

# Universal Design. Meets the Exit Sign.



## The Accessible Exit Sign Project & Performance-Based Building Codes

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Accessible Exit Sign Project & Performance-Based Building Codes

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### About the Author



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After many years of study Lee has achieved academic under-graduate qualifications in building surveying, construction management and risk management. He also holds a post-graduate Masters of Project Management degree and a Graduate Certificate in Performance-Based Building & Fire Codes from Victoria University's Centre for Environmental Safety and Risk Engineering.

Lee is passionate about spreading the word about the need for an accessible means of egress from all buildings, for all occupants.

In 2014 he released a free guidebook titled *Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations*.

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### Further details

For information on the 'Accessible Exit Sign Project' and the use of the 'Accessible Means of Egress Icon' please visit <http://accessibleexitsigns.com/>

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## Disclaimer

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

This paper 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.

Any consideration of the use of performance-based building design to justify and accept the use of the accessible exit signs presented in this paper is hypothetical only. This should not be considered to be an assessment for the purposes of certification of any proposed exit signage strategy in any building, facility or mode of transportation. Readers requiring project guidance in the use and acceptance of the accessible exit signs should engage a fire (safety) engineer 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 information in this paper, in connection with the use of the paper, or reliance on any of the information provided.

Accessible signage used throughout this guide 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.





## Part 1: Overview

Universal Design Meets the Exit Sign is an initiative of The Accessible Exit Sign Project. The Project is an international awareness campaign that promotes the need for an accessible means of egress, with appropriate emergency and exit signage.

*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.*

Australian Building Codes Board, 2014<sup>1</sup>

### Objectives

The objective of The Accessible Exit Sign Project is to 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.



A critical part of any strategy for safe evacuations is providing clear wayfinding information for all occupants, with appropriate exit signage to identify the accessible exits, refuge areas, evacuation lifts and other evacuation devices.

The 'Universal Design Meets the Exit Sign' concept presents a case to support the use of these signs in all buildings, which can help provide a safer and more inclusive built environment.

The objectives being to help facilitate acceptance of the new Accessible Means of Egress Icon on a new era of exit signs and emergency signage.

<sup>1</sup> Australian Building Codes Board 2014, Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement, p.11,

[http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation\\_RIS\\_Emergency\\_Egress\\_for\\_Occupants\\_with\\_Disability.ashx?la=e](http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation_RIS_Emergency_Egress_for_Occupants_with_Disability.ashx?la=e), viewed 27 August 2015



## Approach

The approach taken when preparing this paper has been to release a combination of mediums, including a website, audio files and a document in accessible formats.

These are now available for download.

These formats each propose the use of new inclusive accessible exit signage.



## International Factors

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

When we consider this issue from a global viewpoint, in 2009 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<sup>2</sup>, which is equivalent to the entire Australian population in 2001.<sup>3</sup>



We're also living in times when life expectancies are increasing, people are residing in higher density locations and in taller buildings.

Worldwide, people with disability have increasingly moved into the mainstream of society<sup>4 5</sup> and deserve to be afforded the same level of safety as they go about their day to day activities as other occupants of buildings.

<sup>2</sup> Disabled World 2014, Latest U.S. Disability Statistics and Facts <http://www.disabled-world.com/disability/statistics/census-figures.php>, viewed 26 September 2015

<sup>3</sup> Australian Bureau of Statistics 2012b, 1370.0.55.001 - Measures of Australia's Progress: Summary Indicators, 2012, <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1370.0.55.001~2012~Main%20Features~Population~3>, viewed 26 September 2015

<sup>4</sup> United States Fire Administration Federal Emergency Management Agency 1995, Emergency Procedures for Employees with Disabilities in Office Occupancies, p.1, <http://www.usfa.fema.gov/downloads/pdf/publications/fa-154.pdf>, viewed 26 September 2015

<sup>5</sup> US Fire Administration Federal Emergency Management Agency 2002, FEMA FA 235 Orientation Manual for First Responders on the Evacuation of Disabled People, p.3, <http://www.usfa.fema.gov/downloads/pdf/publications/FA-235-508.pdf>, viewed 26 September 2015

This includes being able to safely evacuate a building, facility or form of public transportation during an emergency.

The practical and equitable provision of safe evacuation 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 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.<sup>6</sup> This is not an acceptable situation and needs more consideration with formulated action.

### Local Factors

Internationally, there are many countries that have a gap in the legislative frameworks relating to the evacuation of people with disability. This gap is also evident in Australia’s legal system, which exposes not just people with disability, but all people who for whatever reason may need some help to identify, register and respond to an alarm, as well as independently moving to a safe place outside the building.



This gap exists in the Australian legal system and exposes those members of the community with disability and the elderly, 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. Even though 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*”.<sup>7</sup>

In 2009 the Australian Bureau of Statistics (**ABS**) reported that there were four million Australians or 18.5% of the population with a disability.<sup>8</sup> The following statistics released by the Australian Network on Disability<sup>9</sup> 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 are affected by hearing loss.
- There are approximately 30,000 Deaf Auslan (Australian Sign Language) users with total hearing loss.

<sup>6</sup> The Northern Officer Group 1993, Personal Emergency Egress Plans, The Northern Officer Group, Wakefield, UK

<sup>7</sup> Australian Government 2011, Workplace Health and Safety Act 2011, Sections 20, 21, 22 and 23, <http://www.comlaw.gov.au/Details/C2011A00137>, viewed 26 September 2015

<sup>8</sup> Australian Bureau of Statistics, 4430.0 - Disability, Ageing and Carers, Australia: Summary of Findings, Australian Bureau of Statistics, Canberra, p. 20, <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4430.0>, viewed 26 September 2015

<sup>9</sup> Australian Network on Disability 2014a, Stats & Facts, <http://www.and.org.au/pages/disability-statistics.html>, viewed 26 September 2015

- Vision Australia estimates there are currently 357,000 people in Australia who are blind or have low vision.
- 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 per cent 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.

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 issue 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.<sup>10</sup> Similar events have recently occurred in educational facilities in Nova Scotia, Canada<sup>11</sup> and Chicago, United States.<sup>12</sup> Closer to home a student was reportedly left on Level 10 of a Swanston Street RMIT Academic Building in Melbourne during a fire evacuation in 2012.<sup>13</sup> 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 a danger.<sup>14</sup>



The Universal Design Meets the Exit Sign concept aims to fill a part of this legislative gap. When an inclusive approach is adopted in a building it could be seen as a contingency when other parts of an emergency plan are not effective. For example, even if people were left behind in a building during an evacuation if there is audible and visual information provided to occupants they will have better chances of finding a suitable exit and moving to a safe place. Accessible exit signs forms part of this approach.

<sup>10</sup> NBC New York 2013, Westchester School Leaves Behind Disabled Students in Fire Evacuation, <http://www.nbcnewyork.com/news/local/New-Rochelle-High-School-Westchester-Leaves-Wheelchair-Students-Behind-Fire-Evacuation-193415871.html>, viewed 26 September 2015

<sup>11</sup> CBC News Nova Scotia 2013, Mom angry disabled daughter left behind in fire drills, <http://www.cbc.ca/news/canada/nova-scotia/mom-angry-disabled-daughter-left-behind-in-fire-drills-1.1316160>, viewed 26 September 2015

<sup>12</sup> CBS Chicago 2012, Parents Of Disabled Child Worried About School's Evacuation Plan, <http://chicago.cbslocal.com/2012/04/11/parents-of-disabled-child-worried-schools-evacuation-plan/>, viewed 26 September 2015

<sup>13</sup> James, F 2012, Student with disability forgotten in fire evacuation, City Journal, <http://thecityjournal.net/news/student-with-disability-forgotten-in-fire-evacuation/>, viewed 26 September 2015

<sup>14</sup> National Council on Disability 2005, Saving Lives: Including People with Disabilities in Emergency Planning, National Council on Disability, Washington, pp. 26-28

## Emergency Planning

Evacuation planning is especially important for building occupants who may not be able to use a fire escape stairway, detect auditory alarms, or recognize and respond to a danger during an emergency, including those with disability.<sup>15</sup>

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 and vision impairments and measures to assist those people who may find evacuating via an escape stairway challenging, difficult or not possible.<sup>16</sup> Appropriate exit signage to identify the accessible means of egress is a critical component to the successful emergency planning for any building.

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<sup>15</sup> Loy, B, Hirsh, A, Batiste, LC 2004, Evacuation Preparedness: Managing the Safety of Employees with Disabilities, Occupational Health & Safety. Sep 2004, Vol. 73 Issue 9

<sup>16</sup> Logli, M 2009, 'Developing Evacuation Plans', Professional Safety, Aug 2009, Vol. 54 Issue 8, pp.44-45



## Part 2: International Law

There are two pieces of international law that must be considered when we consider the needs of people in a building during an emergency:

- The Universal Declaration of Human Rights
- The Convention on the Rights of Persons with Disabilities

### The Universal Declaration of Human Rights

#### About the Declaration

The Universal Declaration of Human Rights, was adopted by the United Nations (UN) General Assembly on 10 December 1948. The Declaration was the result of the experience of the Second World War, when at the end of that war, and with the creation of the United Nations, the international community vowed never again to allow such atrocities experienced in the conflict to happen again.



World leaders agreed to complement the UN Charter with a road map to guarantee the rights of every individual everywhere. The document they considered would later become the Universal Declaration of Human Rights, was taken up at the first session of the General Assembly in 1946.<sup>17</sup>

#### The Founding of Human Rights

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.

The Universal Declaration is not a treaty, so it does not directly create legal obligations for countries. However, it displays the fundamental values shared by all members of the international community.<sup>18</sup>

The Declaration has significant influence on the development of international human rights law and could be argued in some cases that by adhering to the Declaration for so long that it has actually become binding as a part of customary international law.

<sup>17</sup> United Nations, The Universal Declaration of Human Rights, History, <http://www.un.org/en/documents/udhr/history.shtml>, viewed 18 August 2015

<sup>18</sup> Australian Human Rights Commission, What is the Universal Declaration on Human Rights?, <https://www.humanrights.gov.au/publications/what-universal-declaration-human-rights>, viewed 18 August 2015

The Universal Declaration has given rise to other international agreements which are legally binding on the countries that ratify them, including the International Covenant on Civil and Political Rights (**ICCPR**) and the International Covenant on Economic, Social and Cultural Rights.

## The Convention on the Rights of Persons with Disabilities

### About the Convention

The UN General Assembly established an Ad Hoc Committee in 2001 to negotiate a new Convention for the rights of people with disabilities. The first meeting was in August 2002, and drafting of the text began in May 2004. In August 2006, the Committee reached agreement on the text. Delegates to the Ad Hoc Committee represented Non-Government Organisations (**NGOs**), Governments, national human rights institutes and international organizations. It was the first time that NGOs had actively participated in the formulation of a human rights instrument such as the UN Convention on the Rights of Persons with Disabilities (**UNCRPD**).

### Purpose of the Convention

The purpose of the Convention is ultimately to promote, protect and ensure full and equal enjoyment of all human rights by persons with disabilities. It includes a number of key areas such as accessibility, personal mobility, education, health, employment, habilitation and rehabilitation, participation in political life, equality and non-discrimination.

With the Convention came a shift in attitudes away from the previous social welfare issue to a human rights issue. This shift acknowledged that attitudes, prejudices and societal barriers are inherently disabling.

Countries that have signed and ratified the Convention show a strong commitment to develop and implement new policies, laws and administrative controls that ensure the rights of people with disability. This commitment also includes abolishing laws, regulations, customs and practices that constitute discrimination.

### Our Commitment to the UN Convention

Along with other signatories to the Convention, Australia has a strong regime of anti-discrimination legislation at both Commonwealth and State and Territory level. This legislation aims to eliminate discrimination on the basis of disability. Australia signed the United Nations Convention on the Rights of People with Disability on 30 March 2007, which were subsequently ratified on 17 July 2008.<sup>19</sup>

Upon ratification the Convention the Australian Government made the following declaration as a commitment to promote the equality of all people with disability.<sup>20</sup>

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<sup>19</sup> United Nations, Convention and Optional Protocol Signatures and Ratifications, <http://www.un.org/disabilities/countries.asp?navid=17&pid=166>, viewed 27 August 2015

<sup>20</sup> United Nations Treaty Collection, Convention on the Rights of Persons with Disabilities, [https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg\\_no=IV-15&chapter=4&lang=en](https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-15&chapter=4&lang=en), viewed 19 August 2015



*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;*

*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.*

### Relevant Parts of the Convention

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'.<sup>21</sup> The Articles within the Convention cover an extensive range of areas, which have best been summarised by the Australian Building Codes Board (ABCB):<sup>22</sup>

- *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.*

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<sup>21</sup> United Nations, Convention on the Rights of Persons with Disabilities, <http://www.un.org/esa/socdev/enable/rights/convtexte.htm#optprotocol>, viewed 20 August 2015

<sup>22</sup> Australian Building Codes Board 2014, Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement, p.15, [http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation\\_RIS\\_Emergency\\_Egress\\_for\\_Occupants\\_with\\_Disability.ashx?la=e](http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation_RIS_Emergency_Egress_for_Occupants_with_Disability.ashx?la=e), viewed 27 August 2015

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.*”<sup>23</sup>

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

- 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:*
    - (a) *Buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces;*
    - (b) *Information, communications and other services, including electronic services and emergency services.*
  - *States Parties shall also take appropriate measures:*
    - (a) *To develop, promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public;*
    - (b) *To ensure that private entities that offer facilities and services which are open or provided to the public take into account all aspects of accessibility for persons with disabilities;*
    - (c) *To provide training for stakeholders on accessibility issues facing persons with disabilities;*
    - (d) *To provide in buildings and other facilities open to the public signage in Braille and in easy to read and understand forms;*
    - (e) *To provide forms of live assistance and intermediaries, including guides, readers and professional sign language interpreters, to facilitate accessibility to buildings and other facilities open to the public;*
    - (f) *To promote other appropriate forms of assistance and support to persons with disabilities to ensure their access to information;*

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<sup>23</sup> Australian Government Attorney-General Department, Convention on the rights of persons with disabilities, <http://www.ag.gov.au/RightsAndProtections/HumanRights/Pages/UnitedNationsConventionontherightsofpersonswitendisabilities.aspx>, viewed 20 August 2015

- (g) *To promote access for persons with disabilities to new information and communications technologies and systems, including the Internet;*
  - (h) *To promote the design, development, production and distribution of accessible information and communications technologies and systems at an early stage, so that these technologies and systems become accessible at minimum cost.*
- 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.*
    - *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*”<sup>24</sup>

Additionally, 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)*’ provided the following comment on Australia’s commitment to the articles of the Convention:

*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.*<sup>25</sup>

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<sup>24</sup> Australian Building Codes Board 2014, *Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement*, p.15,

[http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation\\_RIS\\_Emergency\\_Egress\\_for\\_Occupants\\_with\\_Disability.ashx?la=e](http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation_RIS_Emergency_Egress_for_Occupants_with_Disability.ashx?la=e), viewed 27 August 2015

<sup>25</sup> Australian Government Attorney-General Department,

[http://www.ag.gov.au/RightsAndProtections/HumanRights/TreatyBodyReporting/Documents/UN\\_Committee\\_on\\_the\\_Rights\\_of\\_Persons\\_with\\_Disabilities\\_Concluding\\_Observations.doc](http://www.ag.gov.au/RightsAndProtections/HumanRights/TreatyBodyReporting/Documents/UN_Committee_on_the_Rights_of_Persons_with_Disabilities_Concluding_Observations.doc), viewed 19 August 2015



## Part 3: 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.<sup>26</sup>*



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.

