

Managing Accessibility: A Case Study at the University of Waterloo

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

This study examined how a quality management system, which includes a crowdsourcing application, could improve accessibility. As a result this research captured the interactions a person with impairment has with the built environment they encounter and how those experiences are facilitated.

No person should be denied access to quality of life enhancing services based on ability. Currently, however, there is a deficient focus on accessibility. Despite legislative advancements, much of North America's current infrastructure and facilities predate accessibility law. While standards regulate accessibility, current building codes offer few contemporary methods for improving accessibility beyond basic guidelines. In that regard, a quality management framework could provide attention and incremental improvement to accessibility.

This case study analyzed connections between people and accessibility at the University of Waterloo. Qualitative methods allowed meaning to emerge from key informant interviews. Secondary sources revealed *how* university operations function. Observations provided data that illustrated effective or ineffective accessibility. Investigation was not limited to the physical provision of access. It included an inquiry of the patterns, behaviors, and mechanics of providing accessibility.

Naturally, accessibility was not the only field where potential improvements were delayed or precluded because of systems concerns. For good environmental practice, the manufacturing industry's reaction to environmental concerns led to the increased use of environmental management systems (EMS) that were based on quality management frameworks. ISO-14001 is an extensive EMS focused on improving quality, which manages tangible inputs (legal compliance, auditing, or reporting) to a larger less tangible concept (environmental conservation). Similarly, accessibility could benefit from recurrent managerial improvements that would identify, manage, and report barriers for improvement. The aspects of ISO-14001 can be adapted for improving accessibility.

Based on the findings, management systems are not used to provide accessibility on campus. While there are no major barriers to impede a person from their educational pursuits, there are some limitations that affect equal opportunities for people with disabilities. Often the limitations remain unchanged. New construction of facilities affords opportunity for improved access. Existing procedures do not give accessibility the attention needed for regular improvements. A quality-based management system would incorporate the aspects of accessibility to gain incremental refinements. Including the crowdsourcing application would provide valuable feedback to assist the process.

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Dedication

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Quote

“If you can’t fly, then run,
if you can’t run, then walk,
if you can’t walk, then crawl,
but whatever you do,
you have to keep moving forward.”

— Martin Luther King Jr.

Chapter 1

Introduction

1.1 CONTEXT

For the purpose of this research accessibility¹ is defined as the unobstructed use of goods and services for persons with impairment (Ministry of Health Promotion, 2009). An individual with an impairment should not encounter barriers to life's basic necessities. Independent access should be realized for people of any ability. Since the 1970's civil rights movement by people with impairment, accessibility has also come to represent equity. North American society has largely adopted a principle that no person should be denied access to quality of life enhancing services based on ability.

The accessibility principle has been expressed and enshrined in legislation. Current accessibility regulations strive to generate equality for people of any physical or mental ability. In the Province of Ontario, accessibility is regulated by the *Accessibility for Ontarians with Disabilities Act (AODA)* (2012); additionally, new building construction within the province must follow the *Ontario Building Code Act 1992* (2012), which includes specifications for accessibility. The United States passed *Americans with Disabilities Act* in 1990 to regulate access.

Currently, however, there is a deficient focus on accessibility within communities, businesses, and institutions for people with impairment (Evcil, 2009; Venter et al., 2002). Despite legislative advancements, much of the current infrastructure and facilities predate accessibility law. Furthermore, enforcement of AODA regulations is weak. While the standards regulate accessibility, current building codes offer few contemporary methods for improving accessibility beyond basic guidelines. As a result, people with impairment continue to encounter a myriad of barriers.

The most often-cited obstacles to improved accessibility involve social attitudes, complexity, and fiscal concerns. Positive or negative attitudes towards accessibility dictate the boundaries in which people live. The human element of accessibility provision can create barriers. Additionally, social attitudes may affect comprehension of accessibility. The complexity of accessibility is observed in many public settings. The poor understanding of the nexus of accessibility is reflected through inadequate accessibility. Missing braille signage or steep ramps highlight the misunderstood complexity of accessibility. A disconnect exists between design standards, legislation and accessibility planning.

¹ Use of the term access and accessibility will be interchangeable where appropriate.

However, financial cost may be the primary determinant for an absent accessibility component. Renovation costs or technology purchases can hinder accessibility projects. Accessibility entails numerous variables to which municipal or commercial entities must comply. In the United States the implementation of the *Americans with Disabilities Act* (1990) highlights expense, where it was seen as an unfunded mandate for municipalities. Legislation commanded accessibility in cities with little consideration of expense. In the U.S. example and currently in Ontario, smaller municipalities may lack the fiscal resources required to provide accessibility. Compliance costs may be substantial.

As a consequence of these factors, a degree of accessibility is provided but management systems are not employed to maintain or improve accessibility. A management system could incorporate the aforementioned accessibility components, while integrating complexity and financial issues. The system would provide a methodical means to improving accessibility.

Naturally, accessibility was not the only field where potential improvements were delayed or precluded because of systems concerns. For many years, corporations were encouraged by society and by legislation to improve their social responsibility, particularly with regard to the environment. Ultimately, companies responded with the utilization of environmental management systems (EMS). The manufacturing industry reaction to environmental concerns led to the increased use of EMSs (ESHO, 2010) that would identify, manage, and report barriers for good environmental practice. Through planning and analysis, an EMS imparts a framework for organizing targets, objectives, legal requirements, auditing, and reporting of environmental concerns.

The EMS components endeavor to create recurrent managerial improvement. The improvement spiral is based on Edward Deming's cycle of "plan, do, check, act" (PDCA), (ISO-14001, 2009), which develops a basis for quality management. The foundation of the PDCA provides a way for individuals and organizations to manage tangible inputs (legal compliance, auditing, or reporting) to a larger less tangible concept (environmental conservation). The International Organization for Standardization (ISO) has thousands of standards. ISO-14001 (2009) is an extensive EMS focused on improving quality with a PDCA-management framework.

The oversight of activities and procedures for a higher level of performance is the basis for quality management. Quality management emerges as a framework that provides solid planning and analysis for improvement. As new information is acquired in one process or activity, plans can be altered for improved performance as guided by the PDCA (Moen & Norman, C. 2006). The principles of the PDCA are central to ISO-14001. Accessibility is a large conceptual ideal that will benefit from

quality management (compliance, auditing or reporting). The aspects of ISO-14001 can be adapted for improving accessibility. ISO-14001, quality, infrastructure management system, and systems design were examined for their application to accessibility.

1.2 PURPOSE STATEMENT

The purpose of this study was to explore the viability of developing an EMS and quality management system that will better facilitate the expansion and improvement of accessibility.

1.3 RESEARCH QUESTIONS

The principle-guiding question to this research was: How can a quality management system, which includes a crowdsourcing application, improve accessibility? The question was answered and researched through the following sub-questions:

1. Are management systems used for maintaining and eliminating barriers to accessibility?
2. Are there restrictions or organizational barriers limiting accessibility?
3. Are there examples from other domains where such obstacles have been successfully overcome?
4. How do organizations maintain legal compliance to accessibility regulations?
5. What EMS or quality management frameworks are employed within organizations?
6. What organizational methods generate favorable outcomes?

1.4 ORGANIZATION OF THE THESIS

Following this introduction, Chapter 2 is a review of literature. Drawing upon and interpreting available literature developed key topics. Chapter 3 describes the methods employed in conducting the research. Key interviews are triangulated with secondary source information (institutional and provincial policy) and observations of the study site. The research questions guided this study. Chapter 4 is the findings section where data collected from the study site are reported. Chapter 5 is the discussion section where the implications of the research findings are discussed and related to the material in the literature review. Chapter 6 is the conclusion where the potential benefits of the research and its findings are further elaborated. Appendices include supporting materials and measurements from data collection.

The next section is a review of relevant literature that develops a foundation to answer the research questions.

Chapter 2

Literature Review

2.1 INTRODUCTION

Disability has many aspects that are examined from a variety of perspectives. The social sciences have two standpoints that are important to this research. The social model interpretation of disability places the responsibility of accommodation for people with impairments on a community level. Oppositely, a medical model definition of disability makes impairment individualistic, which is the dominant perspective of disability rhetoric and attitudes. From the two sides, multiple organizations interpret disability in ways that form operational constructs. Many social, attitudinal, or physical barriers create limitations to people with impairment (Yau, McKercher & Packer 2004; WHO, 2010; Poria, Reichel, & Brandt, 2010, Smith 1987). This chapter will discuss the aforementioned barriers and their impacts on persons with impairment.

Many fields have terminology where meanings are formed through context. Vocabulary used within a theme or employed by a speaker, provides a frame of reference. Accessibility juxtaposed to disability sets the tone of this research.

Municipalities, businesses, and government organizations must comply with regulations that promote accessibility; however, there are operations that fail to provide adequate services for consumers with impairment. The market potential of people with impairment is an estimated \$800 billion USD (Debaise, 2009). The implications of embracing and ignoring the disability market segment will be discussed.

Quality and facilities management literature is examined. The core aspects to quality management are the basic tools that if applied to accessibility could generate improvements on numerous scales. The environmental management system ISO14001 may be an applicable framework to accessibility. Additionally, characteristics of systems engineering could provide aspects that would improve access.

2.2 DEFINING DISABILITY

What constitutes a disability? The infirmities of disability can result from a personal catastrophe or incident, stem from a progressive deterioration of function, or developed congenitally. Impairment can be the consequences of a car accident or the progression of age (Yau, et al., 2004). The former may have lasting traumatic effects where the latter may come with acceptance, as an advance of age.

Defining disability by deficit – or inability – is a result of the medical model of disability in social sciences. Functional limitations are the core of the definition (Devine & Sylvester, 2005). Impairment that restricts activity constitutes disability (Thomas, 2004). The medical model definition of disability is concerned with fixing the person with the impairments. Devine and Sylvester (2005) posit that society will focus time and resources on curing impairment to demonstrate a social concern for people with limited function. Disability becomes individual. What is not considered are the barriers that are already in place due to society's lack of accommodation to people of any ability. Current rhetoric highlights the importance of societal or environmental constraints on individuals. Using the medical model and definition of disability alone discounts factors within one's environment that may prevent a person's full participation, constrain their activity, or exacerbate the limitations of their impairment. It should be recognized that if medical treatment can limit or avoid impairment, steps should be taken for prevention. Whether considering a liberalist mentality, utilitarianism, or altruistic, society should accept the people with impairment as they are and accommodate their needs with an accessibly built environment.

The definition of disability has perspectives from opposing sides in the social sciences' discourse. The medical model's definition of disability is based on the individual. The social model of disability is constructed in the actions of society. Jones' (1996) article on disability as a social construction indicates that the biological aspect of disability is missing. Disability, "framed in the eyes of others," encourages the SPAR model (services, programs, advocacy, research) of disability as a civil construct, according to Jones. The model serves to address the specific needs of a person with impairments and expand the social boundaries of disability. The article recognizes the importance of an individual's impairment and limitations imposed by an exclusive society— one that creates oppressive structures. Social change will focus on altering the oppressive structures to benefit individuals of multiple abilities (Jones, 1996). The need to alter "oppressive structures," comes from "society's failure to accommodate its members who have impairments" (Devine & Sylvester, 2005, p. 87). An advantage to defining disability through the social model is to create an inclusive society where a person with impairment can be an active participant without encountering socially constructed barriers. Obstacles that create exclusion could include the pre-accessibility legislation design of buildings, curbs, or walkways in a manner that impedes a person with impairment (2005). "Disability as a form of social oppression – remains distinct" (Thomas, 2004, p. 580).

Many public organizations delineate “disability” in ways that express numerous characteristics. The World Health Organization (WHO) describes disabilities as a term that encapsulates a more comprehensive “bio/physical” definition (2010). Impairments, activity limitations, and participation restrictions are combined for an interpretation of disability. The WHO explains the disability as a person’s interaction of health conditions and contextual factors that include personal and environmental factors (2010). The integration of the individual and their circumstances bridges the medical model and social model to define disability. The importance of the coalescence is to consider that impairments alone are not the singular cause of disability. The barriers in one’s environment may contribute to disability. The WHO recognizes that defining disability may be a challenge due to the complexity and contested nature of the term (2010). The focus on impairment places the responsibility of disability on the individual. However, environmental factors may disable people. The WHO’s acknowledgment of societal barriers is evident. The current definition of disability allows for the elements previously described and may influence interpretations on government levels.

The Canadian national government passed the Human Rights Act in 1977. However the act only protects people from discrimination for federal activities. Societies’ limited consideration of people with impairment is reflected in urban design engineering that predates accessibility legislation. Accessibility laws are sanctioned provincially in Canada. In 2001, the province of Ontario passed the *Ontarians with Disabilities Act* (ODA), which was a seven-year grass roots campaign for civil rights. Developed from an aggregate of acts (e.g. human rights, employment and education) the ODA led to the next level of accessibility legislation with hard target deadlines to make Ontario accessible.

The current *Accessibility for Ontarians with Disabilities Act* (AODA) defines disability as:

- (a) any degree of physical disability, infirmity, malformation or disfigurement that is caused by bodily injury, birth defect or illness and, without limiting the generality of the foregoing, includes diabetes mellitus, epilepsy, a brain injury, any degree of paralysis, amputation, lack of physical co-ordination, blindness or visual impediment, deafness or hearing impediment, muteness or speech impediment, or physical reliance on a guide dog or other animal or on a wheelchair or other remedial appliance or device,
- (b) a condition of mental impairment or a developmental disability,
- (c) a learning disability, or a dysfunction in one or more of the processes involved in understanding or using symbols or spoken language,
- (d) a mental disorder, or
- (e) an injury or disability for which benefits were claimed or received under the insurance plan established under the *Workplace Safety and Insurance Act, 1997*; (“handicap”) (2005).

The AODA's definition was carried over from the ODA. The merit of a well-outlined definition is that there are perimeters to determining disability. The specific categories help individuals self-identify as disabled. As well, the specifics delineate disability for binding legal applications.

One mandate of the AODA is the customer service standard that requires training for equal provisions to people with impairments. This kind of legislation promotes education and training at multiple levels of an organization. From top-down or bottom-up management structures, entities can move forward collectively to provide accessible services.

People identifying within the defined perimeters of the AODA are now legally protected from discrimination. A problem may be if the definition excludes a group of individuals with impairment. However, the AODA mandates a regular review of the act every four years. The review serves as a method of monitoring to ensure any issues are addressed in a timely manner. An excluded group should be detected in the monitoring process.

A census report of the United Kingdom, states that the mobility impaired account for only 4% of the population of people with disabilities. Even fewer depend on a wheelchair at all times. (OPCS, 1987) In Canada there are 3.8 million people that identify as being disabled; of that 7.2% report mobility impairment (ESDC, 2016). However, mobility impairments are the most visible and most accommodated impairments. Using comprehensive definitions of disability may lead to the creation of more inclusive environments for multiple impairment types.

Many organizations offer various definitions of disability. Businesses, governments and institutions define disability with inconsistent interpretations of accessible services. Disability encompasses different limitations that may be termed as impairments. For the purpose of this study, disability will be related to the social construction of barriers to goods and services. Researchers use the popular nomenclature of "persons with disability" (Dajani, 2001). It is important to recognize disability as social construct. Individuals learn to live with limitations that may be gained from the progression of age or foist restriction as a result of trauma. People with impairment find ways to operate within the built environment unless there are barriers. Then disability results in poor accommodation of access.

Burnett and Baker warn not to treat those in the mobility-disabled group as if they were homogeneous (2001). The same warning could be used when classifying, identifying, or providing accessibility for any group of people with specific impairments. Yet their study focused on mobility impairments. People with sensory impairments – audio and visual – or people with cognitive

limitations were not included in their study. To facilitate their research the authors created a singular group based on one trait – the inability to walk.

Accessibility needs to be inclusive to numerous impairment types (Rodriguez-Ubeda, et al., 2012). Such inclusivity would demonstrate a social responsibility for creating more usable environments. Audio, visual and cognitive impairments require alternate means of accessibility. Contrasting color flooring, hearing enhancement systems, or pictograms may be necessary to providing access beyond wheelchair ramps. This study focuses on issues that concern people with mobility impairments. The observed accessibility was through the lens of a person in a wheelchair. However, there are numerous limitations to mobility. Accessibility, as it relates to disability, will need an array of accommodation, not solely for people with mobility aids.

2.3 DEFINING ACCESSABILITY

The definition of the accessibility can be scrutinized from multiple perspectives. Context can play a major role in determining a suitable definition. Throughout numerous sources accessibility is defined by its juxtaposition to disability.

In 2010 the WHO, in conjunction with The World Bank, released *The World Report on Disability*. Contributors from numerous fields developed a global picture of disability organized into themes. Accessibility was defined in two places. One was in the glossary of terms, which provided clarity in the usage. The other was the collocation with disability. Based on the experience of the reader and an understanding of disability, most may interpret accessibility as the unobstructed use of goods and services by a person with impairment (without referencing the glossary). It reflects the authors' perception of their audience. It is suspected that numerous fields of research define term in contrast to other words. Within the realm of disability research, accessibility requires little interpretation.

It could be argued that when a speaker with an impairment uses the word accessibility their definition relates to disability. However, social ineptitude should not be dismissed. Furthermore, not all impairments are visible and should be considered in social interaction. Social interactions should reveal and provide context for using “accessible.” Context is important in gaining an understanding of terminology (Engelbart & Theuerkauf, 1999). Should the speaker discuss transportation planning then the accessibility may require an operationalization of the term for that specific field. While defining terms in research is important, basic terms and their positioning against other words provide adequate elucidation.

Several researchers use accessibility in their work without the need for dissecting the term. There are exceptions. Iwarrson and Ståhl (2003) review usage of the term accessibility. Similar to the goals of the *International Classification of Function and Disability* (WHO, 2013), the authors sought to determine the most common usage of the term. Dictionaries from various countries, scholars' work, and multiple organizations' definition and use of accessibility were analyzed for content and substance. Across the multiple definitions the personal impairment and the interaction with an environment dictated accessibility.

Accessibility as the unobstructed use of an environment, goods, or services places the onus of accessibility in the social realm. People with impairment develop personal means to navigate in society. Often barriers are the result of decisions made by others that affect the lives of many (Lewis, 2009). When barriers limit further progress of goals then the individual may be disabled (as a construct of society). Deconstructing barriers, physical or attitudinal, may require a strong social effort, as there are cultural aspects that entrench a negative perspective on people with impairment.

2.4 SOCIOCULTURAL ISSUES FACING PEOPLE WITH IMPAIRMENTS

Of the barriers people with impairment encounter, attitudinal ones may be the least expected. "Societal attitudes to disabilities further complicate acceptance" (Yau, et al., 2004, p. 951). There are some cultures that foster negative attitudes.

In some Asian cultures people believe a person with a disability "represents a form of punishment from 'the gods'" (Yau, et al., 2004, p. 951). As a result, the individuals are resigned to a role as the punished (2004). One respondent of their study declared that, "neighbors might say that you must have done something wrong in a past life" (2004, p 951). Cultural attitudes can create a "social construction of disability as a state of marginalization" (Poria, et al., 2010 p. 217).

Negative attitudes can create stigma, which will perpetuate negative attitudes. Empowerment of people with impairment would help to break the recursive cycle of stigmas and attitudes. Countries with support services have strong disability groups that lobby for rights (Martin Prosperity Institute, 2010). The empowered group's interaction with society changes attitudes merely by the initial interaction as well as the on-going pursuit of rights.

Smith (1987) cites numerous authors on attitudes of non-disabled people affected by exposure to disabled people. In his examination of Pearce's study, Smith highlights the alienation that is derived from being an "outsider." Social attitudes towards people with impairment compound alienation

(1987). In West's study of social stigma (as cited by Smith, 1987), 51.9% of their disabled participants noted a level of alienation. Teasing and overt lack of respect were encountered at some point in time. Bullying, job discrimination, and mocking are expressions of negative attitudes (Martin Prosperity Institute, 2010). The cynical perspectives led participants to become less engaged with society. Additionally, families may hide an impaired relative from society. Such expressions could lead to people with impairment withdrawing from social participation. Empowerment could help reduce negative attitudes and expressions.

Avoidance behavior creates another type of attitudinal barrier (Langer, Fiske, Taylor and Chanowitz, 1976). People with impairment become objects of curiosity. Staring and awkward social situations result in obstacles to be overcome. People without impairment also fear saying or doing the wrong thing when a disabled person is present. Expressions like, "Let's go for a walk." may be taken as just an expression to a person in a wheelchair. However the able-bodied speaker may fear they were grossly inconsiderate. This fear leads to issues of avoidance. People without impairment may ignore someone with a disability to avoid uncomfortable situations (Ohlin, 1993).

Marginalization of disabled people can even occur with good intentions by able-bodied people. Such situations arise where a person with impairment will receive overly high praise for performing simple tasks – like grocery shopping. The attention may be unwanted. The person with impairment may interpret the praise as a lack of competence, having low maturity, or little capability for independence (Smith, 1987). Over-praise may be intended as a compliment to the person with the impairment. However its negative effect is a form of marginalization. The praise acts as judgment by the able-bodied speaker. It fosters the divide between health and sickness or abled and disabled.

