



Emergency Egress for People with Mobility Impairments in Australia

Interactive Qualifying Project

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ABSTRACT

Most people will have a disability, temporary or permanent, at some point in their life; Australian building regulations do not provide equitable means of egress for them. The goal of this project was to investigate how emergency egress codes for people with mobility impairments can be implemented in building regulations. Through interviews and intensive research it was determined that provisions such as areas of refuge and lifts should be included in the Building Code of Australia as a means to mitigate the risk of death.

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AUTHORSHIP

All members of the group contributed to all sections of the report equally. Corey Fisher, Peter Lavallee, and Jessica Pham all made equal and significant contributions to the outcome of this report.

Abstract

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NOMENCLATURE

ABCB-Australian Building Code Board

ADA-Americans with Disabilities Act

AHRC-Australian Human Rights Commission

BCA-Building Code of Australia

BCC- Building Code Commission

CFA-Country Fire Authority

CRS-Commonwealth Rehabilitation Service

DDA-Disability Discrimination Act

DSA-Disability Services Act

DTS-Deemed to Satisfy

ICC-International Code Council

IYDP-International Year of Disabled Persons

MFB-Metropolitan Fire Brigade

NCC-National Construction Code

NFPA-National Fire Protection Association

NIST-National Institute of Standards and Technology

PEEP-Personal Emergency Evacuation Plan

PIA-Preliminary Impact Analysis

RIA-Regulation Impact Analysis

RIS-Regulation Impact Statement

US-United States

WTC-World Trade Center

EXECUTIVE SUMMARY

Medical advancements have increased the life span and quality of life for people with disabilities. These advancements, coupled with population growth, will increase the number of people with disabilities in the world. Yet people with disabilities remain a minority that are “disadvantaged socially, vocationally, economically, and educationally” that faces discrimination in the forms of blatant exclusion, segregation, lesser opportunities, and barriers in communication, transportation, and building architecture (Gilbert, 1992, p. 4). In the past thirty years, countries such as the United States, United Kingdom, and Australia have enacted legislation that eliminates discrimination against people with disabilities. Within Australian legislation, a recent standard, Disability (Access to Premises — Buildings) Standards 2010, was released under Australia’s Disability Discrimination Act of 1992. This standard ensures that access to buildings and facilities as well as services within buildings are provided for people with a disability. The Access to Premises also establishes a standard for building certifiers, developers, and managers that permit them to ensure that buildings comply with the Disability Discrimination Act (Access to Premises, 2010). This standard outlines the necessary requirements needed for people with disabilities to gain access into a building, but it fails to address the issue of egress during an emergency.

The goal of this project was to investigate how emergency egress provisions can be implemented within building regulations in Australia for people with mobility impairments within non-residential and multi-family residential buildings. To meet this goal, we created four research objectives:

- To determine the viewpoints of key stakeholders regarding emergency egress provisions
- To determine if the need to introduce the emergency egress code into building regulations are justified
- To determine if Australian emergency egress codes for the target population are adequate
- To evaluate emergency egress provisions for the target population

Viewpoints of Stakeholders

We interviewed key stakeholders and experts to obtain their viewpoints because they will be affected by the introduction of new emergency egress provisions and they have knowledge of

implementing emergency egress provisions. We interviewed fire and safety professionals and engineers, architects, building code writers, and access consultants for their technical expertise regarding emergency egress provisions and their knowledge in connecting the technical aspects of egress provisions with society and government legislations and regulations. We interviewed building owners, fire rescue services, and disability rights authorities for their opinions on possible types of emergency egress provisions since they would be socially and economically impacted by the introduction of emergency egress provisions.

Justification of Emergency Egress Codes

Literary research, interviews, and data collection allowed us to determine if there is a need to introduce new emergency egress codes into the Building Code of Australia and if the need is justified. Literary research on various different case studies that have happened in the past where people with or without mobility impairments died due to fires provided us with key events that affected the BCA. Interviews with key stakeholders permitted us to determine whether they believed that changes were necessary to the Building Code of Australia, and data collection on various fire statistics let us conclude if there is a quantitative need for implementing new emergency egress codes into the BCA. All of these methods would all weigh equally and provide a rounded viewpoint in determining if the need is justified.

Adequacy of Emergency Egress Provisions

To determine if emergency egress codes for people with mobility impairments are adequate in Australia. We performed literary research on the codes in Australia and articles relating to the target population. Having an in-depth understanding of the codes and the process by which they are implemented was important in determining their adequacy. We also conducted interviews with fire engineers, fire professionals, representatives of disability organizations, and representatives from the Australian Building Codes Board to view the topic from many angles and to see the viewpoints of thought leaders in differing fields.

Evaluation of Emergency Egress Provisions

To evaluate emergency egress provisions for the target population we performed literary research and conducted interviews with key stakeholders. Literary research provided a background understanding of different egress provisions that are already employed in the world and the success rate that they have had. Interviews with key stakeholders permitted us to understand what they know of existing emergency egress codes, if they currently use alternative

codes in the BCA, and to determine what they have experienced to have been proficient emergency egress provisions.

Conclusions and Recommendations

We conclude that there is a need to implement emergency egress provisions for people with mobility impairments within the Building Code of Australia (BCA). Since the BCA has codes that make all buildings accessible for people with disabilities, it is reasonable and equitable to provide people with mobility impairments with safe egress from buildings. This need is supported by professional experts and stakeholders, including fire safety professionals and engineers, access consultants, fire rescue services, architects, building owners, code writers, and disability rights authorities. Furthermore, in Australia's history, there exist many cases such as the Kew Cottage, Childers Hostel Palace, and Quaker Hill Nursing Home fires, where people died from fire due to lack of emergency egress provisions and initiated change in code from pressure of the public. Trigger points like these will happen, it is time to be proactive and implement provisions to avoid another trigger point, causing the loss of life.

Complete safety costs an infinite amount of money that is not plausible. Although there is no failsafe method available that allows for complete safety, having multiple lines of defence in the event of an emergency helps alleviate the problem. There are passive and active measures of fire protection that allow for different defence measures. The first lines of defence should be passive measures. These passive measures include aspects of the physical construction of the building such as areas of refuge, smoke proof lobbies, and fire-protected stairwells. These passive measures are non-mechanical means of safety that do not need maintenance. Since there is always the possibility of these passive measures being compromised, there needs to be active measures of fire protection that combat the effects of the emergency.

Active measures of fire protection are generally mechanical in nature. Sprinklers are an active fire protection measure and are over 99% effective in Australia (Marryatt, 1988). However, when using statistics from the United States, only 9% of buildings that have fires have sprinkler systems present, demonstrating that most buildings, even in Australia are not sprinklered (Hall, 2007). This extremely low number shows that on top of sprinkler systems, there should be other lines of defence that assist in the evacuation of people with mobility impairments. These other lines of defence are physical evacuation measures, such as occupant evacuation lifts and stair walkers. Occupant evacuation lifts allow for self-evacuation for people

with mobility impairments while stair walkers allow for assisted evacuation from the fire brigades or bystanders.

On top of these lines of defence are managerial procedures that need to be established. Managerial procedures, such as personal emergency evacuation plans (PEEP) are crucial for people with disabilities to be able to safely egress. Using the PEEP method increases the likelihood of survival in the event of an emergency for people with disabilities. Through our investigation, we conclude that the incorporation of multiple lines of defence, focusing on areas of refuge, occupant evacuation elevators, stair walkers, and personal emergency evacuation procedures are crucial to the evacuation of people with physical impairments in the event of an emergency.

Our findings addressed the first process of implementing emergency egress provisions by justifying and determining the need to introduce emergency egress into the Building Code of Australia, gauging the awareness of the issue with professionals, and examining the many possible egress provisions that can be incorporated. Our research has illuminated many other factors related to implementing emergency egress provisions for people with mobility impairments. These factors can be further addressed through our recommendations of future research projects that our sponsor can support. We recommend that:

- our sponsor examine the cost on an individual's life in order to create a cost-benefit analysis to introduce emergency egress for people with mobility impairments that incorporates the ethical and moral aspect of our issue
- our sponsor determine the costs of different emergency egress provisions, such as areas of refuge, evacuation chair devices, and lifts, individually and as a combination for multiple lines of defence in order to create a cost-benefit analysis to introduce emergency egress for people with mobility impairments
- access consultant groups and fire and building engineers collaborate with each other so that emergency egress solutions for people with disabilities will address all aspects and needs of the target population
- determine the effectiveness of current emergency management procedures and how they would need to change if new emergency egress provisions are included such as lifts

- examine lifts as a means of emergency egress to determine if evacuation lifts are viable options to provide safe exit for the target population and how it can be a safe means of egress
- our sponsor examine possible egress provisions for new and old buildings to determine what egress provisions are suitable for new buildings and for the retrofitting or renovation of old buildings
- examine egress provisions for different class buildings to determine suitable emergency egress provisions for different classes of buildings
- examine emergency egress provisions for other disabilities such as visual, hearing, or mental impairments

1.0 INTRODUCTION

Ten per cent of the world's population lives with a disability (United Nations Web Services, 2011) and this percentage of the population will rise due to population growth and medical advancements that increase the longevity of peoples' lives. People with disabilities require special accommodations for equal access to the workplace, schools, and public venues. According to the United Nations' Declaration of Human Rights, people with disabilities are human beings and are entitled to reasonable accommodations necessary to achieve equality with the able-bodied community. In many instances, society unknowingly violates these rights by discriminating against people with disabilities through the creation of an atmosphere where they are unable to actively participate and contribute to the community.

Advocacy groups, such as the National Association for the Deaf, around the world are making an effort to prevent discrimination against people with disabilities. The perception of people with disabilities has progressively changed from viewing people with disabilities as objects of charity and social protection to citizens with rights, who are active members of society (United Nations Web Services, 2011). Many countries such as the United States and the United Kingdom have standards that eliminate discrimination against people with disabilities. The United States passed the Americans with Disabilities Act (ADA) in 1990 and the United Kingdom Passed their Disability Discrimination Act in 1995. These countries are at the forefront of anti-discrimination legislature.

A growing population of people with disabilities in Australia is a driving force in the emergence of disability rights to eliminate discrimination. The International Year of Disabled Persons by the General Assembly of the United Nations in 1981 began an international recognition of the rights of people with disabilities. The Australian parliament expanded upon this act through the creation of the Disability Discrimination Act (DDA) of 1992 that further defined disabilities in order to eliminate discrimination against people with disabilities. More recently, the Access to Premises of 2010, a standard incorporated into the DDA, outlines and defines key standards in providing access to public venues for people with disabilities. Australia's creation of its Access to Premises made public buildings more accessible to the disabled community, but it does not address accessible means of egress.

If a person with a disability enters a building, they may not be able to safely exit the building in the same manner especially in the event of an emergency. In the event of an emergency, normal means of egress are not always available. Countries, such as the United States and the United Kingdom, have provisions in place that outline accessible means of egress. The Australian Legislation made buildings accessible for people with disabilities through the enactment of the Access to Premises; however, Australian legislation has yet to incorporate usable standards regarding emergency egress in their legislation similar to those in the United States and United Kingdom.

The goal of this project is to investigate how emergency egress provisions can be implemented within building regulations in Australia for people with mobility impairments within non-residential and multifamily residential buildings. We will achieve this goal by determining the viewpoints of key stakeholders regarding emergency egress provisions. We will determine if Australian emergency egress codes for the target population are adequate by comparing Australian codes with other international codes. Emergency egress provisions will be evaluated for the target population and we will determine if the need to introduce the emergency egress provisions into building regulations are justified.

2.0 LITERATURE REVIEW

2.1 Introduction

People with disabilities are a minority that are “disadvantaged socially, vocationally, economically, and educationally” that faces discrimination in the forms of exclusion, segregation, lesser opportunities, and barriers in communication, transportation, and building architecture (Gilbert, 1992, p. 4). Medical advancements have increased the life span and quality of life for people with disabilities. These advancements, coupled with population growth, will increase the number of people with disabilities in the world. In the past thirty years, countries such as the United States, United Kingdom, and Australia have enacted legislation that eliminates discrimination against people with disabilities. Within Australian legislation, a recent standard, Disability (Access to Premises — Buildings) Standards 2010, was released under Australia’s Disability Discrimination Act of 1992. This standard ensures that access to buildings and facilities as well as services within buildings are available for people with a disability. The Access to Premises also establishes a standard for building certifiers, developers, and managers that permit them to ensure that buildings comply with the Disability Discrimination Act (Access to Premises, 2010). This standard outlines the necessary requirements needed for people with disabilities to gain access into a building, but it fails to address the issue of egress during an emergency. In order to introduce feasible egress standards for people with disabilities in Australia, disability viewpoints, legislation regarding people with disabilities, the various building and fire safety codes that address emergency procedures, and different egress methods currently available needs to be understood as a whole.

2.2 Disabilities in Australia

An understanding of what defines a disability is helpful in determining the target population for this report. The Australian Disability Discrimination Act (DDA) is the legislation that defines a disability. According to the DDA, a disability with respect to a person is an illness or handicap that affects either the body or the mental functions of a person (DDA, Sect 4, 1992). This includes disabilities that a person has had, currently has, or may have in the future. The legal documentation illustrates that there is a wide range of disabilities that require different methods of assistance.