### 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.”<sup>27</sup>*

<sup>26</sup> Universal Design History, [http://www.ncsu.edu/ncsu/design/cud/about\\_ud/udhistory.htm](http://www.ncsu.edu/ncsu/design/cud/about_ud/udhistory.htm), viewed 24 September 2015

<sup>27</sup> Universal Design History, [http://www.ncsu.edu/ncsu/design/cud/about\\_ud/about\\_ud.htm](http://www.ncsu.edu/ncsu/design/cud/about_ud/about_ud.htm), viewed 8 September 2015



## Universal Design in the UN Convention on the Rights of Persons with Disabilities

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.<sup>28</sup>



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” with the 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.*<sup>29</sup>

## 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.<sup>30</sup>

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 recognized as a significant hindrance to people with mobility impairments.

## 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.*”

<sup>28</sup> United Nations, Convention and Optional Protocol Signatures and Ratifications, <http://www.un.org/disabilities/countries.asp?navid=17&pid=166>, viewed 27 August 2015

<sup>29</sup> United Nations, Convention on the Rights of Persons with Disabilities, <http://www.un.org/esa/socdev/enable/rights/convtexte.htm#optprotocol>, viewed 19 August 2015

<sup>30</sup> Universal Design History, [http://www.ncsu.edu/ncsu/design/cud/about\\_ud/udhistory.htm](http://www.ncsu.edu/ncsu/design/cud/about_ud/udhistory.htm), viewed 8 September 2015

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

## **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; equivalent when not.
- 1b. Avoid segregating or stigmatizing any users.



- 1c. Provisions for privacy, security, and safety should be equally available to all users.
- 1d. Make the design appealing to all users.

## **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.

## **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.

## **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.

## **PRINCIPLE FIVE: Tolerance for Error**

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

Guidelines:

- 5a. Arrange elements to minimize 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.

## **PRINCIPLE SIX: Low Physical Effort**

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

Guidelines:

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

## **PRINCIPLE SEVEN: Size and Space for Approach and Use**

Appropriate size and space is 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.

## **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.

## Universal Design Is Not a Synonym for Compliance with Access Standards

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.<sup>31</sup>

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's an emergency and a need for evacuation.

## 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.

<sup>31</sup> National Disability Authority, <http://universaldesign.ie/What-is-Universal-Design/The-10-things-to-know-about-UD/>, viewed 20 August 2015



# Part 4: A Gap in the Legal Framework

It could be argued that the evacuation needs of all people with some level of activity limitation or sensory impairment, including the young and the elderly are not being met under current legislative requirements.



This 'gap' presents as a risk for building managers, building owners, employers or any other party that has some level of control and management over public spaces. In this section the evacuation 'gap' is discussed and each piece of legislation is presented for consideration.

## The Existing Gap in Evacuation Legislation

In Australia, like other parts of the world, there is no one specific piece of legislation that mandates all evacuation provisions for people with disability. The current legislative framework in Australia pertaining to evacuation procedures includes the following, which are similar to other developed nations:

- *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)



## 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 the rights of people with disabilities, the rights of children, civil and political rights, and religious beliefs.

## 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 complaints 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 were 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.

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 little consideration for emergency egress of people with disability.

The DDA and the Premises Standards do not directly provide prescriptive requirements ensuring a safe 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).

## 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*”<sup>32</sup>, 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;*

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.*”

In preparing this Guide the definition of impairment provided by the Australian Emergency Management Institute 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.*<sup>33</sup>

## Occupational Health and 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*

<sup>32</sup> United States Equal Employment Opportunity Commission (EEOC), Facts About the Americans with Disabilities Act, p.1, <http://www.eeoc.gov/facts/fs-ada.pdf>, viewed 26 August 2015

<sup>33</sup> Australian Emergency Management Institute 2013, Communicating with People with Disability: National Guidelines for Emergency Managers Handbook 5, <http://www.ag.gov.au/EmergencyManagement/Tools-and-resources/Publications/Documents/Handbook-series/handbook-5-communicating-with-people-with-disability.pdf>, viewed 27 August 2015



- *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*
- *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.*

This mandates that employers are required to ensure as far as is reasonably practicable that the workplace and the means of entering and leaving the workplace are safe and without risks to health. 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.

### Planning for Emergencies in the Workplace

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

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 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.



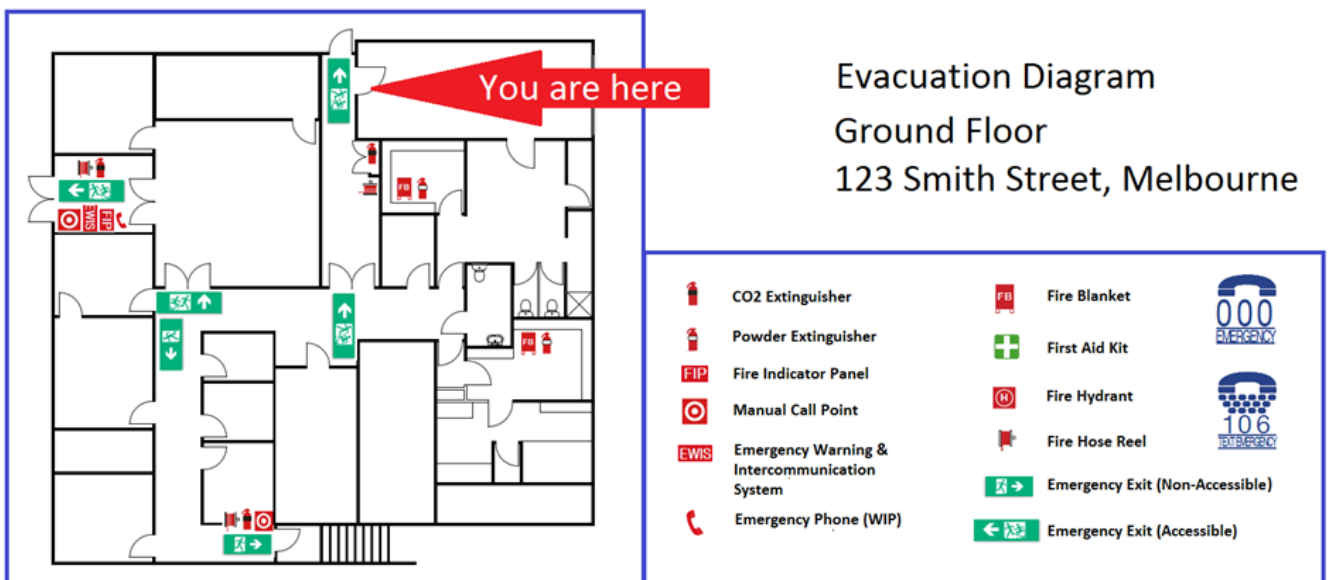
The Standard also recommends that:

- 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 approval, procedural information should be included in the PEEP.<sup>34</sup>

In terms of emergency exit signage, Clause 3.5 of AS 3745 states that evacuation diagrams must be displayed in all facilities which include a number of key features of the building, including a representation of the floor or area and include the locations of designated exits in green, refuges (if present), location of assembly area, locations of manual alarm call points and any warden intercommunication points (WIP phones).

The 'informative' only example Evacuation Diagrams provided in Appendix E include pictograms for fire equipment and emergency exits, in traditional "EXIT" format and an adapted Running Man exit sign style.

No reference to accessible exits, accessible egress paths, or distinguishing between none-accessible and accessible exits is made.



<sup>34</sup> Standards Australia 2010b, Australian Standard AS3745-2010, Planning for emergencies in facilities, SAI Global, Sydney, pp.24-25, 52-53



## Part 5: The Case for Accessible Exits



There is growing awareness of the need to provide suitable exit signage to identify accessible egress paths.

This has been addressed within the International Building Code which requires “AREA OF REFUGE” signage identified with the International Symbol of Access. Furthermore, ISO 7010 and ISO 21542 now provide an option of the Japanese exit sign (or ‘Running Man’ sign) with a European equivalent of the International Symbol of Access at the end of the sign.

This section provides evidence to support the use of the accessible exit sign design presented in this paper, which can be used in any performance-based building solution.

The following is discussed in detail:

- People with Disability and the Need for Accessible Exits
  - Mobility Disabilities
  - Vision Impairment
  - Hearing Impairment
  - Speech, Language and Communication Disorders
  - Cognitive and Psychiatric Impairments, Mental Health
  - Temporary and other Emergent Impairments
- “Do not use lifts if there is a fire”
- Existing Japanese Style (or Running Man) Style Exit Signs
  - A Brief History of the Japanese Exit Sign (also known as the Running Man)
  - A Non-Inclusive & Discriminatory Approach
  - Effectiveness of Typical Exit Signs
- Existing Wheelchair Symbols on Exit Signs
  - The European Style Wheelchair on Exit Signs
  - An Ambiguous Exit Sign Design
- Risk Management and the Accessible Exit Signage
  - The Exit Sign ‘Gap’ and Reducing Risk
  - A Recent Case Study
  - Occupant Expectations and Accessible Exit Signage
- Quotes from Around the World
- Fire Engineering and Performance-Based Building Codes
- Precedence in Performance-Based Exit Sign Solutions
- Support from Australian Building Codes Board References
- An Ageing Population
- Increased Child-Care Centres above Entry Levels of Buildings
- Obesity Trends

## People with Disability and the Need for Accessible Exits

Accessible exits are important for everyone. Information during an emergency is critical and the use of accessible exit signs, with Braille and tactile components, will help provide the necessary information to occupants, so that they may make appropriate decisions based on their abilities and options available. The needs of all occupants must be considered, and the following sections outline some important user groups of any building, including:

- Mobility Disabilities
- Vision Impairment
- Hearing Impairment
- Speech, Language and Communication Disorders
- Cognitive and Psychiatric Impairments, Mental Health
- Temporary and other Emergent Impairments

### Mobility Disabilities

According to data published by the ABS in 2009, 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.<sup>35</sup> The ABCB reported that the number of people physically needing the assistance of a passenger lift to evacuate a building can be estimated by using this ABS data. The ABCB found that of the population 10.5% have a mobility disability, of which 2.5% of the population use a mobility aid and 0.6% of the population use a wheelchair, which equates to approximately 1 in 166 people.<sup>36</sup>

In the United States the Centers for Disease Control and Prevention found that the most common functional disability type was mobility disability, reported by about 1 in 8 adults, whilst it has been found that 1 in 5 adults (or over 53 million people) in the United States have a disability of one form or another.<sup>37</sup>



When this data is further analysed, it has been found that:

- 10% of adults have difficulties climbing a flight of stairs (which increases to 30.2% for people aged over 65 years of age)
- 1.5% of adults use a wheelchair (which increases to 5.2% for people aged over 65 years of age)

<sup>35</sup> Australian Bureau of Statistics 2009, 4446.0 - Disability, Australia, 2009,

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4446.02009?OpenDocument>, viewed 26 August 2015

<sup>36</sup> Australian Building Codes Board 2013, Lifts Used During Evacuation Handbook Non-Mandatory Document, p.35, <http://www.abcb.gov.au/education-events-resources/publications/abcb-handbooks>, viewed 26 August 2015

<sup>37</sup> Centers for Disease Control and Prevention, Key Findings: Prevalence of Disability and Disability Type among Adults, United States – 2013, <http://www.cdc.gov/ncbddd/disabilityandhealth/features/key-findings-community-prevalence.html>, viewed 28 August 2015

- 4.7% of adults use a cane, crutches, or walker (which increases to 17.9% for people aged over 65 years of age)<sup>38</sup>

However, in the United Kingdom it has been reported that 1.9% of the population use a wheelchair<sup>39</sup> and when we consider that a surprisingly large proportion of society across westernised countries use a wheelchair and are likely to be visiting public buildings, schools, universities, workplaces, transport centres, sports stadiums and the like on a frequent basis, it is critical that their needs during an evacuation are considered.

### Vision Impairment

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 and it is therefore important to consider how a building can be better equipped, which must include good wayfinding and exit sign strategies.<sup>40</sup>

Vision Australia has estimated that there are currently 357,000 people in Australia who are blind or have low vision.<sup>41</sup> When using the ABS data, the ABCB found that of the population 1.6% have a vision impairment, which equates to approximately 1 in 62 people.<sup>42</sup>



When we take into account this high prevalence of people in buildings with low vision, or those who are blind, it is critical to provide for their needs during an emergency. Particularly when our current wayfinding strategies in buildings, including exit signage is generally only able to be identified by visual means.<sup>43</sup>

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.<sup>44</sup> This includes providing a consistent, uniform and effective exit sign strategy in building, with Braille and tactile instructions, tactile pictograms and tactile directional indicators.

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<sup>38</sup> Centers for Disease Control and Prevention, Prevalence and Most Common Causes of Disability Among Adults --- United States, 2005, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5816a2.htm>, viewed 28 August 2015

<sup>39</sup> Disabled World, U.K. Wheelchair User Statistics, <http://www.disabled-world.com/disability/statistics/wheelchair-stats.php>, viewed 29 August 2015

<sup>40</sup> Proulx, G & Pineau, J 1996, Review of Evacuation Strategies for Occupants with Disabilities, pp.2-5,13,15, <http://orise.orau.gov/csepp/documents/planning/evacuation-documents/disabilities/evacdisabledir712.pdf>, viewed 21 October 2013

<sup>41</sup> Australian Network on Disability, Stats & Facts, <http://www.and.org.au/pages/disability-statistics.html>, viewed 26 August 2015

<sup>42</sup> Australian Building Codes Board 2013, Lifts Used During Evacuation Handbook Non-Mandatory Document, p.35, <http://www.abcb.gov.au/education-events-resources/publications/abcb-handbooks>, viewed 26 August 2015

<sup>43</sup> Rutherford, P & Withington DJ 1998, 'Sound verses Sight for Emergency Egress', Access by Design, January-April, pp.1-3

<sup>44</sup> United States Fire Administration 1999, FEMA, FA-206/December 1999 Fire Risks for the Blind or Visually Impaired, p. 3, [http://www.preventionweb.net/files/8579\\_firerisksfortheblind.pdf](http://www.preventionweb.net/files/8579_firerisksfortheblind.pdf), viewed 26 August 2015



## Hearing Impairment

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. It's been proposed by the United States Fire Administration Federal Emergency Management Agency (**FEMA**) that people with a hearing impairment are the most affected in their ability to receive notification of an emergency and are therefore most at risk.<sup>45</sup> 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.<sup>46</sup>

This is a significant issue when you consider that the ABC 2009 census found 1 in 6 Australians are affected by hearing loss. The U.S National Association for the Deaf 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. It has also been proposed that designers of emergency communications systems must consider the needs of people with hearing disabilities to ensure the system accommodates all of their needs.<sup>47</sup> When doing so, effective signage strategies advising of emergency information must be considered.

## Speech, Language and Communication Disorders

Throughout society 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. The Australian Institute of Health and Welfare in 2009 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.<sup>48</sup> In the United States it has been found that:

- 3.5% of adults have difficulties seeing words/letters in newsprint (which increases to 10.1% for people aged over 65 years of age)
- 1.1% of adults have difficulties having their speech understood (which increases to 2.1% for people aged over 65 years of age)<sup>49</sup>

When considering the needs of the people 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.