Social attitudes may be formed from the media. In the past, people with impairment were portrayed in "negative, dramatic, and stereotypical ways" (Gilbert, MacCauley, & Smale, 1997, p. 108) that perpetuated devaluation and marginalization. Mental illness was characterized as "The Joker" in the Batman series of movies and comic books. The characterization could lead to a negative stigmatization of mental illness. The cartoon character Mr. Magoo made light of blindness to achieve humor. "Victims" portray people with impairment as weak and in need of help. These depictions could be a source of over-assistance or over-praise by able-bodied people. When people with impairment overcome their handicap they fulfill the role of "supercrip" (Media Awareness Network, 2010). It places value on overcoming impairment rather than acceptance. Conversely, the villain Ernst Stavro Blofeld, in the James Bond movie, *For your eyes only*, is in an electric wheelchair. The

correlation between villains and wheelchairs may brand people that use wheelchairs negatively. Stereotyping disability and the issues related to it generate lasting impressions through media (Burnett, 1996). Enduring impressions “may result in low expectations and poor attitudes towards people with disabilities” (Gilbert, et al., 1997 p. 108).

However, there was a portrayal of the disabled in the media that led to greater acceptance. “Television programs, advertisements, movies and news programs no longer stigmatize the disabled as not quite human. Instead, current portrayals now depict inspirations, not limitations” (Burnett, 1996 p.5). The positive portrayal was “Artie,” a character that uses a wheelchair on the television show *Glee*. While the best intentions represented the character in a positive light there were inconsistencies that are upsetting to some people with impairment. An Internet post by a person with impairment stated,

“He went on a date with Tina and she pushed him the whole time. Nobody I know in a wheelchair would have stood for this behavior. Also, why are they having him play able-bodied football? They are missing a golden opportunity to introduce the world to wheelchair sports. Please have him gain some confidence in his life as a person with a disability...” (US Weekly, 2009)

The person’s statement has valid points; however, the positive visibility and empowerment may lead to fewer social stigmas.

2.5 GETTING AROUND BARRIERS

Cultural and learned attitudes may be difficult to change. A progression towards an inclusive society may depend on the reduction of attitudinal barriers. To create a more accessible world, Universal Design has been suggested as a possible remedy (Darcy, Cameron & Pegg, 2011). The concept is more than accessibility compliance. Universal design is a construction standard that develops access for people with or without impairments, which is recommended by the WHO. The paradigm may create an inclusive society where limitations are minimized by planning. In practice, universal design could make products and environments more inclusive to people of many abilities. However, without enforcement, universal design may only be philosophical discourse. Built environment regulations compel accessibility, where universal design’s principles are voluntary. Nevertheless, organizations could use universal design to create quality experiences for people with impairment. Universal design may improve services for a wider user base.

Barrier-free services may not just be appealing to people with impairment and the elderly. Families with young children have similar requirements for access as the aforementioned groups (Vignuda,

2001). Strollers and walkers amplify limitations to movement. Access for people with impairment can lead to ease for the greater population. The consideration of people from any ability, when providing a useable environment, addresses the principle of inclusive design.

Critics of universal design state that people with impairment are consumers or customers of design products. Universal design principles guide the conceptual development of environments to serve people with impairment. Inclusive design seeks to place *people* as the guide for design (Imrie, 2004, p. 281). Involving people of any ability in the concept stages of product or building design may achieve inclusivity. Aspects of the AODA mandate the inclusion of people with disabilities. The debate between universal design and inclusive design is too extensive to incorporate in this research. Regardless of which design is used the importance lies on the provision of accessible goods, services, or environments.

The accommodation of one individual needs (necessities for accessibility) could assist others in the future. Other institutions, businesses or communities may improve accessibility to remain competitive. However, governmental level encouragement may be needed to make change. Rules and regulations to accommodate access coupled with a measure of enforcement could yield more accessible environments (Rimmer, et al., 2004).

The *Asian-Pacific Conference on Tourism for People with Disability's* 2000 report generated three key elements to barrier-free experiences for people with impairment. One was to encourage more countries to pass accessibility legislation. The legal construct should protect the rights of people with impairment. Training and education was another key to raise awareness of the needs for people with impairment. Organizations armed with the appropriate ways to assist people will be leaders in accessibility. The last key was fostering the provision of accessible facilities (ESCAP, 2000). The three elements are key aspects to incorporate into a quality management system that will continually improve accessibility.

2.6 ATTITUDINAL, INSTITUTIONAL BARRIERS

In a demographic article for marketers, Burnett reports that people with impairment, have lower incomes than their able-body counterparts (Burnett, 1996). Furthermore, there has been a recent decrease in employment of people with disabilities (Trend, 2015). "People with disabilities are still much more likely to be living in poverty" (NOD, 2010, p. 9). In the province of Ontario, Canada people with impairment earn 28% less than people without impairment whose income increased in

the periods between 2001 and 2006. (Martin Prosperity Institute, 2010). This fact undermines the group as a viable market segment. However, the participation of people with impairment in commerce proves that neither perspective of income or viability is accurate (Burnett, 1996, p. 14).

“While traditional marketing researchers frequently employ segmentation studies on ethnic, age, and socioeconomic subgroups, the potential of the sizeable, accessible, and responsive disabilities market is largely ignored” (Burnett & Baker, 2001, p. 4). The Martin Prosperity Institute’s researched the financial impacts of supplying accessibility in the province of Ontario. The report states that providing accommodation for employment could see the earning potential for persons with impairment range between an estimated \$441 million and \$4.8 billion dollars (Martin Prosperity Institute, 2010). However, to achieve the potential, issues of accessibility need to be addressed for inclusive employment opportunities. As wealth builds, opportunities may expand. A greater demand for accessible services may increase with wealth.

Accessibility may be ignored by organizations citing low demand or high cost of accommodation. The propagation of accessible services, goods, or environments may diminish. Due to the shortcomings, people with impairment may continue to struggle through a quagmire of deficient amenities. Marketers could be making a critical financial underestimation by determining that people with impairment are financially unviable (Burnett, 1996).

Yau, et al, state, some service sectors in Hong Kong are too commercialized and profit driven. The concentration on earnings led to a deficiency when accommodating people with impairment (2004, p. 952). Globally, the neo-liberal drive for profit has diminished resources that benefit the greater public (Brenner, Marcuse & Mayer, 2009). The focus on profit may lead to a loss of a substantial emerging market – the baby boomers and the people with impairment. Neglecting a large potential earnings segment may be the downfall of some service providers. Others may flourish by offering, informing, and providing necessary services to persons with impairment or the aging market. Literature indicates that people with impairment are more likely to be disproportionately loyal to businesses that best serve their needs or provide positive experiences (Turco et al., 1998; Yau, et al., 2004).

If organizations understood the loyalty that people with impairment have for businesses that targets their needs, then accessibility standards may likely improve. “Market opportunity and social equity” are the loss of those service sector businesses that fail to “meet often the simple and reasonable needs of customers” (Miller & Kirk, 2002, p. 9). A start could be that goods and service providers strive toward a regular improvement of accessible resources for people with impairment (Turco, Stumbo, &

Garncarz, 1998). Doing so could begin contact with a revenue potential estimated in the billions worldwide. “Tapping into this often-ignored market is a tremendous business opportunity, and can help any company” (Debaise, 2009, para. 6). Catering to this market segment was found to be sound business (Shaw & Coles, 2004).

Furthermore, there is a projected population of 1.7 billion people over the age of 65 by the year 2050 (Lutz & Samir, 2010). Their demand for accessible resources will put pressures on the service industry that should reach record levels. The progression of age increases the prevalence of disability (Burnett, 1996; Freedman, Martin, & Schoeni, 2002; Martin Prosperity Institute, 2010). Acquired impairments may slow the aging population of baby boomers, however, their demand for accessible services is predicted to be strong. Demand for accessible resources may increase in correlation with the amount of people aging (Ohlin, 1993).

There is some indication that there is a reluctance to provide services to people with impairment. (Shaw & Coles, 2004, p. 398). One view is that a strong concentration of people with impairment may deter core business. If this misguided view diminishes accessibility then the people with impairment will continue to be marginalized (Shaw & Coles, 2004). Such disenfranchisement is a result of negative attitudes towards people with impairment.

However one defines disability, those with a clear understanding, are the people who live with the limitations. Global and national efforts have improved accessibility and reduced barriers. Yet there is a level of frustration that builds in spite of accessibility legislation. “Most Americans with disabilities do not believe that the *Americans with Disabilities Act* (ADA) has had either a positive or a negative impact on their lives” (NOD, 2010, p. 16). Constant confrontation with barriers may be the reasons for the uncertain benefits to the *Act*. Protective legislation like the ADA or the AODA helps to prevent further marginalization by people or society.

Legal loopholes can create barriers for people with impairment (Evcil, 2009). Ambiguous phrases can foster unfavorable interpretations that lead to diminished or negated access. Burnett and Baker describe how, “Essentially, the act [ADA] requires businesses to alter existing facilities to accommodate disabled clients if such steps are readily achievable” (2001, p. 4). “Historical value” or “financial restrictions” could be claimed as reasons that do not make accessibility “readily achievable.” Scofflaws that use the loose definition of the latter part of the phrase will continue unchanged. Further research is needed to analyze the specific terms of the ADA or AODA that may be loosely translated.

The AODA contains language that can be alternatively interpreted and exploited. Facilities “are encouraged to abide by the requirements in this document [Accessible Built Environment Standard] where it is reasonable and appropriate to do so” (Government of Ontario, 2012). The standards also allow for exemptions:

- a) in areas that are not normally occupied on a daily basis by people, including, but not limited to,
 - i) crawl spaces;
 - ii) catwalks;
 - iii) elevator rooms; or
 - iv) utility vaults;
- b) where it affects the natural, cultural or heritage value of a protected facility or environment; or
- c) where it creates hardship that
 - i) Considers matters, such as impact on continuation of use of the building, the availability of individual accommodation, alternative measures; and
 - ii) assures that the use of the built environment is of optimum benefit for Ontarians (Council of Ontario Universities, 2010).

The language is meant to avoid undue financial hardships and protect cultural heritage. The committee that generated the proposed standards recognized the broad usage of the term “hardship.” The Ontario Human Rights Commission was concerned that without the allowance for hardship exemptions that there are no concessions for building areas with anomalies. The awareness of the potential loophole was cited as a source that may weaken the proposed standards. The determination of what is exempt is done by the individual organizations. Without enforcement self-policing of standards may not be effective when the language can have multiple interpretations.

2.7 QUALITY MANAGEMENT

This section will discuss potential avenues that could minimize attitudes or negative perceptions and reduce barriers. Literature in quality management, infrastructure management and systems engineering were examined for the purposes of this research project. Quality management may have solutions for organizing multiple aspects for the improvement of a product or service. The operational characteristics of an organization may provide insights for improving accessibility. Finally, systems engineering is used to examine organizations as a way of connecting interacting parts that could work toward a common accessibility goal.

Accessibility has many components. There are goals and objectives; legal requirements; technical specifications; human resources; and compliance monitoring that require attention. There is not one

method that organizes the multiple components to accessibility. An examination of literature did not find that accessibility is managed under a uniform system that promotes quality. Accessibility is a conceptual ideal with physical inputs that would benefit from quality management. Quality management (QM) pervades several sectors of industry like information systems, infrastructure, environment, or goods (Ghobadian & Gallear, 1996; Molina-Azorín, Tarí, Claver-Cortés, & López-Gamero, 2009; Young, 2012). QM may result in a tangible superior product or an intangible reduced environmental impact – or improve accessibility.

Numerous management systems are used to improve products, efficiencies, energy usage, or environmental concerns. When corporate social responsibility focused on environmental concerns, companies responded. As of 2010, 14,000 businesses worldwide have been certified for their environmental preservation and responsible management (Environment, Health and Safety Online, 2010). Accessibility may have marked similarities to environmental stewardship. Corporate image, market demand, and increasing regulations may be drivers for improvement. Environmental and accessibility concerns have many common attributes to manage for successful outcomes. Objectives, legalities, monitoring, and reporting are shared expectations of managing a business' environmental or accessibility responsibilities.

The International Organization for Standardization (ISO) has thousands of standards – one of which includes ISO-14001, which targets environmental concerns (ISO-4001, 2009). This standard provides a quality management framework as an environmental management system. There are extensive components to the system. The components are organized into a framework designed to create an upward spiral of managerial improvement that addresses environmental issues through a four-step iterative process. The improvement spiral is based on Edward Deming's technique of "plan, do, check, act" (PDCA), (ISO-4001, 2009). The PDCA process provides organizations a systematic method for improvement and an incremental problem solving technique by repeating steps to improve processes and outputs (Singh, 2013).

The foundation of the PDCA provides a way for organizations to take action. A framework educates through inductive and deductive learning that allows for solid planning and analysis for improvement. As new information is acquired, plans can be altered for improved performance (Moen & Norman, C. 2006). The principles of the PDCA are the foundation of ISO-14001.

Critiques of the ISO standard included: performance, voluntary participation, and marketing (Shoal, 2000; Christini, Fetsko, and Hendrickson, 2004). Monitoring performance over time was

complicated by the lack of metrics to assess progress. The standard focuses on the effective use of the *process* that reduces environmental impacts. Operations in the construction industry found “normalizing” waste recycling, fuel usage, and air emission difficult. However, the ISO-14001 is forecast to become the standard practices in mitigating environmental concerns (Young, 2012).

Participating organizations can implement all or selected parts of the standard. The issue of voluntary compliance would be eliminated should the standard become the obligatory model for practices. However, the optional nature of compliance to the standard presents various levels of conformity. Environmental concerns may have equally varied mitigation of impacts. Organizations with strict adherence often seek certification to the standard. ISO-14001 certified organizations require audit confirmation from third-party companies. The certification is considered a marketable asset in the world economy (Ghobadian & Gallear, 1996; Frondel, Krätschell, & Zwick, 2014).

Critics find there is less promotion of the standard’s reduction of environmental impacts and mitigation (Shoal, 2000). The standard is said to improve an entity’s marketability. The advantage comes from the promotion of the entity as a green organization. ISO-14001 was not meant to be a marketing tool (Rondinelli, & Vastag, 2000). Proponents of the standard strive for usage as a means of environmental protection. However, with the staffing needs and cost incursions, promoting the market advantage may be necessary to assure investment. Managing environmental impacts and accessibility may have similarities, but infrastructure management may share commonalities in the operations of an organization.

Infrastructure management systems (IMS) may have more influence on tangible aspects to accessibility. Infrastructure life-cycle management requires consideration of specific activities² (Hudson, Haas, and Uddin, 1997). Using an IMS may provide recurrent life-cycle analysis to an organization’s operational systems or physical structures. Accessibility could benefit from similar attention. Regular monitoring can identify safety, functionality, use, and costs indicators that may diminish accessibility. Ignoring access could lead to ad hoc or replacement accessibility (Smith, 2011). Aging buildings with deferred maintenance issues or pre-accessibility legislation designed buildings may be reasons for retrofit accessibility. However, infrastructure decay or age; lack of regular maintenance; preservation and renovation programs; scarcity of financing resources; and

² Activities include: rules of use; regulation for maintenance; emergency management plans; scheduled maintenance; framework and methodology for planning maintenance; replacement and renovation; analysis of do-nothing and deferred maintenance; and financial management to pay for upgrades (Hudson, Haas, and Uddin, 1997).

inadequate financial reporting are key issues to infrastructure management (Hudson, Haas, and Uddin, 1997), which may be causes for limited accessibility. Management of infrastructure may be part of a system that handles an entity's operations.

2.8 SYSTEM ENGINEERING

Systems engineering (SE) “is fundamentally a management technology to assist and support policy making, planning, decision making, and associated resource allocation or action deployment” (Sage 1992 p.4), which involves human and organizational concerns. Factors also include physical and societal infrastructure. Aspects of SE are examined for their potential relationship to accessibility.

Using scientific, reductionist methods of research, dependent on quantitative, mathematical techniques, operations research analyzes the pieces that create a whole system and solicits optimization (Hipel et al., 2008, a, b). SE looks holistically at a complex system for greater understanding, development of a new system, or modification to an existing systems (Hipel, Fang & Kilgour, 2008, a, b). SE is an approach, a process, and a discipline, which addresses the complex challenges of consolidated views of large and small systems in an integrated, efficient way (Agrawalla, 2011; Asbjornsen & Hamann, 2000). Industrial applications of SE are employed to unify traditional and complex systems in a hybrid system of humans and machines (Hybertson, 2006).

Several articles have been examined for elements of SE that may enlighten this research. Principal themes were: system of systems, hierarchies, and value systems. Within the literature studied there were articles dealing with the principles of SE.

2.8.1 System Of Systems

System of Systems (SoS) can be described as a network comprised of multiple intricate structures that are independent and variegated (Hipel, Fang & Heng, 2010). In spite of the previous statement, there is no universally accepted definition of SoS. Absent are the distinctive characteristics that may define SoS (Sage & Cuppan, 2001). Yet, early SoS sources cultivate terms to define and create precise tools for implementation (Ackoff, 1971).

Other authors generate discussions that seek to define the SoS/SE concept. The struggle to generate a rigid classification or identity for SoS/SE does not diminish the characteristics that shape the field. Perhaps the beauty of SoS/SE is that people or organizations from various fields give it a rich identity. The range of contributing fields provides the broad scope that SoS/SE can identify with.

Similarly, fields like geography are not simply devoted to a narrow definition as “study of the earth,” it includes systems and the consequences of human interactions.

Furthermore, researchers examine the details of SoS and its elements in a visual representation for greater comprehension. Risk assessment, nuclear energy, food security, and water resource management where values, ethics, complexity, and risk constitute real-world examples of SoS. Figure 1 is a rudimentary representation of the difference between a system and a SoS.

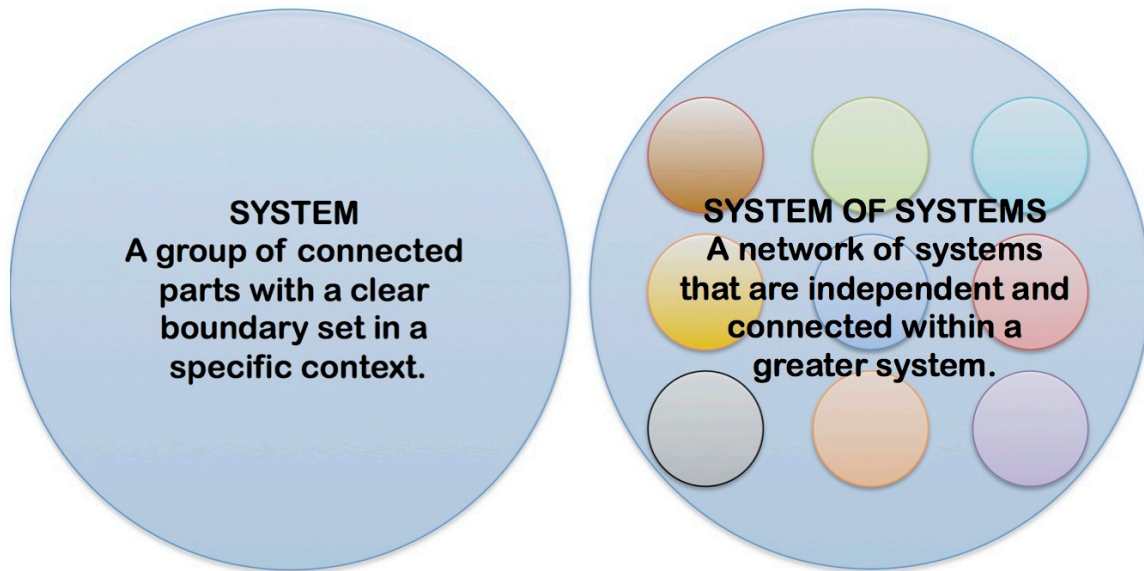


Figure 2.1: Illustration of systems and system of systems. The dynamics and the complexity of systems and SoS are not represented. However, the illustration highlights the broad difference and how they are separate and connected.

A fundamental concept of SoS is the connectivity of a system, where the sum of its parts not only contributes to a whole but the individual systems influences one another. The principles of interrelation, interdependence, and mutual interaction between subsystems are important to work towards a common purpose (Hipel et al. 2009).

The connectivity among systems is important in the efficient operation that creates seamless service provision. Failure in one system or on a small scale may trigger a series of events leading to an overall service disruption. (Eusgeld, et al., 2011). An example of small system failures in a SoS was the North American Blackout of August 2003, where small failures in a control room caused a major power failure in the northeastern United States and southern Canada.

Management may have parallels to SoS. Smaller managerial departments, which have the abilities to act independently, are the subsystems to a larger organization or system. Each supporting system of the greater SoS will need to be well informed of the goals and procedures in the organization. The successful implementation of a management framework in one subsystem will not dictate success in the overall system (Gorod et al. 2008). Each subsystem or department can impact the overall performance of the greater system or organization.

The important aspect of sizable entities is that numerous departments function as individual “subsystems” in a larger system. This recognition of the separate subsystems will be important in achieving a common goal.