Over the past 20 years, Australia has seen an increase in the number of people with disabilities. In 1981, 13.2% of the population was considered disabled. This number has increased to 20% by 2003, which is about 3,958 people in Australia (Australian Bureau of Statistics, 2009). People with disabilities make up a large percentage of the Australian population. Of the 20%, 10.5% are reported to have a mobility disability, 4% have a hearing disability, and 1.6% has a visual disability (Census, 2006). Another population to consider are the individuals who become temporarily disabled due to accidents. There is no percentage of people with temporary disabilities, but they should be heavily considered because they increase the disabled population at any point. It is also important to consider that as people age, they are increasingly more likely to develop some kind of disability, therefore, as time progresses, everyone will be classified as disabled.

2.2.1 Social Issues and Complexities

The complexities involved with disabilities are moral and impairment specific. The disabled community makes up 20% of Australia's population (Australian Bureau of Statistics, 2009) and can greatly benefit from improved emergency egress codes in numerous ways. They can gain a greater sense of security and safety when entering a building, they can worry less about life threatening situations and the impact those could have on their lives, and they can develop a new sense of pride and empowerment by being capable of self-evacuating themselves from a building. There are many different disabilities that each requires a different set of emergency egress provisions. Each disability has varying requirements that need to be addressed in order to adequately meet their needs. For example, a person with mobility impairment may need the use of a lift to safely egress a building and a person with a hearing impairment may need the use of strobe lights to be able to safely egress as well.

The social issues range from the cost of a life to the costs and benefits of implementing new codes. There are two categories that the issue can break down into, a moral viewpoint and a cost-benefit viewpoint. When examining the moral aspect, the life of an individual is important. Different countries place different dollar values on the lives of people. When businesses make decisions concerning egress provisions, they take into account how much the provisions will cost versus the cost of a lost life. If the costs of the egress provisions are less than the cost of loss of life, then they are ignoring the moral aspect of the decision. Costs play a large role in the decisions made by building owners. By adding more emergency egress provisions, the cost of

construction will increase. The cost of buildings with small budgets could be more affected by change than the buildings with large budgets depending on what egress provisions are required.

2.3 Background of Disability Discrimination Legislation

An examination of past Australian legislation and legislation in other countries, such as the United States, that addresses disability rights is necessary to determine how legislation has helped people with disabilities and to understand how government policy can play a role in emergency egress standards.

2.3.1 Disability Legislation in Australia

Legislation in Australia related to disabilities or people with disabilities dates back to the Invalid Pension Act of 1908 and the Repatriation Commission (1919). These legislations created government agencies, such as the Commonwealth Rehabilitation Service (CRS), that provides aid to people who are unable to work due to disabilities, illness, or other impairments, focusing mainly on people of work force age with disabilities and servicemen. At this point, a key force that drives legislation regarding people with disabilities is employment and labour force benefits. However, the component of human rights becomes more prevalent in 1981 with the introduction of the International Year of Disabled Persons by the General Assembly of the United Nations (McIntosh, 2002).

The International Year of Disabled Persons (IYDP) called for a plan of action that helped people with disabilities to have “full participation and equality” (United Nations, 2004) in life and in their society. This drove Australian legislation towards removing barriers that prevented people with disabilities from having the same equal rights as able-bodied persons. A key initiative that resulted from the IYDP was the Disability Services Act (DSA) of 1986. The DSA aims to aid people with disabilities to be active members of the community, obtain increased independence and employment opportunities and to promote a positive image of people with disabilities in the community (DSA-Sect3, 1986).

Following the DSA is one of the key pieces of legislation that had a great deal of influence on rights for people with disabilities, the Disability Discrimination Act of 1992. The Disability Discrimination Act (DDA) works towards eliminating discrimination of people with disabilities, ensuring that they are equal in the eyes of the law (McIntosh, 2002). The DDA makes disability discrimination unlawful in areas such as employment, education, provision of goods, services,

and facilities and accommodation. The Act provides protection to those with disabilities as well as friends, relatives, and others from discrimination due to connections to people with disabilities (Australian Human Rights Commission, 2012). The DDA creates the opportunity for the development of standards in areas such as public transport, employment, education, and building access that aid people with disabilities. These standards define the rights of people with disabilities and the obligations employers, institutions, and agencies have towards people with disabilities. The Commonwealth government of Australia developed and enacted the DDA and the Australian Human Rights Commission (AHRC), which handles complaints and issues related to disabilities (Australian Human Rights Commission, 2011).

Within the Disability Discrimination Act, the Attorney-General can enact Disability Standards that address the rights and responsibilities regarding equal access and opportunity for people with disabilities. One section of the DDA makes it unlawful for public places to be inaccessible to people with disabilities, where public places are educational institutions, pedestrian malls, sporting venues, government offices, hospitals, and many other locations (Australian Human Rights Commission, 2012). A recent standard addressing building access is the Disability (Access to Premises — Buildings) Standards of 2010 (Premises Standards). The purpose of the standard is to provide people with disabilities “dignified, equitable, cost-effective, and reasonable access to buildings” and “certainty to building certifiers, developers, and managers” that if the Standards are complied with they cannot be subject to a successful complaint under the DDA in relation to those matters covered by the Premises Standards. (Access to Premises, 2010)

The Premises Standards specifies national requirements for new buildings and large renovation projects on existing buildings that comply with the DDA. This Standard will provide people with disabilities the opportunities to participate in and contribute to the community as equal citizens. The creation and introduction of the Premises Standard will make buildings and other public venues more accessible to people with disabilities, but it raises the issue of a lack of clear and accepted procedures for emergency egress from buildings for people with disabilities.

2.3.2 Disability Legislation in the United States

The United States and Australia are very similar countries in terms of culture and economic development, understanding how legislation in the United States addressed disability rights can illustrate how Australia compares. In the United States, disability legislation gained a

foundation and basis with the Civil Rights Act established in 1964. The Act prohibited the discrimination on the grounds of race, religion, ethnicity, national origin, and creed (Harrison, 2002). Self-advocacy groups, such as the National Association of the Deaf, built on this civil rights legislation as a basis for their arguments in relation to the protection of their rights as equal members of society. They wished to be viewed for what they can contribute into the community and not by their limitations (Scotch, 2009). Following this, there was a push towards barrier removal so that buildings would be accessible to the disabled community. The result of this push was the United States Architectural Barriers Act that was enacted in 1968, a step towards government policy to enhance and improve the opportunities available for people with disabilities (Percy, 1989).

Although these two pieces of legislation played important roles in establishing the foundation for the protection of rights for people with disabilities, the legislation that played the most important role in changing the course of the disabilities civil rights movement in the United States was the Rehabilitation Act of 1973. The Rehabilitation Act required that priority be given to those who had the most severe handicaps, and programs were to focus on promoting independent living, not just vocational rehabilitation (in cases of disabled war veterans or injured workers) (Percy, 1989). The key components of the Rehabilitation Act required federal government agencies to begin inroads in employing people with disabilities as employees and an antidiscrimination provision that stated: “No otherwise qualified handicapped individual in the United States, as defined in Section 7(6), shall solely by reason of his handicap, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance” (Percy, 1989, p. 54). The Rehabilitation Act made great inroads into bringing awareness and understanding of the needs and rights of the disabled community to the forefront of American society. The Act set the stage for the Americans with Disabilities Act and incorporated the economic benefits of including people with disabilities into the work force.

The passing of the Americans with Disabilities Act (ADA) in 1990 provided civil rights protection for people with disabilities. The rights are modelled after those described in the Civil Rights Act and Section 504 of the Rehabilitation Act (Harris, 1999; Harrison, 2002). The ADA is comprised of four titles, addressing discrimination in employment (ADA Title I, 1990), state and local government activities (ADA Title II, 1990), public transportation (ADA Title II, 1990),

public accommodations (ADA Title III, 1990), and telecommunications relay services (ADA Title IV, 1990). The ADA has produced many standards that benefitted and helped to integrate the disabled community into society. Strong public opinion and disability groups supported the establishment of the ADA. This support generated social awareness and the impetus towards change in attitudes and legislations for the disabled community in the United States that Australia mirrors in its legislations. United States legislation is strongly based on equal rights, where regulations and policies are accepted on the basis of civil rights.

2.4 Australia-The Disability Discrimination Act (DDA)

The Disability Discrimination Act (DDA helps to eliminate discrimination against people with disabilities. The Australian Human Rights Commission protects and enforces this document through a complaints process. If people with a disability feel as though they have been discriminated against, they would file a complaint with the AHRC. Once the complaint has been filed, the AHRC would investigate the incident and take appropriate action depending on the result of the case. Often times the costs of filing a complaint outweighs the financial compensation a person would receive (Access to Premises, 2008). A result of this would be a decrease in the effectiveness of this legislation as well as building owners feeling little pressure to abide by the standards put out by the DDA.

2.4.1 Access to Premises

Recently, in 2010, the DDA published a revised set of standards known as the Access to Premises. These standards greatly increased the availability of buildings for people with disabilities as well as provided more employment and recreational opportunities than existed previously. The goal of incorporating these new standards into the Building Code of Australia (BCA) was to align the BCA standards with the DDA. By doing this, building owners are now fully complying with the DDA, which was previously only enforced by complaints, and guaranteeing more rights to people with disabilities. These improvements to the BCA also work in favour of building owners because they now do not have to worry about lawsuits as much. This is because if they are in compliance with the BCA, then they are in compliance with the DDA, and any complaint will be in many instances, invalid.

2.4.2 Egress in the Disability Discrimination Act

The DDA has made strong improvements with the implementation of the Premises Standards Guidelines in 2010 regarding access to buildings. Despite these recent improvements, they do not address the issue of egress. If a person with a disability is capable of entering a building, then they are capable of exiting by the same means. This does not always hold true in the event of an emergency. The recent push for improved access to premises brings up the complexity that people with disabilities now have a wider availability of buildings to enter, but are they adequately protected by these buildings in the event of an emergency?

The ADA is more progressive when dealing with egress. The ADA released the 2010 ADA Standards for Accessible Design which is a similar set of standards as the Australian Access to Premises. The original standards of 1991 specifically define egress as a means of, “A continuous and unobstructed way of exit travel from any point in a building or facility to a public way. A means of egress comprises vertical and horizontal travel and may include intervening room spaces, doorways, hallways, corridors...courts and yards. An accessible means of egress is one that complies with these guidelines and does not include stairs, steps, or escalators. Areas of rescue assistance or evacuation elevators may be included as part of accessible means of egress” (ADA Standards for Accessible Design, Sect 3.5, 1991). The ADA clearly defines all of the terms related to emergency egress. In section 4.3 of the ADA, the requirements for egress are presented with specific details for each precaution ranging from areas of rescue assistance to identification of these areas. Currently, the DDA does not address egress in the document itself, which makes it difficult to align new building codes that can satisfy both the BCA and the DDA to be in compliance with each other.

2.5 Standards Regarding Emergency Egress for People with Disabilities in Australia and the United States

Many available standards around the world identify the emergency egress needs of people with disabilities. The only stipulation of their use is whether a government decides to adopt them or not. Codes commonly found around the world have no binding legislation written within them until their adoption as law by the governing body. This process can vary greatly by the city, state, or federal government. This section reviews the codes of the United States, Australia, and the United Kingdom. The main code present in Australia is the Building Code of Australia (BCA). In the United States, the National Fire Protection Association (NFPA) and the

International Code Council (ICC), which are both United States based companies, write the applicable codes. These two codes are adopted either fully or in pieces at the state or local level in every state. Most of these codes adopt some of the standards put forth by the American National Standards Institute. In the United Kingdom, the British Standards Institution writes the applicable codes and standards. This section will primarily analyse the Australian codes, however, it will also briefly analyse the other codes previously mentioned.

2.5.1 The Building Code of Australia

The National Construction Code (NCC) comprises of three volumes of which Volumes One and Two are the Building Code of Australia. The BCA are the building regulations accepted by all States and Territories of Australia. As stated by the Australian Building Code Board (ABCB), “The goal of the BCA is to enable the achievement of nationally consistent, minimum necessary standards of relevant, health, safety (including structural safety and safety from fire), amenity and sustainability objectives efficiently.” The ABCB applies this goal as to rigorously test the regulation, generate benefits other than cost, to not be more restrictive than necessary, and to make sure there is no regulation that will create higher net benefits. The BCA contains provisions for the design and construction of buildings and other structures covering structure, fire, access and egress, and services amongst others.

The BCA is based upon a series of performance requirements. These performance requirements are designed in order to meet the relevant functional statement and the relevant objective. The objectives represent why the community wants the matter regulated. The functional statements display how a building could meet those objectives. The performance requirements outline a suitable level of performance which must be met by the building materials, construction methods, components and design factors in order to meet the functional statement and in turn the objectives. The performance requirements can be met by either two ways, the Deemed to Satisfy (DTS) provisions, or by alternative methods. The DTS provisions are found within the BCA and if these provisions are met, the performance requirements are in turn met and the building is up to code. The alternative methods give the designer leeway to choose his own materials, components, construction methods, etc. in order to meet the performance requirements. If the approval authority sees fit, the alternative method can be deemed satisfactory although it does not follow the DTS provisions.