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<sup>45</sup> United States Fire Administration FEMA 1995, Emergency Procedures for Employees with Disabilities in Office Occupancies, p.7, <http://www.usfa.fema.gov/downloads/pdf/publications/fa-154.pdf>, viewed 27 August 2015

<sup>46</sup> United States Fire Administration 1999, FEMA 1999, FA-202/December 1999 Fire Risks for the Deaf or Hard of Hearing, <http://www.usfa.fema.gov/downloads/txt/publications/fa-202.txt>, viewed 27 August 2015

<sup>47</sup> Moore, WD 2010, Emergency Mass Notification and Fire Alarm Systems for All, [http://ohsonline.com/articles/2010/09/01/emergency-mass-notification.aspx?sc\\_lang=en](http://ohsonline.com/articles/2010/09/01/emergency-mass-notification.aspx?sc_lang=en), viewed 27 August 2015

<sup>48</sup> People with Disability Australia 2014, Senate Inquiry into the prevalence of different types of speech, language and communication disorders and speech pathology services in Australia Submission February 2014, p.2, <http://www.pwd.org.au/documents/pubs/SB140228-SCCASpeechPathologyServices.pdf>, viewed 27 August 2015

<sup>49</sup> Centers for Disease Control and Prevention, Prevalence and Most Common Causes of Disability Among Adults --- United States, 2005, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5816a2.htm>, viewed 28 August 2015



This group is considered to include building occupants who may not speak or understand English.<sup>50</sup> It is acknowledged that non-English speaking people may not register the warning triggers during an evacuation and may require additional assistance evacuating a building. It has also been suggested that multi-lingual evacuation messages will benefit the situation, though symbols in internationally recognised designs should also be considered.<sup>51</sup>

With that in mind, there must be some caution shown when developing exit signage using the typical 'International Symbol of Access' wheelchair symbol. This could cause confusion between signage identifying the locations of accessible features in a building, such as accessible entrances or accessible toilets.

### **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.<sup>52</sup>

The Australian Emergency Management Institute also defines it as a disability that affects a person's ability to process information.<sup>53</sup> 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. People with cognitive impairment or learning disability will vary greatly in their abilities and needs.<sup>54</sup> These building occupants may 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.

### **Temporary and other Emergent Impairments**

During an emergency event, there must be consideration for situations that result in accidents, injuries, sprains, broken bones, or a loss of assistive technology. The scenario of a bomb exploding in a building causing the entire work force to become temporality deaf might be considered an extreme example, but it highlights that it is worth considering all possible causes of an emergency event, 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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<sup>50</sup> Cameron, CT 2003, Emergency Planning for People With Disabilities and Other Special needs, p.2, <http://www.disabilitypreparedness-ncr.net/Emergency%20Planning%20for%20People%20With%20Disabilities%20and%20Other%20Special%20needs%20-%20article%20revised%2005-21-03.pdf>, viewed 21 October 2013

<sup>51</sup> Mandelblit, B 2004, 'Planning Evacuation for the Disabled', Security: Solutions for Enterprise Security Leaders, Apr2004, Vol. 41 Issue 4, pp.43-44

<sup>52</sup> International Organisation of Standardization 2011, International Standard ISO 21542 Building construction – Accessibility and usability of the built environment, 1st edn, ISO Copyright office, Switzerland, p.5

<sup>53</sup> Australian Emergency Management Institute 2013, Communicating with People with Disability: National Guidelines for Emergency Managers Handbook 5, <http://www.em.gov.au/Publications/Australianemergencymanualseries/Documents/CommunicatingwithPeoplewithDisabilityNationalGuidelinesforEmergencyManagers.PDF>, viewed 20 May 2014

<sup>54</sup> National Fire Protection Association 2007, Emergency Evacuation Planning Guide for People with Disabilities, NFPA, Massachusetts, p.11

Therefore, evacuation equipment, such as evacuation chairs must be provided for those occupants with a mobility disability, but their use could also help 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 woman going into labour.<sup>55</sup> Of course, these evacuation devices must have suitable signage to identify their location.

### “Do not use lifts if there is a fire”

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.<sup>56</sup> Statutory reinforces this with warning signage stating “*Do not use lift if there is a fire*”.<sup>57</sup>



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 time passenger lifts could allow a car full of occupants to arrive at a level of the building engulfed in flames, with tragic consequences.<sup>58</sup> Since then lifts have been fitted with fail-safe devices which returns 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. It has been widely acknowledged since the 1970's that the use of an evacuation lift will speed up an evacuation and will provide a critical component of an accessible means of egress for those occupants with disability.<sup>59 60</sup>

<sup>55</sup> Security Director's Report 2005, 'New Obligation for Evacuating Disabled Breeds Opportunity', Security Director's Report, Nov 2005, Vol. 5 Issue 11, pp.5-6

<sup>56</sup> United States Fire Administration 1999b, FEMA 1999, FA-204/December 1999 Fire Risks for the Mobility Impaired, p.9, <http://campus.server269.com/wp-content/uploads/downloads/2012/02/USFA-Fire-Risks-for-the-Mobility-Impaired.pdf>, viewed 31 August 2015

<sup>57</sup> Australian Building Codes Board 2015, National Construction Code Series, Building Code of Australia Volume 1, Clause E3.3

<sup>58</sup> Allen, T 2003, Early Evacuation Elevator Operation, ASME International, pp. 1-3, <http://cstools.asme.org/csconnect/FileUpload.cfm?View=yes&ID=19509>, viewed 20 May 2014

<sup>59</sup> Klote, JH, Deal SP, Levin, B M, Groner, NE & Donoghue, EA 1993, Workshop on Elevator Use During Fires, p. 1, <http://fire.nist.gov/bfrlpubs/fire93/PDF/f93009.pdf>, viewed 31 August 2015

<sup>60</sup> Pauls, J, Gatfield, AJ & Juillet, E 1991, ELEVATOR USE FOR EGRESS: THE HUMAN-FACTORS PROBLEMS AND PROSPECTS, pp. 64-65, [http://www.nist.gov/el/disasterstudies/wtc/upload/3Pauls\\_R9100732\\_Elevator\\_Use\\_for-Egress.pdf](http://www.nist.gov/el/disasterstudies/wtc/upload/3Pauls_R9100732_Elevator_Use_for-Egress.pdf), viewed 31 August 2015

More recently, the use of evacuation lifts has become more commonplace and necessary as buildings have become taller. In fact, the use of passenger lifts were extensively used in the evacuation of the World Trade Center during the 9/11 terrorist attacks where 27% of people used a lift for part of their escape route<sup>61</sup> – however, this is not always the case, and in most cases, particularly in existing buildings they cannot be used during an evacuation.

## Existing Japanese Style (or Running Man) Style Exit Signs

The Japanese style (or Running Man style) exit sign has been around for some time now and is widely accepted as the preferred exit sign in many countries around the world.



The following sub-sections provide:

- a brief history of the Japanese exit sign (also known as the Running Man);
- discusses why it presents as a non-inclusive and discriminatory approach; and
- considers the effectiveness of typical exit signs

### A Brief History of the Japanese Exit Sign (also known as the Running Man)

The Japanese style exit sign, now referred to internationally as the 'Running Man' exit sign has been around for many years now and provides an international graphical indication of where an exit is located within a public facility. This is important for safe evacuation of a building during an emergency, such as a fire.



The actual design of the Running Man was created by Yukio Ota in 1979 and has since been accepted into standards in Australia, Britain, Norway and many parts of Asia. It is now adopted into the current edition of ISO 7010 using the methodology under *ISO 3864-1:2011 Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*.

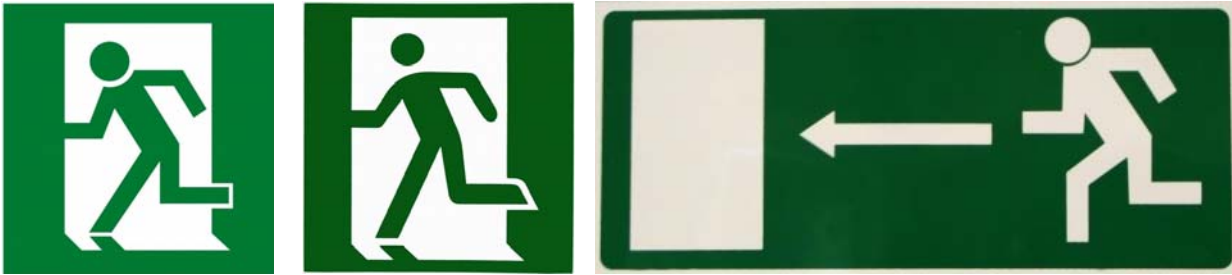
Subsequently, Canada also took the initiative to harmonise ISO 7010, ISO 3864-1 and the National Building Code of Canada with replacement of traditional “EXIT” and “SORTIE” worded exit signs.<sup>62</sup>

The Running Man was introduced into the 1987 international standard on pictograms as a consistent approach, and international approach and a move away from using words in the native language, i.e. “EXIT”, which is still used in many parts of the world, including the United States.<sup>63</sup>

<sup>61</sup> Charters, D, 2008, ‘Express Elevator’, Fire Safety Engineering, May 2008, Vol. 15 Issue 4, pp. 17-19

<sup>62</sup> Emergi-lite Pictogram Exit Sign Catalogue, [http://www.tnb.ca/en/brands/emergi-lite/files/EL-EN\\_RM\\_Catalogue.pdf](http://www.tnb.ca/en/brands/emergi-lite/files/EL-EN_RM_Catalogue.pdf), viewed 9 September 2015

<sup>63</sup> Wikipedia, Exit Sign, [https://en.wikipedia.org/wiki/Exit\\_sign#History](https://en.wikipedia.org/wiki/Exit_sign#History), viewed 26 August 2015



The design has however been modified in numerous way around the world, in designs that differ from that presented by Yukio Ota in 1979.

## A Non-Inclusive and Discriminatory Approach

The ISO/TC 145/SC2 Technical Committee for ISO 7010 says that there will be a hazard if occupants are not able to “*locate an escape route to a place of safety which is provided for evacuation in the event of an emergency.*”<sup>64</sup> Furthermore, the committee states the human behaviour that is intended to be caused after understanding the safety sign's meaning is to be aware of the location of an escape route to a place of safety in the event of an emergency.

With that in mind, it must be acknowledged that the use of the Running Man image, or for that matter the word “EXIT”, does not consider those people with a mobility impairment who deserve the same rights as any other building occupant, including knowing where an accessible means of egress is located.



On this basis, the intent of the image is not meeting its full potential or purpose, as defined by the ISO committee, in that there will be a small proportion of people who will not be aware of the location of an escape route suitable for their needs.



A more inclusive approach is therefore proposed to cater for everyone adopting the principles of universal design. It has now been argued that the reliance on this Running Man sign alone to designate exits is out-dated and discriminatory, with many countries mandating legislation for disability rights after the year of design and adoption of the Running Man exit sign.

In other words – it’s time for a change, a change for an inclusive design.

<sup>64</sup> ISO 7010:2011 – E001, <https://www.iso.org/obp/ui/#iso:grs:7010:2:E001>, viewed 9 September 2015

## Effectiveness of Typical Exit Signs

It has been found that only 38% of people register the presence of an emergency exit sign during an emergency. 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 lead them into an unsafe area or an unprotected (i.e. non-fire rated) path of travel. The research undertaken surmises that signage will only effective is people can actually see them and register them.<sup>65</sup>



For these reasons it is important to consider all options and strategies to help provide the necessary information to building occupants, which can include dynamic exit signs interacting and responding to directions from the fire control centre, low level signage, photo-luminescence signs and accessible exit sign options.

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 those required overseas, where exit doors and egress routes have additional mandated requirements, including other wayfinding provisions, tactile markings and exit signage and stair signage.

## Existing Wheelchair Symbols on Exit Signs



This is not the first time that an exit sign design has been given a symbol representing a person using a wheelchair. There have previously been some sign manufacturers who have also identified this need for accessible exit signage, but generally these are simply re-coloured and the International Symbol of Access or a wheelchair symbol is added.

This section discusses these designs and considers how effective they are in identifying an accessible exit.

### The European Style Wheelchair on Exit Signs

Symbols on exit signs which represent a person using a wheelchair are not a new concept. But as stated above, generally these sign manufacturers simply added the international symbol of access or a wheelchair symbol to their sign and sometimes recolour the background to a green colour.

There are international standards, including the international standard on accessibility (ISO 21542:2011) that actually present this sign as a form of signage to show an accessible exit route.

<sup>65</sup> Galea, E. 2012, 'Would You See it?' Industrial Fire Journal, Summer 2012, pp.12,14-15





These designs do not present well, they show the typical Japanese style ‘Running Man’ moving quickly through an open doorway, whilst the symbol representing a person using the wheelchair remains behind, motionless and potentially in danger... this is not inclusive and not acceptable. It also fails to address the universal design aspects required under nations that have signed and ratified the UN Conventions on the Rights of People with Disabilities.

The standard shows an example accessible exit sign in Figure 72 of the ISO 21542<sup>66</sup>, which can have three components:

- A directional arrow (from ISO 7010)
- The ‘Running Man’ (from ISO 7010)
- A supplementary sign, being the European version of the International Symbol of Access (from ISO 7001)
- This is represented in the example above

### An Ambiguous Exit Sign Design

The ISO 21542 design is an attempt to meet the needs of people with disability, but fails to provide an inclusive design. Furthermore, the design is not clear and could be seen as ambiguous signage that indicates the location of other accessible features within the building or facility. The standard even says that the supplementary sign can be used to show “*Full accessibility or toilets – accessible.*”

The use of the International Symbol of Access could cause confusion and present as a directional arrow to a toilet, as the standard clearly states could be the case (i.e. the sign could be indicating an accessible toilet, or an accessible egress route).

In fact, even in ISO 7001 when using the European equivalent of the International Symbol of Access it provides the meaning as “*Full accessibility or toilets – accessible.*”<sup>67</sup>

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<sup>66</sup> International Organisation of Standardization 2011, International Standard ISO 21542 Building construction – Accessibility and usability of the built environment, 1st edn, ISO Copyright office, Switzerland, Figure 72, p.109

<sup>67</sup> International Organisation of Standardization 2007, International Standard ISO 7001 Graphical symbols — Public information symbols, 3rd edn, ISO Copyright office, Switzerland, Table 3, p.18



Other designs have been produced around the world that appear to have been driven by the ADA market in the United States. These also adopt the International Symbol of Access, but generally the colours, sizes, designs and styles of these signs have differed greatly.

It is therefore argued that it would be better to have a recognizable, clear and internationally recognized symbol of accessible egress, to be used to identify exit signs, exit routes and other components of the accessible means of egress, whilst leaving the International Symbol of Access to identify entrances and accessible toilets.

### Risk Management and the Accessible Exit Signage



Failure to provide adequate evacuation planning, controls, equipment and suitable signage presents as a risk for any organisation. When considering this risk, the following areas are applicable:

- The exit sign 'gap' and reducing risk
- Documented events in the media, which present as bad press for any company
- Occupant expectations and accessible exit signage
- Some relevant quotes from around the world

#### The Exit Sign 'Gap' and Reducing Risk

The 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 specialising in fire litigation (as well as being a fire district chief) 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.<sup>68</sup>



Good planning, communication of emergency evacuation information, appropriate accessible exit signage and an accessible means of egress would have allowed this shopper to evacuate with the rest of the building occupants.

### A Recent Case Study

Whilst preparing this paper a similar event to the one that happened in the United States in 2005 occurred in the United Kingdom. On 17 August 2015 a 77 year old asthmatic pensioner with a disability was shopping in a large local clothing store when she heard the fire alarm.<sup>69</sup> The shopping centre was quickly evacuated due to a fire in a toilet block and the fire brigade arrived to extinguish the fire. By the time the lady arrived at the store front she found the security shutters were down and she was locked inside the store. She shouted for help, but none arrived, she then moved to the back of the store attempting to locate an exit she could use, to no avail. In the end she sat down and waited, for half an hour. Afterwards she was quoted as saying *"It was as bit of an ordeal, it shook me up and I wasn't myself afterwards, I couldn't sleep at night."*

Whilst the reasons for her delay in reaching the exit route are not clear, what is clear is that better emergency management planning and controls could have prevented this situation. Signage showing the accessible means of egress to the required exits would help a person locate the exit. Information, in the form of accessible, identifiable, and suitable sized signage could help people make better decisions.



