mobile No.

Signature: Date:



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Appendix B: PEEP Template*

27. Please nominate any specialised equipment and who in the BST will be responsible for assistance/carrying this equipment:

.....
.....

Evacuating the Building

28. Type of mobility device used (cross-out if not applicable):

.....
.....

29. Other evacuation equipment to be provided to assist evacuation?

.....
.....

30. The evacuation diagram / evacuation plan attached has been marked up to show your primary egress route (and where applicable a secondary egress route) from your work area to a safe place outside the building.

Yes No

31. Your evacuation procedure includes:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....



Updating your Information

32. To ensure we have the most up to date information please acknowledge that you will advise your supervisor or fire warden of any changes to your circumstances so that the PEEP can be updated and adjusted (if required).

I understand and agree

Comments:

Approvals

Your signature: Dated:/...../ 20.....

Manager/ Workplace Supervisor: Dated:/...../ 20.....

Floor Warden: Dated:/...../ 20.....

Chief Warden: Dated:/...../ 20.....

Thank you for taking the time to develop with PEEP.



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Appendix C: GEEP Template

Appendix C – GEEP Template



*Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix C: GEEP Template*

Group Emergency Evacuation Plan



This Group Emergency Evacuation Plan (or GEEP) will assist the building Emergency Control Organisation (ECO) to ensure:

- The GEEP has considered of each person’s unique needs.
- Procedural information is provided within the GEEP identifying egress routes, evacuation equipment and any level of required assistance.

We have a legal responsibility to provide you with a safe working environment, including providing a safe means of egress during an emergency in the building. We, therefore, give the commitment to develop a GEEP considering the needs of visitors, guests and other people in the building.

A copy of this GEEP will be held by:

- Area Manager
- Chief Warden and Floor Warden
- Security Office
- Fire Control Room

Once the GEEP has been developed and implemented it will remain in place. This plan must be reviewed on an annual basis (at a minimum), when any significant changes occur or, on request at any time.

Building Area Contact Details

1. Area Name:
2. Workplace Supervisor:
3. Phone Number:
4. Mobile Number:



Building Location

5. Building:
6. Address:
7. Building Level:
8. Room No:
9. Nearest Lift:
10. Nearest Evacuation Lift:
11. Nearest Fire Stair:
12. Chief Warden:, Phone:
13. Floor Warden:, Phone:
14. Security Office:, Phone:

Evacuation Procedures

15. Building's evacuation procedures held in work area:
Verified on/...../ 20.....
16. Evacuation plans showing exits and fire equipment located on level/area of the building:
Verified on/...../ 20.....
17. First response fire equipment is located on level/area of the building (i.e. hose reels, fire extinguishers, fire blankets or the like):
Verified on/...../ 20.....
18. Evacuation procedures provided in an alternate format:
Verified on/...../ 20.....



20. People visiting remote areas, isolated areas, or other areas not covered by surveillance equipment in the following locations:

.....

Alarm Notification

21. General building alarms provided within the building:

Yes No

22. Other notification methods to alert you to an emergency:

Vibrating pagers	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Visual alarms	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Text messages	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Visitors

23. Visitor register established:

Verified on/...../ 20.....

24. Visitor Group Organiser / Leader information pack prepared, with copies of all evacuation procedures.

Verified on/...../ 20.....

25. In accommodation buildings, the accessible rooms have specific information and evacuation plans showing egress routes.

Verified on/...../ 20.....

26. Information is available in a range of formats (Braille, large print etc.)

Verified on/...../ 20.....

27. Reception Desks have a sign stating *“We operate a system of assisted evacuation for visitors with disabilities. Please tell our receptionist your requirements”*.



Staff Training

28. Security and other staff have had awareness training on the GEEP standardised provisions:
29. Security and other staff with responsibilities in the building's emergency plan have attended training on disability awareness and methods of assistance. This would include all fire wardens and security staff.
30. This GEEP has the ability to meet the needs of any person with disability, with staff on hand to provide assistance, act as their 'buddy', and guide them to a place of safety or refuge area for a staged evacuation.

Evacuating the Building

31. Type of mobility device used (cross-out of not applicable):
.....
.....
32. Other evacuation equipment to be provided to assist evacuation:
.....
.....
33. Type of mobility device used (cross-out of not applicable):
.....
.....
34. The evacuation plan attached has been marked up to show your primary egress route (and where applicable a secondary egress route) from the building visitor area to a safe place outside the building



*Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix C: GEEP Template*

35. The evacuation procedure includes:

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Approvals

Manager/ Workplace Supervisor: Dated:/...../ 20.....

Floor Warden: Dated:/...../ 20.....

Chief Warden: Dated:/...../ 20.....