In order to make a change to the BCA, a Regulation Impact Analysis (RIA) must be completed. The purpose of the RIA is to examine the likely impacts of the regulation change as well as comparing it with other alternative methods. The goal of the RIA is to strive for the solution with the highest net benefits. The RIA is designed to create better legislation through good analysis of the problem. This process identifies problems while addressing whether or not action needs to be taken on the problem. The analysis of the issue includes an assessment of the costs and benefits of the proposed legislation change while considering alternative solutions as well. The key part of this process is consulting the stakeholders who are able to give pertinent information on the topic which brings more depth to the problem. The goal of the ABCB through this process is to find a regulatory balance of the problem.

There are three major aspects of the Regulation Impact Analysis. The three steps are the Proposal for Change, Preliminary Impact Analysis (PIA), and the Regulation Impact Statement (RIS). The Proposal for Change, which creates a case for amending or creating a new provision, can be created by any member of the public. However, these proposals need to follow steps outline by the Best Practice Regulation. If the proposal is deemed legitimate it can move on to the next stage, the Preliminary Impact Analysis.

The Preliminary Impact Analysis starts the early stages of assessing a Proposal for Change. The PIA follows the Best Practice Regulation rigorously. The Building Code Commission would assess the proposal as well as supporting data as they see fit. There are two positive outcomes which can be seen from the PIA process. If the board sees that the impact of the change is minimal, and there is a net benefit, the Board can consider the PIA for decision. If there appears to be large impacts and a possible net benefit to the proposal, the Board can choose to commission a Regulation Impact Statement.

The Regulation Impact Statement is the most rigorous of the three options. The RIS is an in-depth evaluation of the proposal and other alternatives in order to achieve a government policy objective. The RIS is required to be very detailed while having extensive technical knowledge in order for stakeholders, the Board, and the relevant committees, to make an informed decision on the proposal. An RIS must be assessed for completeness by the Office of Best Practice Regulation to ensure it is compliant. If all these steps are followed and the Board sees the provision change as beneficial, it can be changed in the next edition of the BCA.

2.5.2 NFPA 101: Life Safety Code

NFPA 101 originated in 1912 as the Committee on Safety to Life of the National Fire Protection Association. This committee created pamphlets, one of which is *Exit Drills in Factories, Schools, Department Stores, and Theatres*. This fact demonstrates that from the beginning the committee viewed the egress of individuals in case of emergency was of the utmost importance. As the years progressed, and the committee received more information about fatal fires, they continued to write pamphlets such as *Outside Stairs for Fire Exits* and *Safeguarding Factory Workers from Fire*. As the committee continued to produce more pamphlets, the basis for the code started to take shape. In 1921, the first edition of the *Building Exits Code* was drafted. NFPA produced the first *Building Exits Code* in 1927. As years passed, the code continued to grow and to adopt more chapters. In 1994, two years after the enactment of the Americans with Disabilities Act, the code introduced sections involving accessible egress, areas of refuge, and ramps in order to comply with the new legislation (NFPA 101, 1994).

The code is ever evolving and addresses the construction, protection, and occupancy features necessary to minimize the danger to life from the effects of fire, including smoke, heat, and toxic gases created during a fire. The scope also goes on to state that it establishes criteria necessary to design egress facilities to allow prompt rescue of occupants from buildings or to safe areas in buildings. This is saying that the code gives provisions on how to get people out of buildings in case of fire, but also if they are unable to make safe egress, there exists a safe area within the building that they can escape to and wait for further rescue. The code also gives provision as to the design of protective systems, i.e. sprinklers, to allow the safe egress of individuals.

3.0 METHODOLOGY

The goal of this project is to investigate how emergency egress provisions can be implemented within building regulations in Australia for people with mobility impairments within non-residential and multifamily residential buildings. We will achieve this goal using these objectives:

- To determine the viewpoints of key stakeholders regarding emergency egress provisions
- To determine if the need to introduce the emergency egress code into building regulations are justified
- To determine if Australian emergency egress codes for the target population are adequate
- To evaluate emergency egress provisions for the target population

Our approach is to use interviews, data collection, and literary research to meet these objectives.

3.1 Viewpoints of Stakeholders

We determined the viewpoints of key stakeholders regarding the issue of introducing emergency egress provisions by conducting interviews with fire and safety professionals and engineers, access consultants, building owners, architects, fire rescue services, building code writers, and disability rights authorities.

3.1.1 Interviews

Interviews with key stakeholders and experts permitted us to obtain their opinions because they will be affected by the introduction of new emergency egress provisions and they have knowledge of implementing emergency egress provisions. The individuals that we interviewed and their titles are:

- Cathryn Grant, Access Consultant from Davis Langdon, an AECOM company
- Tass Georgas, Manager and Senior Fire Engineer from the Metropolitan Fire and Emergency Services Brigade
- Darryl Weinert, Fire Safety Engineer at AECOM

- Stephen Kip, fire safety professional and consultant
- Contact from the Australian Building Code Board, wishes to remain anonymous
- Representative of a major architectural firm, wishes to remain anonymous
- Disability rights expert, wishes to remain anonymous
- Norm Winn, Victorian representative for the Fire Protection Association of Australia
- Representative of a major property trust business, wishes to remain anonymous
- Max Murray, Access Consultant from Access Designs
- Stephen Doran, Fire and Emergency Management from the Country Fire Authority

We interviewed fire and safety professionals and engineers, architects, building code writers, and access consultants for their technical expertise regarding emergency egress provisions and their knowledge in connecting the technical aspects of egress provisions with society and government legislations and regulations. We interviewed building owners, fire rescue services, and disability rights authorities for their opinions on possible types of emergency egress provisions since they would be impacted socially and economically by the introduction of emergency egress provisions.

Fire and safety professionals, access consultants, and building code experts can provide insight in connecting the technical aspects of emergency egress provisions with government legislature and building regulations since they have experience in implementing fire and safety measures and working with government legislations and regulations such as the Disability Discrimination Act, the Access to Premises, and the Building Code of Australia. Architects and fire and safety engineers can present information on the process of implementing egress provisions into building design, provisions in general practice, and the advantages and disadvantages of different egress provisions for different building types. Fire rescue services and building owners have an interest in the issue because the incorporation of emergency egress would affect the costs of implementing egress provisions in old and new buildings and in the procedure of completing rescue where some provisions can hinder or aid the rescue service. We were able to obtain their ideas and opinions on possible egress provisions and issues that relate to various provisions. Disability rights authorities work with disability groups and ensure that their

rights are not violated and are addressed. They are able to provide information regarding the connection of government legislation and the rights and needs of people with disabilities.

We interviewed many different individuals that are affected and are a part of introducing emergency egress provisions. We were unable to contact and interview other stakeholders that we wished to interview. These stakeholders are representatives of disability groups and multiple representatives of different areas of expertise such as code writers, architects, building owners, and engineers.

3.2 Justification of Emergency Egress Codes

To determine if there is a need to introduce new emergency egress codes into the Building Code of Australia and if the need is justified, we performed literary research, interviews, and data collection. Literary research was performed on various different case studies that have happened in the past where people with or without mobility impairments died due to fires. Interviews with key stakeholders were performed to determine whether they believed that changes were necessary to the Building Code of Australia. Data collection was performed on various fire statistics to determine if there is a quantitative need for implementing new emergency egress codes into the BCA. All of these methods would all weigh equally and provide a rounded viewpoint in determining if the need is justified.

3.2.1 Literary Research

Literary research was used because there have been a multitude of news articles and reports written on major fires that have taken place in Australia. When examining these fires we looked for fires that resulted in the loss of lives. There was no focus on mobility impairments for this specific research because we were more focused on determining fires that influenced change in the building code. By looking at these fires, we were able to look at what went wrong and what the reasons for the people dying were. Knowing these facts would allow us to determine what codes were in place before the fire, if the codes were adequate, and if some exterior agent prevented them from working. They also allowed us to look into whether these fire deaths can act as trigger points. A trigger point is an event that sparked change. Trigger points would allow us to understand about how emergency egress and fire codes change with major fires, and to see if changes occur with the code when there are no fires and loss of life to bring to life the issue of inadequate codes.

3.2.2 Interviews

Interviews were conducted since there are many different stakeholders who could have an influence over the incorporation of new emergency egress codes into the BCA. Getting to understand their viewpoints would help us to see if they believe there is just cause to make these changes or not. A common question was asked between all stakeholders, regardless of whether they were fire safety engineers, building owners, etc., “should there be emergency egress and why?” This question in particular was asked because it allowed the interviewee to give their personal input on the topic. Examining each key stakeholder’s viewpoints on the subject would allow us to assess whether or not the majority supports the idea for new emergency egress codes in the BCA. If a majority of the stakeholders involved support new codes, then it could show justification through the stakeholders.

Fire and safety professionals were asked this question because they are thought leaders in their respective fields and knowing where they stand in regards to emergency egress would provide valuable insight. Architects and fire safety engineers currently design fire and egress provisions in buildings. They are able to provide valuable knowledge on where they stand with the current codes and provisions and informing us whether they design to different standards or just to the BCA. Access consultants were asked this question because they are very knowledgeable on the topic of access, so their thoughts and opinions on egress could prove to be valuable since both topics complement each other. Building owners are the primary clients who ultimately pay to be compliant with codes and it is important to understand their point of view when it comes to costs. Fire rescue services were asked this question because they are the ones who go into the buildings to rescue people in trouble. By understanding their opinions it would help us understand what they feel are the best codes to save lives. Building code writers have a large say of what codes and provisions they feel are necessary in the Building Code of Australia since they will write the new codes. Disability rights authorities were asked this question because they are the stakeholder who this affects the most. After interviews were conducted, the responses were compiled into an excel sheet to compare them all together. Once this was done, the information was synthesized to see what was useful. Knowing their thoughts and ideas on the various emergency egress methods would help us to gauge if they find the current codes to be a problem or not.

3.2.3 Data Collection

Data collection was used because both the United States and Australia have fire statistics that could be useful in determining how frequent fires happen and the death rates associated with them. The total population of the United States was examined and compared with the total population of Australia. By knowing the population differences, we were able to use the percentage difference to compare fire data between the two countries. The number of fire deaths that occurred in the United States and Australia during different time spans was researched to be able to understand how frequent fire deaths occurred in both countries to see if one country has less fire deaths than the other does. Knowing these statistics could help us understand if a particular country has adequate fire safety procedures in comparison to each other.

3.3 Adequacy of Emergency Egress Provisions

We set out to determine if emergency egress codes for people with mobility impairments are adequate in Australia. We decided that the best way to determine whether the codes were adequate was to perform literary research on the codes in Australia and articles relating to the target population. Having an in-depth understanding of the codes and the process by which they are implemented was important in determining their adequacy. We also determined that it would be important to conduct interviews with fire engineers, fire professionals, representatives of disability organizations, and representatives from the Australian Building Codes Board. Interviews with these professionals gave us the ability to look at the topic from many angles and to see the viewpoints of thought leaders in differing fields.

3.3.1 Literary Research

We conducted literary research because we needed to determine if the code is adequate. In order to determine if it is, we had to understand the different aspects presented in the code and what is currently present in Australia. This aspect of understanding the current codes was crucial in formulating our questions for the interviews as well as determining who we needed to interview and why. Our literary research also comprised of studying different codes and standards around the world. We researched the different codes present in the United States because building habits and cultures are very similar between the two countries. It is important to study the codes in the United States because the United States passed similar legislation; the Americans with Disabilities Act (ADA), as Australia passed the Disability Discrimination Act (DDA). We studied these documents to understand the basis for why the codes had been changed and how they could be used to change the codes in the future. We studied the codes created by the National Fire Protection Association (NFPA) and the International Code Council (ICC) because they are the most prominent code creation councils in the United States. We studied the ICC because their International Building Code is adopted to some degree in all 50 states. It was important to study the NFPA codes because they are the most prominent fire protection company in the United States and they have written over 3000 standards on a broad range of topics in the field of fire safety. Conducting literary research was extremely important in determining the adequacy of the codes because it gave us the background necessary to conduct our interviews with professionals from the field and formulate our conclusions.

3.3.2 Interviews

The purpose of conducting interviews was to determine if key stakeholders felt the codes in place in Australia are adequate. The professionals we interviewed dealt with the code on an almost daily basis and have vast knowledge of the code and how it is applied. The key stakeholders who should be interviewed to determine their adequacy are fire engineers, fire professionals, fire brigades, architects, access consultants, representatives from the Australian Building Codes Board (ABCB), building owners, and representatives from disability organizations. The thought leaders from each of these professions gave many viewpoints on the codes as well as gave us a representative viewpoint of the members of each field as a whole. We got different information from each interviewee through different questions for each person.

We interviewed fire engineers because they would be involved in the design process of the building. The design of buildings in Australia must follow either the Deemed to Satisfy requirements put forth by the Building Code of Australia (BCA) or an Alternative Solution which is deemed acceptable by a building certifier. We determined that fire engineers were able to give us their viewpoint as to whether their designs are adequate for people with mobility impairments. We asked them questions regarding what types of egress provisions they incorporated into their designs, what provisions they think are the most effective, and if they thought more provisions should be incorporated into the Building Code of Australia.