2.8.2 Hierarchies

Many organizations utilize hierarchical forms in their internal structures. Researchers recognize that multiple participants within a system will have multiple objectives (Hipel, Fang, Heng, 2010). Participants may come from several backgrounds that may retain some modicum of power depending on their position within a hierarchy.

A representation of a hierarchy may be seen in transportation planning. Four levels of transportation planning are categorized to signify the scope of a planning domain. The range starts with individual projects and widens to a citywide level of planning concerns (Vuchic, 1999). The interconnected nature of the hierarchy and influence of each planning category (or subsystem) illustrates the network connectivity within the transportation system. Furthermore, individual components within a hierarchy may have greater/lesser priority, which may influence that subsystem or SoS. Each level within the hierarchy can influence the effectiveness of the overall system. It is this kind of system connectivity that is emphasized in a SoS.

Another expression of a hierarchy and power may be recognized in social and political issues, which may influence the performance of a system. Should actors oppose a common goal, their opinion, at any level of social or political influence may hinder the effectiveness of the system. Decision-making frameworks are meant to counteract such hierarchical influences (Hipel, Fang, Heng, 2010).

Understanding the context (or hierarchies) of subsystems within a SoS may be important to implementing a new goal. As Hipel et al. (p 459, 2009) state, openness may be required for a full understanding of behaviors as one system interoperates with another. The understanding reiterates the

message that many systems are not entirely independent. Therefore the influence of hierarchies should be considered in the functioning of a system. This same understanding is vital to expressing a coherent goal to each subsystem within an organization.

2.8.3 Separate And Valued

As independent operations function within an over arching system, there may be differences in values or principles. Understanding that separate departments function independently, with their own set of goals and ethics, should assist in providing the proper information to communicate an overarching goal. Shipping may have different priorities from marketing within manufacturing. Police services may hold different ideals from plant operations within an organization. “In order to effectively govern in a SoS, we must understand how complex systems behave and how desired behaviors may be achieved” (Hipel, Fang, & Heng 2010).

The values and ethics from one subsystem may affect others. Part of a greater understanding is to comprehend the connections between different departments and their influences on each other. The nested nature of hierarchical enterprises has a similar representation to that of a SoS. There may be systems that overlap or influence the performance or actions of another; however, they operate under the auspices of the larger system (Rebovich, 2006). Knowing the connections will assist in understanding a subsystem’s willingness to adapt.

“It is important for policy makers and decision makers to understand the interlocking process of adaptation in order to guide productive institutional reforms that make use of the complexity” (Hipel, Fang, & Heng 2010). Unifying the subsystems on a common course of action should lead the greater system to success in forwarding a shared goal in spite of varied values or ethics. Connections may stimulate change or the facilitation of a desired goal. Differing values and ethics may or may not hinder performance.

2.9 SUMMARY

Defining disability for this research showed that multiple definitions exist. Establishing the social construction of disability demonstrates an institutional bias that creates limitations for people with impairment. Further barriers may manifest as a result of attitudes that may challenge accessibility.

The review of disability literature reveals the importance of equal access to environments, goods, or services. Equity is not the sole reason for providing accessibility just for people with disabilities.

The equity would reflect a liberal embrace of a utilitarian enhancement of environments for all. Furthermore, a noteworthy segment of the world's population is near retirement age. As ability declines with age, a variety of accessibility will be required. Providing such access may take a methodical process of provision.

Quality management may provide a repeating, incremental process for improvement. Many organizations maintain their built environment through infrastructure management processes. As a result accessibility is a peripheral concern instead of having a greater focus. The use of a quality management system could provide that focus through the PDCA process. Quality management may yield greater benefits not only to people with impairment but businesses seeking to gain a market share of loyal consumers by limiting the shortcomings of infrastructure management.

Direct connections between accessibility and SE may not be obvious; however, there are key elements in SE that will assist in the development of a quality management system that is focused on accessibility. The understanding of SoSs, with their separate values and ethics, will guide the study to providing information on accessibility that will permeate each subsystem and any hierarchy, which can be facilitated with the smartphone application in Appendix J. SE examined an intangible large-scale issue (e.g. conflict resolution) and analyzed the tangible components in a holistic manner to develop a framework to solving problems. Accessibility has many tangible components that do not have a systematic framework for management.

The next chapter will present the methods for a case study involving an analysis of accessibility on a university campus.

Chapter 3

Methods

A qualitative case study was conducted on the main campus of the University of Waterloo to gain an organizational perspective of accessibility. The goal was to extract the essence of *how* accessibility is addressed from an operational standpoint. The case study method provided understanding of the phenomena of accessibility in a real world setting (Barratt, M., Choi, T.Y., Li, M., 2011, p. 329). Barrett et al further state, “We define a qualitative case study as an empirical research that primarily uses contextually rich data from bounded real-world settings to investigate a focused phenomenon” (2011, p329). The contextually rich data was enhanced by the lived experiences of the researcher that provided greater insight to campus accessibility.

To comprehend human interactions within the world, qualitative methods were used to interpret the built environment (Patton, 1987). Understanding develops from lived experiences and deep comprehension of a phenomenon (Charmaz, 2004). As a paraplegic of twenty-five years, the researcher is familiar with impairment. To imbue the impairment perspective a modicum of ethno-methodology influences this study’s constructivist worldview.

Interviews of key informants built understanding, influenced by the constructivist paradigm that established the expressions of disability and accessibility at the study site. Selecting key actors on accessibility demonstrated *how* and *why* the “real-world settings” appear as they do. Newing (2011) describes targeted sampling as deliberate selection of participants that will contribute the greatest knowledge to a study (2011). Research of the study site revealed a hierarchal structure of the organization; there were several actors whose decisions affected accessibility. Selection of those actors was important to inform this study. The key actors’ intra-organizational perspective revealed the mechanics to implementing accessibility on a university campus. Furthermore, the upper echelon posts within the organization may be the “gatekeepers” who will permit access to facilities and participants (Creswell, 2014, p. 188). From the discussions, themes emerged that can be supported or refuted by observations and secondary source information.

3.1 DESIGN OF THE STUDY

Qualitative methods are used to seek understanding of human interactions within the world (Patton, 1987). Establishing the patterns and mechanisms of disability and accessibility by research

participants will aid in a constructed meaning between the researcher and the participants. People with impairment have a perspective that differs from those who are not impaired. This research captures the interactions a person with impairment has with the built environment they encounter and how those experiences are facilitated. An aim of this research is to report accessibility and barriers encountered by people with impairment.

Employing a qualitative case study method of inquiry allowed meaning to emerge from the participants. Rich description was provided by the case study method, which may have been missed in other methods. The case study aided the exploration of connections between people and accessibility within the university context. The researcher has a mobility impairment and is a graduate student at the University of Waterloo. The study site has limitations that may affect independent accessibility in the attainment of an education. Utilizing a case study allowed for an intrinsic exploration to understand access and barriers. Furthermore, the post-positivist and constructivist worldviews permit the understanding to build between the researcher and the participants at the site. The case study method allowed the investigation of the *what*, *how*, and *why* of accessibility at the study site, especially since the nature of the research question is about how quality management can improve accessibility. Furthermore, the case study method allowed analysis of the accessibility within its real-world context (Yin, 2011). While the goal of the study was to examine accessibility, the examination was not limited to the physical provision of access. An investigation of the patterns, behaviors, and mechanics of providing accessibility was studied.

While survey data collection may provide a statistical basis for opinions on impairment and accessibility, quantitative surveys have limitations in determining meaning. Due to individuals' privacy rights, there may be difficulty of gaining an adequate sample of participants in the university context. Furthermore, quantitative methods, through use of surveys, may miss the rich details that interviews and observations offer. A greater depth of information was desired more than what statistical surveys could capture. For these reasons quantitative methods were not employed.

3.2 INTERVIEWS

Interview with key informants were conducted to build understanding, influenced by the constructivist paradigm. Gathering various perspectives of disability and accessibility are to establish the conditions at the study site. As a collection of viewpoints was gathered, a rationale for the built environment began to emerge.

To identify key informants, an examination of the university's employment chain of command revealed target participants. To gain an alternate perspective, lower tier staff was recruited for interviews. Anonymity was offered to insure there was no threat to employment. Also, the ability to speak freely elicited more genuine responses. Gaining a perspective of accessibility from various administration levels was significant to understanding.

Once potential participants were identified, an email inquiry was sent to secure a meeting time (email content is available in Appendix A). In-person interviews were the primary method of interview. However, phone interviews and email exchanges furnished alternatives that were partially employed for the convenience of the participant. Participants were amenable to follow-up questions via email.

Semi-structured interviews provided an opportunity to probe for more information on accessibility and university operations (Barriball & While, 1994). Casual conversations allowed anecdotes and fortuitous insights. The use of qualitative interviews allowed individuals to be expansive in their answers to questions. Interview questions were developed from the research sub-questions. Questions referring to the utilization of systems relates to the query "Are management systems used for maintaining and eliminating barriers to accessibility?" Furthermore, the inquiry into the resolution of access issues relates to the "elimination of barriers." If respondents communicated a process used to remediate an access issue, then perhaps there are systems in place.

The following is a sample of questions for participants:

- What systems are there for providing accessibility on campus?
- Can you explain access issues that have received your attention and how they were resolved?
- What outlets are there for people with impairment to report accessibility issues?

Questions were altered and added as unexpected facets manifested that needed further inquiry. Participants in various roles required questions geared toward their responsibilities or positions.

A full list of questions is provided in Appendix B.

3.2.1 Sampling

A range of five to fifteen interviews was expected to impart a sound perspective on the research topics. The range in numbers allowed room for the engagement of enough key informants to provide a fully developed perspective of the service and operational aspects of accessibility at the study site.

Insights from outside the study site illustrated why accessibility is important beyond a provisional or managerial point of view. While it was important to secure a management perspective of accessibility, insights did not begin or end with management. Consequently, there was value in incorporating chain sampling. To extend the range of interview targets further, respondent-driven sampling was incorporated. Intentionally selected participants had inner and outer organizational knowledge of additional informants within the topic of study. There was great value in asking, “Whom should I talk to next?” (Creswell, 2009, p. 183). The organizational insiders provided connections to actors on accessibility beyond the researcher frame of reference. However there was a risk that referrals may not be well suited to inform the study. Vetting referrals filtered less desirable candidates. Many individuals may have experience or a form of interaction with disability they can share. Preferable candidates had more than anecdotal knowledge of accessibility. Selected informants had direct interaction with shaping the built environment, people with disabilities, or both.

Eleven interviews provided an adequate intra-organizational perspective of accessibility on the university campus. Two more gave insights of accessibility from viewpoints outside the university. Lastly, a research professor shared their quality management knowledge.

3.2.2 Analysis

Aspects of Grounded Theory were employed as a means to analyze interview content. Data collected from interviews uncovered themes that emerged from the transcripts. Participants verified information found during observations. The multiple interview targets served to cross check information from alternative sources. Post-interview contact was maintained to provide clarity on content that developed during observations. Through multiple conversations, trust was built to get at core issues that may have not been revealed with a single interview.

3.2.3 Interview Data Collection

Recording software was incorporated to capture and chronicle participant responses. The full scope of the conversations was recorded using GarageBand software. However recorders can be intimidating to interviewees. One participant expressed concerns about audio recording. Explaining the details of the research assuaged their anxiety.

Transcribing conversations was time consuming. It was recognized that audio records reduced bias or faulty interpretations. Capturing every word or inflection of tone in the transcription process minimized errors in meaning. Furthermore, the researcher has years of interviewing experience,

which helped to capture the essence of each discussion. Note taking generated ease for the interviewees. Written notations were used to document distinctive points in conversations.

3.3 SECONDARY SOURCES

Secondary sources provided a sense of *how* university operations should function. Sources manifest in the form of codes, policy, or legislation. The mandates of those documents served as guides to operations. Sources included a master plan, accessibility legislation, building codes, and policy documents. In addition, related websites furnished information concerning accessibility.

The sources provided alternate lenses of analysis. Each gave evidence to what has been used as standards or reasons for accessibility in the built environment. Compliance to the standards was evidenced in items that were or were not measured accessible. Observing the study site was to collect data that illustrated effective or ineffective accessibility. The data collected during observations were crucial to represent current accessibility. Analysis of secondary sources explains why accessibility is depicted in its current state. With the information provided by the secondary sources another level of clarity is provided to the accessibility of the university.

The university's master plan is a public expression of the institution's intent for the future (2009). It was important to investigate how accessibility is specifically addressed in the plan. The plans may not be current; however, officials devised objectives, targets, and actions for achieving the university's goals. Past performance and future expectations were found within the plan.

Accessibility standards were used to evaluate collected data. The *Ontario building codes standard for barrier-free design 1992* provided a lens for analyzing observation data. The established building standards highlighted where accessibility may need to be upgraded to meet current regulations.

The mandates of the *Accessibility for Ontarians with Disabilities Act (AODA)* were studied. The accessibility perimeters within the act supplied a level of analysis on the observational data. The actions reported by participants were evaluated against the specific regulations in the *Act*. This level of analysis illustrated differences between legislated and actual accessibility on campus.

The examination of secondary sources assisted in the validation of this research and the formation of interview questions. Policy and procedure documents developed themes from interviews. Information from various sources offers some explanation of the built environment.

3.4 OBSERVATION

Using the experience gained from years of paralysis, the researcher collected data across the study site to aid in the triangulation of thesis content. The position as a graduate student and a person with a disability aided the role of a participant observer. First-hand observations of accessibility were conducted utilizing the dual perspectives to provide an illustration of the of the researcher's experiences. Documented observations were recent; however, casual field observations have taken place since 2010. Casual field observations may lack academic rigor, but nevertheless the collected experiences are important to the representation of accessibility. Spontaneous data collection points would be missed without the casual observations. The details of walkways, entrances, buildings, services, and washrooms illustrate the mobility experience for a person in a wheelchair. Observations and measurements were vital to supporting the themes of this research. Accessibility, as a focus for analysis, helped to further delineate the boundaries of this study. The boundaries focused the study on the accessible features to avoid measuring every centimeter of space on campus.³

Observations were conducted to collect information on possible discrepancies between accessibility in place and the legal requirements. The observed accessibility may demonstrate where access conforms or does not conform to legislative mandates. Measurements further highlighted differences in access for people with impairment and able-bodied individuals. Areas of inaccessibility emphasized exclusion and inequity.

The scope of the case study included the buildings, walkways, and public facilities within Ring Road. Narrowing the scope to the limits of the circulation road restricted the size of this research for financial and temporal constraints. The proximity of the researcher's living situation to the study site (less than 190-meters) reduced the impact of the constraints.

Walkways, washrooms, and lecture halls are some observed features within the study area. Access to areas not normally encountered by students (e.g. closets, maintenance corridors, or plant operations facilities) was not sought for examination. Furthermore, using the lens of accessibility, the observation focus was narrowed to elements specific to accommodating needs for people with impairments. To expedite the data collection, elements with little or no perceptible differences generated a simple visual inspection corroborated with photo evidence.

³ The measurements of this study are in centimeters and meters. The standard in accessibility legislation uses millimeters. The researchers preference is for the U.S. Customary Units of measure (inches, feet, yards); however, for adherence to scientific methods the metric system was used in the reporting of observations. Comprehension was eased through the use of centimeters.

3.4.1 Walkways

The assessment of walkways employed aspects of transportation planning through origin and destination analysis. Six locations around Ring Road were selected for their high pedestrian volumes. Walkway analysis took place from origin to origin along three pedestrian routes (two east/west routes, one north/south). GPS tracking was used to map routes and set waypoints where observations were taken. Photos were taken at the waypoints to further illustrate the reported aspect. The research assistant walked the desired routes or what was to be determined as the shortest routes. The researcher and the assistant observed the accessible routes. The comparison of the two routes is meant to illustrate the extra distance people with impairment are required to take.

For pathway analysis, documentation was conducted as a continuous path survey combined with the problem assessment method. The procedure is where assessments are made and recorded at points where there is a change in the normal characteristics of the route. In accordance to the problem assessment method, during the path survey, locations of issue were documented to show obstacles to access. Changes in width, height, or pathway surface material served as points for measurement.⁴ The areas of diminished accessibility were observed and measured. Problems include broken paving stones, faulty curb cuts, or cracks in the asphalt. It should be noted that observation were conducted during optimal conditions. Seasonality could compound accessibility issues or create new ones.

The points of origin selected were: Student Life Center (SLC) area, Environment 3 (EV3), South Campus Hall (SCH), Carl A. Pollock Hall (CPH), Davis Center (DC) area, and B.C. Mathews Hall (BMH). Places designated as areas have multiple points of beginning or ending a route within that location (e.g. DC has an entry point for pedestrians from University Plaza along with 4 bus stops). Charts, maps, and descriptions will be presented in the Findings chapter discussing pathways. Destinations were set to correspond to the routes.⁵

⁴ Pavement has a smoother less resistant surface for wheeled mobility devices. Brick pavers have grooves every 16.51cm that reduced forward momentum requiring greater effort in progress.

⁵ Pathway observations were restricted to exterior routes. The priority for examining exterior routes was that depending on the time of day and day of the week some buildings may be closed. People may be unable to enter or exit buildings as a shortcut. However there were exceptions that could not be ignored, as there was a high volume of observed traffic enter/exiting buildings along a route. On casual observations, DC and SCH had numerous students that passed through the buildings en route to another destination. One university Internet source illustrates the direct route passing through SCH. The shortcuts are estimated timesavers compared to circumnavigating the exterior of the buildings.

Table 3.4
Observed buildings and associated features

Faculty:	Buildings	Observed features: Entrances	Washrooms	Classrooms	Food services	Student services	Retail services
Applied Health Science	BMH	X	X	X			
Arts	AL	X	X	X			
	HH	X	X	X			
Engineering	RCH	X	X	X			
Environment	EV1	X	X	X			
	EV2	X					
	EV3	X	X	X			
Math	M3	X	X	X			
	QNC	X	X	X			
Science	PHY	X		X			
Services:	LIB	X	X		X	X	
	NH	X	X			X	
	SCH	X	X		X		X
	SLC	X	X		X		X

Note: "X" indicates the feature(s) observed in the buildings.

3.4.2 Buildings

Due to the vast number of potential destinations within the study area, a criterion was set for building observations. Six major faculties operate in the study site; they are: Applied Health Science, Arts, Engineering, Environment, Math, and Science. Using the Registrar Office's Space Listings, the largest and smallest classroom capacity of each faculty was determined and observed. Not all buildings housed both capacities. Therefore, each building containing the designated classrooms was examined as a single destination. Details of the entrance, classrooms, and washrooms were examined in each instance. Out of the Registrar's thirty-three structures with assigned classroom space, thirteen individual buildings were observed – nine classroom buildings and four services buildings. While not exhaustive, the selected buildings offer a representation of accessibility within the scope of the study area. The old and new stock of facilities was represented in the selected buildings.

Additionally, the gravity model in transportation analysis assisted in determining four service buildings for observations. The model suggests a destination is weighted by the activity attracted to the location (Casello, 2015). Service buildings were selected for their level of attraction as high activity centers. Locations like Needles Hall draw numerous students from across all faculties to

handle their affairs. The Student Life Center, South Campus Hall, the Dana Porter Library, and Needles Hall were observed due to their strong pull of students. Similarly, the buildings with large classroom capacities have similar gravitational qualities. The General Services Complex, the University Club, or the Graduate House were no less important but had a lower gravity, with smaller levels of activity.

The specific measurable characteristics may be unknown until arrival at a particular feature within the study site. The observed details were used to illustrate various characteristics that affected accessibility. Lecture halls, food service locations, pathways, washrooms, and classrooms had a plethora of unique characteristics (e.g. height of washroom fixtures, inclines of slopes, or pathway attributes) that were measured. Table 1 lists the buildings selected and the observed features within. The categories like washrooms are more diverse than the name indicates due to the volume of characteristics that were measured.

Many photographic images were collected as evidence and for reference. The photos provide proof of barriers and places of independent access. Numerous perspectives on the built environment and accessibility were important for recall after completing collection. A collection of images is provided in Appendix E.

3.4.3 Collection Tools

Selected devices were used for collecting data. The following is a list of tools employed in the research process with a brief description of use.

Garmin GPS 76C – the unit was employed to capture route data and set waypoints. Waypoints were set at locations where barriers, obstacles, or hazards were found.

Fuller 5-meter measuring tape – The device was used to collect height, width and lengths many of characteristics within the study site.

Lufkin 50-meter fiberglass tape – There were some distances that required measurement beyond the limits of the regular measuring tape. The longer tape measure determined the measure of greater distances. Use was negligible due to the use of the laborsaving meter wheel.

Keson Roadrunner Model-RR3M (Meter wheel) – the wheel calculated distances through building hallways to measure the distances to accessible washrooms and alternative pathways. This tool was more efficient than the 50-meter tape.

Olympus Stylus Tough Camera – The shockproof, waterproof camera captured images where accessibility was provided, limited, or non-existent. The collection of photos provided recall to specific settings described in field notes.

Pesola scale – The scale measured the pull strength of doors in kilograms and pounds. Observation of this data was in U.S. Customary Units of measure for comprehension. Building codes report force in Newtons (1 pound force equals 4.4482 Newtons).