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix D: PEEP Matrix

Appendix D – PEEP Matrix



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix D: PEEP Matrix

PEEP Matrix									
Category	1	2	3	4	5	6	7	8	9
PEEP Consideration <input checked="" type="checkbox"/> = needs considerations	Mobility	Vision	Hearing	Speech/ Language	Cognitive/ Psychiatric/ Mental Health	Respiratory	Temporary, Emergent & Physical	Emergent Emotional	Service Animals
General									
Working after-hours?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provided copy of evacuation plans & procedures?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provided plans & procedures in an alternate format?		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				
Buddy Support team identified and trained?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Egress evacuation familiarisation walk-through conducted?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Familiarisation to include the use of communications equipment for emergency management (warden phones, refuge communications etc.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Participation in emergency evacuation drill?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix D: PEEP Matrix

Category	1	2	3	4	5	6	7	8	9
PEEP Consideration <input checked="" type="checkbox"/> = needs considerations	Mobility	Vision	Hearing	Speech/ Language	Cognitive/ Psychiatric/ Mental Health	Respiratory	Temporary, Emergent & Physical	Emergent Emotional	Service Animals
Emergency Notification									
Exposure to building alarm system notification methods?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Use of alternate alarm notification system – vibrating device /pager?			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				
Use of alternate alarm notification system – visual alarms?			<input checked="" type="checkbox"/>						
Use of alternate alarm notification system – Mobile Phone SMS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Use of alternate alarm notification system – Computer network alerts	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
First Response									
Knows how to raise the alarm? Including those with hearing or speech, language & communication disorders	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Manual call points (or Break Glass Alarms) in accessible locations?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix D: PEEP Matrix

Category	1	2	3	4	5	6	7	8	9
PEEP Consideration <input checked="" type="checkbox"/> = needs considerations	Mobility	Vision	Hearing	Speech/ Language	Cognitive/ Psychiatric/ Mental Health	Respiratory	Temporary, Emergent & Physical	Emergent Emotional	Service Animals
Familiar with fire equipment (i.e. hose reels, fire extinguishers, fire blankets etc.)?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Moving from Work Area to Exit									
Need assistance you're your workstation?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Need assistance to use stairs on own?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Can use stairs unassisted?		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Have stairs handrails both sides?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Benefit from Refuge Areas? Including for resting purposes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Use of evacuation chair?	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Buddy Support Team assigned to carry equipment?	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			
Tactile mapping and wayfinding strategies	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Exit doors clearly identifiable? With luminance contrast	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations, edition 2.0
Appendix D: PEEP Matrix

Category	1	2	3	4	5	6	7	8	9
PEEP Consideration ☑ = needs considerations	Mobility	Vision	Hearing	Speech/ Language	Cognitive/ Psychiatric/ Mental Health	Respiratory	Temporary, Emergent & Physical	Emergent Emotional	Service Animals
Do exit doors have less than 20N door force to open, or is the Warden / Buddy Support Team providing assistance?	☑	☑	☑	☑	☑	☑	☑	☑	☑
Photo-luminescence markings, wall lines and exit signs?	☑	☑	☑	☑	☑	☑	☑	☑	☑
Signage showing all exit routes, evacuation lift, evacuation chair, refuge area etc.?	☑	☑	☑	☑	☑	☑	☑	☑	☑
Signage adopts a clear and unambiguous approach, including of 'Accessible Means of Egress Icon'?	☑	☑	☑	☑	☑	☑	☑	☑	☑
Is signage provided in Refuge Areas and Stairs?	☑	☑	☑	☑	☑	☑	☑	☑	☑
Use of Evacuation Chair	☑					☑	☑		
Use of Refuge Area	☑					☑	☑		
Rechargeable torches available in egress routes, refuge area and stairs?	☑	☑	☑	☑	☑	☑	☑	☑	☑



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A gap exists in the Australian legislative framework relating to the evacuation of people with disability under current disability discrimination, building and workplace safety laws in Australia.

The gap exposes those members of the community with disability, particularly those with sensory or mobility disabilities to the risk of being delayed in their ability to evacuate a building or being entrapped within a building that has been evacuated.

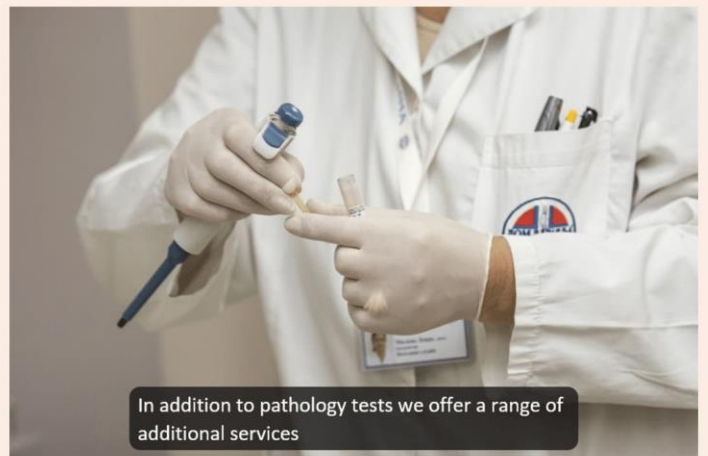
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