<sup>68</sup> Comstock, DC 2005, ADA Decision Heralds New Safety Thinking, Fire Chief, Sep 2005, Vol. 49 Issue 9, pp.18,20,22

<sup>69</sup> The Shields Gazette, Disabled pensioner left trapped behind shop shutters after fire evacuation at Hartlepool shopping centre, <http://www.shieldsgazette.com/news/local-news/disabled-pensioner-left-trapped-behind-shop-shutters-after-fire-evacuation-at-hartlepool-shopping-centre-1-7436298>, viewed 13 September 2015

## Occupant Expectations and Accessible Exit Signage



Everyone deserves the right to a safe working environment or safe public space.

A safe accessible signage strategy should form part of any emergency egress solution for a building. It has been evident over the years that the needs of all people, including those with a disability are not being met.

It must be acknowledged that following the attack on the World Trade Centre in 2001 there have been some improvements made in the U.S., but most countries are far behind these actions:

- A survey undertaken in 2001 in the U.S. discovered that 50% of people with disabilities said they had no plans made to safely evacuate their workplaces and were far more anxious about their personal safety.<sup>70</sup>
- 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 were now in place to safely evacuate employees with disabilities, compared to only 45% in a similar survey conducted in 2001.<sup>71</sup>
- A survey of companies showed that 50% of companies admitted that their evacuation plans did not account for people with disabilities.<sup>72</sup>
- A survey undertaken by the British Research Establishment found that all respondents believed that the building owner, employer or facilities management team were responsibility for the evacuation of people with disabilities.<sup>73</sup>
- There are still recent accounts in the press of people being left behind in areas of a burning building whilst other occupants safely evacuate.<sup>74 75</sup>

<sup>70</sup> Suttell, R 2003, 'Proactive Evacuation Assistance', Buildings. Apr 2003, Vol. 97 Issue 4, pp.32-33

<sup>71</sup> Mandelblit, B 2004, Planning Evacuation for the Disabled', Security: Solutions for Enterprise Security Leaders, Apr2004, Vol. 41 Issue 4, pp.43-44

<sup>72</sup> Security Director's Report 2005, New Obligation for Evacuating Disabled Breeds Opportunity, Security Director's Report, Nov 2005, Vol. 5 Issue 11, pp.5-6

<sup>73</sup> Communities and Local Government 2008, BD 2441: The adequacy of refuges, escape stairs and management procedures, Department for Communities and Local Government, London, pp. 7-9, 12, 14-15, 21-22

<sup>74</sup> CBC News Nova Scotia 2013, Mom angry disabled daughter left behind in fire drills,

<http://www.cbc.ca/news/canada/nova-scotia/story/2013/01/16/ns-fire-evacuation-weilgart.html>, viewed 25 August 2015

<sup>75</sup> CBS Chicago 2012, Parents Of Disabled Child Worried About School's Evacuation Plan,

<http://chicago.cbslocal.com/2012/04/11/parents-of-disabled-child-worried-schools-evacuation-plan/>, viewed 25 August 2015

## Quotes from Around the World

The following quotes have been collected and presented to highlight the issues discussed within this paper.

*People with disabilities are entitled to the same level of protection in an emergency as everyone else – no more, no less.*<sup>76</sup>

*History has shown that planning for emergency evacuation dramatically increases the chance for successful evacuation.*<sup>77</sup>

*Individuals with disabilities may have specific needs and concerns, all employees will benefit for knowing workplace safety features and emergency procedures.*<sup>78</sup>

*Disability will affect the lives of everyone at some point in their life, it is time society changed to acknowledge this.*<sup>79</sup>

*One man's final image as he left the 80th floor (of the World Trade Center on September 11 2001) and made it to safety was that of a room full of people using wheelchairs and walkers waiting to be rescued by firefighters who were coming up the stairs. They all perished.*<sup>80</sup>

*.....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.*<sup>81</sup>

*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.*<sup>82</sup>

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<sup>76</sup> US Fire Administration FEMA 2002, FEMA FA 235 Orientation Manual for First Responders on the Evacuation of Disabled People, p.3, <http://www.usfa.fema.gov/downloads/pdf/publications/FA-235-508.pdf>, viewed 30 August 2015

<sup>77</sup> Loy, B, Hirsh, A, Batiste, LC 2004, Evacuation Preparedness: Managing the Safety of Employees with Disabilities, Occupational Health & Safety. Sep 2004, Vol. 73 Issue 9, <http://ohsonline.com/Articles/2004/09/Evacuation-Preparedness.aspx>, viewed 30 August 2015

<sup>78</sup> Bruyère, SM & Stothers, WG 2002, 'Enabling Safe Evacuations', HR Magazine, Jan2002, Vol. 47 Issue 1, pp. 65-67

<sup>79</sup> Disabled World 2014a, Worldwide Disability News & Information, <http://www.disabled-world.com/>, viewed 30 August 2015

<sup>80</sup> National Council on Disability 2005, Saving Lives: Including People with Disabilities in Emergency Planning, National Council on Disability, Washington, pp. 26-28

<sup>81</sup> Isaacson-Kailes, J 2002, Emergency Evacuation Preparedness: Taking Responsibility for Your Safety: A Guide for People with Disabilities and Other Activity Limitations

<sup>82</sup> Scottish Government 2010, Practical Fire Safety Guidance: The Evacuation Of Disabled Persons From Buildings, p.5, <http://www.scotland.gov.uk/Resource/0040/00402451.pdf>, viewed 30 August 2015



## Fire Engineering and Performance-Based Building Codes

Many countries now have ‘performance-based’ building codes and buildings are getting more and more reliant on fire engineering to satisfy the building code ‘Performance Requirements’ under ‘Alternative Solutions’. This is discussed in further detail in Part 8 of this paper.

Recent advances in lift and building technology has allowed the use of passenger lifts to provide a form of evacuation under a ‘performance-based’ solution. However, there must be appropriate signage to advise occupants of the arrangements and how the accessible means of egress can be provided out of the building. Accessible exit signage, showing refuge areas, locations of evacuation chairs, if evacuation lifts are available and accessible exit doors must be part of any exit sign solution.

An ‘Alternative Solution’ can be defined as a building solution which complies with the ‘Performance Requirements’ other than by satisfying the prescriptive ‘Deemed-to-Satisfy’ provisions of a building code. 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 often sees the introduction of new materials, technologies or methodologies, which could also see some efficiencies, safer buildings, better outcomes and cost savings, whilst still meeting the relevant Performance Requirement.

When considering the use of an ‘Alternative Solution’ as part of an overall egress solution to a building, the International Standard on Accessibility ISO 21542 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*”.<sup>83</sup>

ISO 21542 could also be considered when developing ‘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 egress 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 move to a safe refuge area.
- 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.

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<sup>83</sup> International Organisation of Standardization 2011, International Standard ISO 21542 Building construction – Accessibility and usability of the built environment, 1st edn, ISO Copyright office, Switzerland, Clause 15.6, p.45

- The ability to use all passengers lifts in new buildings to evacuate occupants.
- The ability to upgrade passengers lifts in existing buildings to evacuate occupants.

### Precedence in Performance-Based Exit Sign Solutions

The concept of deviating from the prescriptive 'Deemed-to-Satisfy' provisions for exit signs in commercial buildings is not new.

Two relevant examples come to mind, the first is Southern Cross Railway Station in Melbourne. When the station was redeveloped and reopened in 2006 the typical safety green 'EXIT' signs were replaced with blue 'EXIT' signs. One can only assume this was to match the colour scheme throughout the station.



The second example is within parts of Federation Square in Melbourne. These areas have a modified version of the 'Running Man' that is clearly different from the accepted design referenced within AS 2293.1, which is adopted in the current version of the building code.

The concept of deviating from the prescriptive 'Deemed-to-Satisfy' provisions for exit signs in commercial buildings is not new.

### Support from Australian Building Codes Board References

The ABCB has made three very pertinent statements in the document '*Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement September 2014*':<sup>84</sup>

*The current D-t-S provisions do not prescribe accessible solutions for occupants with disability despite the mandatory 'Performance Requirements' requiring exits and warnings being appropriate to the number, mobility and characteristics of occupants*

*The primary limitation with emergency egress for people with mobility disabilities is the inability to independently manoeuvre stairs. The report also highlights the difficulties people with vision and hearing impairments experience in recognising safe paths of egress and traditional warning cues in the event of an emergency*

<sup>84</sup> Australian Building Codes Board 2014, *Emergency Egress for Occupants with Disability Consultation Regulation Impact Statement*, pp.10-11,

[http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation\\_RIS\\_Emergency\\_Egress\\_for\\_Occupants\\_with\\_Disability.ashx?la=e](http://www.abcb.gov.au/~media/Files/Download%20Documents/RIS%20docs/Consultation_RIS_Emergency_Egress_for_Occupants_with_Disability.ashx?la=e), viewed 27 August 2015

*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.*  
Australian Building Codes Board, 2014



### 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<sup>85</sup>, 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 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.<sup>86</sup>

Similarly, closer to home the Australian Government attempted to introduce legislation in 2014 to require people to remain working until 70 years of age before eligibility for the age pension.<sup>87</sup>

<sup>85</sup> Australian Bureau of Statistics, 2012, Year Book Australia, Population Size and Growth, <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Population%20size%20and%20growth~47>, viewed 30 August 2015

<sup>86</sup> The Economist 2014, Age Invaders, <http://www.economist.com/news/briefing/21601248-generation-old-people-about-change-global-economy-they-will-not-all-do-so?frsc=dg%7Ca>, , viewed 30 August 2015

<sup>87</sup> The Sydney Morning Herald 2014, Retirement age rise to 70 by 2035, Joe Hockey announces, <http://www.smh.com.au/federal-politics/political-news/retirement-age-rise-to-70-by-2035-joe-hockey-announces-20140502-zr318.html#ixzz30dDf1vvX>, viewed 30 August 2015

The elderly often experience 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.<sup>88 89</sup> The Centre for Clinical Research Excellence Aphasia Rehabilitation reported that in 2012, 420 000 people or 1.77 per cent of the Australian population were living with the effects of stroke.<sup>90</sup>

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 a significant disability increases with age.

### Increased Child-Care Centres above Entry Levels of Buildings

As people move towards higher density living there is a growing trend to provide child-care services in high-rise buildings.



In late 2014 the City of Sydney in New South Wales approved three new child-care centres with places for 240 children. It has been recognised that there are now more and more child-care centres being provided in high-rise buildings in the central business districts around the country and this presents as a significant risk if the unique needs of the occupants are not considered.

As of 2014, the City of Sydney had at least 14 child-care centres located above ground level in inner city buildings. But it is understood that the Council approved some of these on the basis that enhanced evacuation provisions were imposed, that provided for a fire-rated refuge area to help the staff evacuate the children safely.<sup>91</sup> No doubt these were part of a robust fire engineering report, but it highlights that consideration of universal design principles not only benefits the children, but other occupants that might be in the building that could take advantage of any refuge floor or refuge area.

In Victoria, the Metropolitan Fire & Emergency Services Board (MFB) released a Fire Safety Guideline in 2003, which was recently updated in late 2014 to help address this growing trend. The Guidelines aims to “*provide guidance to child care providers and building designers on the risks associated with the evacuation of children.*”<sup>92</sup>

<sup>88</sup> United States Fire Administration 1999, FEMA, FA-203/December 1999 Fire Risks for the Older Adult, <http://www.usfa.fema.gov/downloads/txt/publications/fa-203.txt>, viewed 31 August 2015

<sup>89</sup> Simkins TE, 2005, Study on High-rise Evacuation of Elderly Residents during Fire Alarms, p.7, <http://www.usfa.fema.gov/pdf/efop/efo38038.pdf>, viewed 31 August 2015

<sup>90</sup> Parliament of Australia 2014, Senate Report, Prevalence of different types of speech, language and communication disorders and speech pathology services in Australia, p.29

<sup>91</sup> The Sydney Morning Herald 2014, City to build three new childcare centres, <http://www.smh.com.au/nsw/city-to-build-three-new-childcare-centres-20140920-10jo1y.html>, viewed 7 September 2015

<sup>92</sup> MFB Fire Safety Guideline GL-23, Child Care Facilities Located Above Ground Floor, Version 8, October 2014, <http://www.mfb.vic.gov.au/Media/docs/GL%2023%20->

In terms of evacuating small children by stairs the MFB also state that “*Carers should be aware that when moving down a staircase, children will have difficulty coping with the steps as they have generally been designed for adult use.*” Consideration of an accessible means of egress not only benefits those people with a mobility limitation, but also small children, parents of children and those staff attempting to evacuate a large number of small children as quickly as possible.

### Obesity Trends

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, over one-third of adults over 20 years of age in Australia were overweight.<sup>93 94</sup>

Obesity is a growing problem in all westernised nations. In the United States the prevalence of obesity in children and adolescents aged 2-19 years resides at about 17%.<sup>95</sup> In contrast, more than one-third (34.9% or 78.6 million) of adults in the United States are obese.<sup>96</sup>

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.<sup>97</sup>

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[%202015%20web%20Child%20care%20facilities%20located%20above%20ground%20floor-2161bf96-5bc8-4a3c-9c41-8f072b9104d3-0.pdf](#), viewed 7 September 2014

<sup>93</sup> Australian Bureau of Statistics 2010, 4102.0 - Australian Social Trends, March 2009, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features10March%202009>, viewed 31 August 2015

<sup>94</sup> Australian Bureau of Statistics 2012, 4102.0 - Australian Social Trends, March Quarter 2012, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20Jun+2012>, viewed 31 August 2015

<sup>95</sup> Centers for Disease Control and Prevention, Childhood Obesity Facts <http://www.cdc.gov/obesity/data/childhood.html>, viewed 28 August 2015

<sup>96</sup> Centers for Disease Control and Prevention, Adult Obesity Facts <http://www.cdc.gov/obesity/data/adult.html>, viewed 28 August 2015

<sup>97</sup> Australian Building Codes Board 2013, Directions Report on Egress for All Occupants pp. 17-18 [http://www.abcb.gov.au/~media/Files/Download%20Documents/Consultation/Other%20Consultation%20Documents/ABCB\\_Directions\\_Report\\_on\\_Egress\\_for\\_All\\_Occupants\\_2013\\_word.docx](http://www.abcb.gov.au/~media/Files/Download%20Documents/Consultation/Other%20Consultation%20Documents/ABCB_Directions_Report_on_Egress_for_All_Occupants_2013_word.docx), viewed 31 August 2015





# Part 6: Accessible Means of Egress Concept

*An ‘accessible means of egress’ is a relatively new term in Australia, though it is one that is widely accepted in many parts of the world and was adopted into the 2009 International Building Code (or ‘IBC’) published by the International Code Council. This term encompasses the parts of a building that make up the evacuation route for people with disability during an emergency evacuation.*

*When we compare the Australian situation to the requirements overseas, it is clear there must be further debate as to how the concept of an ‘accessible means of egress’ in some form can be adopted into the NCC. This debate must consider the international requirements for the accessible means of egress path to be continuous from all accessible parts of a building to a safe place outside the building, which may include the use of evacuation lifts, refuge areas, or assisted evacuation techniques such as the use of evacuation chairs, in conjunction with good emergency evacuation procedures.<sup>98</sup>*

## International Building Code 2012

Historically, the United States building regulations has been based on model building codes developed by three regional model code groups.<sup>99</sup> The three codes were developed by the Building Officials Code Administrators International (**BOCA**), the Southern Building Code Congress International (**SBCCI**) and the International Conference of Building Officials (**ICBO**) groups. However, during the early 1990’s a need was evident for a single national building code. The three model code groups joined to become the International Code Council (**ICC**) with a view to develop codes that could be used without any regional restrictions.

After three years developing the new code, the International Building Code (**IBC**) was first published in 1997 by the International Code Council. The codes establish minimum regulations for building approvals using prescriptive and performance-based provisions.