Suunto clinometer – The angle of inclines were measured with the use of a clinometer. Efficiency of data collection was enhanced by the use of the tool.

GarageBand – the audio recording software was utilized in capturing interview data.

Measuring stick – A 122cm stick was used to eliminate surface inconsistencies when taking incline measurements with the clinometer. Additionally, two notches (2.54cm and 5.08cm) at one end aided in quick visual inspection of pathway surfaces.

Pen, paper, clipboard, and various observation forms (See appendix C) – Pen and paper were useful for documenting characteristics and personal reactions. Field sketches noted specific details that may be overlooked in a photograph. The data collection forms organized the recording of measurements.

3.5 METHODS FOR VERIFICATION

A triangulation of the data generates validation of the study. Key informant interviews, secondary source analysis, and observations situated data around the themes developed from the research. The multiple data sources developed a consistency in the themes (or highlight inconsistencies). Open communication with informants provided an avenue of verification of data or themes.

Due to the qualitative nature of this study, generalizability may be extremely limited. However, some characteristics of the research may be evident in other institutions, communities or businesses. Management, mechanics, or accessibility provision may benefit from similar analysis at other sites.

3.6 CONCEPTUAL FRAMEWORK

Three conceptual frameworks were considered while conducting this study. The postpositivist, constructivist, and transformative frameworks framed the theoretical perspective of this study but also served as motivation for the research.

The research methods included participant involvement (key informants) in the study. This study sought understanding of the pattern and performance of an institution providing accessibility for people with impairments. There was an expectation that causal relationships and mechanisms to accessibility provision will be revealed (Hoon, 2013, p. 525), which was facilitated by the collaboration between the participants and researcher. Patterns and behaviors to providing accessibility emerged as well. Understanding the institution's basis for accessibility allowed the researcher to challenge conventional thinking (Hoon, 2013, p 525). Meanings, as expressed by multiple participants, built understanding through the guidance of constructivism.

The use of the transformative framework promotes equity and change. As accessibility methods are revealed, the collaboration of the researcher and participants should invoke change that will improve accessibility beyond its current state. The change was not only meant to influence the institution but the researcher as well (Creswell, 2009, p 9).

The goal is not to test theory through application of a strict positivistic method. The study attempts to build an understanding of accessibility in an institutional setting then create change. The change is not only to challenge conventional patterns and behaviors, but also improve accessibility.

3.7 POTENTIAL FOR FUTURE RESEARCH

To avoid the negative perception of limitations, the potential for future research is explored. The study could be expanded if there were a reduction in financial or temporal restraints that would provide a potential to explore other research avenues. Additional time could provide more observation of the university's buildings, additional interviews, or other avenues of investigation.

Alternate research methods could be employed in this study. Quantitative or mixed methods could provide alternate perspectives to the research. However, a modification of the study may need to include a wider scope. Sampling of participants would change as a result of alternate methods. There may be an opportunity for generalizability if quantitative methods were incorporated.

This study focused on the analytics on a single impairment type – mobility. The purpose was to utilize the extensive skills of the researcher. Sensory and cognitive impairment types have accommodations specific to their needs. This study could be repeated to include other impairment types. The methods of observations may be replicated; however, other metrics may be necessary to capture observations or data specific to impairment.

The scale of this study could be expanded to a variety of larger operations. A major hotel chain

could benefit from a study of accessibility seeking to gain an international market share of people with impairment. Entertainment corporations, such as the National Association of Stock Car Auto Racing, could understand trackside accessibility on a national level. A regional municipality could study accessibility provision for their residents.

An interesting course of inquiry would be to analyze accessibility in cities that have hosted Paralympic games. A level of accessibility is required by the International Paralympic Committee, which would include infrastructure, transportation, and service improvements. The question then could be, “How has accessibility endured since the Paralympic event?”

3.8 OTHER RESEARCH CONSIDERATIONS

3.8.1 Personal Perspective

The researcher’s personal experience with disability garnered a unique skill set to this investigation. The insights gained from twenty-five years of paralysis informed this study. An example of insight included that accessible routes to navigate campus are different from desired pedestrian routes. The drive to understand the reason for alternate routes kept the researcher motivated to find answers.

3.8.2 Ethics Requirements

Due to the inclusion of human participants, the study was reviewed by the Office for Research Ethics. Ethics confirmation was acquired November 6, 2014.

3.8.3 Management Implication

Since the transformative worldview guides this study, an objective of this research was to create change. There are expectations that the university may examine accessibility systematically. The elements of “plan-do-check-act” that create an improvement of accessibility will serve as a framework. The campus lacks a formal accessibility plan as required by the AODA. The university’s current master plan indicates that, “Accessibility for people with disabilities should be a primary goal throughout the Waterloo Campus” (University of Waterloo, 2009, p. 43). There is no plan of implementation of accessibility. The management system proposed in this study will provide a meaningful way to achieve the university’s goal.

The next chapter consists of the findings garnered from the use of the aforementioned methods.

Chapter 4

Findings

Analysis of secondary sources, a series of interviews, and observations were performed to formulate answers to the research questions. The amalgam of methods begins to form context to accessibility within the university's built environment. Secondary sources offer accessibility parameters to which the university must comply. The information from key informants demonstrates the connection between decisions and the physical infrastructure. Data and measurements collected during campus observations give dimensions to accessibility at the study site.

The next section will report secondary source information important to shaping the built environment. The following section presents an understanding of accessibility gained from interviews with key informants. Lastly, the section will end with observations of walkways and buildings.

4.1 SECONDARY SOURCES

The following content provides a brief examination of several sources. The accommodations for people with mobility impairments are formed by policy, legislation, and codes. Those conventions are reviewed for their influence on campus facilities.

Provision of Goods and Services to Persons with Disabilities Policy

AccessAbility Services (AAS) has a statement on their website that expresses a commitment to persons with disabilities to ensure an equitable academic experience. The statement is a requirement of the AODA section for Accessibility Standards for Customer Service. The webpage should include a link to the university's accessibility plan. However that plan is "under revision" according to the site. (The policy can be seen in Appendix D)

Facilitating the commitment is regulated through customer service training. The policy states that the university will "strive to make reasonable efforts" to limit barriers in the provision of goods and services. The mandated training for faculty, staff, and students provides information to facilitate interactions with people with disabilities. Part of the training includes awareness of the appropriate channels to assist a person with disabilities if they are having difficulty in their academic pursuits. While training has been administered, the lack of an accessibility plan may be a violation of the AODA.

University Master Plan

The university's aspirations are presented in the *University of Waterloo Campus Master Plan Update* (2009). The investigation of accessibility goals or directives to accommodate persons with disabilities yielded very little content within the plan. In the section of "Pedestrian & Cycle movement" accessibility was addressed in the recommended directions. "Accessibility for people with disabilities should be a primary goal throughout the Waterloo Campus" (p.43). Additionally, "Ensure the pedestrian network and internal pedestrian circulation corridors provide convenient access to all resources on the campus for people with disabilities" (p.57). Some terminology (e.g. "... for all.") set an inclusive tone to actions.

The plan is not current or recently updated. However, officials devised objectives, targets, and actions for achieving the university's goals. Since the AODA mandates province wide compliance by 2025, there should be goals for ensuring adherence.

Ontario Human Rights Code

Protecting rights and freedom from discrimination for people with disabilities is a central principle of the *Ontario Human Rights Code* (HRC) (2016). Mandating equal opportunities, treatment, and access to goods and services guides the province towards inclusion. Furthermore, access to education by public and private institutions is specifically addressed.

The HRC recommends the removal of barriers – attitudinal, physical, or systemic. It was suggested that providers take a proactive stance by eliminating barriers before they are reported as issues. Reviews and accessibility plans, as recommended by the HRC, would facilitate the reduction of barriers.

Service providers and people with disabilities are advised to collaborate for solutions to reported issues. Devised solutions should serve a majority of people with disabilities, but also for individual needs. The collaboration can identify actions that may make accommodation while longer-term initiatives are developed.

The HRC offers broad guidance to service providers. The requirements for particular accessibility features were absent. The HRC did not provide measurement guidelines for the observations of the study site. However, much of the HRC has been incorporated into the AODA, which has few design specifications.

Accessibility for Ontarians with Disabilities Act

The AODA was created to reduce barriers to goods and services for people with disabilities. Furthermore, the legislation was designed to protect against discrimination. To facilitate the reduction in barriers and discrimination, the Act requires the involvement of people with disabilities in shaping the built environment. The participation between the people with disabilities and decision-makers creates an accessible path forward created *by* interested parties not *for* said parties.⁶

The language of the *Act* was direct, yet the volume of information was substantial, which muddled comprehension. Upon repeated readings the spirit of the legislation emerges; however, not every part of the text was easy to decipher. Amendments and updates to the Act have been ongoing. To increase a greater level of understanding, the Province provides guides and websites for clarity. Interested parties can navigate through numerous fields of webpages that will guide accessibility on many levels of operation.

From the legislation there are five separate standards that serve to reduce barriers:

Information and Communications Standards;
Employment Standards; Transportation Standards;
Design of Public Spaces Standards (Accessibility Standards For The Built Environment); and
Accessibility Standards for Customer Service.

The separate standards provide guidelines in language that specifically relate to each aspect. The standards are designed to reduce barriers within those fields.

The Design of Public Spaces Standards (DPS) and the Accessibility Standards for Customer Service (ASC) of the *Act* were used in the observation of the study site. The DPS provides design stipulations for Recreational Trails and Beach Access Routes, Outdoor Public Use Eating Areas, Outdoor Play Spaces, Exterior Paths of Travel, and Accessible Parking. The detailed specifications for exterior walkways and ramps in the DPS were applied in the observation section of this chapter. Some details include the width of walkways and ramps, the allowable slope on ramps, and the types of surfaces permitted. Excerpts of the *Act* are provided in Appendix F. Similar aspects are noted in the forthcoming section.

The ASC supplied numerous guidelines to customer and provider interactions. Mandatory staff training is a requirement to facilitate the interaction between providers and customers with

⁶ The AODA is available through the Province's web portal: <http://www.ontario.ca/laws/statute/05a11>. Link to the four integrated standards: <http://www.ontario.ca/laws/regulation/110191>. Link to the Accessibility Standards for Customer Service: <http://www.ontario.ca/laws/regulation/070429>

disabilities. Furthermore, training of assistive devices that facilitates interactions is outlined as a stipulation. The service or goods provider is instructed to track and institute staff training for compliance. The compliance aspect was investigated with service providers. The results will be given in the observation section of service facilities.

Ontario Building Code Act 1992

The *Ontario Building Code Act 1992* (OBC) is extremely technical with a high level of detail. The precision reduces individual interpretation of the content. In this legislation, accessibility content is 16 pages of 690 that dictate building design in Ontario. The immense length of the OBC is to account for multiple considerations to new construction.

The OBC has six major objectives that govern construction for human protection:

- Safety;
- Health;
- Accessibility;
- Fire, Structural,
- Water and Sewage Protection of Buildings;
- Resource Conservation, Environmental Integrity; and
- Conservation of Buildings (2012).

While most objectives benefit people with disabilities, the accessibility guidelines have the greatest connection to this research. Access to maintenance areas or utility closets are not mandated by the code. Spirit of accessibility within the code is to provide equity through barrier-free spaces, which means people with physical or sensory disabilities, can approach and enter a facility.

Accessibility within the OBC accounts for numerous aspects in building design, which include but are not limited to: entryways, paths of travel, washrooms, signage, and ramps. Specifications are provided for the design of accessibility. There are ratios of accessibility outlined in the OBC. The amount of accessible parking spaces, seating, or washrooms have to meet strict quotas, which is drafted with great detail in the codes. An example is that one, two, or three story buildings, where a washroom is required, are to have one universal washroom. Similar ratios and specifications are provided for parking and seating.

Section 3.8 Barrier-free Design, was used to guide the observations at the study site. Entryways, walkways, washrooms, and seating areas comprised a partial list of observed features. There were several aspects that needed measurement (e.g. sink heights, ramp inclines, door widths). To simplify the complexity of the code and the data gathered from observations, a synthesis of the findings has

been compiled in the observation section of this chapter. The Barrier-Free Design section of the OBC is provided in Appendix F.

The next section will discuss data from interview with key informants.

4.2 INTERVIEWS

It is important to understand the administrative guidelines as well as the personal perspectives of university staff. As key actors in university operations, their decisions affect accessibility. While most participants agreed to identification, the findings from conversations are more important than titles or names. This section presents multiple viewpoints.

To provide structure to presenting interview content, the findings have been grouped into four categories. One is a services perspective to accessibility that promotes student success. The second category is the provision side as expressed by participants from Plant Operations (PO). The third category perspectives are from outside the study site. Finally, an industrial/organizational professor shares their insights in the fourth category.

The service perspectives have a greater connection to people with disabilities. The PO side offers insight on how the built environment is provided. While the impact of PO decisions on the physical landscape are important, their viewpoints are slightly removed from people with disabilities, as there is a minimal level of contact. The perspectives from outside of the university highlight the importance of understanding accessibility and the user experience. The fourth group consisted of a discussion on aspects to quality management, without any direct connection to persons with disabilities.

Interview content has been referenced to the specific interview questions. Since the roles of the participants varied, questions were tailored to their positions. There are six sets of questions that have been labeled for reference as A, B, C, D, E, F. (The question sets can be found in Appendix B). The specific set of questions and the question number have been provided for the reader's understanding. (Example: Question set "A" and question number one will appear as AQ1 in the text.) Question set A was the primary set used in most interviews. The remaining five have many of the same questions but have added questions that are directed to the participants' specific role. Not all questions generated equal volumes of content. Set A, question 2 did not relate to participants that dealt with the service aspects of accessibility. The question content with the most revealing responses is presented.

4.2.1 GROUP 1

Service Level Staff

Two participants provide accessibility services to people with disabilities. Anonymity was a condition to participation. To conceal their identity the following insight is an amalgam of their discussions. Their duty as Student Access Van (SAV) drivers was to provide “safe transport for students with disabilities between various points on campus,” said one driver (AQ1). The drivers developed experience with the performance of their duties and with students with disabilities. Through their interaction with students, a greater level of service progressed.

Drivers said they desired an increase in decision-making power (AQ7). Intimate knowledge of the service and user preference permitted an increase in students assisted. They felt that changes to SAV procedures diminished staff autonomy. The changes experienced by the drivers left the service idle for extended periods during the day. Driver downtime was perceived as better utilized with unscheduled or spontaneous service requests, which included unregistered users. Since vacant timeslots were not predictable, driver empowerment was desired to decrease idle periods. Drivers sought more decision-making to increase the use of the service. Drivers stated that university staff (at any level) is not granted access to the same SAV service. It was described that allowing staff access to the service, while maintaining preference to students, may decrease the estimated 80% downtime.

Each driver expressed dissatisfaction in the communication between levels of their organization (AQ7). They perceived a disconnection between drivers and the administration where little feedback was sought from drivers. The SAV objectives were not clear to drivers and reportedly to students.

Underutilized forms of communication were the SAV driver summaries (reported issues or cancellations), which are documented and relayed from one driver to another. According to sources, the SAV administrator did not access that information. To improve communication, technology was suggested as a potential mechanism to facilitate correspondence. Electronic schedules could be altered in real-time and the office administration could monitor schedule changes. Furthermore, drivers could enter field notes to improve communication, one driver stated.

The drivers are the contact point for people with disabilities (AQ4). The users inform drivers of their issues and concerns. Communication of the issue terminates with the driver unless the student reports their concern to their AAS advisor. Beyond that, “Complaints were falling on deaf ears.”

The staffers recognize there is always room for improvement (AQ7). Their expressed key element was effective communication. Information channels from the office need improvement. Busy drivers are required to “call in” to get daily information. Due to service demand the information exchange may not take place until late day. Drivers expressed a desire for such communication channels to be improved so information may be accessed earlier and at their convenience.

Mid-Level Service Staff

Two mid-level service staff agreed to participation with anonymity. To conceal their identity the following insight is an amalgam of their discussions.

The role of the staff members is to “ensure an equitable opportunity for people with disabilities” (AQ1). The AAS has a focus on accessibility that is concentrated on academic access (e.g. note taking, audio or visual assistive technology). Access within the built environment is accommodated; however, academic accommodation has greater emphasis. Skilled staff collaborates with registered students to accommodate their specific needs.

Student involvement is key to self-advocacy, which is where staff assists in the process (AQ3). It is expected that students with disabilities register with the AAS. To provide equitable conditions in service provision, there are operational procedures. The procedural paths allow the individual nature of disability to be accommodated through multiple service alternatives that may be tailored to specific needs. In spite of rigid processes, there is tremendous flexibility in the services available (AQ1).

Multiple service options are available to accommodate students. Health Services, Counseling Services, Student Success, Libraries, faculties, advisors, and PO are sources that generate a “circle of care” so no student “falls through the cracks.” The assemblage of services is meant to be a dynamic mélange of options that can assist students (AQ1). There is a consensus that self-advocating students will have a greater prioritization of their needs. Any issues with accessibility will be recorded (means of reporting) and transmitted to assigned staff (AQ4). AAS personnel have skillsets to facilitate the needs for different impairment types. Students with specific needs are directed to particular staff members.

User feedback has been a form of monitoring for the level of service provided and to developing new services (AQ4). Surveys have been employed to garner a consensus of the department’s performance. While no major issues were discovered, valuable insights were collected and incorporated into new services.

Communication with other departments is an important aspect to providing service (AQ7). An example gave context to the effectiveness of communication. Reportedly, there was a disconnection in the proper application of services (AQ5). Once the service provider was contacted, the issue was remediated by the end of the business day. Students are expected to contact AAS to use the same path of communication for their concerns. Students are involved in the facilitation of their needs.

There is expressed desire to educate both the institutional staff and student body of accessibility goals (AQ7). The vehicles that develop the “education” currently are through open houses, websites, and referrals from other departments. Educating the user to take greater responsibility for their needs is one goal of the office. There was an inclination that attitudes could be changed through the understanding of other people’s perspectives that would reduce barriers (AQ8). The change would be fostered through education. It was recognized that AAS should influence more accessibility protocols and increase understanding similar to other departments that exercise their mandate for university operations (e.g. payroll, human resources). To this end, the communication of AAS goals and directives to other areas of operation on campus was deemed necessary.

The interpretations of policy – AODA, Ontario Human Rights Code, Occupational Health and Safety Act, Conflict Management and Human Rights Office, Policy 33 – Ethical Behavior, and Secretariat and Office of General Counsel – were seen as management systems (AQ6). Staff training incorporated the policies. To the participants they are instrumental in guiding operations.

New technology was expressed as a way to provide access more efficiently (AQ7). Until recently, service procedures worked well for a low volume of students. The current number of students receiving services has exceeded the capacity of older procedures. The recent acquisition of new equipment and space is expected to increase the level of service. New opportunities presented a favorable time to evaluate their systems and procedures. With change they embraced improvements to their physical space and procedural aspects of service provision.

It was recognized that human resources should be devoted to the compliance of institutional access as it relates to the AODA (AQ7). The responsibility of the AAS is to the student. The built environment is adjusted when students request accommodation. The AAS facilitates communication with PO to make appropriate changes. However, compliance to accessible building regulation is not their focus.

AAS Director

The interim director for AAS had an understanding of the office's role in the university. Their working knowledge of the services specific to students was enough to effectively handle the operational aspects to the AAS office. While there was a limit to accessibility-specific service information, there were rich details on university operations. Past performance and future goals of the AAS were the dominant topics.

At the time of the interview the participant had assumed the director duties of the AAS role for ten months. Even in their short tenure, they recognized the need for a proactive approach to institutional accessibility. The former AAS director provided accessibility in two categories. One was to limit barriers to education for students with disabilities. The second was on the reduction of barriers for people with disabilities in the built environment. The former had a limited effect on the physical attributes of campus. The latter had a greater impact. While AAS advisors may make arrangements to work around the physical landscape (classroom reassignment, furniture placement, or pathway snow maintenance alerts to PO) much of their services accommodate learning accessibility (AQ1).

The former AAS director, with a source in PO, worked towards accessibility goals in the built environment. PO sought advice in shaping the built environment. The PO inquires aided in the AAS's assuming the role for guiding institutional accessibility (AQ1/AQ7). However, accessibility has two roles that need devoted human resources. One is for the services provided by the AAS to students. The second consideration is for access in the built environment. The current director expressed concern for the needs of faculty and staff where an institutional accessibility coordinator would be beneficial (AQ7). "It is hard to get a large organization coordinated towards a common goal when there are so many other priorities and audiences," said the director. Additionally, a devoted institutional access coordinator could start a proactive approach towards the reduction of barriers in the built environment while providing PO with the guidance to implement the approaches. The access coordinator position would also provide a level of accountability (AQ8).