Fire professionals are involved in determining if an Alternative Solution is adequate. These fire professionals are knowledgeable about what methods of egress are successful and what would work best for the target population. These fire professionals also have extensive knowledge of the Code. We asked them questions relating to their implementation and what they feel the best egress provisions would be.

We interviewed fire brigades because they are involved in the rescue of individuals if they are caught in a fire. We determined that it was important to see what egress provisions were considered to be the most effective by the individuals who are in charge of rescuing people if there is an emergency. We determined this because they would have seen different methods that have worked or not worked in the field as opposed to on paper. We asked them questions relating to their standard operating procedures when they encounter someone who is trapped. We also asked them what methods they have seen that work well, as well as what methods would make fire fighting operations run more smoothly.

Architects are heavily involved in the design process of buildings. Architects must follow the BCA or an alternative solution when designing their buildings so they are knowledgeable about the codes and provisions that are currently in place as well as other solutions that they have incorporated in their designs or the designs of other architects. The interviews with the architects were important in determining if they believe the buildings they design are adequate for people with mobility impairments. They were also important interviews to determine what means of egress are available and currently being used and what architects prefer using in their designs.

Access consultants have a deep understanding about the Disability Discrimination Act (DDA) and the provisions related to access within the Building Code of Australia. It was important to interview these consultants to understand what is needed to get someone with a mobility impairment into and out of a building in a dignified and safe manner. We asked the consultants how the DDA has shaped the building code in relation to the Access to Premises and what they believe what egress provisions can be incorporated into the BCA. We also asked them what they felt would be the best and most dignified provisions for egress for the target population and why.

We interviewed representatives from the Australian Building Codes Board because they are the overseeing body for the Building Code of Australia. They are in charge of amending the code so it was important to determine whether they believe if the code is adequate. We determined it was important to see why they addressed access to premises but not egress. We felt as though they could give us a better understanding of the process of changing the code. We asked them questions related to the code creation process and the Access to Premises Standards of 2010.

Building owners choose the final design of their buildings and choose whether they will design exactly to the Building Code of Australia or to a higher degree. These interviews were important in determining whether the general opinion of building owners is to use the most cost effective design or a design of greater safety. We asked the building owners why they think egress provisions should be added, what different provisions should be added, and how much of a cost they would incur for the additions. The building owners were important to interview in order to learn if they think spending the money on additional provisions are justified.

3.4 Evaluation of Emergency Egress Provisions

To evaluate emergency egress provisions for the target population we performed literary research and conducted interviews with key stakeholders. Literary research was performed to have a background understanding of different egress provisions that are already employed in the world. It also allowed us to examine where else in the world they are implemented and the success rate that they have had. Interviews were conducted with key stakeholders because it permitted us to understand what they know of existing emergency egress provisions, if they currently use alternative provisions in the BCA, and to determine what they have experienced to have been effective emergency egress provisions.

3.4.1 Literary Research

The method of literary research was used because there are numerous reports, research, books, and other literature published on the topic of emergency egress provisions. Examining the various works would allow us to get an understanding of the different egress methods and provisions that exist. In order for us to be able to develop a set of questions to ask key stakeholders, we had to first have background research to know what specifically to ask each interviewee. Research was focused on emergency egress provisions that would apply to our target population. We looked into what other countries are currently using in their codes to provide emergency egress and what kind of research has been done on these different provisions.

3.4.2 Interviews

Interviews with fire and safety professionals, engineers, and architects provided us with their understanding of the current codes and provisions that are used in Australia. These experts also have firsthand experience with the success of each code and provision. One question that we asked each interviewee was, “What is the best option for emergency egress provisions in non-residential buildings and multi-family residential buildings and why that is the best option?” This question allowed us to get an understanding of what each stakeholder feels is the best solution to the problem. It also gave them a chance to answer the question in regards to both multi-family residential buildings and non-residential buildings. Each different stakeholder was asked this question because each one may think that a different provision is better for different reasons.

Fire rescue services were asked this question because they have the unique viewpoint of being the people who enter buildings to assist emergency egress and to save those who are at

risk. Understanding what provisions they believe would be most effective in assisting their jobs would be valuable input. We asked fire and safety engineers and professionals this question because they are the ones who currently design to code specification and are knowledgeable on the costs and effects of different provisions. Access consultants and disability rights authorities were asked this question because they are very aware of the needs of people with disabilities and might have input that could correlate with access codes and provisions. Building owners were asked this question because they are the ones who have the final say on what provisions they incorporate, as long as they are compliant with the BCA. All of these stakeholders' inputs are important in determining what the best set of provisions and codes are available to ensure the most effective provisions are introduced. After these interviews were conducted, all of the information was compiled and analysed to be able to assess and interpret the information.

4.0 RESULTS AND ANALYSIS

We found that there is a need to implement emergency egress provisions for people with mobility impairments within the Building Code of Australia to mitigate the risk of fire deaths of people with mobility impairments based on interviews with experts and professionals, data collection, and literary research. In addition, multiple lines of defence using emergency egress provisions are the best method to provide safety and equitable means of egress for our target population.

4.1 The Need for Emergency Egress Provisions

Based on current Australian government legislation on disabilities, we determined that emergency egress provisions should be included in building regulations, specifically the Building Code of Australia. Government policy such as the Disability Discrimination Act (DDA) and the Access to Premises defines new building solutions in the Building Code of Australia that make all buildings accessible for people with mobility impairments. However, there are no provisions regarding egress for the target population, especially in an emergency. Experts, including fire rescue services, access consultants, engineers, and professionals, stated that since government legislation is allowing people access into buildings, it is reasonable and equitable to provide them safe and equitable means of egress.

4.1.1 Quantitative Analysis

Background research was conducted on fire statistics in both the United States and Australia in order to compare the number of mobility impaired fire deaths there were in the US, where there are more enhanced emergency egress provisions than in Australia. From 1991 to 1996 the United States experienced 27680 fire deaths (NFPA, 2012) and Australia experienced 550 fire deaths (Queensland Fire and Rescue Services, 1998). Australia's population is 13.7 times smaller than the US and Australia's fire death toll was 73 per cent less than the United States. More recently, from 2006-2008 the US experience 1.21 fire deaths per 100,000 people and Australia experience .48 fire deaths per 100,000 people (GAIN, 2011). It is clear that Australia experiences much fewer deaths due to fires than United States does. However, the fire statistics do not provide enough specific information about mobility impaired fire deaths or what class buildings they occurred in for either the United States or Australia. As a result of this we were unable to make any strong conclusions one way or another based off of quantitative analysis.

Table 1: Comparison of Fire Statistics in the United States and Australia

	United States of America	Australia
Population (in millions)	313	22
Fire Deaths 1991 – 1996 (in thousands)	27.68	0.55
Fire Deaths 2006 – 2008 (per thousand people)	1.21	.42

4.1.2 Risk Mitigation

Risk mitigation justification for improving the BCA provisions regarding emergency egress was a common theme among experts from reading new codes. According to Norm Winn, a reoccurring trend that can be seen in Australia is that if there are no incidents, tragedies, or deaths, then nothing is done to improve the existing codes and provisions and people become complacent. When a large, fatal incident occurs, society becomes aware of current regulations and puts pressure onto the government to make the necessary changes to lessen the chance of another similar traumatic event. Examples include the Kew Cottages fire in 1996, the Childers Hostel fire in 2000, and the recent Quaker Hill Nursing Home fire in 2011. These incidents can be referred to as “trigger points” because these large-scale events incurred great loss of life and

triggered change in policy. Becoming proactive and addressing the issues before they become a trigger point, will allow Australia to minimize future trigger points.

Risk mitigation also takes into account the moral justification support by the key stakeholders. The ABCB makes changes to their building codes based on a cost/benefit analysis. As a result, the moral implications are set aside and have little influence on the decisions made regarding new codes. After a trigger point takes place, new codes are put in place to prevent the tragedy from reoccurring while the cost/benefit of the new codes does not change. For example, the cost/benefit of putting in a sprinkler system does not change following a trigger point. Risk mitigation allows for moral decision making to take place since the cost/benefit remains the same. The decision is made based off of whether or not it is the right thing to do as judged by society.

4.1.2.1 Kew Cottages, Victoria

The Kew Cottages fire acted as a trigger point in Victoria stimulating change in their building codes with improved smoke detector and sprinkler requirements for residential care buildings (Building Regulations 1997). On April 8, 1996, a fire broke out in the Kew Cottages and the fire claimed the lives of nine men with disabilities. After the investigation, it was determined that the smoke detectors were too old and not working properly, delaying the smoke detectors from sounding the fire alarm. The fire alarm was also disconnected from sending a message to the MFB, preventing the alarm from notifying MFB of the situation, suspending the response time. The tragic event went to the forefront of the public's attention as well as the governments. If Victoria had evaluated their fire safety provisions earlier, and implemented sprinkler systems into buildings that house people with disabilities, then the lives of the nine men could have been saved. This is an example of how Australia is reactive to fatal events that take place.

4.1.2.2 Childers Hostel Palace Fire, Queensland

Similar to the Kew Cottages fire, the Childers Palace Backpackers Hostel fire triggered the Queensland Government to improve their fire safety management policies, including smoke detector and sprinkler system requirements, for backpacker hostels, boarding houses, hotels and similar building types (Fire Safety and Budget Accommodation: The Building and Other Legislation Amendment Bill 2001). On June 23, 2000, an arsonist set the Childers Palace Hostel

on fire in Queensland. Of the 88 guests that were in the hostel, 15 young backpackers perished. The hostel had no sprinkler system, a lack of smoke detectors present, and the fire alarm system was turned off. To make things worse, the hostel only had one centralized staircase, there were bars over the windows preventing people from escaping, and the fire exits were blocked. Once the public and the government knew this incident, they began to address the need to revise their fire safety provisions. Queensland's government improved fire safety regulations, including fire alarms, smoke detectors, and improved sprinkler system requirements for multifamily residential buildings. This is another example where Australia has not made changes to their fire safety codes because they thought that they were currently adequate, and only re-evaluated them once a tragedy happened.

4.1.2.3 Quaker Hill Nursing Home Fire, New South Wales

The recent Quaker Hill Nursing Home fire has brought the issue of whether or not the New South Wales Government should improve and make changes to their fire safety management and fire codes. On November 18, 2011, an arsonist set the Quaker Hill Nursing Home on fire. Of the 87 residents, 32 were sent to the hospital with injuries, and within 2 months after the fire, 11 deaths were linked to the fire, with seven more deaths that cannot be directly related to the fire. This recent event has brought a lot of attention to New South Wales (NSW) fire safety codes and provisions. The situation is present in the public eye and the NSW government is looking into whether or not they should implement new sprinkler provisions for multifamily residential buildings. Both states of Victoria and Queensland have previously addressed this issue. Despite evidence in the past showing that multifamily residential buildings, especially those that host people with disabilities, should be fully sprinkled, NSW has yet to address the issue.

4.2 Evaluation of Emergency Egress Provisions

Through literary research and interviews with professionals, we determined many possible emergency egress provisions. The most common provisions suggested were improved emergency management procedures and provisions, sprinklers, areas of refuge, and evacuation lifts. The advantages and disadvantages of the provisions were discussed and evaluated.

4.2.1 Human Assistance

Current procedures of emergency egress for people with mobility impairments are heavily dependent on the assistance of other people such as co-workers, friends, and family. These procedures include emergency evacuation plans adopted within a company or building, personal emergency evacuation plans (PEEP) for the person with a disability that may include the use of evacuation chairs (Australian Standard 3745). A fire safety professional, access consultant, and an expert on disability rights we interviewed all discussed that building management during an emergency would need to be improved especially in the case if lifts are implemented. They stated that building management plans would need to incorporate training for emergency roles and procedures to ensure that people with disabilities would have the first priority and the people using the lifts will use it correctly to prevent the overloading and misuse of lifts.

It is not only the responsibility of the company or building to provide evacuation management, it is also the responsibility of the individual to have an established and practiced personal emergency evacuation plan. An access consultant we interviewed greatly supported the PEEP method where these plans need to be reviewed and practiced constantly to ensure the best method of evacuation. An example of the PEEP was shown to work where a man with mobility impairment prepared methods to leave the World Trade Center (WTC) using an evacuation chair and human assistance. He was able to evacuate from the 69th floor of the WTC in the 2001 attack in 1 hour and 30 minutes. This time is considerably less than the 6 hours that it took him to evacuate the WTC during the 1993 bombing when he had no plan or device to evacuate (Fraser, 2007).