The International Building Code provisions provide many benefits, including offering an international forum for building professionals to “*discuss performance and prescriptive code requirements.*” This forum provides an excellent arena to debate proposed revisions. This model code also encourages international consistency in the application of provisions.

The Preface of the IBC 2012 states that:

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<sup>98</sup> Sourceable, Why We Need an Accessible Means of Egress, <https://sourceable.net/why-we-need-an-accessible-means-of-egress/#>, viewed 24 September 2015

<sup>99</sup> Wikipedia, International Building Code, [https://en.wikipedia.org/wiki/International\\_Building\\_Code](https://en.wikipedia.org/wiki/International_Building_Code), viewed 24 August 2015

*Code officials recognize the need for a modern, up-to-date building code addressing the design and installation of building systems through requirements emphasizing performance.*

*The International Building Code®, in this 2012 edition, is designed to meet these needs through model code regulations that safeguard the public health and safety in all communities, large and small.<sup>100</sup>*

## A Means of Egress

A means of egress for all building occupants is defined in Section 1002.1 of the IBC as a "*continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way.*"<sup>101</sup>

As defined in Section 1002.1, a means of egress consists of three separate and distinct components:

- The exit access
- The exit
- The exit discharge



These requirements are essentially the same as those prescriptive 'Deemed-to-Satisfy' requirements of the BCA and other prescriptive building codes from around the world.

### The Exit Access

The part of a means of egress system that leads from any occupied portion of a building or structure to an exit.

### The Exit



The part of a means of egress system which is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives as required to provide a protected path of egress travel between the exit access and the exit discharge. Exits include exterior exit doors at ground level, exit enclosures, exit passageways, exterior exit stairs, exterior exit ramps and horizontal exits.

### The Exit Discharge

The part of a means of egress system between the termination of an exit and a public way.

<sup>100</sup> International Code Council, International Building Code, Preface, [http://publiccodes.cyberregs.com/icod/ibc/2012/icod\\_ibc\\_2012\\_intro.htm](http://publiccodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_intro.htm), viewed 24 August 2015

<sup>101</sup> International Code Council, International Building Code, Section 1002.1, [http://publiccodes.cyberregs.com/icod/ibc/2012/icod\\_ibc\\_2012\\_2\\_sec002.htm](http://publiccodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_2_sec002.htm), viewed 23 August 2015

## The Public Way

It is also critical to consider how one moves to a safe place outside the building, and in the IBC as public way has been defined as a street, alley or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet (or 3048 mm).

## The Accessible Means of Egress



An 'accessible means of egress' is a new concept in Australia, New Zealand, Asia and other westernised countries, though this concept that has been developed and accepted in the United States and some parts of Europe. In fact, it has been adopted into the 2012 International Building Code (IBC) published by the International Code Council.<sup>102</sup> This term encompasses the parts of a building that form the evacuation route for people with disability during an emergency evacuation.

### The IBC Commitment to People with Disability

Unlike other less prescriptive building codes, including the BCA in Australia, the IBC acknowledges the additional needs of people with disability during an evacuation of a building and considers the challenges that this user group may face when trying to exit a building during an emergency.

This is where the IBC stands out as a building code that considers the needs of people with disabilities, particularly those who are unable to exit via a vertical path (i.e. a fire escape stairway).

## The IBC Accessible Means of Egress

The IBC includes a requirement for accessible spaces to be provided with not less than one accessible means of egress. Where more than one means of egress is required by Section 1015.1 or 1021.1 from any accessible space, each accessible portion of the space shall be served by not less than two accessible means of egress.

Though there are some exemptions to this rule (Section 1007.1):

1. Accessible means of egress are not required in alterations to existing buildings.
2. One accessible means of egress is required from an accessible mezzanine level in accordance with Section 1007.3, 1007.4 or 1007.5.
3. In assembly areas with sloped or stepped aisles, one accessible means of egress is permitted where the common path of travel is accessible and meets the requirements in Section 1028.8.

<sup>102</sup> International Code Council, <https://www.iccsafe.org/safety/Documents/MeansofEgressBroch.pdf>, viewed 23 August 2015

The IBC defines the 'accessible means of egress' as "*a continuous and unobstructed way of egress travel from any accessible point in a building or facility to a public way.*"<sup>103</sup>

## Parts of an IBC Accessible Means of Egress

An IBC accessible means of egress may include any combination of the following, but must be continuous when leading to the public way:

- Accessible routes (referred to as continuous accessible paths of travel in some legislation)
- Stairways (including interior exit, interior exit access and exterior exit stairways)
- Elevators (also referred to as passenger lifts in some countries)
- Platform lifts
- Horizontal exits
- Ramps
- Areas of Refuge
- Exterior area for assisted rescue
- Two-way communication
- Accessible signage
- Directional signage
- Where an exit stairway forms part of the accessible means of egress is must include either an 'area of refuge' or an exterior 'area for assisted rescue'
- In buildings where accessible floors are four or more stories above or below a level of exit discharge, at least one required accessible means of egress must be provided by an elevator as outlined above.

The following sections provide further definitions from the IBC 2012.<sup>104</sup>

### Accessible Routes (including Accessible Ramps)

A continuous, unobstructed path that complies with Chapter 11 – Accessibility (Section 202). There are a few exceptions to this rule, but generally Section 1010.1 applies to ramps used as a component of a means of egress. These provisions include (but are not limited to), the following:

- All interior exit ramps must be enclosed in accordance with Section 1022.
- Exit access ramps must be enclosed in accordance with Section 1009.3.
- Ramps must be not steeper than 1:12.
- The cross-slope must be not steeper than 1:48.
- The minimum width must be 36 inches (914 mm) minimum (Section 1018.2).
- The minimum headroom must be not less than 80 inches (2032 mm).
- Ramps shall have landings at the bottom and top of each ramp, points of turning, entrance, exits and at doors (Sections 1010.7.1 through 1010.7.5).
- Ramps with a rise greater than 6 inches (152 mm) must have handrails on both sides. Handrails to comply with Section 1012.

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<sup>103</sup> International Code Council, International Building Code 2012, Section 202, [http://publiccodes.cyberregs.com/icod/ibc/2012/icod\\_ibc\\_2012\\_2\\_sec002.htm](http://publiccodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_2_sec002.htm), viewed 23 August 2015

<sup>104</sup> International Code Council, International Building Code 2012, <http://publiccodes.cyberregs.com/icod/ibc/2012/index.htm>, viewed 23 August 2015

## Stairways (Exterior or Interior)

One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another (Section 202). In order to be considered part of an accessible means of egress, a stairway between stories shall have a clear width of 48 inches (1219 mm) minimum between handrails and shall either incorporate an area of refuge within an enlarged floor-level landing or shall be accessed from either an area of refuge complying with Section 1007.6 or a horizontal exit. Exit access stairways that connect levels in the same story are not permitted as part an accessible means of egress.

The clear width of 48 inches (1219 mm) between handrails is not required:

1. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2; or
2. For stairways accessed from a horizontal exit.

## Elevators (Passenger Lifts)

In buildings where a required accessible floor is four or more stories above or below a level of exit discharge, at least one required accessible means of egress shall be an elevator complying with Section 1007.4, except:

1. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a horizontal exit and located at or above the levels of exit discharge.
2. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a ramp conforming to the provisions of Section 1010.

In order to be considered part of an accessible means of egress, an elevator shall comply with the emergency operation and signalling device requirements of Section 2.27 of ASME A17.1. Standby power shall be provided in accordance with Chapter 27 and Section 3003. The elevator shall be accessed from either an area of refuge complying with Section 1007.6 or a horizontal exit. (Section 1007.4).

There are however some exceptions:

1. Elevators are not required to be accessed from an area of refuge or horizontal exit in open parking garages.
2. Elevators are not required to be accessed from an area of refuge or horizontal exit in buildings and facilities equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
3. Elevators not required to be located in a shaft in accordance with Section 712 are not required to be accessed from an area of refuge or horizontal exit.
4. Elevators are not required to be accessed from an area of refuge or horizontal exit for smoke protected seating areas complying with Section 1028.6.2.



## Platform Lifts

Platform (wheelchair) lifts shall not serve as part of an accessible means of egress, except where allowed as part of a required accessible route in Section 1109.7, Items 1 through 9. Standby power shall be provided in accordance with Chapter 27 for platform lifts permitted to serve as part of a means of egress. (Section 1007.5).

## Horizontal Exits

Horizontal exits are essentially being paths of egress from one fire compartment into another fire compartment, being on approximately the same level and affords the same level safety from fire and smoke from the area of incidence (Section 202).

## Area of Refuge

An area of refuge is defined as an area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation (Section 202). This could include people with mobility related activity limitations, the elderly, the very young, people with respiratory conditions, heart conditions and the like. Essentially, an area of refuge is an important aspect to universal design in terms of emergency evacuation.

Every required area of refuge must be accessible from the space it serves by an accessible means of egress. The maximum travel distance from any accessible space to an area of refuge shall not exceed the travel distance permitted for the occupancy in accordance with Section 1016.1. Every required area of refuge shall have direct access to a stairway complying with Sections 1007.3 or an elevator complying with Section 1007.4. Where an elevator lobby is used as an area of refuge, the shaft and lobby shall comply with Section 1022.10 for smoke-proof enclosures except where the elevators are in an area of refuge formed by a horizontal exit or smoke barrier.

Each area of refuge must be sized to accommodate one wheelchair space of 30 inches by 48 inches (762 mm by 1219 mm) for each 200 occupants or portion thereof, based on the occupant load of the area of refuge and areas served by the area of refuge. Such wheelchair spaces shall not reduce the required means of egress width. Access to any of the required wheelchair spaces in an area of refuge shall not be obstructed by more than one adjoining wheelchair space.

Each area of refuge shall be separated from the remainder of the story by a smoke barrier complying with Section 709 or a horizontal exit complying with Section 1025. Each area of refuge shall be designed to minimize the intrusion of smoke.

Areas of refuge are not required in the following situations:

1. At stairways in buildings equipped throughout by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Stairways serving open parking garages.
3. Smoke protected seating areas complying with Section 1028.6.2.
4. Group R-2 occupancies, being residential occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature, including apartment houses, boarding houses, dormitories, hotels, motels and the like.

## Exterior Area for Assisted Rescue

Exterior areas for assisted rescue shall be accessed by an accessible route from the area served in accordance with Section 1007.7.1 or 1007.7.2.

## Two-way Communication

Areas of refuge must be provided with a two-way communication system complying with Sections 1007.8.1 and 1007.8.2, including:

1. Two-way communication systems that provide communication between each required location and the fire command center or a central control point location approved by the fire department. Where the central control point is not constantly attended, a two-way communication system shall have a timed automatic telephone dial-out capability to a monitoring location or 9-1-1. The two-way communication system shall include both audible and visible signals.
2. Directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system and written identification of the location shall be posted adjacent to the two-way communication system.

## Accessible Signage

Signage indicating special accessibility provisions shall be provided as shown:

1. Each door providing access to an area of refuge from an adjacent floor area shall be identified by a sign stating: "AREA OF REFUGE".
2. Each door providing access to an exterior area for assisted rescue shall be identified by a sign stating: "EXTERIOR AREA FOR ASSISTED RESCUE" (Section 1007.9).

Signage must have visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by Section 1011.3, the signs shall be illuminated. Raised character and Braille signage must be located at each door to an area of refuge and exterior area for assisted rescue in accordance with Section 1011.4.

Section 1011.4 states that a sign stating "EXIT" in raised characters and Braille must be provided adjacent to each door to an area of refuge, an exterior area for assisted rescue, an exit stairway, an exit ramp, an exit passageway and the exit discharge.

## Directional Accessible Signage

Direction signage indicating the location of the other means of egress and which accessible means of egress are to be provided at the following:

1. At exits serving a required accessible space but not providing an approved accessible means of egress.
2. At elevator landings.
3. Within areas of refuge (Section 1007.10).

## Instructions on Signs

In areas of refuge and exterior areas for assisted rescue, instructions on the use of the area under emergency conditions shall be posted. The instructions shall include all of the following:

1. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.
2. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summon such assistance.
3. Directions for use of the two-way communications system where provided (Section 1007.1).

## International Symbol of Accessibility

Section 1007.6.5 (Identification) in IBC also required each door providing access to an area of refuge from an adjacent floor area shall be identified by a sign complying with ICC A117.1, stating: “AREA OF REFUGE”, and including the International Symbol of Accessibility. The same requirement is in place for any “EXTERIOR AREA FOR ASSISTED RESCUE AREA”.

## Americans with Disabilities Act 1990

The Americans with Disabilities Act 1990 (**ADA**) cross-references these requirements from the IBC.

## 2010 ADA Standards for Accessible Design

The Department of Justice released the 2010 ADA Standards for Accessible Design in September 2010, which set minimum requirements for newly designed and constructed or altered State and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities.<sup>105</sup>

IBC 2000 and IBC 2003 are referenced within the 2010 ADA Standards for Accessible Design for areas such as a means of egress and areas of refuge. Section 207 of the 2010 ADA Standards for Accessible Design (Accessible Means of Egress) requires that the means of egress must comply with Section 1003.2.13 of the International Building Code (2000 edition and 2001 Supplement) or section 1007 of the International Building Code (2003 edition).

Like the IBC, the ADA Standards require 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. The accessible means of egress can include the use of exit stairways and evacuation elevators, when provided in conjunction with horizontal exits or areas of refuge. Standard elevators are not designed to be used during an emergency evacuation and will usually return to an entrance level when the building goes into alarm mode, but evacuation elevators are designed with standby power and other features according to the elevator safety standard and may be used for the evacuation of people with disabilities.

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<sup>105</sup> Department of Justice, 2010 ADA Standards for Accessible Design, p.1

The ADA Standards also acknowledge the need outlined in the IBC for areas of refuge, being 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.

### The ADA Accessible Means of Egress

While the IBC defines the 'accessible means of egress' as a "*continuous and unobstructed way of egress travel from any accessible point in a building or facility to a public way.*"<sup>106</sup>, the 2010 ADA Standards enhances this definition to include reference to an area of refuge or horizontal exit also; "*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*".

Accessible signage and directional signage in line with IBC Section 1007 is also required in the ADA Standards (Section 216 and 703). Though, in a similar approach to IBC 2009 and IBC 2012, there is no requirement in the ADA Standards to provide the International Symbol of Accessibility on signs for components of the accessible means of egress.

### Australians and an Accessible Means of Egress

Similar to other nations, Australia does not mandate an accessible means of egress from buildings. Where they one is provided, this is usually by luck or coincidence when one is able to exit through the same accessible entrance by which one arrived.

When we consider that people with disabilities may be working or visiting other levels of a building other than the entrance level, there will obviously be limitations for some occupants in terms of safe evacuation.

This presents a risk for any commercial property owner, facility manager or employer. It also presents a risk for a nation with a growing obesity rate and an ageing population that could find a vertical egress route difficult.

It must be acknowledged that the current BCA has very limited prescriptive requirements (referred to as 'Deemed-to-Satisfy' provisions) relating to the evacuation of people with disability.

The BCA does not address the issues around negotiating a vertical egress path. Surely it is time to consider the IBC egress route components outlined above and require them in Australian buildings. At present, these needs may be only addressed when stakeholders take a more proactive approach or when they opt for a 'performance-based' fire engineered approach to compliance using the 'Performance Requirements' of the BCA.



<sup>106</sup> International Code Council, International Building Code 2012, Section 202, [http://publiccodes.cyberregs.com/icod/ibc/2012/icod\\_ibc\\_2012\\_2\\_sec002.htm](http://publiccodes.cyberregs.com/icod/ibc/2012/icod_ibc_2012_2_sec002.htm), viewed 23 August 2015

Unfortunately, when the absolute minimum is provided as part of a building design and only the prescriptive 'Deemed-to-Satisfy' provisions are met, we're ignoring a portion of society and their needs for evacuation.