Since an institutional accessibility role has not been clearly defined, other community services have been enlisted to shape the university's built environment. The Independent Living Center of Waterloo Region (ILCWR) consulted on two separate occasions. The Student Life Center and the Modern Languages Theatre had their facilities evaluated by the ILCWR. Representatives from the ILCWR toured the facilities and made suggestions based on their observations. The ILCWR focuses on assisting people with disabilities to lead independent lives. The consultation was meant to improve

access for people that may or may not seek guidance through the ILCWR. The establishment of an access coordinator would serve as an on-campus resource for accessibility concerns. They added that duties of the position might dedicate efforts to avoid access issues prior to being reported by students. It was proposed that the AAS should be more proactive by building supports and relations to the office. The director said large classes with hundreds of students should have an immediate connection to the AAS for them to receive assistance before academic issues emerge. Current AAS staff works towards that end by consulting with students prior to the start of classes. Communication needs to be strengthened. There is a level of uncertainty in many faculties and departments to their roles in accessibility. Clarity is to be provided through educational methods or information channels. There needs to be an increased engagement for accessibility to be supported proactively, they said (AQ7).

Increasing the visibility and connections of the AAS will be a task for the incoming manager. The Student Success Office increased their awareness through various methods (information sessions, orientation presentation, linking to other services). The same methods are proposed for the AAS to educate students, faculty, and staff for increasing visibility.

Within the AAS there is a hope that new technology and office space will assist in providing better access or service. Internal systems or processes were designed to handle a few hundred students. System upgrades should streamline processes that will free up human resources. The new systems are expected to handle thousands of students.

Associate Provost, Students'

There are several student service units at the University of Waterloo (e.g. retail, housing, athletics). Associate Provost of Students, Chris Read handles business operations for multiple services, which includes AAS. His task is to provide senior executive oversight to deliver on the accountabilities of that office (BQ1).

Read recognized the duties for the AAS are not clear. There were “soft edges” to the responsibilities of the office. The AAS is meant to provide an equitable opportunity for people with disabilities. Some of the office responsibilities included institutional accessibility and the shape of the built environment (BQ2). Read wants to provide bounds to AAS responsibilities to direct the office as a student service. Due to the provincial source of funds, the office needs to perform as a service resource for students, he said.

In the past, staff within the AAS was tasked with advocating for access for people with disabilities in the built environment. The AAS feedback was not meant to guide building codes. The input was meant to consider accessibility beyond what building codes mandate by saying, “yes, technically it says we have to do this, but it would be better if we did this; or have we thought about these things,” Read said. Such advocacy added responsibilities to a burgeoning office while trying to maintain their existing service to students. With new boundaries limiting the AAS to student services, a new source for institutional accessibility needs to be formed to assist university operations in compliance to legislation not only for students, but faculty and staff that may have accommodation needs (BQ7).

Communication is a driver for improvement. Communicating the services and limitations to students is expected to increase the awareness of the AAS as a student resource for reducing barriers to education. Read stated, “We need to communicate with people and tell them, ‘Here’s what we do. Here’s how you get access to services. These are the boundaries. Here’s who makes the decisions.’” The clarity in communication is seen as a successful way to proceed in the AAS operations (BQ8).

Previously, there was a weak internal structure within the AAS. The limited structure was a reason for the “soft edges” to the office responsibilities. The internal hierarchy of the AAS was not as strong as expected. The uncertain direction of the office limited foresight into future needs or directions (BQ8). Read expressed a need for senior level staff in the AAS that will plan for the future and anticipate subsequent demand.

The AAS evolved to include the compliance function to institutional accessibility. Handling both the student service and the compliance function were not well executed in the past according to Read. However, with the delineation of duties and removing the compliance function of the AAS is expected that an improvement to student service provision will result.

4.2.2 GROUP 2

The next series of interviews were participants from the university’s PO. These perspectives represent accessibility through design, operation, and maintenance. Within PO there are four departments – Business services, Custodial & Grounds Services, Design & Construction Services, and Maintenance & Utilities. Directors of each department (and one manager) provided insights into the accessibility of the built environment.

Director, University Architect

Since legislation mandates accessibility, new projects integrate specific access measurements into the design, said university architect Daniel Parent (AQ1). New design projects are tracked to ensure accessibility codes are met. The process is mechanical (AQ2). Building needs and accessibility needs are designed and presented in schematics. The building codes and AODA requirements for accessibility are incorporated early (AQ9). Any dereliction of accessibility standards sends designers back to the drawing board.

Due to the rigid nature of building codes, architects apply accessibility design that may compromise the use of a designed element, claimed Parent. Building codes dictate specific dimensions to accessibility and the application of the requirements may not logically fit the space. Common sense was recommended for the design of spaces. The use of an accessible washroom stall may be negated by the direction the door opens. Due to the nature of a disability, different accommodations may be selected in priority over another impairment type. It was suggested that infrastructure might be developed or renovated to favor people with mobility impairments. The assertion was people with sensory or cognitive impairments are less likely to be impeded by barriers for people in wheelchairs. Accommodations of other impairment types are included but may have less priority unless there was an expressed demand. (AQ5)

Access needs are reported through the AAS according to Parent. For students, the AAS is the primary point for communicating accessibility concerns (AQ4). The office was seen as the driver for accessibility concerns, to reported issues, or offer new building requirements. Architecture and other PO departments rely on the information of user demands to originate from the AAS.

Demand for access was cited as a point of caution when providing access. Accessibility may not be initiated without knowing current usage. As an example, it was proposed that a survey by AAS should have been conducted to determine the accessibility demand for the Graduate House. The level of use may have been incorporated in the decision making for renovation investment (AQ7).

The elevator in the General Service Complex (GSC) is an example where the need of an elevator was perceived as having low demand. In the past, the need for that piece of infrastructure was minimal, Parent mentioned. Investments of funds were used to renovate elevators in buildings with perceived higher demand. Regardless of demand, the elevator was installed in GSC two years ago for accessibility compliance and to accommodate use that could not be predicted. Furthermore, the GSC

elevator was cited as an example where older buildings need to be retrofitted for accessibility (AQ8).

Buildings constructed prior to accessibility legislation complicated access provision, said Parent. Washrooms were cited as an example where new buildings incorporate accessible spaces into the design and older buildings need retrofits. Requirements for accessibility need compliance, which increasingly includes existing buildings. The challenge has been redesigning spaces to comply with code in established buildings (AQ5).

Manager, Client Services

PO Client Services manager Fernando Silvestri tracks efficiencies across campus and accessibility was one of those aspects (AQ1). To focus on accessibility, Silvestri forged a connection with the previous director of AAS. Projects generated from the AAS were analyzed to integrate the needs into other capital projects or plans. Collaboratively, they identified numerous projects for accessibility. Through a capital repairs auditing software, projects were entered for assessment of required resources. Based on fiscal restrictions projects were targeted to fit within financial parameters. Additionally, projects not targeted were analyzed for inclusion in other capital repair projects, he noted. A repairs and needs list is maintained continuously. Accessibility projects are part of that list to address concerns in the future.

Access issues are reported sporadically (AQ4). When an issue was identified, that need was discussed with the AAS director, Silvestri added. A PO project coordinator investigated issues to determine the scope of the projects. An assessment was made to determine the priority and remediation. Reported issues were given a high priority for a greater possibility of being addressed, which are ranked by need and use. The determination for such projects is discussed annually to consider other outstanding capital projects that have a greater likelihood of failure, which will need immediate attention, by both human and fiscal resources (AQ2). Competing needs for similar resources complicates project selection.

Two items that facilitate access are elevators and door openers. However within budget frameworks they are separate interests, said Silvestri. Elevators are major project incurring expenses over \$600,000. Financial resources for elevator projects are secured from the capital repairs budget. Door opener projects are funded from an accessibility budget. Accessibility budgets were reportedly smaller than capital budgets. Fewer financial resources may limit the number of accessibility projects

than can be completed. However, numerous capital projects incorporated accessibility to finance access improvements.

To manage capital assets, the University of Waterloo has joined with other Ontario universities in a request-for-payment to secure the services of an auditing firm. VFA Canada Corporation has conducted previous capital asset audits for the university. VFA's human resources and software are used to assess targeted areas within the university's built environment. Projects are identified and prioritized based on audit findings.

There is no formal process that analyzes accessibility; however, accessibility is discussed as they relate to greater capital projects (AQ3). When possible accessibility features like door openers are incorporated into renovations or upgrades. Annual meetings are scheduled for projects planning with the criteria of consequence of failure, need, and the financial resources for execution (AQ2). The urgency of some projects may influence where capital expenditures will be allocated during that particular budget cycle, he added.

Much of the accessibility projects processed through PO were in reaction to a report filed from AAS. The need to be more proactive was expressed (AQ7). Awareness of some access issues may go unnoticed. Some projects are not identified until they are reported as concern (e.g. automated doors within the Faculty of the Environment). PO does not provide a formal reporting outlet for people with disabilities. All access concerns are expected to generate from the AAS (AQ4). Since the AAS is student oriented, faculty and staff report their concerns elsewhere (e.g. human resources).

Director, Business Services

Within PO, information systems, fiscal resources, government reporting, accounts payable, and key control are interests handled by the Business Services department. Former director Gene Starchuk provided senior level executive oversight to the business interests (CQ1). In that role Starchuk recognized that budgets dictated accessibility in the built environment.

There is a division of provincial funding allocated for capital repairs and operations. PO designated where financial resources were allocated. Previously, PO received \$1.2 million for facilities renewal to address safety, deferred maintenance issues, accessibility, energy saving, and capital repairs. "It is small money for a campus of this size," Starchuk said (CQ10).

Unpredictably, additional funding manifests periodically. Every three to six years the provincial government provided additional money for the university. Starchuk suspected that the funds were

leftover year-end money or spending perhaps designed more to get votes than solve problems. In 2009/2010 there were two grants for \$9.1 and \$33 million dollars. Unfortunately there were short time frames for spending the funds on capital repairs, he added. While accessibility was improved, high priority concerns were addressed first.

Accessibility projects were allocated \$25,000 per annum. The figure was based on previous allocations in the budget cycle for AAS. Annual allotments remain at \$25,000 annually; however, additional resources are added as needed. In the recent past, provincial grant money was used to upgrade three elevators on campus. The cumulative cost exceeded the \$25,000 (over \$800,000) (CQ10).

Starchuk acknowledged that issues cannot be resolved if they are not reported (CQ4). The reporting of accessibility concerns to PO was expected to generate from AAS. However the line of communication may be broken with the staffing changes in AAS. If non-accessibility related issues are reported directly to PO, a work order is created for inspection and potential remediation. High priority issues are addressed immediately (e.g. burst water pipe is high priority) Low priority issues may have longer repair timelines (e.g. small crack in the sidewalk is low priority).

The prioritization of projects is related to the consequences of failure. Starchuk's example was that a failing roof may have greater consequences than upheaved curb cut. Related to those concerns are the associated costs. Project pricing, adjusted year-to-year, is used to predict maintenance while prioritizing projects and their associated funding requirements. Much of the prioritizing analysis is conducted through VFA software (CQ6). Their audit of systems and buildings is entered into a database where a numerical rating is assigned from 1 to 5 based on the expectation of failure. The rankings are:

- 1 = on verge of failure or has failure,
- 2 = will fail in one or two years,
- 3 = may fail in 3 to 5 years.
- 4 and 5 = safety issues and adaptation (e.g. modernizing classrooms).

Projects were prioritized or weighted based on different criteria. System failure had a different weight compared to safety.

Starchuk added, that the AAS should produce, maintain, and gather information to create an ongoing list that captures the deficiencies of accessibility in the built environment (CQ7). An open line of communication between AAS and PO may assist in setting priorities and securing funds. AAS

staffing changes may influence the communication. Furthermore, access issues may still be deferred if level 1 or 2 projects emerge.

New building construction was seen as an efficient way to implement access. Expanding space requirements and upgrades furnished the opportunity for new buildings. Starchuk claimed that new construction is when the AAS should be involved in design or renovations of buildings. “Currently, design staff, architects, engineers, consultants, and PO staff are involved,” he said. Often access was not at top of the list. Meeting the minimum requirements through adherence to building codes was meant to address accessibility concerns. “We should try to set sights higher in access and energy efficiency,” he continued. The example provided was that new designs would be better with ramps with slope ratios of 1:15 instead of the minimum of 1:12. “There is no one advocating that,” he added.

The AAS should direct the university towards improving access (CQ7). Starchuk felt other departments, such as payroll or human resources impose their directives on other departments. The AAS should educate departments in accessibility directives, which will inform departments of their capabilities to improve access. He observed that departments have the capability to convert washrooms or address other access issues out of their funds. Most often, issues were reported and PO set it within their list for capital repairs.

A proactive outlook was suggested where PO reviews the potential requirements of the AODA’s proposed regulations to anticipate which will become the new standards. Such an outlook would allow PO to plan ahead for accessibility. Starchuk’s recommendation was an attempt to be proactive in access provision (CQ7).

Accessibility is not only for the greater good or social responsibility. Increasing the level of equity is good business. Starchuk advocated for better access on campus because, “It’s the right thing to do.”

Director, Maintenance & Utilities

“We do a reasonable job on accessibility, given size of campus and multitude of access routes that people need to take throughout the campus,” said Rick Zalagenas, director of Maintenance and Utilities (AQ1). Extending accessibility any further was seen as a challenge; however, user input was welcomed to allocating resources in the right areas, he added. Efforts to reduce barriers (e.g. snow, construction) could be concentrated on desired routes identified from user feedback. User input was expected to originate from the AAS.

Communications of service outages or route closures were reported to the AAS (AQ4). Barriers had occurred from construction or renovations. Strict construction deadlines needed adherence or risk having project funding rescinded, which resulted in unexpected barriers. When service outages are forecast, the AAS is responsible for making alternate arrangements for students that may be impacted.

Any number of departments may identify issues for PO to address (AQ4). Multiple channels of reporting issues were said to exist. PO's 24-Hour Service and Maintenance Line are appointed to handle most service related concerns. It is expected that access issues originate from the AAS.

To be more proactive, the university (along with other Ontario universities) collaborated to invest in capital asset audits (AQ6). The audit level of detail is determined by the university and the last audit was conducted 5-year ago by VFA Canada Corporation. Depending on the level of analysis requested, accessibility code violations may be reported. A high level analysis of systems (e.g. heating, cooling, water) was performed in the last examination, which did not include access issues. Other categories may subsume issues of accessibility. Zalagenas cited flooring as an example of categories that indirectly include accessibility. Repairs of heaved flooring did not report as an access issue, even though stable flooring is a barrier-free pathway issue. Addressing the issue for structural integrity was the primary concern.

In the last ten years the university has been driven to upgrade aging elevators (AQ5). However some elevators have yet to be upgraded since they are operational. Should there be a request to upgrade functioning elevators then the faculty or department will have to cover the expense.⁷ Furthermore, various elevators on campus are considered part of the aging stock that may need replacement. The Technical Standards and Safety Authority (TSSA) began to phase out hydraulic lift elevators in the province (AQ8). The elevator type was often used in mid-rise buildings. The operating hydraulics can fail with age as seals wear. The university has steadfastly maintained their elevator stock. Yet the TSSA makes few exceptions. The phase out was meant to protect people from derelict landlords of buildings. The change left little recognition for organizations that regularly maintain their elevator stock. Eventually inspectors may shut fully functional elevators down regardless of documented maintenance. Zalagenas recognized that, “public and semi-public institutions can't afford to let those things [elevator maintenance] go, because the risk is too high.”

⁷ Two types of PO projects were highlighted. The first type was work orders the second was work requests. The former resolves breakage issues. The latter were requested projects. Work orders are funded by PO budgets to maintain university operations. Work requests--carpet changes, heating-cooling temperature verification—are projects that are departmentally funded.

Since the elevator industry is heavily regulated, few companies exist to provide service and installation. The limited number of companies created a demand that has backed up projects by 12-months. A reported problem was that funding allocated to address problems had a fixed timeline. Projects that could not be serviced in a specific timeframe risked losing the capital allocation (AQ5).

Capital repair budgets have many interests competing for funds. Elevators have been costly. Due to the age of the university, much of the roofing stock reached the end of their lifecycle. Zalagenas reported the budget allocation for 2015 was simplified by the roofing demand; three new roofs were scheduled for replacement, which exhausted the capital budget for the year.

In an additional effort to be proactive, Zalagenas participated in an exchange of ideas among other PO administrators (AQ2). The Ontario Association of Physical Plant Administrators meets annually and is a forum for communicating ideas or best practices (AQ7). Opportunities arise for efficiencies, group “request for purchases,” or to purchase commodities at wholesale. Ideas that may facilitate accessibility would permeate within its members.

Director, Custodial & Grounds Services

There was an expressed concern to provide independent access. “We want to make sure people are able to get around on multiple surfaces – even in winter,” according to Tom Galloway, director of Custodial and Grounds Services (AQ1). To ensure independence PO sought guidance from the AAS on where to focus resources based on reported student need.

The communication link between PO and the AAS serves as a reporting device (AQ4). PO relies on information from AAS to prioritize student accommodations. “If a student with mobility issues has a 10 a.m. class, we make sure to clear their route by a certain time,” Galloway added. Student turnover by term may manifest new needs and priorities.

There are multiple channels to communicate issues (e.g. snow removal, heating concerns, building maintenance). None are designated for reporting accessibility issues. AAS has been the outlet for students with disabilities to express their concerns. The Student Success Office (SSO) maintained a blog that was monitored for PO concerns. Galloway stated that heating issues were posted on the SSO blog (and to Twitter). Their staff monitored the blog and forwarded the concern to PO. Nevertheless, PO expects reported access issues to originate from the AAS. It was stated that the AAS is involved or consulted in the remediation of the issue (AQ5).

While there were procedures to facilitate operations there were no formal systems used in the

management of custodial and grounds services. Galloway felt it is uncertain that a system could be employed to improve accessibility (AQ3). There is little familiarity with the benefits to using a management system; however, an in depth look at the potential may illustrate the merits.

Accessibility is a focus in the department. Nevertheless, Galloway places a portion of the responsibility of compliance on architects. It is in their design stage where compliance should be incorporated in design of new facilities, he added (AQ8). Any post-construction or modification initiatives were expected to develop from AAS.

4.2.3 GROUP 3

The next two interviews were participants from outside of the study site. These external perspectives present insights to providing accessible experiences, being proactive, and seeking feedback from persons with disabilities.

Restaurant Manager

A local restaurant manager provided understanding for creating accessible experiences. Their insights showed how accessibility can affect a person with a disability. Intuitive customer service elevates the dining experience. The participant manages a restaurant in the Region of Waterloo.

Their perspective from the beginning was to the point, “everybody should have an enjoyable experience regardless of ability.” To facilitate satisfaction staff assesses customer needs (DQ1). Elderly people may prefer a quieter section of the restaurant to account for hearing issues. People with mobility devices may need an area where staff and patrons can move freely (DQ5). Based on repetition of similar need, sections of the restaurant become designated to particular accommodations.

The manager expressed a heightened sense of empathy and hospitality that increases over time. The added sense allowed the manager to observe patrons and their satisfaction. Disposition and body language offered cues of dissatisfaction that needed remediation to improve the experience.

An example given was that visual cues communicate to the host apprehension for a seating selection or other preference (DQ4). Visual cues might be obvious for some but not so much with others, they added. People with disabilities need to make their preferences clear to ensure an experience to their liking.

The restaurant gains customer feedback through four channels (DQ4). In-person interactions with customers gain immediate feedback to satisfaction. Passive options include website feedback,

comment cards, and the electronic reservation system *Open Table*. Website feedback and comment cards rely on the customer's willingness to express their concern. *Open Table* acts as data storage for customer preferences. Users willingly interact to book tables and select dining preferences; furthermore, the system inquires for a review of the consumer's experience. The retained data is amended when new preferences are reported.

The reservation tool was one method to make people feel comfortable. Businesses that extend themselves to increase customer satisfaction have greater viability. "That's the competitive advantage – the more helpful you are and the more welcoming you are to everybody – the better you're going to do," they stated. (DQ3)

In a service industry it is not just the customer in the facility *now*. Their return to the location will depend on a quality experience. The restaurant that strives to provide a quality experience will see guests return. This focus on quality extends beyond accessibility, to people with limited tastes or dietary restrictions. The manager added, accommodation by the business gains favor that it results in "better advertising than you can pay for" (DQ3).

Project Manager

This interview highlights how proactive attitudes can develop and sustain accessibility. The advantage of their proactive campaign manifested when mandatory legislation was enacted, targeting public transportation. Former Operations Division manager Joe Marie stated the Massachusetts Bay Transportation Authority (MBTA) worked to make the transit system accessible before accessibility legislation was enacted. At the early onset, temporary service provisions were utilized to offer a minimum level of accessibility (e.g. MBTA operated paratransit) (EQ8).

Community engagement was cited as a key for progressing the MBTA system in Boston, Massachusetts (EQ6). The complexity and age of the transit system presented numerous impediments (EQ2). People familiar with the barriers they encounter could voice, not only concerns, but also potential solutions (EQ3). According to Marie, the MBTA sought user feedback through the Transportation Access Advisory Committee (TAAC). The open exchange between staff and riders allowed discussion about quality of service. The TAAC was a vocal disability group that worked with the MBTA to develop solutions to access.

The relationship with advisory committees allowed for exchange and transparency that builds trust and avoids costly litigation. There were constraints to providing access. Marie expressed that their

communication channels created an exchange of concerns and feedback. A result of the transparency was that plans for remediation were more accepted even if there were lengthy timelines. Not everyone could be satisfied but the communication allowed for a greater majority of acceptance.