Stair walkers or evacuation chairs, a portable stairway evacuation device that can be used to transport a person with a mobility impairment up or down a stairway (Australian Standards 3745), were recommended as a method of egress for people with mobility impairments by fire safety professionals and an access consultant. The evacuation chairs provides a way to transport people with mobility impairments up or down stairs with the aid of one or two other people. Evacuation chairs can be folded into a compact size, and mounted on a wall at or near a stairwell (National Disability Authority, 2008). This low-cost, simple solution can be easily included in evacuation procedures and plans. However, the use of evacuation chairs can violate the clause of

dignified egress in the Building Code of Australia, since the individual would have to be lifted up and transported into the evacuation chair

4.2.2 Sprinklers

The use of sprinklers greatly reduces the need of alternative means of egress. However, Stephen Kip, the immediate past president of the Society of Fire Safety, believes that multiple lines of defence are critical for the safekeeping of the occupants of the building. Sprinklers work in 96% of fires where sprinklers are installed in the United States (Hall, 2009). In a study completed by Marryatt, there was a 0.2% failure rate for sprinklers in Australia and New Zealand between 1886 and 1968. Due to this high success rate, NFPA has no record of a fire killing more than three people in a correctly installed, fully sprinklered building. This overwhelming success rate, along with the low death rate, points to the inclusion of sprinklers in every new building. However, there are still buildings that are not required to be sprinklered by the Building Code of Australia and there are many older buildings in Australia that are not sprinklered. In the United States, between 2003 and 2007 in reported fires, only 9% of the buildings were sprinklered. During this same time period, there were 15,500 deaths in structure fires. Because Australia and the United States are both developed countries with similar building types and habits, the amount of sprinklered buildings can be roughly translated to Australia. Installing sprinklers in a building is the first line of defence when it comes to protecting the occupants, especially those with mobility impairments. If the sprinkler system were to fail, the occupants would need a way to evacuate safely from the building. If they were unable to evacuate, they would need a safe place within the building where they can stay and wait for assistance. Two other lines of defence that are possible for the occupants of the building are areas of refuge and evacuation lifts.

4.2.3 Areas of Refuge

The use of areas of refuge for the emergency egress of people with disabilities is an option that is supported by many experts in the field of fire and life safety. The use of areas of refuge allows for assisted evacuation using a protect in place method. Areas of refuge provide people with disabilities the ability to wait in a safe place for assisted rescue from the fire brigade. Although areas of refuge are not specifically addressed within the Building Code of Australia, important aspects of what would need to be incorporated are already present. These aspects include fire-isolated stairways and fire walls. The basis of areas of refuge includes the ability for

a person to be within the area and not be affected by the emergency taking place. These areas are created by using fire and smoke barriers, which are rated for multiple hours. This use of compartmentalization allows for the separation of individuals from the fire. In addition, areas that contain sprinklers can be used as an area of refuge. As long as these systems do not fail, and the structural integrity of the building is not compromised, these areas are very effective. Areas of refuge can be whole floors, portions of floors, or even landings of stairwells.

The use of stairwells as an area of refuge makes relevant how many stairwells are present in the building, as well as their size that was brought forth by Jonathan Barnett, a fire-engineering expert. Typical stairwells in buildings within Australia would not provide sufficient space for a wheelchair. If that stairwell was used, there would be decreased flow of able-bodied people self-evacuating. This decreased flow would cause the potential of increased injury or death. In order to use a stairwell correctly as an area of refuge, the landings on the stairways would need to have increased area to allow for a safe place for a person with a disability, as well as allowing for enough space for traffic flow through the stairwell.

There are also many buildings present in Australia that only have one stairwell which Jonathan Barnett detailed. In these buildings, evacuation of occupants, as well as access for fire fighters would conflict. This need for upward and downward movement would greatly hinder the fire fighting operations as well as the evacuation measures. In this scenario, the need for two stairwells is evident. If one stairwell is designated for evacuation, and one is designated for fire brigade use, the conflict is very much reduced and leads to a much smoother process.

When using areas of refuge, the need for a two-way communication system is essential. This communication allows occupants to alert the authorities that they are in fact waiting for assistance within the area of refuge. A representative of the Metropolitan Fire and Emergency Services Brigade stressed this need. The MFB officer also made it clear that rescue would be easier if the person caught within the building is in a protected place that is known to them. Using a two-way communication system, they would be able to establish contact with the trapped person to assure them help was on the way. It was pointed out by Norm Winn that a good fire officer would inquire, upon arrival to the scene, whether or not there are people trapped within the building and utilize this system to contact them. Even though the uses of areas of refuges provide a safe place for a person with a disability to take refuge within a building, there are still aspects that hinder their use.

There are both economic and social aspects that create problems with the inclusion of areas of refuge. If a stairwell is to be used as an area of refuge, there would be a larger surface area on the landing. This increased area, will decrease the amount of space on each floor that can be used for commercial gains. This would create lower economic gains for the building owner because the tenants will not pay the same amount of money for less space. On the other hand, an area of refuge would cost less to add during construction than a lift suitable for evacuation. However, retrofitting an area of refuge into a stairwell could potentially incur greater costs. In addition to these economic problems, there are social problems that are evident. Using areas of refuge, people are left within a building that is on fire waiting for assistance. Cathryn Grant, an access consultant as well as an occupational therapist, stated that this could cause immense trauma. A person is left within the building waiting for assistance that could potentially never come. They could be prone to anxiety that is detrimental to their health and could create future psychological problems. These problems are important when determining which egress option is best to implement in a building.

4.2.4 Evacuation Lifts

The use of lifts as a means of evacuation during emergencies has always been a heavily debated topic. Before the attacks on the World Trade Center in New York, the consensus was to use elevators in the event of an emergency. After the attacks, it was seen that elevators were able to evacuate a large quantity of people very quickly in the second tower, which amounted to a lesser death toll. This re-energized the debate of whether to use elevators as a primary means of egress in the event of an emergency. This debate brings forth the option for two different types of lifts, passenger lifts and occupant evacuation lifts. A regular passenger lift will return to the ground floor once smoke is sensed in the lift shaft. Occupant evacuation lifts would continue to operate during an emergency to assist in the evacuation. In a study done by the National Institute of Standards and Technology (NIST), it was determined that in modern high-rise buildings, lifts operating at sufficient speed and capacity are able to move 10% of the buildings population in 5 minutes during peak times. This would mean that a building would be capable of evacuating in less than one hour.

These lifts would also provide a person with a mobility impairment the ability to self-evacuate from the building and not have to rely on help from others. The target population would no longer have to wait in the building where they could be overcome by the effects of the fire

and perish. The addition of these elevators would also have a positive effect on the population as a whole. People who may not necessarily be disabled, but may not be able to walk down many stairs, would be able to use these lifts for quicker and safer evacuation. The addition of lifts as a method of egress in the event of an emergency, however, does bring forth some managerial changes that would have to take place. Norm Winn reiterated that because both people with disabilities, as well as able-bodied people, would have the opportunity to use these elevators, prioritizing lift use would be of the utmost importance. Training as to the use of these lifts, while making sure people with disabilities are given priority to use these lifts during evacuation is crucial. In addition to these managerial changes, there are physical aspects of the lifts as well as monetary costs that would have to be addressed.

These additional lifts that could be installed would cost money. Retrofitting a lift is expensive. Even if a lift is installed during construction, there is still a price increase that has to be taken into account when amending the Building Code of Australia. During fire fighting operations, it is probable that water would enter the lift shaft. If water enters the shaft, it is possible that the lift could become inoperable. If the lift becomes inoperable, there is another problem on top of the fire and evacuation problems already present. Stephen Kip, the Immediate Past President of the Society of Fire Safety, stated that this problem could lead to potential loss of life that could be avoided. This shows that even if a lift is a viable option for egress, there should be alternative means of egress that would be accessible to the target population. This additional means of egress would be the inclusion of areas of refuge into the Building Code of Australia.

4.2.5 Multiple Lines of Defence

According to many fire professionals and thought leaders, using both lifts and areas of refuge in conjunction with one another is the best option for the emergency egress of people with disabilities. “The most beneficial way to safely evacuate from a building is to have a combination of methods” (Kip, 2012). NFPA 101 mandates that if an area of a building is accessible then there must be two accessible means of egress. This provision allows for an alternative method in case one of the means of egress is unusable. For use in Australia, this provision would mean the inclusion of both areas of refuge and evacuation lifts into the Building code of Australia to assist in the evacuation process. This would also allow for staged evacuations as well as less bottlenecks in the stairwells that was laid out by both fire engineers

and the fire brigade. If both options are employed, the pros and cons of both will play off each other. People who are unwilling to wait in an area of refuge would be capable of using a lift to self-evacuate. On the other hand, people who have reservations about using the lift and the potential dangers accompanying their use can wait for assisted rescue from the fire brigade. This can help alleviate some of the traumatic concerns that were mentioned by access consultants. Using both of these options would make it necessary to address the needs of back-up power for the lifts as well as pressurization of the lift lobbies in addition to the widening of stairwells for areas of refuge. Having multiple options for evacuation is the best way of evacuation, even if it is the most expensive option.

5.0 CONCLUSIONS AND RECOMMENDATIONS

We conclude that there is a need to implement emergency egress provisions for people with mobility impairments within the Building Code of Australia (BCA). Since the BCA has codes that make all buildings accessible for people with disabilities, it is reasonable and equitable to provide people with mobility impairments with safe egress from buildings. This need is supported by professional experts and stakeholders, including fire safety professionals and engineers, access consultants, fire rescue services, architects, building owners, code writers, and disability rights authorities. Furthermore, in Australia's history, there exist many cases such as the Kew Cottage, Childers Hostel Palace, and Quaker Hill Nursing Home fires, where people died from fire due to lack of emergency egress provisions and initiated change in code from pressure of the public. Trigger points like these will happen, it is time to be proactive and implement provisions to avoid another trigger point, causing the loss of life.

Complete safety costs an infinite amount of money that is not plausible. Although there is no failsafe method available that allows for complete safety, having multiple lines of defence in the event of an emergency helps alleviate the problem. There are passive and active measures of fire protection that allow for different defence measures. The first lines of defence should be passive measures. These passive measures include aspects of the physical construction of the building such as areas of refuge, smoke proof lobbies, and fire-protected stairwells. These passive measures are non-mechanical means of safety that do not need maintenance. Since there is always the possibility of these passive measures being compromised, there needs to be active measures of fire protection that combat the effects of the emergency.

Active measures of fire protection are generally mechanical in nature. Sprinklers are an active fire protection measure and are over 99% effective in Australia (Marryatt, 1988). However, when using statistics from the United States, only 9% of buildings that have fires have sprinkler systems present, demonstrating that most buildings, even in Australia are not sprinklered (Hall, 2007). This extremely low number shows that on top of sprinkler systems, there should be other lines of defence that assist in the evacuation of people with mobility impairments. These other lines of defence are physical evacuation measures, such as occupant evacuation lifts and stair walkers. Occupant evacuation lifts allow for self-evacuation for people

with mobility impairments while stair walkers allow for assisted evacuation from the fire brigades or bystanders.

On top of these lines of defence are managerial procedures that need to be established. Managerial procedures, such as personal emergency evacuation plans (PEEP) are crucial for people with disabilities to be able to safely egress. Using the PEEP method increases the likelihood of survival in the event of an emergency for people with disabilities. Through our investigation, we conclude that the incorporation of multiple lines of defence, focusing on areas of refuge, occupant evacuation elevators, stair walkers, and personal emergency evacuation procedures are crucial to the evacuation of people with physical impairments in the event of an emergency.

Our findings addressed the first process of implementing emergency egress provisions by justifying and determining the need to introduce emergency egress into the Building Code of Australia, gauging the awareness of the issue with professionals, and examining the many possible egress provisions that can be incorporated. Our research has illuminated many other factors related to implementing emergency egress provisions for people with mobility impairments. These factors can be further addressed through our recommendations of future research projects that our sponsor can support. We recommend that:

- our sponsor examine the cost on an individual's life in order to create a cost-benefit analysis to introduce emergency egress for people with mobility impairments that incorporates the ethical and moral aspect of our issue
- our sponsor determine the costs of different emergency egress provisions, such as areas of refuge, evacuation chair devices, and lifts, individually and as a combination for multiple lines of defence in order to create a cost-benefit analysis to introduce emergency egress for people with mobility impairments
- access consultant groups and fire and building engineers collaborate with each other so that emergency egress solutions for people with disabilities will address all aspects and needs of the target population
- determine the effectiveness of current emergency management procedures and how they would need to change if new emergency egress provisions are included such as lifts

- examine lifts as a means of emergency egress to determine if evacuation lifts are viable options to provide safe exit for the target population and how it can be a safe means of egress
- our sponsor examine possible egress provisions for new and old buildings to determine what egress provisions are suitable for new buildings and for the retrofitting or renovation of old buildings
- examine egress provisions for different class buildings to determine suitable emergency egress provisions for different classes of buildings
- examine emergency egress provisions for other disabilities such as visual, hearing, or mental impairments

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APPENDIX A — THE INTERACTIVE QUALIFYING PROJECT

The Interactive Qualifying Project, IQP, is a project that challenges students to address a problem that relates to science or technology with society, developing an understanding of how science and technology are an integral part of society. Undergraduates at WPI must complete the IQP since it is a graduation requirement, a special feature at WPI, fostering the institute's goal of "forming a deep appreciation of the interrelationships among basic knowledge, technological advance, and human need" (Worcester Polytechnic Institute, 2011-12, p. 3). Generally, the work completed on this project is outside of student's major fields, they work in interdisciplinary teams on projects that are sponsored by external organizations or WPI faculty that solve real world problems. Through the project, students are expected to learn "about the role of science and technology, its impact on society, its place in meeting human needs and human efforts to regulate, control, promote, and manage our changing technologies" (Worcester Polytechnic Institute, 2011-12, p. 17). As a sophomore, a student would organize the IQP that they complete the following academic year as a junior. The IQP is equivalent to the completion of three courses at WPI; it is generally completed over one full seven-week term or over three terms. There are many options to the location of the completion of the project such as staying on-campus or traveling off-campus to one of the many project centres in the United States and abroad.