When we compare the Australian situation to the requirements in some parts of the Europe and the United States, it is clear there must be further debate as to how the concept of an 'accessible means of egress' in some form can be adopted into the building codes. This debate must consider the international requirements for the accessible means of egress path to be continuous from all accessible parts of a building to a safe place outside the building, which may include the use of evacuation lifts, refuge areas, or assisted evacuation techniques such as the use of evacuation chairs, in conjunction with good emergency evacuation procedures.





# Part 7: The Accessible Exit Sign Project

## About The Accessible Exit Sign Project

The Accessible Exit Sign Project is an international campaign that promotes the need for an accessible means of egress in all buildings. The concept has been developed by Egress Group Pty Ltd in Melbourne, Australia. The intention of The Accessible Exit Sign Project is to promote universal access and universal 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, particularly when the only way out is via a fire escape stairway.

The Accessible Exit Sign Project website at <http://accessibleexitsigns.com/> presents accessible exit signs adopting universal design principals. It is envisaged that in the near future these signs will become the norm and a minimum requirement in all new buildings around the world. The project has already started some important discussions between industry stakeholders, disability groups, building code officials and legislators, who are now looking at better building design solutions. The project presents ideas that provide for safer buildings, with reduced risks and exit sign wayfinding strategies that meet the needs of all occupants. The 'Accessible Means of Egress Icon' used on these signs is a critical part of the solution to address these issues.

## Accessible Means of Egress Icon



The 'Accessible Means of Egress Icon' was developed in late 2013 and forms the principal pictorial element of The Accessible Exit Sign Project.

The introduction of the 'Accessible Means of Egress Icon' onto exit signage changes the current discriminatory approach to exit signs in buildings and present a fully inclusive design.<sup>107</sup>

However, there are important issues to consider when using these images:

1. The design of the 'Accessible Means of Egress Icon' is a new universal design concept and at the time of writing is not referenced within any technical standard or building code; and
2. Emergency exit signage using the 'Accessible Means of Egress Icon' may be considered as part of the overall exit signage solution for any public facility (which could include a building, open space, transportation hub, airplane, train or ship).

<sup>107</sup> GAATES Global Accessibility News, The Accessible Exit Sign Project, <http://globalaccessibilitynews.com/2014/12/09/the-accessible-exit-sign-project/>, viewed 26 August 2015

3. Dependant on local code requirements, the use of the 'Accessible Means of Egress Icon' may require approval from the relevant authority to permit the adoption of this new form of signage, confirmation will therefore be required from local authorities;
4. Use of the 'Accessible Means of Egress Icon' could replace existing building code exit sign requirements under a 'performance-based' solution (see Part 8 of this paper). Alternatively, it could be used to complement local requirements, and enhance the minimum prescriptive requirements; and
5. A performance-based assessment, using fire engineering principles may be required to support the use of the designs presented in The Accessible Exit Sign Project. This is discussed in the accompanying 'Performance Assessment Template' to this paper.

## The 'Accessible Means of Egress Icon' Exit Sign



The 'Accessible Means of Egress Icon' presents a fully inclusive universal design.

It is inclusive and provides a clear pictographic indication of where an accessible exit is located.

It can also be used to help identify features of the accessible means of egress, such as refuge areas, evacuation lifts, evacuation chairs, or areas of rescue assistance.

## Universal Design Approach

The introduction of the 'Accessible Means of Egress Icon', onto accessible exit signage changes the current discriminatory approach to exit signs in buildings and presents a fully inclusive universal design. The design is 'inclusive', rather than 'exclusive' and shows both the figures moving through the open doorway together, in contrast to other previous designs that use the Japanese style 'Running Man' alone.

## A Consistent Approach

The Accessible Means of Egress Icon design is also consistent with the figures shown within international standards ISO 7001, ISO 7010, and ISO 21542.

It's also consistent with the images presented in the booklet titled, *'The international language of ISO graphical symbols'*, which includes the 'Running Man' in safety green colour with a white pictorial element or icon.<sup>108</sup>



<sup>108</sup> The international language of ISO graphical symbols, [http://www.iso.org/iso/graphical-symbols\\_booklet.pdf](http://www.iso.org/iso/graphical-symbols_booklet.pdf), p.31, viewed 25 August 2015

The Accessible Means of Egress Icon design also includes a hatched line in a similar approach to the proposed new access symbol developed by Sara Hendren & Brian Glenney, as part of the Accessible Icon Project being used in many areas now to identify accessible car parking spaces and building entrances.<sup>109</sup> Provision of the hatched line gives the image a sense of motion (and style), but more importantly allows the symbol to be used as a stencil for painting walls adjacent to exit doors.

### A Sense of Movement and Motion



The Combined 'Running Man' and Accessible Means of Egress Icon, which has been described as a person using a wheelchair moving quickly to an exit door, in the same style as the existing Running Man style exit signs are working together to escape the building.

- They move in unison.
- They display the same urgency and motion.
- They appear to be travelling at the same speed.
- This is an inclusive design.

### The 'Accessible Means of Egress Icon' Dissected

The upper bodies of both figures within the 'Accessible Means of Egress Icon' are identical. Arms are extended in the same style. Legs are also in the same style. Both Figures graphically represent the same message.



<sup>109</sup> The Accessible Icon Project, <http://accessibleicon.org/about/>, viewed 25 August 2015

The heads on both figures are forward, showing their haste. Arms are extended and motioning back and forth as they move through the doorway.

The Accessible Means of Egress Icon (or person using the wheelchair and exiting with the Running Man through the exit doorway) is consistent in design with the accepted Japanese style exit sign ('Running Man' design).

## Comparison to Applicable Technical Standards

The use of the 'Accessible Means of Egress Icon' is an inclusive exit sign design, but as it is a new concept it is not adopted or referenced within any current International or National Standard. The 'Accessible Means of Egress Icon' design is nevertheless consistent with the graphical symbols and methodology outlined within International (or ISO) Standards:

- ISO 7001:2007 Graphical symbols - Public information symbols.
- ISO 7010:2011 Graphical symbols - Safety colours and safety signs -- Registered safety signs, which includes the use of the 'Running Man' exit sign design.
- ISO International Language of Graphical Symbols Booklet, which also includes the 'Running Man' exit sign design, Accessible Lift pictogram and Evacuation Assembly Point.<sup>110</sup> It also includes the layout of safety signage, including those identifying evacuation routes, emergency equipment and assembly points using a green safety sign with white symbol.<sup>111</sup>
- ISO 21542:2011 Building construction - Accessibility and usability of the built environment, which includes the 'Running Man' in conjunction with the International Symbol of Access.
- The design is also consistent with the 'Running Man' design currently referenced within many countries technical standards (such as the Australia Standard AS 2293).<sup>112</sup>

## Egress Group Pty Ltd

Egress Group is a company based in Melbourne, Australia that promotes the need for an accessible means of egress via its websites and social media presence. The Accessible Exit Sign Project website presents ideas that have been developed by Egress Group Pty Ltd to display the concept of accessible exit signage.

Egress Group believe it's time for a change. A change in attitudes, perceptions and legislation regarding exit signs in buildings.

The company believes all buildings need to show the egress route, with clear, unambiguous signage showing the path to safety. This includes the use of the 'Accessible Means of Egress Icon' as a universal design best practice.

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<sup>110</sup> The international language of ISO graphical symbols, [http://www.iso.org/iso/graphical-symbols\\_booklet.pdf](http://www.iso.org/iso/graphical-symbols_booklet.pdf), pp.5,18-19, viewed 25 August 2015

<sup>111</sup> The international language of ISO graphical symbols, [http://www.iso.org/iso/graphical-symbols\\_booklet.pdf](http://www.iso.org/iso/graphical-symbols_booklet.pdf), p.31, viewed 25 August 2015

<sup>112</sup> Standards, Australia, AS 2293.3—2005, Emergency escape lighting and exit signs for buildings Part 3: Emergency escape luminaires and exit signs, Clause 1.4.3.3

Egress Group now manages the licensing arrangements in the use of the 'Accessible Means of Egress Icon'. By doing so, they can maintain consistency in design, promote users of the Icon and use income generated to further promote the need for inclusive and accessible egress routes.

## Why Licence the Use of the Icon?



From time to time the question is raised as to why the use of The Accessible Exit Sign Project designs and Icon is restricted and protected under copyright, trademark and registered designs. The reason for this is essentially to maintain consistency.

As discussed earlier the design of the Japanese style 'Running Man' design has been extensively remodelled, modified and altered in numerous way around the world in designs that differ from that presented by Yukio Ota in 1979. By controlling the use of the image it is believed that one can control consistency, which is a critical part to successfully implementing any new initiative.

This approach also protects the licensees, or sign manufacturers, who have shown a commitment to helping to provide a safer built environment. These licensees have been required to make new moulds, produce new designs, change marketing, websites and promotional information at their own cost.

## Closing the Exit Sign Gap

There's a number of strategies that can be adopted to reduce risk. They include adopting best practice concepts with wayfinding, and the use of the Accessible Means of Egress Icon.

### Evacuation Guidebook

Extensive research was undertaken when developing the evacuation guide titled '*Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations*'.<sup>113</sup> The guide aims to assist workplaces manage their obligations to provide a safe work environment.

The concepts discussed within the guide help to identify strategies to increase the level of safe egress for people with disabilities, or with other emergent limitations during an emergency. During this research, it was found that an accessible means of egress is not always mandated, including in Australia.

A main finding of the research undertaken when preparing the guidebook is that we need to develop strategies to improve social and attitudinal factors in terms of an inclusive approach to accessible means of egress.

<sup>113</sup> Wilson, L. 2014, *Evacuation of People with Disability & Emergent Limitations: Considerations for Safer Buildings & Efficient Evacuations*, <http://accessibleexitsigns.com/evacuation-guide/>, viewed 25 August 2015



## Accessible Exit Signs for the Future

To further impede safe egress for people with disabilities, an accessible means of egress, when provided within a building, may not be easily identified with appropriate exit signage. If this is the case, it could result in a person with mobility limitations making a poor decision and heading down an exit path leading to an architectural barrier, such as stairs when an alternate path was provided elsewhere.

In most countries there is currently no legislated requirement to distinguish between accessible exit paths, and other non-accessible exit paths that have barriers (such as stairs). This is an obvious 'gap' in legislation where an accessible means of egress is not always provided and not identifiable. The use of accessible exit signs, adopting the 'Accessible Means of Egress Icon' as an international standard would help address and close this gap.

Accessible exit signage is needed to direct people to parts of an accessible means of egress, including Evacuation Lifts, refuge areas and exits. Signage throughout a building, including in refuge areas, evacuation lifts and fire escape stairs should 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.

## Wayfinding Principles



The National Fire Protection Association (NFPA) in the United States believes that there are four elements of information that people need during an evacuation:

- Notification (What is the emergency?)
- Use of the way (Can I get out by myself, or do I need help?), which might be evacuation independently, independently with the use of a device, or with assistance from someone else
- Assistance (What kind of assistance might I need?)
- Wayfinding (Where is the way out?)<sup>114</sup>

Wayfinding is critical for every occupant of a building, without knowing where to go a person may experience delays and during an emergency every second can count.

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 AS1428 suite of accessibility standards, but there are acknowledged gaps within these standards.

<sup>114</sup> National Fire Protection Association 2007, Emergency Evacuation Planning Guide for People with Disabilities, NFPA, Massachusetts, p.9

As a result, a new standard, Australian Standard AS1428.4.2 *Design for access and mobility – Wayfinding* is being developed to detail “*how to provide wayfinding solutions for people of all abilities*”.<sup>115</sup> The standard will provide design solutions to enhance the current minimum BCA prescriptive ‘Deemed-to-Satisfy’ provisions. However, given it may be some time before the Standard is released, or adopted into the BCA, 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. On a positive note, Like Australia, other countries also currently mandate for some elements of exit signage in formats that include Braille and tactile information.

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.<sup>116</sup>

Improving circulation and orientation with logical egress routes will not only benefit those occupants with vision impairment, but all occupants.<sup>117</sup> Evacuation routes should be clear to identify on emergency diagrams, without superfluous information to confuse occupants. The addition of the proposed ‘Accessible Means of Egress Icon’ exit signs discussed within this paper could further enhance the wayfinding strategies within any regional technical standard to include the parts of an 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.

Implementation of enhanced wayfinding strategies, including the use photo-luminescence markings and the use of the “Accessible Means of Egress Icon’ exit signs 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.<sup>118</sup> 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.<sup>119</sup>

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<sup>115</sup> Standards Australia 2011, ABCB Building Australia’s Future 2011 Challenges and opportunities regarding technical standards in the built environment, viewed 04 May 2014, <http://abcb.gov.au/en/education-events-resources/national-conference/~media/Files/Download%20Documents/Marketing%20Docs/BAF/4%20Fred%20Reynolds%20FINAL.ashx>, viewed 29 August 2015

<sup>116</sup> Security Director's Report 2005, ‘New Obligation for Evacuating Disabled Breeds Opportunity’, Security Director's Report, Nov 2005, Vol. 5 Issue 11, pp. 5-6

<sup>117</sup> Fuller C 2008, *Fire and Disability 2008: Special Report*, Workplace Law Publishing, Cambridge

<sup>118</sup> Rutherford, P & Withington DJ 1998, ‘Sound versus Sight for Emergency Egress’, *Access by Design*, January-April, pp. 1-3

<sup>119</sup> Pauls, J 1994, *Vertical Evacuation in Large Buildings: Missed Opportunities for Research*, pp. 11-13, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.112.9228&rep=rep1&type=pdf>, viewed 29 August 2015

### Accessible Exits in Evacuation Diagrams



As discussed earlier in this paper, Clause 3.5 of AS 3745 outlines the minimum requirements for evacuation diagrams which must be displayed in all buildings and facilities. These diagrams help to provide visual information to building occupants to aid them in their evacuation from their location, to a suitable exit and then to a safe assembly area outside the building. When providing this information one has to ask some questions:

*Is this approach an inclusive approach that satisfied the requirements to provide a universally accessible building? Not just into the building, but out during an emergency?*

*If I am unable to negotiate stairs, and I'm looking at the evacuation diagram on the first floor of a building, how can I get back to the ground floor and get out the building?*

*If I am moving down a corridor, and I have a decision in whether to turn left to an exit, or to turn right to an alternate exit, will one of them be accessible?*

At the moment, there is no restriction from the ability to utilise an accessible exit sign anywhere within AS 3745, and nothing to preclude the use of the 'Accessible Means of Egress Icon'.

When reviewing the 'informative' only example Evacuation Diagrams provided in Appendix E of AS 3745 the examples show pictograms for emergency exits and these are in traditional "EXIT" format and an adapted Running Man exit sign style which differs from that shown in AS 2293.1.<sup>120 121</sup> It would be a natural extension of universal design principles to identify both 'accessible' and 'non-accessible' means of egress on all evacuation diagrams in the future. This could also include locations of evacuation chairs, refuge areas, assisted rescue areas and evacuation lifts.

### Universal Design Meets the Exit Sign

#### 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.



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.

<sup>120</sup> Standards, Australia, AS 2293.1—2005, Emergency escape lighting and exit signs for buildings Part 1: System design, installation and operation, Appendix D

<sup>121</sup> Standards, Australia, AS 2293.3—2005, Emergency escape lighting and exit signs for buildings Part 3: Emergency escape luminaires and exit signs, Clause 1.4.3.3

## The Problem with Existing Exit Signs

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



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.

## 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.



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 stigmatizing 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.

## 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.

## 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.

## 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 removed potential for people to be put into an unsafe situation.

## 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 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 with their environment.





## Part 8: Performance-Based Building Codes

Performance-based building codes have been regarded as one of the three major building regulatory reforms, the others being the development of a single national building code in the early 1990's and the integration of the plumbing code into the new National Construction Code in 2011.<sup>122</sup> Sadly, what could be the fourth major building regulatory reform (i.e. an accessible means of egress) may not occur for some time.