Internal commitments within the MBTA helped to move the organization towards greater access. The management buy-in aided in moving accessibility forward in their directives (EQ6). According to Marie, instructions from the Chief Operating Officer required that the Office for Transportation Access develop mandates that move closer to goal achievement.

Accessibility may be viewed as compliance to standards. On a personal level, Marie viewed access as a civil rights issue that not only provided equity but also created inclusive environments for people with bikes and strollers, which resulted in an increased market share. Providing a comfortable experience for people of any ability and communicating with the end users strengthens trust that helps to gain competitive advantage. Marie added, maintaining access was not only good business but also the increase of transit use allowed for more fare box recovery and increased viability (EQ6).

4.2.4 GROUP 4

One participant agreed to enlighten the study on quality management (QM). The knowledge gained from the interview reinforces the researchers beliefs that accessibility can improve through a quality management framework.

Industrial/Organization Research Professor

To permeate the various levels of an organization it is important to understand the organizational culture, the participant stated. Leadership is required to influence behaviors towards the goals of Quality Management (QM) (FQ2). Without management acceptance to utilize QM, the level of success may be in question, they added.

The effective dissemination of QM targets should foster goals and objectives at each level of operation. Clear communication should permeate each level and not exist as a top-down directive. However, strong management support will be necessary, they observed (FQ4).

The concept of QM was not a directive that declares quality as a goal. Furthering quality demands analysis of processes that foster, create, and maintain a desired output. The participant stated, that positive attitudes were not enough to produce quality. It requires implementing quality assurances into various processes (FQ6).

Ongoing monitoring is used to maintain resilience within processes (FQ6). Flaws in operational processes will yield unfavorable results, they noted. Regular analysis of a process allows for the mitigation of undesired outputs. Monitoring enables improvements to be made in smaller, perhaps more affordable, increments. After alterations are made, monitoring will determine the effectiveness of the adjustments.

The findings from the interview content begin to describe the landscape of accessibility on the university's campus. There were some recurrent insights throughout several conversations. Those perceptions will be developed in the next chapter. The next section will provide findings from field observations collected at the study site.

4.3 OBSERVATIONS

This section presents the field observations that were obtained on the University of Waterloo's main campus. The listed facilities were assessed for measurements that develop the bounds of accessibility. The researcher's use of a wheelchair facilitated, with great clarity, the identification of elements with good access, as well as places with deficiencies, within the site. Measurements were made systematically and are used as supporting information in the sections that follow. Incidental observations were collected to further illustrate a state of accessibility. The collected content will be used to compare accessibility at other areas of the study site. Technical measurements of access are presented in the appendices.

4.3.1 BUILT ENVIRONMENT

WALKWAYS

To facilitate this study and provide quality analysis, six points of origin were selected around the University's Ring Road. The purpose of the exercise was to determine where a person with an impairment would have to go in order to reach the same destination as an able-bodied person. The origins were points of high pedestrian volume. While precise pedestrian counts were not performed there were several casual observation to support the locational choices. Data was collected along two east/west routes and one north/south route. The utilization of problem assessment method led to the documentation of several possible access issues along the route. The procedure is where assessments are made and recorded at points where there is a change in the normal characteristics of the route. Measurements and photo evidence were collected at problem areas.

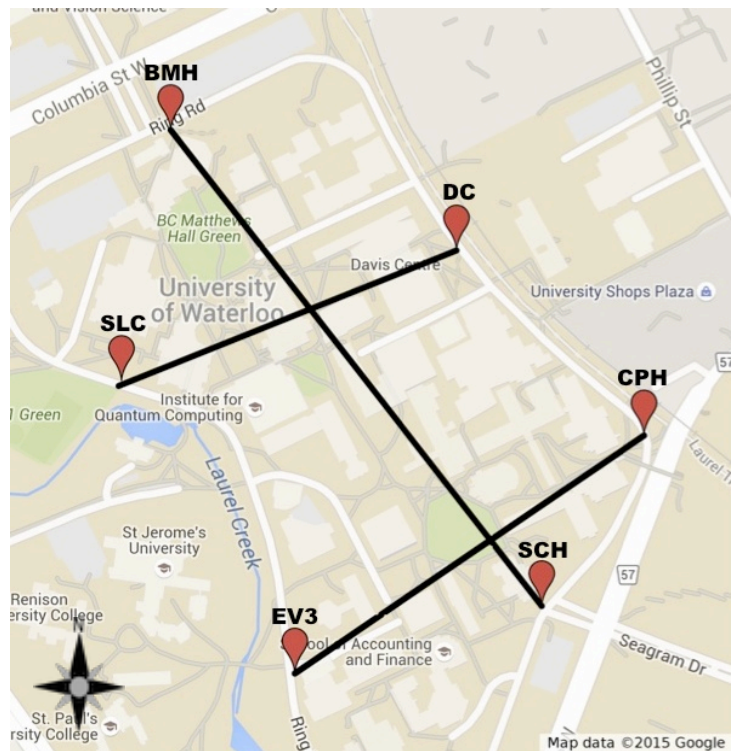


Figure 4.1: Map of origins and associate routes. Three routes were generated from the connection of six points around the university's Ring Road.

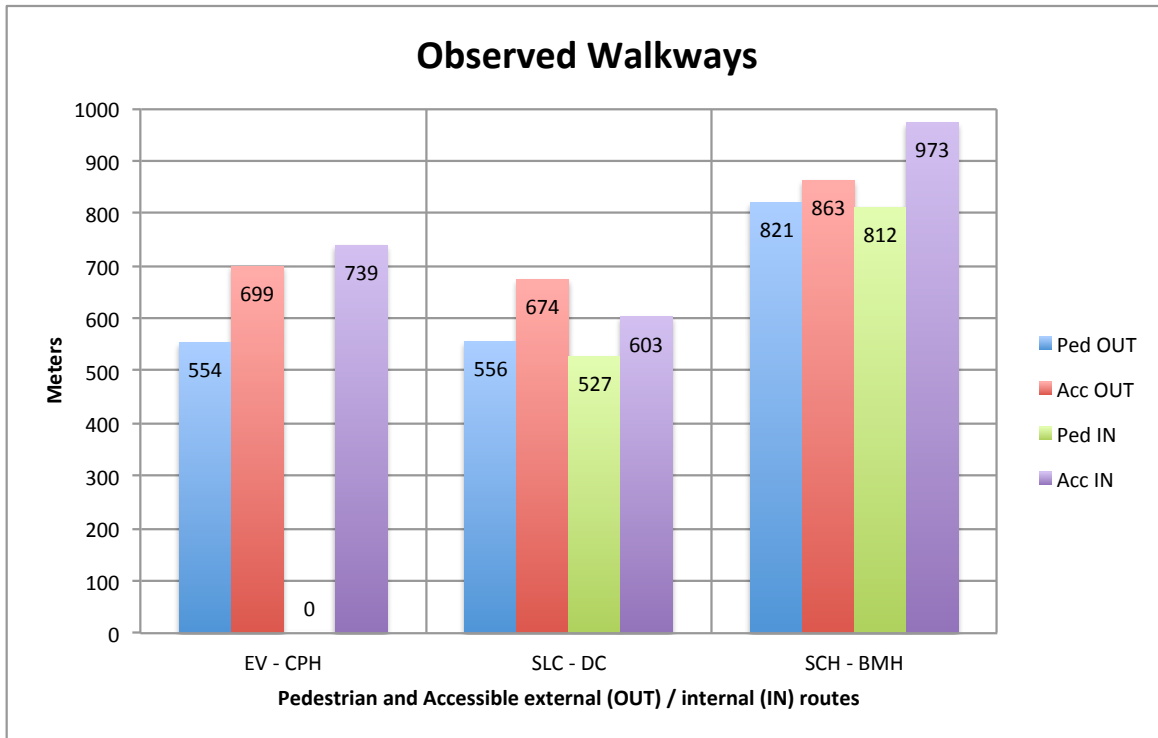


Figure 4.2: Chart of observed walkways. The bars represent the length of the observed routes. The difference between the accessible and pedestrian route is evident. The zero value of the EV-CPH route indicates that there was no probable route that enters or exited a building that would save time.

The six points of origin are: Student Life Center (SLC) area, Environment 3 (EV3), South Campus Hall (SCH), Carl A. Pollock Hall (CPH), William G. Davis Computer Research Center (DC) area, and B.C. Matthews Hall (BMH). The three routes developed from the origins are: SLC area to DC area, EV3 to CPH, and SCH to BMH. Figure 4.3.1 is a map that illustrates the selected points and their cross-campus connections.

In addition to the access issues, distances were calculated to demonstrate the difference between pedestrian desired routes and accessible routes. The findings are illustrated in Figure 4.3.2 the Observed Walkways chart.

The chart reveals that accessible routes tend to be longer than pedestrian routes. The zero-value of the pedestrian route from EV to CPH was because no buildings were in the direct path between the two points. There is not a drastic difference between accessible and pedestrian routes. However, in the course of a day the extra distance could develop as a limitation. The characteristics of the routes will be highlighted in great detail in the next section.



Figure 4.3: Observed routes and waypoints. Three routes are displayed in different colors – green: EV to CPH; blue: SLC area to DC area; pink: SCH to BMH. Places of pathway inconsistencies (e.g. holes in pavement) were plotted with waypoints along the routes.

The following sections are summaries of findings from the observed routes. Detailed descriptions of each issue are documented in map form on Google MyMaps. Figure 4.3.3 is a map of the observed routes as plotted by a gps unit. Along the route numerous waypoints were collected at places where an inconsistency in the walkway characteristics was noted. An interactive look at observed elements that may affect accessibility can be seen at the following link: (<https://www.google.com/maps/d/edit?mid=z-vCJTkd1rTI.k8o2pBDaxCCo&usp=sharing>). Due to the application’s limitations a list of issues with photos is provided in Appendix E.

Legislated Guidelines

Specific measurements for walkways were attained in the examination of secondary sources. The OBC provides guidelines for the construction of barrier-free facilities. Pathways, ramps and curb cut guidelines were examined for their influence on the observations.

Paths should be unobstructed, slip resistant, and stable with 110cm of clearance. Any grates in the path should not have openings greater than 1.3cm. Any change in levels should not exceed 1.3cm – anything greater should have a ramp or sloped floor.

Ramps in barrier-free paths of travel should have clearance of 90cm between handrails. The slope of the ramp should not exceed 8.33%. Ramps longer than 9m should have a level area between sections also if the ramp changes direction. Barrier-free paths with inclines greater than 5% should be designed as ramps. To assist in comprehension an illustration of inclines has been provided. (See Figure 4.3.4.)

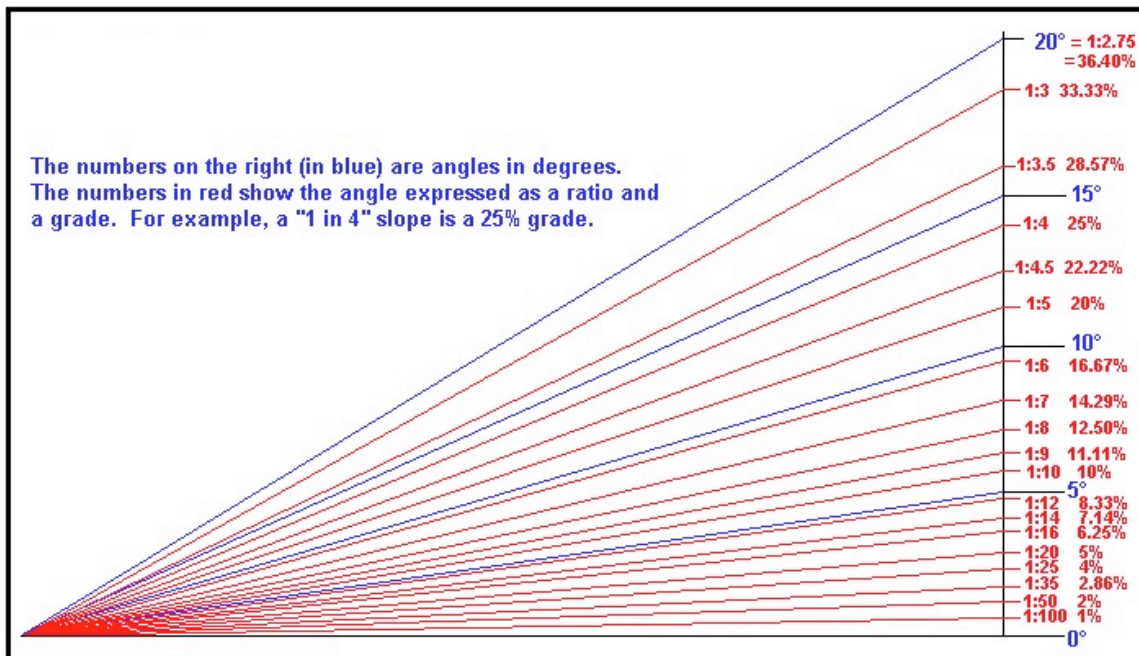


Figure 4.4: Illustration of slopes and their ratios. There are many percentages and ratios discussed in the OBC, AODA and this study. The illustration aids in understanding what a discussed incline may look like. (Image source: www.1728.com)

Curb cuts should not have slopes in excess of 8.33%. The transition between surfaces should be smooth and slip resistant. Furthermore the color and texture should be different for easy detection.

The AODA guidelines for exterior pathways correspond to the measurements of the building codes. There are slight differences in measurements by a few millimeters. An example is the clearance for pathways is 120cm to 150cm as compared to the 110cm requirement of the building codes. The clear width of ramps is consistent for both measurements at 90cm. Specific dimensions of accessibility infrastructure were collected to illustrate how access compares to regulation.

The precise measurements and language of each guideline has been provided in Appendix F. The content of the appendices are excerpts from the guidelines. The exact content is given to avoid misinterpretation of the subject matter.

The next section is data gathered from observing three routes across the study site. The measurements of the guidelines help frame the findings along the routes. The details of the routes are listed below and in supplementary information provided in the appendices.

4.3.2 ROUTE OBSERVATIONS

EV3 to CPH

(Pedestrian route = 554m / Accessible route = 699m)

Observation began at the service road adjacent to EV3 and progressed eastward.

Three storm water grates in close proximity presented a hazard for mobility devices with small wheels. The holes in one grate are not horizontal aligned with the slope of the terrain. Inattention to crossing this structure on the downward grade could and has led to wheeled mobility devices seized in the grate.

The transition between surfaces of alternate materials presented locations where the integrity of the surface was compromised. Walkways that changed from asphalt to brick pavers (or vice versa) presented limitations. One location had asphalt at a higher grade than the level of pavers. The grade separation reduced the ease of use and increased travel time. On a larger topographic incline the transition zone had a slope that ranged 5° to 10°. The grade separation and incline required greater effort to traverse. Other transitions were scarred with broken asphalt.

Large sections of asphalt had seams where the gap in the surface created a foothold for erosion. Gaps over 2.54cm were large enough to cause a wheeled mobility device to cease forward momentum. Eleven separate instances were documented as issues related to seams or broken asphalt. The instances on the slope outside SCH are particularly hazardous. The uneven levels of asphalt in the same section can create unsure footing or affect people with balance issues. Sections at the front of SCH have similar issues with heaving or below grade sections of walkway.

Five curb cuts along this route share similar faults where the transition in grade and surface materials limit effective use. Gaps in the material surrounding curb cuts, combined with steep inclines impede steady forward momentum. One noted curb cut on Ring Road (crossing from the west side of SCH towards University Avenue) does not align with the crosswalk. The misalignment created a longer crossing distance for people with disabilities by 1.20m.

The pedestrian route and accessible route share similar paths for long distances; yet, the terminus for each route does not align. Pedestrians cross at CPH directly to far sidewalks that join routes along University Avenue. Level curb cuts are present on the inner side of Ring Road, but are absent on the far side. People with disabilities need to go farther around Ring Road to cross and return for a combined distance of 118m to keep on the same trajectory as able-body pedestrians.

SLC area to DC area

(Pedestrian route = 556m / Accessible route = 674m)

Observation began at the accessible pedestrian crossing of Ring Road to the PAC service road entrance and progressed eastward.

The direct pedestrian route, not observed, was impeded by a set of steps at the north side of SLC. The route with stairs is 529m. The observed route was perceived shorter since the unobserved pedestrian route had stairs in its path. An alternate accessible route will be discussed later in this section.

The transitions between surfaces of alternate materials created challenges. The change in grade or materials had offsets that ranged from 1.27cm to 10.16cm. The offsets may be hazardous if unnoticed by users. There were five places on this route with transition issues. Similar transition issues were experienced at seams, cracks, or fragmented surfaces. Places where pavement or brick pavers deteriorated had surface inconsistencies. Seven different locations along the route had some form of the issue. One seam in the pavement measured 12m long. Other places where the pavement was fragmented covered the width of the walkway. The depths in some fissures were almost nonexistent to 2.54cm. Neglecting repairs of these issues may lead to worsening conditions and may develop as barriers to access.

There were numerous curb cuts along the route. Six different curb cuts were identified with some level of difficulty. A common problem was the transition between the surfaces over the curb itself. Many locations were difficult for a person in a mobility device. The protruding concrete of the curb acted as a barrier that impeded forward momentum. There were curb cuts where material was missing creating a below grade depression. Caution was exercised at several curb cuts that were hazardous.

An alternate route was estimated to be the most direct for accessibility. Topography served as an advantage in two places along this route. The downward slope from the start of the observation point (across from PAC service road) to the south side SLC pathway was a more probable route since the

ascent had greater ease. Descending the slope reduced time and effort in a 205m stretch. The 661m-route between destinations was shorter than the route that progressed around the PAC. Travel east to west (DC to SLC) was similarly aided with a 160m downward slope on the DC/E3 service road.

There were eight different curb cuts with issues equivalent to ones listed above. Similarly to previously described issues, there were two places with surface inconsistencies. One location was a large 90m² area of inconsistent pavement comprised of fragmented pieces, cracks, and seams. Along this route there was a preference to use the roadway (traveling from the front of DC to back of ESC). The roadway surface was favorable as it was smooth and consistent compared to the sidewalk. Walkways with pavers had a slight gap every 16.51cm. Each gap created friction to forward momentum. Paved surfaces were smoother (with noted exceptions) and had less friction.

SCH to BMH

(Pedestrian route = 821m / Accessible route = 863m)

Observation began at the south side of SCH and progressed north along a path PO calls “the spine.”

The distance between the front of SCH and to the northeast corner of TC was observed on the EV3 to CPH route. A quick visual inspection was performed on the 148m walkway to ensure no new issues had manifested. Observation began at TC. Since there was two directions that could circumnavigate the Grad House green, the pathway from the back of SCH was observed to where each path connected at the northeast corner of the DPL.

Similar to the other observed walkways there were issues with transitions, surface inconsistencies, and curb cuts. Four transition issues were highlighted where the difference between grades created difficulty. Separations in grades were noted in a range between 1.9cm and 4.44cm. Surface inconsistencies manifested in many locations as broken paver stones. Numerous points were observed where a broken paver created a hole in the surface of the walkway. Some depths measured up to 2.54cm. Two sections next to BIO1 and BIO2 had large areas with numerous broken pavers. The combined sections had an estimated area of 750m². The affected section experiences high pedestrian volumes. A 49m section of the path is on a downward slope. Navigation of a wheelchair through this section required numerous serpentine movements to avoid potential hazards.

There were three locations where pavement was cracked or had a seam that could be problematic. One fissure had a depth of 6.35cm on a downward slope. The other two issues were places of broken pavement.

Utility covers, storm water grates, and water mains created issues on the route. The utilities presented issues where portions of the materials were above or below grades. Transition issues on or around the items could be hazardous.

Curb cut issues were minimal since the internal route had very little road crossings. Three issues were noted. Two on Ring Road were deteriorated and crumbling. The roughness of the brickwork and concrete created transition issues. The third had a 10° cross slope with protruding concrete that created a barrier. The issues are similar to ones noted on previous routes.

Observation of the direct route was halted by unreported construction of the pathway that crosses the green at BMH. 15 pedestrians were unimpeded by the construction, as they were able to cross the green. The observation route bypassed the east side of M3 and ERC and terminated at the north side of BMH. The detour added time and distance to the accessible route. The accessible route had 106m of additional length.

4.3.3 FACULTY AND SERVICE BUILDING OBSERVATIONS

The following sections are observations made of the university's built environment. Since multiple cross-campus walkways were observed, determining where students terminate was difficult to assess. To illustrate accessibility, buildings with the largest and smallest classroom capacity were observed for each of the six faculties. Furthermore, centers for student activity were represented at four service buildings, which were observed. Most buildings selected are positioned along an observed route.

The buildings were observed for their accessibility features. Measurements, notations, and photos were collected to show the accessibility in place. The findings are then framed against regulations for accessibility. Newer buildings provided greater ease of use because they adhere to current regulations. Older buildings with newly installed accessibility elements presented issues that may impede effective use. Organizations are not mandated to upgrade facilities built prior to the passage of new guidelines (except if the building undergoes major renovation). However, organizations recognize the need to provide access. Often accessibility is retrofitted into older structures, which is complicated by the constraints of the existing form. Some of those complications are highlighted in the findings.