Most IQPs are categorized into different divisions. These divisions are technology and environment; energy and resources; health care and technology; urban and environmental planning; science and technology — policy and management; social studies of science and technology; safety analysis and liability; humanistic studies of technology; economic growth, stability and development; social and human services; education in a technological society; law and technology; and historic and artistic preservation technology. (Worcester Polytechnic Institute, 2011-12, p. 17-18) Through the completion of the IQP, students will achieve WPI's undergraduate learning outcomes such as understanding the technical, social and humanistic context of the project; analyse and synthesize information from multiple sources and results from social, ethical, humanistic, technical or other perspectives; maintaining effective working relationships with the project team, project advisor(s), and external sponsor(s); and demonstrate oral and written communication and an awareness of the ethical aspects of the project work (Worcester Polytechnic Institute, 2011-12, p. 17).

Our project has many aspects and proponents to it that makes it qualified as an IQP. First, our project deals with the incorporation of accessible means of egress for people with disabilities in the Building Code of Australia. This project goal touches upon many divisions of IQPs such as safety analysis and liability, social and human services, and law and technology. Our project falls under these IQP divisions because we are aiming to introduce safety measures that would aid people with disabilities through the examination of disability legislation and codes and standards that are established and to analyse how they influence technology. In addition, in developing guidelines for the application of emergency egress procedures, we will analyse and synthesize many sources regarding legislation, codes, and standards, conduct numerous interviews, and develop a cost-benefit analysis about the implementation of egress systems. Through the course of the project, we will be dealing with the science and technological aspects of studying codes and standards and established accessible means of egress. In addition to these aspects, we will be dealing with the social aspect of introducing these recommendations in Australian standards and the effects for the disabled community in Melbourne and the whole of Australia.

APPENDIX B — PROJECT INFORMATION

The following pages in this appendix contain the project brief provided to us at the start of the project and a description of our sponsor.

AECOM

DISABLED EMERGENCY EGRESS PROVISIONS WITHIN BUILDINGS IN AUSTRALIA

The Building Code of Australia's (BCA's) Deemed to Satisfy (DtS) Provisions do not have specific requirements for emergency egress of persons with a disability particularly if they are unable to use a stair. Although there are a number of publications on this topic including a report by the Australian Building Code Board (ABCB) on building access, a conclusive solution has not been agreed upon, or regulated.

Managing the evacuation of a person with a disability from a building relies on individual building management systems, procedures and training, which are outside the scope of the BCA, but substantially contribute to the overall evacuation efficiency.

Typically buildings are designed, even within a context of Performance Criteria, such that safety features are at least equivalent to that of the BCA DtS Provisions. Therefore, disabled access and independent disabled egress are usually not specifically addressed.

At AECOM we recommend the implementation of an emergency evacuation plan for all occupants including persons with disabilities in accordance with AS 3745-2010. We usually consider that this reasonably addresses disabled egress in relation to the fire safety strategy for this building.

The reality is this is not sufficient, and clearly does not match the level of safety specified in the US in either the International Building Code or the NFPA building code (NFPA 5000) or NFPA's Life Safety Code (NFPA 101).

Questions:

Does this lack of regulation matter? To whom?

Do people know the regulation is lacking?

If the BCA were to address disabled emergency egress in a more comprehensive manner would the cost be justified (all changes to the BCA have to show a risk based analysis based cost/benefit)?

The goal of this IQP is to answer these questions, and other appropriate questions as may be identified by the project group.

Because there is strong legislation in the US it's crucial that the US regulatory environment for emergency disabled egress be reviewed and evaluated prior to the end of C-Term.



AECOM is a globally respected company which stands for Architecture, Engineering Consulting, Operations and Management. Although, the company has a global influence, the branches in their locations throughout the world are dedicated to creating, enhancing, and sustaining their local environment.

AECOM Australia with offices throughout Australia is comprised of new hires as well as companies that have been purchased by AECOM, some of which are Bassett Consulting Engineers, Maunsell Engineering, and Davis Langdon. These three companies specialized in many engineering fields including mechanical engineering services for buildings, sprinkler and fire alarm design, fire engineering, and private building certifications.

In the Eastern three states of Australia there are no public building officials regulating and ensuring compliance to the building code and the Disability Discrimination Act (DDA). Davis Langdon offers consultancy regarding the DDA in conjunction with their building certification services. Their expertise in the areas of fire safety, building codes, and the DDA will assist in addressing the lack of building codes related to the egress of people with disabilities.

APPENDIX C —BACKGROUND INFORMATION

The following pages in this appendix contain the background information about disabilities in Australia, the National Fire Protection Association, the International Code Council, and the American National Standards Institute. It also contains information regarding key standards and codes produced by these Fire Safety Organizations.

The Definition of Disability

The Disability Discrimination Act in Australia defines disability as: “in relation to a person:

- 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; and
- includes a disability that: presently exists; or previously existed but no longer exists; or may exist in the future (including because of a genetic predisposition to that disability); or is imputed to a person (DDA, Sect 4, 1992).”

The National Fire Protection Association

The National Fire Protection Association (NFPA) is a non-profit code creating council that is the authority on fire, electrical, and building safety (NFPA, 2012). As of 2012, they have developed over 300 codes and standards with the intent on minimizing the potential fire risk of buildings and reducing the effects of fires. It was established in 1896, in Quincy, Massachusetts, United States of America, and has a membership of over 70,000 people worldwide. Because they have been around for so long, they have had to adapt their codes to comply with the Americans with Disabilities Act, as well as many other civil rights acts throughout the years. There are many codes and standards that the NFPA has developed which are relevant to the emergency egress of people with disabilities during times of emergency. Three of the main codes or standards are NFPA 101: Life Safety Code, NFPA 5000: Building Construction and Safety Code and the NFPA Guide on Evacuation for People with Disabilities. The NFPA updates their codes every three years so they can stay up to date with the major changes in industries around the world. The subsequent sections address the codes and guides provided by the NFPA.

NFPA 5000: Building Construction and Safety Code

NFPA 5000 is the equivalent NFPA Code to the ICC's International Building Code. NFPA developed this model building code using the standards put forth by the American National Standards Institute. The code bridged the gaps in construction between the other NFPA codes. The code was developed and published for the first time in 2002. The requirements for accessibility and egress for the disabled population were incorporated into Chapter 11: Means of Egress, and Chapter 12: Accessibility. Ever since its creation, the code has been controversial because the NFPA did not have much involvement in building codes beforehand.

NFPA Guide on Evacuation of People with Disabilities

The NFPA Guide on Evacuation of People with Disabilities is a recently formed document designed to give an overview on disabilities and what special requirements people with disabilities need in case of emergency evacuation. The document describes the four main elements of evacuation needed by the disabled community in the event of an emergency. These four elements are the type of emergency; how they get out; the need to get out; and the type of help needed to get out. These problems seem commonplace, but some of them are very serious

issues depending on the type of disability someone may have. The guide refers to NFPA 101 so the two are able to work in conjunction to evacuate people with disabilities. The guide also refers to the ADA and codes within NFPA 101 that are in direct relation to the provisions put forth by the ADA.

The International Code Council

The International Code Council is a non-profit organization with the goal of developing a single set of comprehensive model construction codes. The ICC designed their codes to protect the health, safety and welfare of people by creating safe buildings and communities. The ICC formed through a combination of the Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCCI) in 1994. All three of these councils were based in southern United States. The councils had the United States split into three sections and each council provided their code to each section. As the codes changed and evolved, the three councils found it difficult to keep up with the demand and joined to create one larger company. The creation of the ICC in 1994 is important because the Americans with Disabilities Act was passed before the inception of the company. This means that these codes put into place by the ICC have been compliant with the ADA since the first printing of the material. The ICC updates their codes in three-year cycles so they are capable of providing the most current information from industry.

The International Building Code and the International Fire Code

The two most relevant codes to the emergency egress of people with disabilities are the International Building Code and the International Fire Code produced by the International Code Council. Both of these codes contain chapters on means of egress, which primarily focus on emergency egress not just everyday egress. In addition, they have chapters on accessibility, which refers to accommodating physically challenged persons whether it is with building entry, elevators, or refuge areas, among other topics. Because the ICC writes both codes, the chapters on means of egress and accessibility are practically identical in each code. The ICC created the accessibility chapters of the code specifically to comply with the Americans with Disabilities Act. The codes were also written in conjunction with the American National Standards Institute that oversees the creation and use of thousands of guidelines that influence businesses from every sector of industry.

American National Standards Institute

The American National Standards Institute is a standards committee that develops standards for different industries around the United States. The committee originally formed in 1916 when the American Institute of Electrical Engineers invited other professional institutes including the American Society of Mechanical Engineers (ASME), the American Institute of Mining and Metallurgical Engineers (AIME), the American Society of Civil Engineers (ASCE), and the American Society for Testing Materials (ASTM) to establish a national body in charge of coordinating and improving national standards and to improve ease of their use. They also included the United States Departments of War, Navy, and Commerce to create a more widespread group to encompass more industries and disciplines. Over the course of the next twenty years, the committee grew to an international level and became inclusive of almost every industry with specialties in factory worker safety and engineering amongst other disciplines.

APPENDIX D — INTERVIEWS CONDUCTED IN THE UNITED STATES

The following pages of this appendix contain a summary of interviews conducted in the United States with professionals in relation to the creation and implementation of codes and standards. In order, the interviews included are the following:

1. Interview with representatives of the National Fire Protection Association
 - a) Ron Coté
 - b) Robert Solomon
 - c) Rita Fahy
2. Interview with representatives of the International Codes Council
 - a) Beth Tubbs
 - b) Kim Paarlberg

INTERVIEW WITH NFPA

Corey Fisher, Peter Lavallee and Jessica Pham conducted the interview with the National Fire Protection Association (NFPA) in Quincy, Massachusetts, United States on Wednesday, February 15, 2012. We interviewed Ron Coté, Robert Solomon, and Rita Fahy. They answered questions pertaining to the process by which the NFPA Codes and standards are revised and historical contexts of the codes. One of the main points they made was that when a building is built to code the first time the cost will be greatly reduced. One example of this would be retrofitting a sprinkler system compared to installing one during construction.

They also explained that one of the key experts in the development of codes related to accessible means of egress is Jake Pauls. He did studies during the Vancouver Olympics related to the movement of persons throughout the venues and how they reacted to different situations. He achieved this goal through the placement of different cameras throughout the major venues of the Olympics before proposing code changes to the NFPA.

Before the Americans with Disabilities Act was passed in 1990, members from the ICC and NFPA joined with the Council of American Building Officials to discuss access to premises as well as accessible means of egress because they were aware of the impending legislation change. They also took part in a Building Component Materials Conference (BCMC) in 1990. They addressed accessibility and egress for people with disabilities. The material which they presented on in the conference can be seen in Appendix D. The councils put forth an addition to the codes, which outlines every aspect from entrances to exits to areas of refuge.

The interview was extremely informative and gave us a lot of information to mould our background. The interview also provided us with different aspects of disability to look at when it comes to recommendations. They also provided us with a document, The Cost of Fire in 2008, which gave us useful information regarding fire damage and how much that actually cost during 2008. The document also outlined the process by which the NFPA places a value on a person's life.

INTERVIEW WITH ICC

On February 23, 2012, Corey Fisher, Peter Lavalley, and Jessica Pham conducted a phone interview with Beth Tubbs and Kimberly Paarlberg of the International Code Council (ICC). Beth is a senior staff engineer and Kimberly is a Senior Architect. They answered questions regarding different accessible means of egress options, which can be applied in Australia. One of the main items they discussed was the use of elevators for egress.

For many years, the use of elevators for egress was forbidden, but after the attacks on the world trade center the consensus changed. In the south tower, elevators were one of the main sources of evacuation and many more people made it out safely. After it was seen that elevators could be used efficiently in the event of an emergency on that scale, the use of elevators as the main source of evacuation was a hot topic for discussion. At the same time, there was many people who were unable to self-evacuate because they could not traverse the stairways or make it onto an elevator. It could be from physical disabilities such as being in a wheelchair to having asthma or heart problems. The use of elevators for evacuation would greatly enhance the ability for people with disabilities to self-evacuate a building.

The need for self-evacuation is very important for people with disabilities. In many instances, some people with disabilities are unable to leave their wheelchairs. They could be paralyzed and unable to walk or they could need oxygen amongst other things. This would pose the need for other means of egress, like an elevator, which would make it so they would not have to leave their wheelchair.

This need of using elevators increases greatly when attempting to exit high-rise buildings. These high rise building present a huge risk when it comes to evacuation. The only issue with using elevators in high-rise buildings is that the fire department may be attempting to use these elevators for firefighting purposes. In recent editions of the code, separate fire department elevators are needed when a building reaches a certain height. This negates the issue of the evacuees creating issues with the fire department.

The other upside to being able to use elevators for evacuation is that the stairways would not become as clogged. When helping a person with a disability that requires bringing the wheelchair down stairs, the stairway may become clogged. By giving people with disabilities the opportunity to use elevators, the stairwells will become more accessible to the able-bodied community.