### Performance-Based Building Codes around the World

The transition to performance-based building regulatory systems commenced in the late 1970s, with the first generation of the 'new' regulations being promulgated in the 1980s and 1990s. These regulatory systems have also been referred to as functional or objective-based building regulations. But by the mid-1990s only a small number of countries, Australia included, had implemented functional or performance-based building regulations, whilst several others were in the process of developing them.<sup>123</sup>

It was in 1997 that representatives from lead building regulatory development agencies from four countries created a platform to discuss, formulate and develop strategies for implementing performance-based building regulations. These four founding nations established the Inter-Jurisdictional Regulatory Collaboration Committee (IRCC).

The IRCC then sought contribution and involvement from other countries and soon released a document for the Guidelines for the Introduction of Performance-Based Building Regulations.

Prior to the accepted use of performance-based building codes most building regulations had been prescriptive (descriptive) specifications that detailed "*how a building must be built, including what materials can be used, how they may be used, and when they can be accepted.*"<sup>124</sup> However, building codes have permitted alternatives to prescriptive requirements for years.<sup>125</sup>

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<sup>122</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.5, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

<sup>123</sup> Inter-jurisdictional Regulatory Collaboration Committee 2010, A Report of the Inter-Jurisdictional Regulatory Collaboration Committee, pp.2,11

<sup>124</sup> Inter-jurisdictional Regulatory Collaboration Committee 2010, A Report of the Inter-Jurisdictional Regulatory Collaboration Committee, p.19

<sup>125</sup> Bergeron, D, Bowen, B, Tubbs, B & Rackliffe T, 2001, Acceptable Solutions, CIB World Building Congress, April 2001, Wellington, New Zealand Paper number: 257 p.5

## Inter-jurisdictional Regulatory Collaboration Committee

The IRCC was established to promote effective international collaboration concerning performance-based building regulatory systems. The IRCC has specific goals, which include:

- *Providing a forum for promoting a common understanding of, and a framework for, performance-based building regulatory system development;*
- *Fostering the exchange of ideas and the development of "Best Current Practice" documents and approaches;*
- *Providing guidance and support for members who develop, implement, and support performance-based building regulatory systems;*
- *Promoting the pooling of resources, on an international scale, to aid research and development of commonly-needed components of a performance-based building regulatory system;*
- *Providing benefit to countries embarking on performance-based building regulation development, by providing guidance and support materials, thus minimizing potential duplication; and,*
- *Encouraging investment in construction-related technology and innovation.*<sup>126</sup>

The IRCC Committee is a collaborative of countries engaged in discussions, work and exchange on building regulatory policy issues with focus on the use of the performance concept.<sup>127</sup>

Since the Guidelines for the Introduction of Performance-Based Building Regulations were released the Committee has grown to consist of 14 countries:

- Australia
- Austria
- Canada
- China
- Japan
- New Zealand
- Norway
- Scotland
- Singapore
- Spain
- Sweden
- United States of America
- England
- Netherlands<sup>128</sup>



<sup>126</sup> Inter-jurisdictional Regulatory Collaboration Committee, <http://www.ircc.info/>, viewed 28 September 2015

<sup>127</sup> Bergeron, D 2008, Codes for Existing Buildings: Different Approaches for Different Countries, National Research Council Canada, p. 1

<sup>128</sup> Inter-jurisdictional Regulatory Collaboration Committee, About Us, <http://www.ircc.info/AboutUs2.html>, viewed 28 September 2015

## International Building Regulations Reform



Internationally, a performance-based approach can help break-down barriers, provide consistency, reduce ambiguity and allow new technologies developed overseas to be quickly utilised in local projects. It has been stated that building regulatory systems around the world are going through dramatic change in response to changing stakeholder needs and political environment.<sup>129</sup>

These changes in building regulatory systems around the world are occurring for a number of reasons. The most common reason is that it allows the introduction of greater flexibility for the building code users.<sup>130</sup>

The use and acceptance of 'Alternative Solutions' is now an integral part of a well-functioning performance-based regulatory system. They also provide freedom to deal with innovative ideas.<sup>131</sup>

## International Fire Engineering Guidelines

The International Fire Engineering Guidelines, Edition 2005, has been developed from the original Fire Engineering Guidelines developed by the ABCB and published in 2001.

The International Fire Engineering Guidelines (**IFEG**) were developed with consultation from the Inter-Jurisdictional Regulatory Collaboration Council (**IRCC**), the International Code Council (**ICC**), United States of America and the Department of Building and Housing, New Zealand (**DBH**). After a collaborative approach was taken, the International version was developed for use in Canada, Australia, USA and New Zealand.<sup>132</sup>

## Definition of Fire Safety Engineering

Fire safety engineering has been defined as:

*The application of engineering principles, rules and expert judgement based on a scientific appreciation of the fire phenomena, of the effects of fire, and the reaction and behaviour of people, in order to:*

- *save life, protect property and preserve the environment and heritage;*
- *quantify the hazards and risk of fire and its effects;*
- *evaluate analytically the optimum protective and preventative measures necessary to limit, within prescribed levels, the consequences of fire.*<sup>133</sup>

<sup>129</sup> Bergeron, D 2003, Role of Acceptable Solutions in Evaluating Innovative Designs, Proceedings of the CIB-CTBUH International Conference on Tall Buildings, 8-10 May 2003, Malaysia, p.1

<sup>130</sup> Bergeron, D, Bowen, B, Tubbs, B & Rackliffe T 2001, Acceptable Solutions, CIB World Building Congress, April 2001, Wellington, New Zealand Paper number: 257 p.1

<sup>131</sup> Bergeron, D, Bowen, B, Tubbs, B & Rackliffe T, 2001, Acceptable Solutions, CIB World Building Congress, April 2001, Wellington, New Zealand Paper number: 257 p.5

<sup>132</sup> International Fire Engineering Guidelines, Edition 2005, Foreword

<sup>133</sup> International Fire Engineering Guidelines, Edition 2005, p.0.3-7

## The Use of the International Fire Engineering Guidelines

The IFEG have been developed for use in the fire engineering design and approval of buildings and can definitely be applied to any assessment considering the use of The Accessible Exit Sign Project style signage. The 'Scope' section<sup>134</sup> of the IFEG adds:

*.....the concepts and principles may also be of assistance in the fire engineering design and approval of other structures such as ships and tunnels which comprise of enclosed spaces.*

*This document provides guidance to the fire engineering fraternity in their work to design fire safety systems to achieve acceptable levels of safety. The Guidelines presuppose that the fire engineer has a level of competence and experience that would enable accreditation by an appropriate body.*

*In particular, the Guidelines provide guidance for the design of Alternative Solutions for the Building Code of Australia (BCA).*

*Fire engineers need to interpret the guidance given in these Guidelines with flexibility and use it as a tool for responsible fire engineering.*

## Benefits of Fire Safety Engineering

The IFEG recognises the many benefits of adopting a fire engineered approach to compliance and meeting the objectives of the BCA. One of these other objectives may be protecting corporate and public image, which any organisation showing best practice and social responsibility may benefit from when adopting a universal design approach to exit sign provisions in buildings.

## Uniqueness of Fire Engineered Solutions

The IFEG also recognises that many buildings may appear to have similar or identical design features but on closer examination it has been found that minor variations can have a major influence on the fire safety of the buildings. Therefore, the IFEG recommends that when considering a performance-based building solution from a fire engineering point of view, every building, however similar, must be assessed individually and on this basis, the use of The Accessible Exit Sign Project designs must form part of a unique fire engineered solution when used.

## Fire Engineering Brief Considerations

There are a number of areas where the use of The Accessible Exit Sign Project designs can be considered during the development of a Fire Engineering Brief. Sub-system E (SS-E) of the fire engineering process is used to analyse the evacuation of the occupants of a building and this process enables estimates to be made of the times required for occupants to reach a place of safety.<sup>135</sup>

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<sup>134</sup> International Fire Engineering Guidelines, Edition 2005, p.0.1-3

<sup>135</sup> International Fire Engineering Guidelines, Edition 2005, p.1.1-2

At this stage of the assessment the ability for occupants to locate a suitable accessible means of egress, move to the exit, move through the exit and travel to the safe place outside the building must be considered, in terms of all occupants.

In order to do this, when evaluating or designing a building's fire safety system, it is therefore important to understand the building's characteristics and its normal mode of functioning.<sup>136</sup> These characteristics relevant to consideration of emergency exit signage include:

- Occupancy Building classification - Usage, particularly unusual use
- Size & shape – Number and size of floors and general layout of each floor
- Structure – Refuge areas, egress paths etc.
- Management and use - Regular inspections of preventive and protective measures, Training of occupants

It is critical to also understand the likely occupants of the building.<sup>137</sup> There are many characteristics that can be identified that make complete characterization a complex and difficult task. However, for the IFEG states for a given fire engineering evaluation only a limited number of 'dominant occupant characteristics' may affect the outcome. The following are examples of dominant occupant characteristics that are relevant to consideration of emergency exit signs in a building:

- Distribution – number, gender, age, or location
- State - awake or asleep, intoxicated or sober, unconscious or fully conscious
- Physical attributes – mobility, speed of travel, hearing ability, or visual ability
- Mental attributes - level of understanding, potential emergency behaviour, ability to interpret cues, and ability to take and implement decisions independently
- Level of assistance required - requires full assistance, requires some assistance or does not require assistance
- Level of assistance available - shift schedules or staff numbers and type
- Emergency training - trained or untrained
- Occupant (group) roles - parent or child, teacher or student, nurse or patient, or staff or customer
- Activity at the outbreak of fire - asleep or awake, working in a noisy environment, or watching a performance
- Familiarity with the building - unfamiliar, relatively familiar or familiar

## Fire Engineering Occupant Evacuations

Sub-system E - Occupant Evacuation and Control is the main section of IFEG pertinent to assessing occupant evacuations and for consideration of the effectiveness of emergency exit signs.<sup>138</sup> The section includes consideration for the following:

- Evacuation plans
- Occupant training
- Emergency communications

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<sup>136</sup> International Fire Engineering Guidelines, Edition 2005, p.1.2-5

<sup>137</sup> International Fire Engineering Guidelines, Edition 2005, pp.1.2-6 to 1.2-7

<sup>138</sup> International Fire Engineering Guidelines, Edition 2005, p.1.8-1



- Egress signage

Sub-system E (SS-E) is used to analyse the evacuation of the occupants of a building. By doing so it enables estimates to be calculated during an evacuation to determine the time from fire initiation required for occupants to reach a place of safety. This required amount of time is referred to as the 'Required Safe Evacuation Time' or RSET.

RSET comprises a number of components that vary according to the number and locations of occupants with respect to the fire. This timeline includes the following in order of occurrence:<sup>139</sup>

- *Fire initiation ( $t_0$ ) is time zero for the analysis of the fire, evacuation and determination of RSET*
- *Occurrence of cue ( $t_c$ ) is the time of a cue that indicates the occurrence of a fire. The cue may be from an automatic alarm device, aspects of the fire itself or people warning others*
- *Recognition of cue ( $t_r$ ) is the time at which occupants, having received a cue, recognize it as an indication of a fire*
- *Initiation of movement ( $t_d$ ) is the time at which occupants begin the evacuation movement. This may occur after a delay during which occupants carry out other actions (including 'no action')*
- *Completion of movement ( $t_m$ ) is the time when occupants reach an (internal or external) safe area.*

All these events (or points in time) are separated by time periods that comprise the components of RSET. These event are used to define the components of RSET, including:

- Cue period ( $P_c$ )
- Response period ( $P_r$ )
- Delay period ( $P_d$ )
- Movement period ( $P_m$ ).

Various phases may be identified to represent one or more of the above periods during the stages of the RSET, including:

- Detection phase =  $P_c$
- Pre-movement phase =  $P_r + P_d$
- Movement phase =  $P_m$
- Evacuation phase =  $P_r + P_d + P_m$
- RSET =  $P_c + P_r + P_d + P_m$

The IFEG points out that when considering the RSET in any fire occurrence there could be differing evacuation management plans in place that may necessitate any one of the following evacuation strategies:

- Staged evacuation: *"In high-rise buildings with an emergency warning and intercommunication, the evacuation maybe managed by trained personnel, with occupants*

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<sup>139</sup> International Fire Engineering Guidelines, Edition 2005, p.1.8-2

*on floors furthest from the fire placed initially on alert and evacuated progressively only if the fire continues to develop.”*

- Assembly in refuge areas: *“In particular types of buildings, the concept of a fire safe refuge, where occupants go to a special fire compartment to await rescue by the fire service rather than evacuate, is sometimes used.”*
- Protect in Place: *“A further and more recent development is the ‘protect in place’ concept. Occupants are encouraged to remain where they are, rather than try to evacuate through potentially smoke-filled corridors and/or stairs.”*

The IFEG states that in all *“buildings the consideration should be given to the question of providing safety for persons with disabilities. Use of refuges and use of elevators for evacuation of persons with disabilities, are some of the options that may be considered.”*

Considering the ability to provide an accessible means of egress from all accessible parts of a building in the Fire Engineering Brief will ensure that the needs of all occupants are quantified. An occupant analysis can be undertaken to determine the likely occupant groups, the abilities and estimated evacuation speeds can them form part of the fire engineering process.

This analysis should consider the likelihood that an evacuation by people with activity limitations, or family group members with such limitations, will be more successful when they have suitable signage in place to help make informed decisions on which route to take. On this basis, it would be advantageous to provide suitable signage to identify all components of the accessible means of egress (see Part 6 of this paper) to help reduce the evacuation phase (being Pr + Pd + Pm) and in turn the RSET.

### Performance-Based Building Reform

The Centre for International Economics (CIE) stated in the report *‘Benefits of building regulatory reform’* released in 2012<sup>140</sup>:

*The building regulatory reforms of the early 1990s, culminating in the single national BCA, were always directed at the ultimate goal of introducing a nationally consistent performance-based building code. This was supported by the findings and recommendations of the BRRT report in 1991. The 1996 release of the BCA (BCA96) was the first performance-based building code in Australia.*

*The objectives behind a performance-based building code have been well established internationally: by focussing on the outcomes that the building is required to deliver, it is expected that the market will have more flexibility to develop innovative and cost effective solutions. The ultimate goal is to improve the efficiency of the market in delivering no less than a minimum level of building quality, without being overly prescriptive and impeding the uptake of new technologies and design principles.*

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<sup>140</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.13, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

*The ideology behind a performance-based code is that it focusses on the following attributes.*

- *minimum requirements, not aspirational goals;*
- *objective outcomes, not subjective methods; and,*
- *final product delivery, not process of delivery.*

## Benefits of Performance-Based Building Codes

Investigations into the benefits of performance-based methods in commercial construction projects (prior to 2012) found that there are savings arising from finding cheaper ways of doing things (i.e. lower costs — reduced inputs/output). Additionally there are considerable, but less certain and less detectable gains likely from innovative solutions that lead to more floor space per unit of input (i.e. increased output/input), as well as better quality, and more attractive spaces per unit of output (increased quality/output).<sup>141</sup>

The 2012 report released by CIE commented that only stakeholders believe that only 50% of the potential benefits of the national construction code and performance-based provisions had been realised.

Prior to the introduction of BCA96 Australian building regulations were very prescriptive which relied on ‘Deemed-to-Satisfy’ provisions in early versions of the BCA. Later versions of the BCA introduced minimum levels of compliance in each area, termed the ‘Performance Requirements.