The next section highlights aspects to accessibility legislation that were important to the observations made at the study site. Various measurements have been provided to give the reader some conception of what was observed and how access should look. Relevant guidelines to specific facility requirements are presented. Appendix F has the precise language for specifications.

Legislated Guidelines

Specific measurements for accessibility were attained in the examination of secondary sources. The OBC provides guidelines for the construction of barrier-free facilities. Various guidelines were examined for their influence on the observed built environment. Specific aspects of the codes are discussed because they were important to representing the current accessibility at the study site.

Entry – Buildings over four floors should have two accessible entrances with doors that have a passage clearance of 86cm. Entry doors in a barrier-free path of travel should have door openers. The entrances should be marked with the International Symbol of Access. The symbols designate that location or walkway as accessible. Ramps and barrier-free paths of travel should conform to the standards previously described in the walkways section.

Washrooms – To ensure accommodation, the OBC requires one universal washroom for buildings that are one to three stories tall. The required number of washrooms increases in correlation with the addition of stories. Furthermore, the number of accessible toilets must adhere to a ratio that is proportionate to the amount of non-accessible toilets (referred to as water closets in the OBC). One accessible stall must be provided for up to nine regular stalls (unless a universal washroom is provided on the same floor).

Washroom fixtures have height and placement requirements outlined in the codes. Paper towel and soap dispensers cannot be higher than 120cm from the finished floor. Sink fixtures should be automated or have lever handles. Mirrors should be placed at the back of the sink not higher than 100cm from the floor.

Seating – Many of the observed classrooms are considered assembly spaces with fixed seats. For assembly spaces with a capacity of 80 or less, two wheelchair-seating areas are required. Adaptable seating spaces have a ratio of one for every twenty seats. Spaces with 100 seats or over shall have a percentage of wheelchair and adaptable spaces provided. Barrier-free paths are a part of providing access to the seats.

Elevators – Several buildings had elevators where access to upper or lower floors was reliant on vertical transportation. The equipment is monitored and regular inspections of elevators are required. All elevators were operational during observations. Casual observations found outages that were unreported, which was in violation of the Customer Service Standard of the AODA. Since elevators are regularly monitored, observations of elevators were minimal with some exceptions that had

limitations or unique characteristics to use. Furthermore, the OBC requires elevators conform to standards set forth by the American Society of Mechanical Engineers in Appendix E of the ASME A17.1 / CSA B44, “Safety Code for Elevators and Escalators”.

The OBC will continue to legislate accessibility until standards of the AODA have been approved. Provincial government has not ratified the AODA guidelines for structures. Until the passage of the Built Environment Standard of the AODA the Ontario building codes govern new construction.

There are many more requirements than can be listed here. The precise measurements and language of the guidelines pertaining to this study have been provided in Appendix F. The content of the appendices are excerpts from the OBC and AODA. The exact content is given to avoid misinterpretation of the subject matter.

The next section presents data gathered from observing faculty and service buildings across the study site. The measurements of the OBC offer perspective to the findings of this study. The details of the buildings are listed below and in supplementary information provided in the appendices.

4.3.4 FACULTY BUILDINGS

The buildings selected for observation are based on classroom capacities. One or combinations of two buildings house a faculty’s largest and smallest classroom space. The capacity relates to the previously mentioned gravity model. The larger classrooms have the potential for higher use or activity, which creates a greater attraction. Smaller classrooms were selected to develop a contrast that may provide alternate views to accessibility. Furthermore, graduate courses are held in smaller spaces. The rooms provide an accessibility context for graduate students. The following buildings were observed for their accessible features. A summary of the findings is provided.⁸

Applied Health Science

B.C. Matthews Hall (BMH) Built 1972

Two accessible entrances for BMH were marked on campus maps. There was another that could be listed but construction blocked the route available to pedestrians at the time the research was conducted. The observed south entrance was marked with the international symbol for accessibility.

⁸ Room numbers indicate the floor of the building where the classroom or washrooms are located. Building names and abbreviations are consistent with the titles used on the “University of Waterloo Campus Map:” <https://uwaterloo.ca/map/?buildings=16&basemap=D#map=16/43.4706/-80.5425>

A north-south pathway on BMH Green was newly resurfaced. Concrete at the entrance was heaved and broken, which created a partial barrier at the transition between surfaces. The location of the button, for the operational door opener, was along the preferred path to the entry. The height of the door handles and opener button were of similar height to other observed locations, which is shoulder height to a person in a wheelchair. The pull strength of the door may be heavy should the door opener not function; especially since the adjoining door caught on the other, creating more opening resistance.⁹

To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. Access to the large classroom on the same floor was through a set of security-controlled doors that had restricted entry outside of normal business hours. The door openers in this corridor were functional.

The large classroom *BMH 1621* (Capacity: 93) had a slight transition into a door without a door opener. The door had a vertical bar handle. The weight of the door and the pull strength indicate that it may be better serviced with a door opener. There was access to both the front and back of the classroom. Access required the use of a restricted elevator to a lower entry into the front of the room. There was no designated accessible seating at the front of the room. A table, placed along a wall, could be relocated to accommodate seating in the front, but it was not set up for easy use. The lack of integrated accessible seating in the front of the room gave preference to the “barrier-free” seating options at the back.

The accessible seating area consisted of three spaces of which two had desks. The seats were located to the left and right at the back of the room. The small accessible desks were fixed to the floor. Their height had clearance for a person in a wheelchair. The rest of the seating in the room consisted of fixed tablet armchairs. Placement of the emergency procedures was at the front of room. The procedures are posted above eye-level of a person in a wheelchair. The procedures are posted above eye-level of a person in a wheelchair. A second set may be useful at the back of the room.

There was ample space for the circulation of students at the front of the room. The classroom’s e-podium was high for a person in a wheelchair but there was adequate clearance between the podium and the whiteboard. A large cabinet blocked access to the room controls (lights, projector screen).

Accessible washrooms (Women #1624 and Men #1625) –The nearest accessible washrooms were 3m from the classroom. The two washrooms had many identical features and measurements with

⁹ The pull strength is a measurement of the weight or force required to physically open the door.

highlighted exceptions. Each washroom had the appropriate signage and neither had a door opener. The entry doors were heavy. Holding them open, while passing through, was slightly impeded by the persistent weight of the closing door. Entering the doors was without any substantial transition between floor surfaces. Each door opened against a wall, allowing entry into the space within.

The accessible stalls in men and women's washroom were nearly identical in size. The placement of the toilet and associated features were opposite; however, the arrangement did not limit use. Fixtures like soap dispensers, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations. Each of the washrooms had sections of the counter removed to allow more clearance beneath the sinks. The sink fixtures in the accessible space had lever handles to accommodate people with limited dexterity.

The small classroom *BMH 3701* (Capacity: 12) was located in a renovated section of BMH. Access to the room required the use of an elevator. Access to floors two and three are elevator dependent. Any service outage of the elevator may complicate an individual's participation in a course held on upper floors. Furthermore, way finding to the room was labyrinthine by the arrangement of offices and corridors on the floor. People with mobility impairments need to navigate through the Applied Health Sciences department to gain access to the section where the classroom was located. Otherwise, stairs are located near the room for access to the lower floors. There was no emergency procedure information posted in the classroom. In this location such information would be important to people with mobility impairments to know escape routes in case of fire.

There was a change in grade at the entrance to the room. The exterior carpet indicated the start of the rise, but not well. The lever-handled door did not have an automatic opener where one would be beneficial due to the heavy pull strength of the door.

A full classroom would present difficulty circulating within the room. The tables and chairs were arranged to match the rectangular shape of the room. There was a wide aisle at the front of the room that provided a bit of circulation. The tables and chairs limited the space to move around with no one seated. Potentially every seat at the tables was an accessible seating area. The exception was where two tables join and the legs of the table blocks clearance of a wheelchair. Though the smaller classroom may hold more casual formats for courses, a tabletop lectern was available at the back of the room.

There were small metal boxes inlaid into the flooring of the room. Under the box lids were Ethernet ports for Internet connectivity. Some of the box lids were bent inward and the boxes themselves created uneven flooring that caught the small wheels of a wheelchair. Other boxes on the floor protruded above the floor grade. The boxes also may present a tripping hazard.

Accessible washrooms (Men #3804 and Women #3807) – The nearest accessible washrooms were 10m from the classroom. The two washrooms had many identical features and measurements with highlighted exceptions. Each washroom lacked the appropriate signage or a door opener. Entering the doors was without any substantial transition between floor surfaces. The men’s room door opened in a way that reduced access. The opened door limited the remaining space to the wall. The tight turning radius increased the difficulty for entering the washroom. Furthermore, placement of the trashcan next to the door further narrowed the passageway. The women’s room door had a more direct entry as it opened against the wall allowing passage into the space within.

The accessible stall in the women’s room was wider by 20cm; however, a chair that was placed in the stall subtracted from the gained space. The necessity of an additional chair was not clear but its removal would allow more room in the stall to accommodate mobility devices.

Fixtures like soap dispensers, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations. Each of the washrooms had sections of the counter removed to allow more clearance beneath the sinks. Similarly, each washroom had a heating fixture that protruded from the wall, which reduced the amount of navigable space to enter the accessible sink.

Each washroom had modern accessible features. The men’s room door and chair in the women’s room may be a bit limiting. There were no major barriers to using either washroom.

Arts

Arts Lecture Hall (AL) Built 1965

No exterior doors are marked with the international symbol for accessibility, yet, to the right of the entrance, there was a button to operate the functioning door opener. The pull strength of the exterior door was heavy. Regular maintenance or monitoring of the door opener may be necessary for the entrance not to become a barrier to entry. The button placement was slightly out of the preferred path of travel. Interior doors were appropriately labeled and outfitted with functioning door openers; again the button placement was not in the direct route. The height of the door handles and buttons were at

levels consistent to other observations. While there were broken or chipped floor tiles, none limited the ease of entry. To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair.

The large, two-story classroom *AL 116* (Capacity: 357) had a smooth entry into a door with recessed handles and without a door opener. The handle selection to enter the room may be a barrier for those with impaired fine motor skills; however, the pull strength was very light. There was access to both the front and back of the classroom. Access to the front required the use of the elevator and navigation through a utility corridor. The door to the corridor has a knob handle to enter. At the end of the corridor, a locked door at the front allowed access into the classroom (entry was gain by the aid of the able-bodied research assistant). The locked door may be an issue for regular unimpeded access. There were no “barrier-free” seating options at the front or back of the classroom.

The room consisted of fixed tablet armchairs. There was space for a person to sit behind a low wall at the back of the room. The front of the room may permit the placement of a small table for a student with a disability. A table placed next to the podium may be available for use. To avoid blocking students in the front rows, the seating position for students with disabilities may be awkward and too close to the front.

Placement of the emergency procedures was eye-level of a standing person at the right side of the room. The location made sense since it was next to an exit door at the lower level of the classroom. The procedures are posted above eye-level of a person in a wheelchair.

There was adequate clearance between the podium and the chalkboard. The modern e-podium was high for a person in a wheelchair. Reaching the touchscreen controls may be difficult for persons of smaller stature. The podium had a pullout area at a lower height; however, none of the operational features (computer and touchscreen control panel) reached the lower level. The problem with accessing the chalkboard or the podium was a 20cm step on to a platform. The step limits a person’s ability to use the equipment freely.

A water fountain in the hallway outside of the classroom had limited use for a person in a seated position. The area in front of the fountain was constrained by furniture. The high level of the waterspout was difficult to reach, as the fountain is recessed into the wall. The twist knob handle was limiting for people with diminished dexterity.

The nearest accessible washroom was 24.4m from the classroom and required the use of the elevator. If the elevator were out of service it would be possible to exit the main floor of the building, use the exterior ramp, and re-enter the lower floor to gain access to the washrooms. However, the lower entrance does not have a door opener.

Accessible washrooms (Women #1624 and Men #1625) – The two washrooms had many identical features and measurements with highlighted exceptions. Each washroom did not have the appropriate signage and neither had a door opener. The entry was slightly narrower than doors for modern washrooms. Entering the doors was without any substantial transition between surfaces. Each door opened against a wall, allowing entry into the space within.

Since the building predates accessibility legislation, accessible features were retrofitted, which created an odd configuration in the women's washroom. The accessible stalls in men and women's washroom were nearly identical in size. The placement of the toilet and associated features was opposite; however, the stall location in the women's washroom was closest to the entry. The jutting accessible stall presented odd angles to navigate into the stall door. Exiting the stall to use the sinks was complicated by the stall door, which opens upon a protruding shelf. The men's washroom accessible stall was placed towards the middle of the room and did not have the same effect on entry.

Fixtures like soap dispensers, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations. In each washroom, a larger sink basin was installed slightly higher for increased clearance compared to the smaller, older sinks. The sink fixtures in the accessible space had lever handles to accommodate people with limited dexterity.

Each washroom had accessible features. With the exception of the women's washroom configuration, there were no major barriers to using either washroom.

J.G. Hagey Hall of the Humanities (HH) Built 1968

The small classroom, for the Arts faculty was located in Hagey Hall. Two accessible entrances are listed on the campus maps. The accessible entrance on the north side of HH was closed due to construction (with no notice of closure). The remaining, marked, entrance was a less probable choice since the location of the entrance was not along any perceptible desired route. Furthermore, there were three other entrances that had accessible doors that were not listed on the campus maps.

The less probable entrance was observed as it was marked for accessibility. The curb cut access to the ramp was uneven with broken pavement on each side of protruding concrete. The ramp slope was

gradual, although the concrete surface at the top of the ramp was broken. The top portion had large cracks and holes that measured 2.54cm to 5.08cm deep.

No exterior doors are marked with the international symbol for accessibility. The button to operate the functioning door opener was to the left of the entrance. The button placement was along the preferred path of travel; however, the door opens into the path. The height of the door handles and buttons were at levels consistent to other observations. Interior doors were not appropriately labeled, but were outfitted with functioning door openers. The button placement was along the direct route. The pull strength of the interior door was heavy combined with an odd, disc shaped handle. Regular maintenance or monitoring of the door operator may be necessary for the entrance not to become a barrier to entry. To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair.

The small classroom, *HH 123*, (Capacity: 16) had two doors to enter with no transition of floor surfaces. The knob handle of the doors may be problematic for people with limited dexterity. The doors had no resistance to opening.

If the classroom were full, there would be difficulty circulating within the room. The tables and chairs have just enough clearance with no one seated. Potentially every seat could be an accessible seating area. The tables and chairs were arranged in accordance to the rectangular shape of the room. Two smaller tables and four chairs were against a wall adding to the congestion of the room. The smaller classroom may hold more casual formats for courses. The absence of a lectern or e-classroom system added to the relaxed feeling of the room.

The front and left sides of the classroom were too narrow for a wheelchair to pass. While each space around the table could seat a person in a wheelchair the actual spaces are limited to the right and rear of the room. Placement of the emergency procedures was eye-level of a standing person at the back of the room. The procedures are posted above eye-level of a person in a wheelchair.

A water fountain in the hallway outside of the classroom had limited use for a person in a seated position. The large metal cabinet of the lower portion to the fountain did not provide clearance. There was difficulty reaching the waterspout due to the height of the fountain. The push button activator may be limiting for some people.

Accessible washrooms (Women #167B and Men #169) – The nearest accessible washrooms were 85.5m from the classroom. The two washrooms had many identical features and measurements with

highlighted exceptions. Each washroom had the appropriate signage and neither had door openers. The women's washroom had two different doors for entry. The first was propped open; the second had a heavy opening strength and friction against the floor that could be limiting. Holding the door open while passing through was slightly impeded by the persistent weight of the closing door. Entering the washrooms was without any transition between surfaces. Each door opened against a wall, allowing entry into the space within.

The accessible stall in each washroom had different configurations but was similar in size; however, their size was narrower than modern accessible stalls. The placement of the toilet and associated features presented challenges to use. The men's room accessible stall had the toilet situated to the right of the space while the toilet paper and grab bars were situated on the left wall. The distance between the grab bars and the toilet reduced the effectiveness or usability of the fixture. The women's washroom accessible stall had grab bars on both sides of the stall. The placement of the toilet was on the left side where a grab bar and toilet paper dispenser was located. Both accessible stalls were confining for a person in a wheelchair.

Fixtures like soap dispensers, hand dryers, and sinks were placed at similar heights and locations. The sink fixtures did not have lever handles to accommodate people with limited dexterity. The mirrors in each washroom were too high for a seated person to use. The women's room had another mirror that was slightly lower that may allow more visibility.

Each washroom had some accessible features. While there were no major barriers to using either washroom, specific elements of the washroom may present some level of difficulty for people with disabilities.

Engineering

J.R. Coutts Engineering Lecture Hall (RCH) Built 1967

The one accessible entrance to the building was marked on the school's printed and electronic map. The international symbol for accessibility did not demarcate the entry; however a sign indicated an automatic door. In the foyer two separate buttons opened the separate sets of doors; neither indicated the button to the corresponding door. The location of the door opener button was along the preferred path to entry. The height of the door handles and buttons were at levels consistent to other observations. To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. The pull strength of the interior door may be

heavy should the door opener not function. Ground level access was restricted to the third floor of RCH. Access to floors one and two are elevator dependent. Any service outage of the elevator may complicate an individual's participation in a course held on the lower floors.

The large, two-story classroom *RCH 101* (Capacity: 352) had a smooth entry into a door without a door opener. The round doorknob to enter the room may be a barrier for those with limited dexterity; however, the pull strength was very light. There was access to both the front and back of the classroom. Access to the back requires the use of the elevator to the second floor and entry into doors that are too narrow for a standard wheelchair. Though there may be challenges to seating in the back of the room, it may be more favorable to some than the "barrier-free" seating options at the front.

Student seating in the room consisted of fixed tablet armchairs. The accessible seating area at the front consisted of five spaces without desks. Two spots were located at the left and right sides of the room. The three remaining spots were at the center. The central location may block the vision of students seated in the next row. There were three tables arranged for the instructor's use. One may serve as desk space for students with disabilities. The accessible seating positions may be too close to the front. Seating may be arranged at the back of the room, but the slightly narrow distance between the back wall and last row of seats may not permit the use of a table.

There was ample room for the circulation of students at the front of the room. The modern e-podium was high for a person in a wheelchair. Reaching the touchscreen controls may be difficult for persons of smaller stature. There was adequate clearance between the podium and the whiteboard. Placement of the emergency procedures was eye-level of a standing person above the third step at the right side of the room.

Outside the classroom, a modern water fountain had clearance that may be too low for a person in a seated position. There was an automatic water bottle filling portion that may offer better accommodation.

The small classroom *RCH 208* (Capacity: 30) had a smooth entry into a door with no automatic opener. The round doorknob to enter the room may be a barrier for those with limited dexterity; however, the pull strength was very light. There is access to both the front and back of the classroom. The room furniture consists of standard tables and chairs. Table heights were too low for the observer to sit under. Upon inspection there were a variety of table heights each as limiting. The space between the table rows was too narrow for most wheelchairs. The room configuration may restrict accessible

seating to the back of the room, which was more ample; however, a file cabinet narrowed the seat location that would have been preferred.

The classroom technology was an older model console system. The clearance under the console was too short for a person in a wheelchair. There was ample space between the instructor's table, console, and the whiteboard.

Accessible washroom (RCH #126) – The nearest accessible washroom was 6m from the large classroom. The distance to this accessible washroom was 24.7m from the small classroom (with use of the elevator). The universal washroom was demarcated with the international symbol of accessibility. There was no door opener, but the levered handle to enter had no pull strength. The door width allowed passage of a standard wheelchair. The light switch may be too high for people of short stature. The coat hook was too high for use. The dimension and placement of washroom fixtures were standard to most washrooms. A single grab bar aids transfers from a wheelchair to the toilet. The sink's pull knob for hot and cold water was stiff and may be limiting. A larger washroom on the third floor has accessible features. However, the first floor location was observed, as it was the closest washroom to the classrooms.

Environment

The Environment buildings presented an interesting maze of navigation that led to the examination of all three buildings. The campus maps list only one accessible entrance into EV2. There are three others that could be listed. Additionally, a maintenance entrance could be enhanced to create an accessible entrance exclusive to EV1 (across from accessible parking).

Environment 1 (EV1) Built 1965

The smallest classroom *EV1 225* had very limited space for a person in a wheelchair. EV1 does not have any direct accessible entrances to the outside. The connecting passages between EV1 and EV2 did have one entrance that led outside. The entrance lets out on a side of the building that does not directly lead to the center of campus towards more services and other lecture halls. An aging elevator facilitates access to the classroom from the lower floor. The corridors throughout EV1 have a considerable number of doorways. Passage through the numerous doors was limiting. It was especially distinct when navigating through two sets of doors to get to the nearest washroom.

Entering the classroom was slightly restricted with a narrow door. There was a smooth surface to enter. Once inside the furniture limited the seating options for a person in a wheelchair. Table heights

were too low for the observer to sit under. Upon inspection there were a variety of table heights, each as limiting. There was narrow passage around the tables and chairs with no one seated. If room were occupied then there would not be enough room to circulate. The tables and chairs restricted access to the chalkboard and audio-visual equipment. The one potential seating placement for a wheelchair was directly in front of the door. There may not be enough room for people to enter without brushing against a person's wheelchair.