An aspect of areas of refuge that was brought up was the use of two way communication systems. If there is a case where someone is stuck on an upper floor of a building and can't evacuate someone needs to know. In the code there are provisions for two way communication systems from elevator lobbies and areas of refuge. This makes it possible for victims to communicate with the fire department that they are there and need helping getting out safely. This would help with the fire department's plan of attack when it comes to search and rescue missions.

They also made it known that most states have adopted some form of the International Building Code. The states that have not adopted the code have either written their own code or adopted some version of a code that is put out through the Americans with Disabilities Act.

APPENDIX E — INTERVIEWS CONDUCTED IN AUSTRALIA

The following pages of this appendix contain a summary of interviews conducted in Australia with professionals to obtain their viewpoints regarding emergency egress for people with mobility impairments in non-residential and multi-family residential buildings. In order, the interviews included are the following:

1. Interview with Cathryn Grant, an Access Consultant from Davis Langdon, an AECOM company
2. Interview Tass Georgas, Manager and Senior Fire Engineer from the Metropolitan Fire Brigade
3. Interview with Darryl Weinert, Fire Safety Engineer at AECOM
4. Interview with Stephen Kip, a fire safety professional and consultant
5. Interview with a contact from the Australian Building Code Board
6. Interview with a representative of a major architectural firm
7. Interview with a disability rights expert
8. Interview with Norm Winn, Victorian representative for the Fire Protection Association of Australia
9. Interview with a representative of a major property trust business
10. Interview with Max Murray, an Access Consultant from Access Designs
11. Interview with Stephen Doran, Fire and Emergency Management from the Country Fire Authority

Minutes of Interview

Subject	General Interview	Page	55
Venue	AECOM -80 Collins St 48th floor	Time	1530
Interviewees	Cathryn Grant, Associate, AECOM		
WPI Participants	C. Fisher, P. Lavallee, J. Pham,		
		Date	20-Mar-2012

Cathryn is an Associate Access Consultant at Davis Langdon, an AECOM company with a background as an Occupational Therapist. As an access consultant, Cathryn reviews design documentation and attends consultant meetings, providing in-depth understanding of legislative requirements and standards regarding access for people with disabilities.

Cathryn explained how accessibility regulations have changed and the impact to industry. These changes include:

- The introduction of the Access to Premises (2010) Act (is it an Act): provides clarity and protection to builders during the construction process from the effects of the Disability Discrimination Act of 1992 (DDA).
- She informed us that designers can construct a building according to the Deemed to Satisfy (DTS) provisions within the Building Code of Australia (BCA) and that would comply with the DDA. The performance requirements were the overarching objectives for the DTS and if the designer could not fully comply with the DTS, they can provide reasonable measures that achieve and meet the performance requirements. Egress for people with disabilities is covered within the performance requirements. But there are no guidelines or standards that are specific to egress provisions for people with disabilities, therefore contractors do not have to provide methods of egress. Cathryn stated that the most effective way to incorporate the necessary standards regarding egress would be through the Deemed to Satisfy provisions.

Cathryn explained that the access consulting group (ACG) at AECOM provides their clients with recommendations regarding egress but it is ultimately the clients' decision to include the recommendations into the building. ACG have drafted a new set of recommendations for their use. These recommendations are heavily based on the Australian Standards with references to standards and guidelines outlined by the International Codes Council and the British Standards that address access and egress.

Significant findings from the Interview:

- Gave us a deeper understanding of how the BCA is used in the industry
- Provided information how the DDA affects the business
- Identified literature regarding the use of lifts in an emergency, a guide for the management of emergencies for people with disabilities, and relevant British and Australian standards

Minutes of Interview

Subject	General Interview	Page	1
Venue	AECOM -80 Collins St 48th floor	Time	1000
Interviewees	Cathryn Grant, Associate, AECOM		
WPI Participants	C. Fisher, P. Lavallee, J. Pham,		
		Date	12-Apr-2012

Cathryn is an Associate Access Consultant at Davis Langdon, an AECOM company with a background as an Occupational Therapist. As an access consultant, Cathryn reviews design documentation and attends consultant meetings, providing in-depth understanding of legislative requirements and standards regarding access for people with disabilities.

Cathryn clarified some ideas and questions we had:

- She agrees that there should be emergency egress provisions within the Building Code of Australia (BCA) because it is moral/ethical reason since the government has made it so buildings are accessible they need to include egress. It is the idea of the DDA providing equal access; they must also provide equal egress. There are no statistics to support this since there are very few incidences, they occur but not often.
- Two main emergency egress provisions that she suggests in terms of non-residential buildings (commercial, multi-level) are areas of refuge and evacuation lifts.
 - Areas of refuge because it is low cost but the problem is that the person still has to wait for rescue, causing anxiety and even trauma.
 - Evacuation lifts because it is an independent method of egress however it is more expensive, can cause confusion as to who can use the lifts (responsibility of the warden to prioritize people), and be a hindrance too rescue services (fire brigade)
- In multi-family residential buildings, the apartments are divided into compartments that are fire-rated to Australian codes. The best form of egress is to remain in the person's individual compartment (apartment/home) and wait until rescue services arrive to determine whether evacuation is necessary.

Significant findings from the Interview:

- Gave us her viewpoint on the issue of emergency egress provisions and methods
- Gave us her permission to quote or use information that she provides for us.
- Provided some key contacts such as cost managers, advocacy groups, and general building owners

Minutes of Interview

Subject	General Interview	Page	1
Venue	MFB, 450 Burnley St, Richmond, Victoria	Time	1030
Interviewees	Tass Georgas, Manager and Senior Fire Safety Engineer, MFB		
WPI Participants	C. Fisher, P. Lavallee, J. Pham,		
		Date	22-Mar-2012

Tass Georgas is the manager and senior fire safety engineer of the community safety technical department at the Metropolitan Fire Brigade (MFB).

Tass explained the standard operating procedure in emergencies would not differ in aiding an able-bodied person or a person with a disability, the first objective is rescue and the difference would be resource use. He also described some methods of egress that can be suggested in a design. These methods of egress are:

- Fire isolated stairs as a primary means of egress
- Protect in place is a good solution that does not discriminate between able-bodied and people with a mobility impairment
- Protected lobby is a good design element with access to lift and fire isolated stairs
- Re-entry onto a safe floor to avoid congestion in stairways
- Sprinkler systems to manage fire

He also explained that his department is a reporting authority, and they primarily report on the design submitted to them, they do not generally look at other international standards since they have not been benchmarked to Australia's expectations. However, they will inform the person that has submitted the design of a better solution if they are aware of. In addition, if a standard or guideline stands out they will discuss it with other fire authorities in Australia and will determine whether to implement that guideline. They may reference some guidelines in a technical report but they do not require industry to comply with it since it would not apply in Australian building legislation.

Important findings from the interview:

- Identified alternative solutions that are not outlined in the Building Code of Australia
- Egress methods are from a designer's standpoint, from the fire-fighter standpoint rescue is first priority
- A combination of building design and human aid is an appropriate method of egress for people with disabilities

Minutes of Interview

Subject	General Interview	Page	1
Venue	AECOM -80 Collins St, 34th floor	Time	1430
Interviewees	Darryl Weinert, Fire and Risk Engineer, AECOM		
WPI Participants	C. Fisher, P. Lavallee, J. Pham,		
		Date	27-Mar-2012

Darryl Weinert is a fire and safety engineer at AECOM. He has worked on many projects and considered emergency egress provisions in his designs.

Darryl explained the process of building design in regards to egress and the standards that are examined. He also identified some key issues in introducing egress codes and standards into the Building Code of Australia (BCA) which are:

- The BCA would need to specify the buildings these codes would be affecting
- Small buildings would be the most likely affected especially in cost
- The codes would affect the aging population in addition to people with disabilities
- Will priority be given to those with disabilities or will all people use the lifts
- Building designs follow the Building Code of Australia and are presented to clients, the Australian Standards are sometimes referenced but mainly in terms of access that can be applied with egress
- Alternative solutions can be based on other standards such as the NFPA but only in certain cases

Darryl explained that in terms of egress, especially in regards to disability, the BCA does not address the issue. It is a difficult issue to address and would be easier to let the consultants and fire engineers figure out egress methods, especially those that are relation to disability egress. He also informed us that since the BCA does not have codes or standards regarding egress for people with disabilities, it is up to the client to include the possible options of egress.

Significant findings from the Interview:

- Client decides on the implementation of egress methods
- BCA does not specify egress methods for people with disabilities
- The codes would affect small buildings more than the large high-rise since they would have a smaller budget

Minutes of Interview

Subject	General Interview	Page	2
Venue	AECOM -80 Collins St, 48th floor	Time	1400
Interviewees	Stephen Kip, Fire Safety Engineer and Regulatory Consultant, SKIP		
WPI Participants	C. Fisher, P. Lavallee, J. Pham,		
		Date	29-Mar-2012

Stephen Kip is the Immediate Past President of the Society of Fire Safety. Stephen is a very well-known and respected individual in the fire safety field in Australia holding many high positions in both the public and governmental sectors.

Stephen discussed about many different aspects and issues that exist in addressing emergency egress for people with disabilities. These are:

- Using lifts can have many different issues and difficulties such as regulatory barriers (required signs against the use of lifts, efficiently using lifts invades people's private space, water and heat damage, and training people in the use of lifts
- Providing egress options for people with disabilities can violate the equitable and dignified aspect of the law.
- The codes do not address this issue directly; it is left for the engineers in the performance requirements. Engineers need to protect themselves through Fire Engineering Brief (FEB). Provide redundancies in design but it is difficult since in the end engineers need to make pragmatic decisions.
- Management procedures with emergency egress can also discriminate against people with disabilities. People that are not in leadership positions in their daily life are put into roles of floor wardens/marshals. They need to be leaders and have proper training to aid people with disabilities by being clear and identifying themselves visually and verbally.
- Enforcers and leaders in the industry of fire safety and engineering need to be an example. If the places that enforce standards and illustrate the problem do not first address it at their workplace, who else will?
- It is also a theoretical problem where there are little case studies and no statistics. It is difficult to address since absolute safety requires infinite money to achieve the standards of equity and dignity

Significant findings from the Interview:

- There needs to be a middle ground when addressing emergency egress for people with disabilities in relating safety and the ideals of equality and dignity
- Designers and engineers can only do so much; the rest is on management and human behaviour

- This is a difficult issue to address since there are so many aspects to it and engineering can have an answer but it may not be the answer society accepts, cannot provide absolute safety.

Minutes of Interview

Subject	Consultation Interview (Phone)	Page	1
Venue	AECOM-80 Collins Street, 48 th Floor,	Time	10:00
Interviewees	Australian Building Codes Board		
WPI Participants	C. Fisher		
		Date	29-Mar-2012

The expert we communicated with in the consultation interview with the Australian Building Codes Board cannot be identified however, the information gathered can be used.

The individual gave an overview of the process by which codes are added or amended to the Building Code of Australia. The Regulatory Impact Statement (RIS) is used to inform decision makers about the technical aspects of the project as well as the costs and benefits. The government has the final say over these decisions and whether or not they pass.

The individual mentioned how the process for adopting the Access to Premises Standards was a very lengthy process. The individual said that egress was brought up as an issue that needed to be addressed but it was quarantined until a later time. The individual also explained that the ABCB is currently working on egress of people with disabilities and it is a live situation.

The individual suggested contacting the Attorney General's office in regards to aligning the BCA with the DDA in terms of egress like how they aligned in terms of access.

The individual stated that they do look at codes overseas, especially codes within the United States when developing their codes. The individual said that they do get a lot of information about elevators from the United States.

Important points taken from the interview:

- Egress is currently being addressed but the process is very lengthy.
- The ABCB consults overseas codes, like codes from the US, in the amendment process.
- The government has the final say on whether or not codes are changed.
- Elevators are the main source of egress they are looking at.

Minutes of Interview

Subject	General Interview (Email)	Page	62
Venue	AECOM - 80 Collins St, 48th floor	Time	1400
Interviewees	Representative of a major architectural firm		
WPI Participants	J. Pham		
		Date	3-Apr-2012

The representative and the architectural firm cannot be identified however, the information from the interview can be used.

The representative answered the key questions we asked regarding the codes references, design compliance, and possible egress provisions. The responses are:

- Architects have specific knowledge on the Building Code of Australia (BCA) but they use fire engineering solutions that could be based on international codes and standard outcomes
- Designers comply with the BCA in regards to the Access to Premises working with access consultants to contribute and facilitate interpretation of the Disability Discrimination Act (DDA) requirements and in examining alternative solutions.
- Refuge zones with fire stairs or pressurized lift lobbies where the fire brigade can evacuate people with disabilities are currently used.
- Lifts with pressurized shafts for egress are increasingly adopted since it aids all inhabitants and reduces reliance on stairs.
- Areas of refuge would add to the cost of design but the area required for one wheelchair is small, providing no big cost impact.
- Refuge zones/floors aid high-rise design but since the World Trade Center internal design of cores and structures for large buildings are aspects to look into

Significant findings from the Interview:

- Refuge zones are in use and provides low cost impact
- Lifts are an option but more costly than refuge zones
- Not just emergency egress provisions can be examined but also building core and structure design for large buildings

Minutes of Interview

Subject	General Interview (Phone)	Page	1
Venue	AECOM - 80 Collins Street, 48 th Floor	Time	1030
Interviewees	Expert of the Disability Discrimination Act		
WPI Participants	P. Lavallee		
		Date	12-Apr-2012

An individual with expert knowledge regarding the Access to Premises for the Australian Human Rights Commission was interviewed but wishes to remain anonymous.