*Performance requirements specify mandatory levels of building performance and provide optional means of compliance for the designer or builder to decide how this is achieved. The approach allows more flexibility and innovation in building design and construction.*<sup>142</sup>

The CIE reported that various studies have identified the expected benefits and some of the potential costs associated with performance-based standards. Identified benefits include:<sup>143</sup>

- cost savings relating to the efficiency of design and construction;
- more functional and aesthetic looking buildings;
- flexibility to use new building products and materials, which also encourages innovation by product manufacturers; and
- more regular updating of the ‘Deemed-to-Satisfy’ provisions or alternatively less updating as the prescriptive approach becomes only one method of compliance (i.e. by using performance-based solutions).

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<sup>141</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.6, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

<sup>142</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.7, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

<sup>143</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.14, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

The CSIRO reported that benefits attributed to performance-based standards have been estimated at \$646 million, whilst the Building Regulation Review Taskforce suggested that a performance-based national building code would deliver benefits of around \$200 million per year.<sup>144</sup>

One of the most significant identified benefits is that performance-based solutions facilitate the rapid take-up of new (international) technology by removing the constraints that the prescriptive ‘Deemed-to-Satisfy’ solutions would impose.<sup>145</sup> This is particularly relevant when considering the benefits of a design solution including the use of the Accessible Exit Sign Project designs.

### 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.

### Building Code of Australia 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.*<sup>146</sup>

### Building Code of Australia Performance Hierarchy

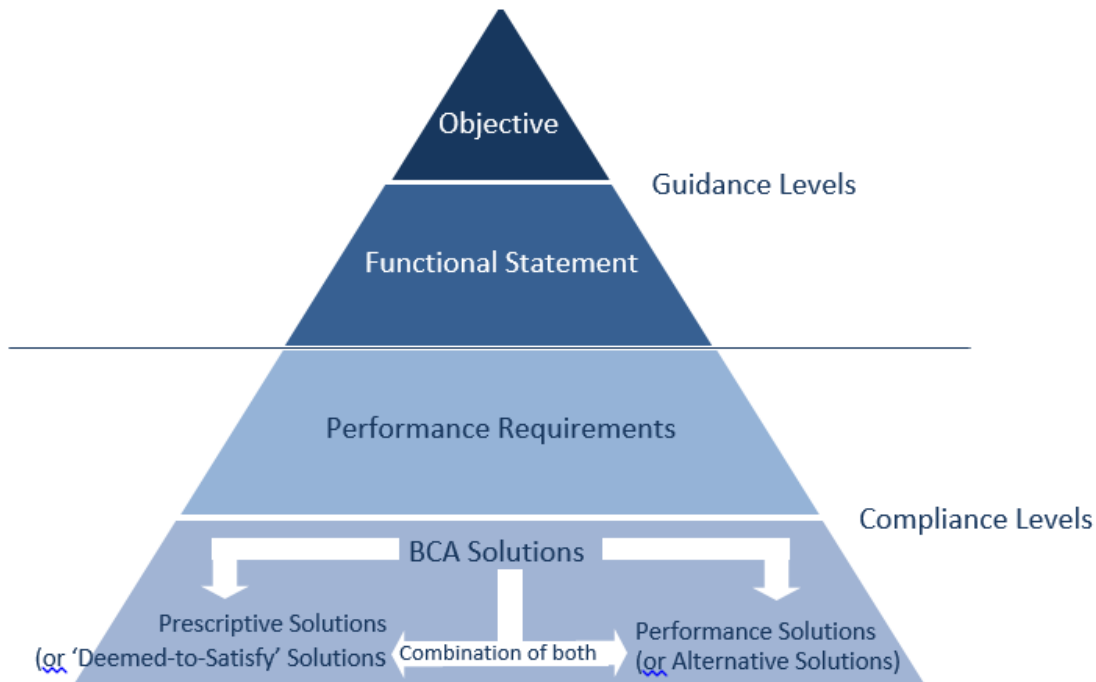
The BCA performance hierarchy currently consists of the following parts represented in the diagram below adapted from the BCA Clause A0.3.

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<sup>144</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, pp.29,37  
<http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

<sup>145</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.50,  
<http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015

<sup>146</sup> Australian Building Codes Board 2015, Building Code of Australia, Volume 1, National Construction Code Series, ABCB, Canberra.



This hierarchy of requirements for buildings draws heavily on the hierarchy that was published by the Nordic Committee on Building Regulation in the late 1970s.<sup>147</sup> 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:
  - 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.

<sup>147</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.14, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015



## What are Performance Solutions / 'Alternative Solutions'?

An 'Alternative Solution' has been defined as *“a building solution which complies with the Performance Requirements other than by satisfying the 'Deemed-to-Satisfy' provisions of the BCA.”*

Performance -based building codes and the use of 'Alternative Solutions' have led to *“significant cost savings and more modern and innovative designs”*.<sup>148</sup>

The National Construction Code (NCC), which includes the Building Code of Australia (BCA) (Volumes One and Two) is a 'performance-based' building code. As the code is 'performance based', each section of the BCA has minimum levels of compliance which are mandatory – these are called the 'Performance Requirements'.

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.

## Building Code of Australia Assessment Methods

Assessment Methods are used to determine whether a building solution complies with the relevant Performance Requirements of the BCA. The Assessment Methods available within BCA Clause A0.09 to verify if an 'Alternative Solution' meets the relevant Performance Requirements include:

- A0.09(a) Evidence of Suitability
- A0.09(b) Verification Methods
- A0.09(c) Comparison with the Deemed-to-Satisfy Provisions
- A0.09(d) Expert Judgement

## Evidence of Suitability

BCA Clause A2.2 allows the following evidence to be submitted in support of a proposal that a material, form of construction or design meets a Performance Requirement or a Prescriptive Deemed-to-Satisfy Provision:

- A report from a Registered Testing Authority.
- A current Certificate of Conformity or Certificate of Accreditation.
- A certificate from a professional engineer.

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<sup>148</sup> Australian Government, Productivity Commission Research Report, Reform of Building Regulation, 2004, Page xxx, <http://www.pc.gov.au/inquiries/completed/building/report/building.pdf>, viewed 20 September 2015

- A current certificate issued by a product certification body that has been accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).
- Any other form of documentary evidence that adequately demonstrates suitability for use.

### Verification Methods

Verification Methods include:

- Calculations – using analytical methods or mathematical models; and/or
- Tests – using a technical operation either on-site or in a laboratory to directly measure one or more performance criteria of a given solution.

### Comparison with the Prescriptive Deemed-to-Satisfy Provisions

This method allows a comparison to be made between a Prescriptive ‘Deemed-to-Satisfy’ provision and a proposed Building Solution (including ‘Alternative Solutions’). If the performance assessment determines that the proposed building solution complies in an ‘equivalent’ or it exceeds a Prescriptive ‘Deemed-to-Satisfy’ provision, then it can be deemed to meet the relevant Performance Requirement.

### Expert Judgement

Where physical criteria are unable to be tested or modelled by calculation, the opinion of a technical expert may be accepted. This is referred to as the use of Expert Judgement, that is, the judgement of a person who has the qualifications and experience necessary to determine whether a Building Solution complies with the Performance Requirements.

### A Performance-Based Mind-Set

In 2015, the NCC was amended to include a fourth publication titled ‘*Performance Requirements extracted from the NCC 2015*’. This fourth document includes a summary of all the performance requirements from NCC Volumes 1, 2 and 3.

The ABCB has moved towards changing attitudes within the building industry and to promote the use of performance-based solutions, as well as establishing an enabling environment, which encourages a new mind-set. A building or plumbing solution will comply with the NCC if it satisfies the relevant performance requirements which are the actual parts of the NCC that one must comply with.

The ABCB recently announced three strategies that aim to create a built environment where the use of performance-based solutions is recognised, encouraged and supported, these include:

1. Create a performance mind-set
2. Build capacity
3. Establish an enabling environment

How one currently achieves compliance in a building solution can therefore include a prescriptive ‘Deemed-to-Satisfy’ solution (as defined and prescribed within the many parts of the NCC

volumes), or by adopting a performance-based approach to compliance through development and acceptance of an alternative solution, or through a combination of both approaches.

In 2012 The Centre for International Economics (CIE) acknowledged the benefits of using a performance-based approach to compliance and stated:

*The objectives behind a performance-based building code have been well established internationally: by focussing on the outcomes that the building is required to deliver, it is expected that the market will have more flexibility to develop innovative and cost effective solutions. The ultimate goal is to improve the efficiency of the market in delivering no less than a minimum level of building quality, without being overly prescriptive and impeding the uptake of new technologies and design principles.<sup>149</sup>*

### ‘Performance Assessment Template’

The Universal Design Meets the Exit Sign White Paper presents the case for a new generation of exit signs to be used in all forms of public transportation, facilities and buildings.

This White Paper discusses the many complex issues that have led to the development of this initiative and argues for the support of these new emergency and exit signs.

The White Paper includes this Appendix, which is titled ‘Universal Design Meets the Exit Sign White Paper Performance Assessment Template’

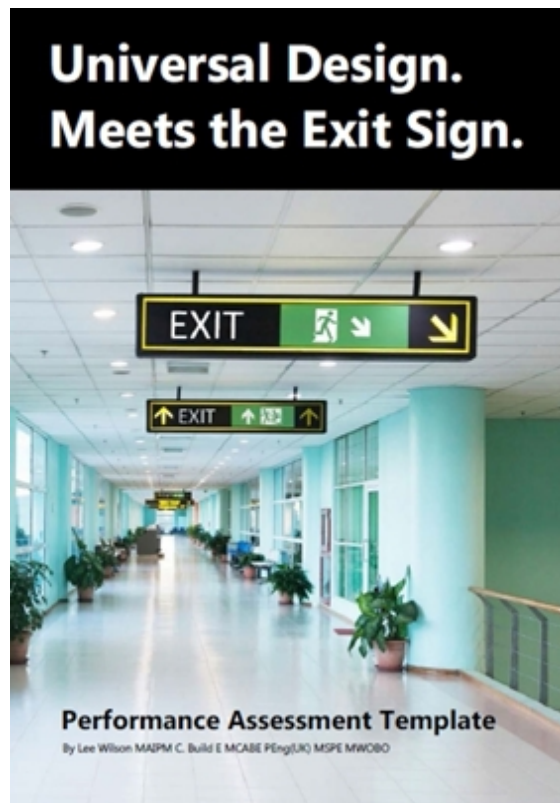
The performance-based template provides support to accept the use of The Accessible Exit Sign Project signage as a variation from the prescriptive ‘Deemed-to-Satisfy’ provisions of the building code.

The template also provides support for this approach with consideration to the content of the White Paper. It proposes the use of a performance-based building solution to accept that emergency egress and exit signage provided throughout the building will adopt a best practice ‘universal design’ approach and argues that this approach provides a safer solution for all building occupants, including people with disabilities.

The proposed signs presented in the assessment form part of the ‘Accessible Exit Sign Project’, which adopt the ‘Accessible Means of Egress Icon’ on all emergency egress and exit signage used throughout the building.

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<sup>149</sup> The Centre for International Economics (CIE), Benefits of Building Regulatory Reform, p.13, <http://www.abcb.gov.au/~media/Files/Download%20Documents/About%20the%20NCC/The%20CIE%20-%20Benefits%20of%20building%20regulation%20reform%20-%20Final%20Report.ashx>, viewed 20 September 2015



The 'Performance Assessment Template', Appendix A to this paper can be downloaded in PDF and Microsoft Word file formats from <https://universaldesignmeetstheexitsign.com/download-the-performance-assessment-template/>

The template includes an extensive amount of this paper within the assessment section, which can be used to support any proposed performance-based approach to exit signs in buildings.



## Part 9: Conclusions

After preparing this paper it is evident that a large proportion of workplaces and public buildings do not fully consider the needs of people of all abilities within emergency management plans.

There is an obvious demand to provide greater guidance to industry and the disability sector to protect the safety of those persons with a disability, the elderly, the very young or anyone else who may not respond in an optimum manner during an emergency event in their workplace or when visiting a public building. The provision of suitable emergency exit signage and information is one important initiative to help solve these issues.



It has already been suggested that current BCA exit sign provisions should be amended to include signage to identify the accessible means of egress.<sup>150</sup> However, in the interim, the use of a performance-based solution can be adopted to address this requirement.

To achieve this we also need to develop strategies to improve social and attitudinal factors in terms of an inclusive approach to accessible means of egress.<sup>150</sup> These strategies must also consider the use of refuge areas, wheelchair spaces in each refuge, evacuation lifts and evacuation chairs.

Furthermore, this thought process must extend to providing a clear, unambiguous approach to emergency and exit signage for these parts of the accessible means of egress, as well as accessible exits, exit doors, including directional signage.

By considering the needs of all occupants and providing signage that identifies all components of an accessible means of egress we will undoubtedly provide safer buildings which are more inclusive for everyone. This adds a level of complexity to the design of some buildings, but no more so than other areas of the building industry that currently use innovative materials, technologies and construction methods to add value to the construction project and provide a better, safer and more usable environment during the life of a building.

In some cases, the use of the Universal Design Meets the Exit Sign concept for exit signs in a building will actually add no cost to the project, no additional maintenance and no increase to the operating costs of a building – it is simply a different pictorial element on an exit sign, but one that sends a key message to people and provides certainty as to how to get out a building.

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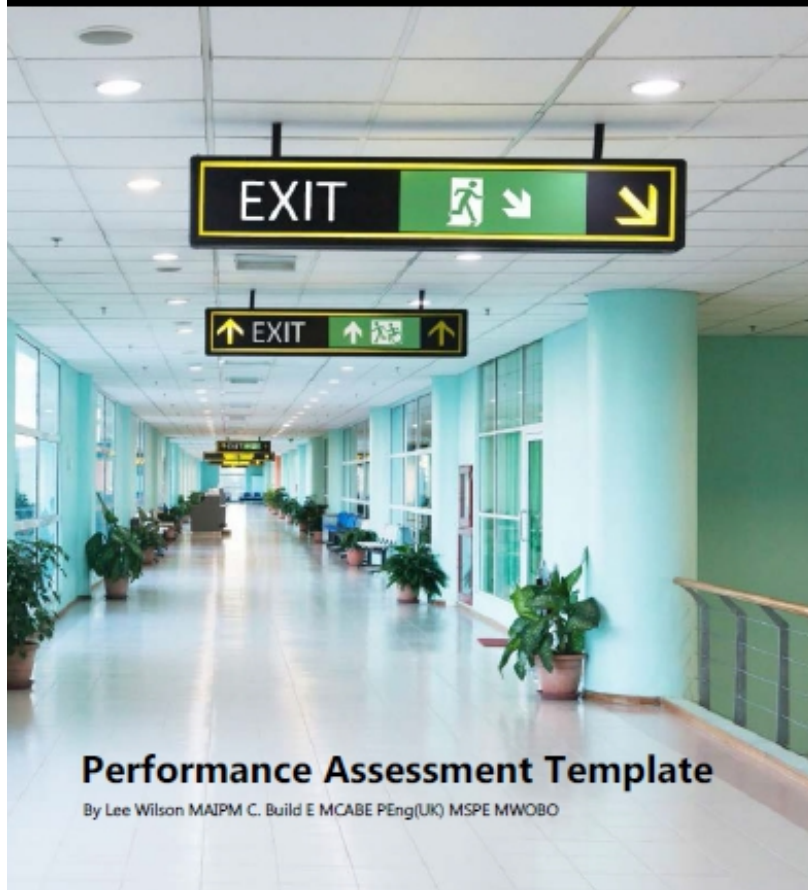
<sup>150</sup> Bretherton, WA 2003, Everybody Out – Emergency Evacuation for Persons with a Disability, University of South Australia





# Appendix A: Universal Design Meets the Exit Sign Performance Assessment Template

**Universal Design.  
Meets the Exit Sign.**



**Performance Assessment Template**

By Lee Wilson MAIPM C. Build E MCABE PEng(UK) MSPE MWOBQ

Available for download from [www.universaldesignmeetstheexitsign.com](http://www.universaldesignmeetstheexitsign.com)