- US and Australia have similar changes with Access with the ADA and DDA
- 1993 DDA became operational AHRC knew confusion and complications with buildings complying with BCA and DDA
- Significant support from building professions such as architects and designers, people with disabilities
 - Unified approach to government because the DDA and the BCA were non-compliant with each other
- In 2000 spent 4-5 years of what would be in Access to Premises
- Put into political bottom level for 2-3 years, once new labour government came into office, they picked it up and its now operational
- In very early days looked at area of emergency egress, knew 2 issues existed
 - Low cost/easily changeable for example audio and visual alarms
 - Discussion of areas of refuge and lifts
- People with Disabilities did not want areas of refuge because they did not want to be waiting in a building on fire to be rescued
- 2000-2003 made the decisions to put all emergency egress issues in the same basket and put them aside until Access to Premises was completed
- ABCB made a commitment to return to emergency egress codes as a priority level, continues to have it as a priority
- Emergency egress is on agenda for ABCB and review of the Access to Premises

Minutes of Interview

Subject	General Interview (Phone)	Page	64
Venue	AECOM-80 Collins Street, 48 th Floor,	Time	15:00
Interviewees	Norm Winn, Fire Protection Association of Australia		
WPI Participants	C. Fisher		
		Date	13-Apr-2012

Norm Winn is a member of the Victoria State Committee of the Fire Protection Association of Australia. He also spent 30 years with the Country Fire Authority and sits on many Australian Standards Committees.

Norm gave an overview of the relationship between the FPAA and the NFPA. He explained how they have a memorandum of understanding that allows for NFPA codes and Standards to be adopted to meet Australian codes and standard that allow for their use in Australia.

He explained that the biggest hurdle to changing the BCA is that it is a lengthy process and that the changes have to be quantified on an economic basis.

He explained that the fire brigades concentrate on the incident level (1 floor below and 2 floors above the fire level) first. These floors have the highest risk of fire extension as well as smoke damage.

He mentioned that in buildings with large footprints, such as shopping centres, it would be more beneficial for areas of refuge, especially because they generally do not exceed four floors. Compartmentalization is critical for these. He also mentioned that areas of refuge would be more difficult for high-rise structures but also that the incident level is of the utmost importance in comparison to the other floors.

When asked about the building protecting people in relation to relying on other people for help he gave valuable information. He explained how in buildings with large footprints it is much easier to compartmentalize and use areas of refuge. In buildings with smaller footprints, it is possible for areas of refuge, but they would just have to be designed correctly and used more efficiently. He also mentioned many different designs which would include areas of refuge or lifts would depend a lot on the fire load within the building itself.

He said that areas of refuge would work best for people with impairments because they would not have to try to evacuate only move to a safe area.

Norm also provided us with the contact information for Max Murray.

Minutes of Interview

Subject	General Interview (Phone)	Page	65
Venue	AECOM-80 Collins Street, 48 th Floor	Time	1130
Interviewees	Representative of a major property trust business		
WPI Participants	J. Pham		
		Date	13-Apr-2012

The representative and the major property trust business cannot be identified however, the information provided in the interview can be utilized.

The representative discussed the effects that would occur if emergency egress provisions were included into the Building Code of Australia (BCA). These are:

- Buildings construction are guided by the BCA, including emergency egress will increase the cost but not a large factor
- Increase in construction costs is ideally recovered through rent prices of tenants within buildings, however in the market driven economy, the business would have to pay for the costs out of pocket therefore profitability is low

The representative discussed two possible emergency egress provisions, lifts and areas of refuge and the issues and benefits of their use that are:

- Lifts are impractical since history has shown that the last place to be in an emergency is a lift and it would hinder emergency services and fire brigade in a rescue. At the moment lifts cannot be used since they return to the ground floor. In addition, it cannot guarantee that able-bodied people would not use the lift. Installing a new lift would be expensive
- Areas of Refuge in the stairwell and on every floor is a more sensible solution since it is low cost and provide a safe place to wait for emergency services and fire brigade

Significant findings from the Interview:

- Areas of refuge are preferable to lifts since it is less costly, thereby profitability will not be greatly affected
- Buildings will comply with BCA requirements, including Access was not a large issue since it has been in existence for years
- The use of lifts in an emergency includes many issues and risks such as failure, obstacle to rescue services, and prioritizing people

Minutes of Interview

Subject	General Interview (Phone)	Page	1
Venue	AECOM-80 Collins Street, 48 th Floor,	Time	10:00
Interviewees	Max Murray, Access Designs		
WPI Participants	C. Fisher		
		Date	17-Apr-2012

Max Murray is an Access Consultant for Access Designs. He also is a member of many committees within Standards Australia and advises the Australian Government on access and egress.

First, Max provided us with the information of 3 books, 102 Minutes, Last Man Down, and 2 Seconds Under the World, which he said sufficiently summarize his views on emergency egress for people with disabilities. These books are all related to either the 1993 bombing of the World Trade Center in New York or the 2001 Terrorist Attacks on the World Trade Centers in New York.

He explained that the single most important part of egress is having a well thought out and practiced personal emergency evacuation plan (PEEP). He said that this is very easy to do if you work in the building where the emergency would take place. He also said that if the person in the building is visiting, then management should have a well thought out and detailed plan of how to deal with the evacuation of visitors.

He explained that stair walkers are a very simple way to evacuate people from buildings, as long as the stairwell is not compromised. He said as long as there is someone to help the person with a disability this would be the case. Also that these stair walkers would not have to be powered when descending buildings and would only need to be powered when trying to evacuate from a level below the exit discharge level.

He reiterated that PEEP's are critical to any evacuation process, followed by the use of stair walkers, areas of refuge, and lifts. He explained how lifts would have some limitations for use such as the power supply being compromised. He said when used correctly, areas of refuge would be beneficial. They would be most beneficial when used in conjunction with fire-isolated stairways, as those would make for easier egress, especially if someone was willing to help.

He gave us personal insight on his use of PEEP's and how that process has helped him out of a building when there was an emergency. He was a strong advocate of people helping people in case of an emergency because he had a personal experience of it working.

He explained how it was unethical for the DDA and the BCA to exclude egress when they already have addressed access. He said that changes were made due to business, not due to need. He said that if it is to be regulated, they would definitely have to reference AS 3745.

Minutes of Interview

Subject	General Interview (Email)	Page	1
Venue	AECOM-80 Collins Street, 48 th Floor,	Time	1000
Interviewees	Stephen Doran, Country Fire Authority		
WPI Participants	C. Fisher		
		Date	26-Apr-2012

Stephen is involved with Fire and Emergency Management for the Country Fire Authority.

Stephen answered some questions for us regarding the viewpoint of the Country Fire Authority (CFA) on the topic of emergency egress. He informed us that the CFA is in agreement that there should be more provisions within the BCA dealing with egress for people with mobility impairments. He stated that they deserve to have the right to safe egress in emergency situations based on moral aspects and are equal.

He stated that in the event of an emergency, rescue is the first priority of the fire fighters responding to the emergency. This statement mirrored what was stated by the MFB.

He also told us that even though the parts of Victoria which the CFA is in charge of are not as developed as the central business district of Melbourne the CFA still sees high rise building incidents and that there are more high rise buildings being constructed and more being planned for the future.

The CFA is also involved in determining if alternative solutions to the BCA are satisfactory designs.

He told us that it is ok to quote or reference him/CFA in our work.

APPENDIX F — RECOMMENDATIONS FOR INTERACTIVE QUALIFYING PROJECTS (IQP)

The following pages of this appendix contain recommendations for future possible Interactive Qualifying Projects that can be completed as a follow-up to our IQP or as additional research. We developed these recommendations from our research and what we have concluded to be important areas to address in regards to emergency egress in Australia.

Recommendation 1: Cost of a Life

For this IQP the cost on an individual's life can be examined. This is an important aspect when considering the moral complexities involved in improving the emergency egress provisions within the Building Code of Australia (BCA). Currently, in order to make changes to the BCA, a cost/benefit analysis needs to be submitted. If moral implications are ignored in the cost/benefit analysis, then there will never be any changes made to the BCA. Addressing the issue of the cost of someone's life in the cost/benefit analysis could support a net benefit. There is both a qualitative and quantitative aspect to determine the value of a person's life. For example, the emotional support provided to the individuals' family or the income that the individual provides their family. For this IQP, the qualitative and quantitative aspects should be examined in-depth. Other countries should be examined to see how they put a cost on a person's life, keeping in mind that different societies have different views on life. Students can interview actuarial mathematicians, insurance companies, and lawyers to develop an understanding of the cost of a life that are currently placed on a person. Past court cases and law suits of cases where individuals died as a result of inadequate provisions should be examined to determine the monetary outcomes for the prosecutors.

Recommendation 2: Costs of Emergency Egress Provisions

For this IQP the costs of different emergency egress provisions can be determined to develop a cost/benefit analysis for implementing new emergency egress provisions into the Building Code of Australia. The previous IQP done on this topic was able to determine through interviews with the key stake holders involved that areas of refuge, evacuation chair devices, and lifts are all viable options to implement. Currently the Building Code of Australia requires a cost/benefit analysis to make changes to the building code. Although there is an importance to stress the moral aspects of the issue, the monetary, hard costs associated with these possible provisions are important. The IQP should examine the individual costs of each of these provisions. They could also examine the costs for each provision in a new building compared to the costs of renovating or retrofitting an old building to comply with new egress codes. They could also examine if the different classes of buildings would incur different costs. A social implication of this topic would be the effects that these costs could potentially have on Australia's economy. By potentially significantly increasing the costs of new provisions within one and two-storey buildings, it could greatly increase the cost of living for the average person.

Recommendation 3: Collaboration between Access Consultants and Fire/Building Engineers

Currently within AECOM, access consultant groups and fire and building engineers do not collaborate with each other when designing aspects of the building. With a new push for improved emergency egress provisions within the Building Code of Australia, it could provide AECOM with a chance to provide a service to customers that other companies do not offer. The goal of this IQP would be to determine why and if these two departments should work together or not. Questions to answer could be:

- Is it necessary for these two groups to work together in order to adequately address the needs of people with disabilities?
- Would customers save money because they no longer have to deal with addressing issues of access independent of egress?
- Would customers be willing to pay for this service?
- What would AECOM get out of the collaboration between the two groups?

Interviews could be done within AECOM to determine what each group thinks about the subject. Interviews could also be done with current clients of AECOM.

Recommendation 4: Evaluation of Emergency Management Procedures

For this IQP, students would determine the effectiveness of current emergency management procedures and how they would need to change if new emergency egress provisions are included such as lifts. The students would need to research what management procedures are in place in the United States and Australia, and make comparisons to national or international standards developed, such as NFPA's Guide to the Evacuation of People with Disabilities, and Australian Standard 3745. Managerial aspects of evacuation are extremely critical to the safety of occupants in buildings, especially in the workplace. The students would develop a set of recommendations regarding the current state of emergency evacuation procedures and how they can be improved if lifts were included into the Building Code of Australia.

Recommendation 5: Lifts for Emergency Egress

For this IQP, students would examine lifts as a means of emergency egress to determine if evacuation lifts are viable options to provide safe exit for the target population and how lifts can be used as a safe means of egress. Since emergency egress for people with disabilities is at the forefront of the discussion among professionals in the field, many different egress methods are being evaluated for the target population. The students would research countries that are currently using lifts as a method of egress and evaluate their effectiveness in emergencies. The students would also research what precautions need to be taken in order to use lifts safely and effectively. Recommendations would be provided for AECOM as to whether they should be using lifts as a means of egress in their building designs and how they can be made safe to use in an emergency.

Recommendation 6: Egress Provisions for New and Old Buildings of Varying Building Classes

For this IQP, students would examine possible egress provisions for new and old buildings of varying classes. There are many viable options for egress but each one may not be suitable for every design. Each building has different aspects that hinder the implementation of certain provisions. Older buildings present many difficulties when renovating or retrofitting and the cost of these provisions is of the utmost importance. The students would examine what is currently being used in Australia and around the world and if the methods are successful. Students would use case studies of fires that acted as trigger points to change the current practices for the implementation of new provisions. Students would provide recommendations as to the best practices for renovating buildings as well as the best options for egress in the design of new buildings.

Recommendation 7: Emergency Egress for Other Disabilities

For this IQP, students would examine emergency egress provisions for other disabilities such as visual, hearing, or mental impairments. In a previous IQP, students focused on emergency egress provisions for people with mobility impairments. With the recent passing of the Access to Premises, the need for egress for people with disabilities is up for debate. As the Australian population continues to age, more people with disabilities than ever will be have a need and right to evacuate safely in the event of an emergency. A previous IQP dealt with emergency egress provisions for people with mobility impairments and labeled this as extremely important in creating equality for the population as a whole. Recommendations would be made as to whether or not there is a problem and what egress provisions should be made available to aid disabilities other than mobility impairments.