Accessible washroom (EV1 #312) – The nearest accessible washroom was 82m, three sets of doors, and one floor up from the classroom. The central washrooms of EV1 were not designed for accessibility; nor had they been retrofit with any accessible features. A universal washroom was located on the third floor. There was no transition of floor surfaces through the lever-handled door without an opener, which would be beneficial to exiting the washroom. The resistance of the door and a privacy panel narrowed the exit pathway, which created difficulty.

The fixtures within are placed at heights consistent with other washrooms. The trashcan and a coffee table congest the useable space around the sink and toilet. The trashcan limits space under the soap dispenser at the sink's edge. When moved to access the sink and soap, the trashcan then blocked the paper towel dispenser. Placement of the trashcan would be best across the room closer to the exit. A coffee table blocks access to the coat hook and limits the space in front of the toilet. In multiple observations of this location, attempts were made to put the coffee table in the corner only to find it replaced to the previous location.

The ample space and privacy made this washroom preferable. The congestion of items, difficulty exiting, and remote location reduces the attractiveness of the washroom. With the noted exceptions, there were no major barriers to the use of the washroom.

Environment 2 (EV2) Built 1981

To access EV1, the campus maps indicated the entrance at Ring Road of EV2 for entry. The door had an opener for ease of use, which was helpful since the transition from the brick pavers was challenging due to the broken threshold. The height of the door handles and buttons were at levels consistent to other observations.¹⁰

¹⁰ Upon recent observations a portion of the walkways pavers were replaced. The transition into the building was reduced. The threshold was refastened, which generated greater ease of entry. It should be noted that the grade separation had been noted as an issue since 2010.

To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. The map was important for guidance to EV1. The path from EV2 into EV3 had two sets of heavy doors without openers. The two accessible entrances to EV3 were easier to enter. Campus maps should have the EV3 entrances and the second EV2 entrance on the map to avoid unnecessary navigation.

Since EV2 does not house the large or small classroom there were minimal observations conducted. It was noted there are accessible washrooms on the first and second floor of EV2. The accessibility within was not evaluated. However it was noted that the accessibility was not at the current standards that was observed in EV3.

Environment 3 (EV3) Built 2011

Two entrances to EV3 have door openers (one east side and one west side of the building). Transitions over the door thresholds were minimal. The west entrance's placement of the buttons for the door openers was awkward. Each button was placed on a far wall that added an additional 12m in distance to travel. Often more effort was needed to use the buttons than to open the door manually. Entering the east entrance had the buttons next to the doors, which made use of the buttons easier. However, exiting the east entrance has odd button placement that extends a person with a disabilities' traveling distance. The height of the door handles and buttons were at levels consistent to other observations.

The large classroom *EV3 1408* (Capacity: 144) had a smooth entry into the room with an operational door opener. There was access to both the front and back of the classroom. Access to the front required the use of a platform lift. The lift key had to be acquired from AAS. On three separate occasions the lift was not operational. In one instance the lift prevented access to the front of the room but seating in the back of the room had accessible space. On the second occasion the defective equipment prevented the efficient delivery of a lecture. In spite of the user following procedures well in advance of the lecture, AAS and PO were ineffective in providing accommodation. The last attempt to use the lift was initially unfavorable. However, operation was restored by an electronic reboot, which took an able-bodied person to manipulate the lever to reset the lift. The challenges to the functionality of the lift gave preference to seating in the back of the room, which may be more favorable to the barrier-free seating options at the front.

The room's furniture consisted of fixed tables with swivel chairs. The two accessible seating areas (front and back of room) consisted of six spaces with fixed tables and no chairs. The front seating area may be confined between table rows. The area at the back had ample room for passage.

Circulation at the front of the room was narrow between the whiteboard and e-podium. There was adequate clearance, yet not enough space for a person to pass another in a wheelchair. The modern e-podium was high for a seated person. Reaching the touchscreen controls may be difficult for persons of smaller stature. The podium had a pullout area at a lower height; however, none of the operational features (computer and touchscreen control panel) reached the lower level.

At the back of the room placement of the emergency procedures was eye-level of a standing person. The procedures are posted above eye-level of a person in a wheelchair. A large table blocked the procedures, telephone, and door opener button. The table should be removed for improved access.

An emergency exit to the building exterior had a small walkway that did not have a curb cut.

A modern water fountain near the classroom did not have clearance for a person in a seated position. There was water bottle filling portion that may offer better accommodation, but the controls were not automated.

Accessible washrooms (Men #1933 and Women #1934) – The nearest accessible washrooms were 12m from the classroom. The two washrooms had many identical features and measurements with highlighted exceptions. Each washroom had the appropriate signage. Entering the washrooms was without any substantial transition between surfaces. The washrooms were designed without entry doors.

The accessible stalls in men and women's washroom were nearly identical in size. The placement of the toilet and associated features was opposite. Fixtures like soap dispensers, hand dryer, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations to other modern washrooms. The automated sink fixtures accommodate people with limited dexterity. The placement of the soap dispenser was a long reach from the sink counter. Placement may be better suited on the left and right walls of the sink area. The hand dryer was designed for a standing person and may be the reason for the paper towel dispenser. The placement of the trashcan under the paper towels reduced access in both washrooms.

Each washroom had accessible features. With the exception of the soap dispensers and trashcan placement, there were no major barriers to using either washroom.

Mathematics

Mathematics 3 (M3) Built 2011

The single accessible entrance was marked on the campus maps. A poor transition between grades was noted at the curb cut leading to the ramp at the entrance (as previously noted in the walkway section). The gradual slope of the ramp led to the button, for the operational door opener, which was along the preferred path to the entry. The observed entrance was not marked with the international symbol for accessibility. Door handles and the opener button were of similar height to other observed locations. The pull strength of the door may be heavy should the door opener not function. The threshold at the entry had a slight transition that was complicated by a seam in the concrete. To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. The large classroom on the first floor was close to the entrance.

The large, classroom *M3 1006* (Capacity: 387) had a smooth entry into a door with an operational door opener. There was access to the front, middle, and back of the classroom. Access to the middle and front requires the use of a long ramp, but the ramp provided access without reliance on faulty technology.

The room consisted of fixed tables with swivel chairs. Five accessible seating areas were noted. Three accessible seating spaces are located at the left-center of the room. The two remaining spaces were at the rear right of the room. No accessible seating areas were at the front of the room. Placement of the emergency procedures was eye-level of a standing person at the right side of the room. The procedures are posted above eye-level of a person in a wheelchair.

There was ample room for circulation at the front. The modern e-podium was high for a person in a wheelchair. Reaching the touchscreen controls may be difficult for persons of smaller stature. The podium had a pullout area at a lower height; however, none of the operational features (computer and touchscreen control panel) reached the lower level. There was generous clearance between the podium and the whiteboard.

A modern water fountain in the hallway had clearance that may be too low for a person in a seated position. There was water bottle filling portion that may offer better accommodation, but the controls were not automated.

Accessible washrooms (Women #1902 and Men #1903) – The nearest accessible washrooms were 8.7m from the classroom. The two washrooms had many identical features and measurements with

highlighted exceptions. Each washroom had the appropriate signage. Entering the washrooms was without any substantial transition between surfaces and was designed without entry doors.

The accessible stalls in men and women's washroom were nearly identical in size. The placement of the toilet and associated features was opposite. Fixtures like soap dispensers, hand dryer, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations to other modern washrooms. The sink fixtures had lever handles accommodate people with limited dexterity. One exception was the women's washroom had one sink with a knob handle to activate the water. The placement of the soap dispenser was at each side of the sink counter. Trashcans in each washroom were placed under the paper towels, which reduced access in both washrooms.

Each washroom had accessible features. With the exception of the trashcans, there were no major barriers to using either washroom.

Mike & Ophelia Lazaridis Quantum-Nano Centre (QNC) Built 2011

A curb cut leading to the entrance of QNC had a steep incline. None of the accessible entrances are listed on the campus maps. The observed west entrance (along Ring Road) did not have the appropriate signage marked with the international symbol for accessibility. The location of the button, for the operational door opener, was along the preferred path to entry. The height of the door handles and opener button were of similar height to other observed locations. The pull strength of the door may be heavy should the door opener not function; especially since the adjoining door caught on the other, creating more opening resistance.

To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. The map was important in navigating to the elevators. The elevators are not located in the central lobby. Signage to find the elevators was absent.

The small classroom *QNC 2501* (Capacity: 42) had a smooth entry into a lever-handled door with no opener. There was access to the front and back of the room.

Three long rows of tables and chairs had table heights suitable for a person in a wheelchair. Furniture placement offered enough clearance for a person in a wheelchair to circulate when no one was seated. However, if the classroom were full, there would be difficulty to proceed around the room. Potentially every seat could be an accessible seating area. However, the last row at the back of the room offered more circulation space.

Circulation at the front of the room was narrow between the whiteboard and podium, which did not have enough space for a person to pass another in a wheelchair. The double-layered whiteboards presented a challenge when trying to reach an elevated board. The modern e-podium was high for a person in a wheelchair. Reaching the touchscreen controls may be difficult for persons of smaller stature. The podium had a pullout area at a lower height; however, none of the operational features (computer and touchscreen control panel) reached the lower level. Placement of the emergency procedures was eye-level of a standing person near the exit. The procedures are posted above eye-level of a person in a wheelchair.

A modern water fountain in the hallway had clearance that may be too low for a person in a seated position. There was water bottle filling portion that may offer better accommodation, but the controls were not automated.

Accessible washrooms (Women #2492 and Men #2493) – The nearest accessible washrooms were 21.3m from the classroom. The two washrooms have many identical features and measurements with highlighted exceptions. Each washroom had the appropriate signage. Entering the washrooms was without any substantial transition between surfaces. The washroom doors opened inward against a wall allowing for easier passage into the room.

The accessible stalls in men and women's washroom were nearly identical in size. The placement of the toilet and associated features was opposite. Fixtures like soap dispensers, hand dryer, paper towels, toilet paper, grab bars, sinks, and toilets were placed at similar heights and locations to other modern washrooms. The automated sink fixtures accommodated people with limited dexterity. The placement of the soap dispenser was a long reach across the sink counter. The placement of the trashcans under the sink counters avoided awkward placement in both washrooms.

Each washroom had accessible features. With the exception of the soap dispensers, there were no major barriers to using either washroom.

Science

Physics (PHY) Built 1959

As one of the original buildings on the university campus, accessibility may have had very little consideration at the time of construction. Much of the current access in the building was retrofit. Campus maps marked the one accessible entrance for the building. The walkway approaching PHY

was uneven. The entry, with an operational door opener, did not have the appropriate signage marked with the international symbol for accessibility. The height of the door handles and buttons were at levels consistent to other observations. To assist in way finding there was a floor plan on an interior wall near the entrance, placed above eye-level of a person in a wheelchair. From the lobby, a set of doors leading to the large classroom had a narrow width that almost prevented the passage of a standard wheelchair.

The large, classroom *PHY 145* (Capacity: 200) had a smooth entry into a door without an opener. There was limited access at the front of the classroom. The sloping floor of the classroom allowed access to the back of the room, but there was not an accessible seating area.

There were no accessible seating areas designated in the room. A seat was removed in the first row of fixed tablet armchairs. However, the incline of the location would not provide a suitable seating position. Furthermore, a person in a wheelchair seated in that position may block the view of people in the second or third rows. An area at the right of the room may grant space for a person to sit without a table (it is possible a small table could be brought in). Placement of the emergency procedures was eye-level of a standing person at the left side of the room, but a cart with an overhead projector blocked the postings. The procedures are posted above eye-level of a person in a wheelchair.

There was room for the circulation of students at the front. The modern e-podium was high for a person in a wheelchair. Reaching the touchscreen controls may be difficult for persons of smaller stature. The podium had a pullout area at a lower height; however, the placement of the podium next to the wall prevented use of the pullout feature. There was navigable space between the chalkboard and the fixed counter at the front of the room. The double-layered chalkboards presented a challenge when trying to reach an elevated board. The problem with accessing the chalkboard was a 5.08cm step on to a platform. The platform barrier limited resources available to instructors with disabilities.

While the room may not prevent a transfer of knowledge, students with disabilities have limited physical, accessible resources that would facilitate learning.

A water fountain in the hallway had limited access for a person in a seated position. The area around the fountain was slightly congested with furniture.

The small classroom *PHY 313* (Capacity: 80) had a smooth entry into a knob-handled door with no resistance. There was access to the front and back of the room.

The rows of tables and chairs had table heights, which offered just enough clearance for a person in a wheelchair. Two aisles allowed circulation to the front of the room. Space at the front was limited due to the room arrangement and a protruding instructor's desk on a platform. If the classroom were full, there would be difficulty to proceed around the room. The classroom furniture had just enough space to get around in the room when no one was seated. Potentially every seat could be an accessible seating area. However, the last row at the back of the room offered more circulation space.

At the front of the room, there was leeway between the instructor's desk and chalkboards. The classroom technology was an older model console system. The clearance under the console was too short for a person in a wheelchair. The major limitation with the instructor's area of the room was a 20cm step on to a platform. Placement of the emergency procedures was eye-level of a standing person at the front of the room. However, the postings were placed on the platform level. The narrow circulation space and the platform severely limit the ability of an instructor with a disability. The procedures are posted above eye-level of a person in a wheelchair.

Accessible washrooms – Due to the age of the building and lack of retrofit accessibility, there were no accessible washrooms in PHY. Two inaccessible washrooms (Men #141 and Women #142) are 37m from the classroom. There were a number of factors (e.g. narrow stall doors, foot-activated sinks) that limited use of either washroom. Accessible washrooms in EIT or E2 provided accommodations but are good distances from the classroom and require the use of an elevator. A universal washroom in E2 was 124m from the small classroom. EIT had accessible washrooms that were 172m away and required the use of an elevator. The distances between the two observed classrooms and accessible washrooms may be prohibitive.

4.3.5 SERVICES BUILDINGS

Centers for activity were selected for their strong attraction of students. Four service buildings were selected to provide alternate destinations not related to specific faculties. An argument could be made that the service buildings will generate a greater attraction since there is not an association to a specific faculty. The following buildings were observed for their accessible features.

Ira Needles Hall (NH) Built 1972

NH had two buildings for observations. The new addition opened during observations of the study site. The old building will be discussed first, and then the second buildings findings will be presented.

NH Original Building

Two accessible entrances were listed on the campus maps. The eastern entrance, under stairway, next to LIB has greater visibility opposed to the second entrance, which was in the parking garage. The main entrance to the building along Ring Road did not have signage to indicate location of the accessible entrances. Neither entrance was labeled with the international symbol for accessibility; however, the doors had push-button openers that gave some indication of accessibility. The lower, garage entrance door opener was not functioning at the time of observation. The steep curb cut onto the walkway located at the door opening was limiting. The pull strength of the door was heavy. The curb cut, faulty opener, and heavy pull strength of the door created difficulty entering through the parking garage.

The location of the door buttons was along the preferred path at each entrance. The height of the door handles, door buttons were at levels consistent to other observations. The parking garage entry had a knob handle, which added to the level of difficulty for entering the building. To assist in way finding there was a floor plan on the interior walls near the entrances.

Three student service areas were observed for accessibility: Student Accounts, Graduate Studies Office, and the Registrar's Office. One casual observation was made of the Pastry Plus food services.

Student Accounts – Students cue at the entryway, which had few issues since the entry and exit doors are propped open during the hours of operation. Entering the office was simplified by a smooth level surface with very little transition from tile to carpet. Inside, the low-rise carpet did not slow forward momentum.

The service counters were high for a person in a wheelchair. The primary seating locations of the staff was at the high counters. Personnel were not visible to the researcher in the seated position. The space between the counter and far wall allowed room for a person to pass another in a wheelchair.

Upon inquiry it was reported that the staff received the mandated AODA training for the Customer Service Standard.

Graduate Studies Office – The standard door with the lever handle was closed to this office. The weight of the door and slight threshold reduced the ease of entry. The seated staff member at the service counter was visible upon entry. The counter was not accessible but low enough to facilitate interaction. The small space around the counter did not allow a person to pass another in a

wheelchair. Queuing students reduced the amount of space to move freely around the entryway. Furthermore, the confined area created difficulty in exiting the office.

Upon inquiry it was reported that the staff received the mandated AODA training for the Customer Service Standard.

Registrar's Office – Entry into the office was simplified from the propped-open doors and no transition between surfaces. The doors remain opened during hours of operation. Inside, the queuing area was expansive with ample room for circulation.

Most personnel were assisting students at high counters. The counter height would not prohibit interaction between staff and a student in a wheelchair. To assist accessibility there was a lower counter for people with wheelchairs. It was reported that the accessible counter is occasionally used, but “not comfortable” for staff.

Upon inquiry it was reported that the staff received the mandated AODA training for the Customer Service Standard.

Pastry Plus – The university's Food Services department operates a small kiosk in NH. A casual observation was performed at this location. There were three steps to enter the area that was below the grade of the first floor. Most items were visible from the top step. Food and drink items at the back of the kiosk were partially obscured by the counter. The staff person was willing to assist in completing a transaction. However, the use of bank or credit cards would have been awkward.

Accessible washrooms (Women #1902/#2110 and Men #1904/#2113) – There were accessible men and women washrooms on the two observed floors of the building. The second floor washroom had signage indicating accessibility when there were more limitations to use. The first floor washroom had fewer limitations without the proper signage. The floor plan for each washroom was almost identical. However the differences were the limitations found on the second floor.

The first floor washroom was not marked with the international symbol for accessibility; yet, there were door openers for the men and women's doors. The button activated two openers that created a clear path into the washroom. The second floor lacked openers. The two sets of doors on the second floor reduced the ease of entry.

The accessible stall on the first floor had ample room to move within. It was the only stall in the washroom. The second floor had two stalls. The accessible stall on the second floor was more confined. Larger wheelchairs may have difficulty negotiating the space.

The sinks, soap, and paper towels placement were similar but the elements themselves had differences. The first floor sinks were situated on a counter with the soap dispenser placed at the left and right of the counter. Sinks were outfitted with lever handles. The second floor sinks were attached to the wall with the soap dispensers situated on the same wall. The sinks were outfitted with knob handles, which created a limitation for some. On both floors the paper towels were situated on the wall between the sinks and the urinals of the men's washroom – each with the trashcan situated under the towel dispenser (similar placement was found in the women's washroom).

The researchers preference was the first floor as there was more room in the stall and ease of entry with the door openers. The second floor sinks were slightly easier to use with closer access to the sink bowl, fixtures, and soap.

NH New Building Built 2015

The three accessible entryways to the new addition of NH lack the appropriate signage or any designations on campus maps. The first accessible entrance had a door opener button on the inclined first run of a ramp. There was a slight transition into the lobby. The lower lobby entry led to the building's elevator, as there were no services or offices at that level. At the top of the ramp, the second entrance's button was located at the side of the entryway. Transition into the upper doorway was raised and required extra effort to cross. Entrance at that level was on the building's first floor where AAS was located as well as a connecting corridor (yet to be completed) to the old NH. The height of the door handles and buttons were at levels consistent to other observations. Interior door openers were activated with vertical, elongated push buttons. The new design permitted activation from various heights or abilities.

The third entrance, in the new parking garage, had a level entry into a door with a functioning opener. Once inside, a short passage led to the building's elevator.

AccessAbility Services – Entry into AAS had a slight transition between surfaces into the reception area with an operational door opener. The interior carpet impeded forward momentum.¹¹ The service counter was designed for a standing person. To facilitate customer interaction, there was a lower, accessible service counter next to personnel. Interior doors were wide to permit passage of wheelchairs. Common use rooms (e.g. study spaces, conference rooms) had door openers.

¹¹ Carpet in the corridors and reception area of AAS have padding that reduces forward momentum for a person in a wheelchair. It was noted that the common study space has low-rise carpet that permits greater mobility.

Accessible washrooms (#1913) – There was one accessible washroom on each floor of the new building. The universal washroom, marked with the appropriate signage, was designed for one user at a time. A door opener allowed for ease of entry. The slight transition from the corridor surface to tile was a bit jarring to a wheelchair. The open space within granted ample accommodation. The fixtures were logically placed so that access was not hindered. The exception was the placement of the trashcan under the paper towel dispenser. The paper towel may be easier to reach if the trashcan was relocated.

Student Life Centre (SLC) Built 1967

Three accessible entrances were marked on the campus maps for this location. However, one was incorrectly labeled and the building has a number of entrances that are or could be accessible. The entrance on the north side of the building, closest to Ring Road, was marked accessible when there were no door openers. Plus there was a slight incline at the door, which added difficulty. Three entrances with door openers were not marked. One was located at the north side of the building near the food service area. The second was on the second floor, which is the sole accessible route to the administration offices of the PAC. The third entrance is a lower level entrance next to the Bike Centre. A fourth ground level entrance granted access into the Bombshelter Pub.¹²

Equally complex were the routes within the building. Depending on the entrance selected, there were a variety of services near the entrance. International News and Tim Horton's were located at the primary Ring Road entrance. The door openers at this entrance were glacially slow and have not been improved since 2010. The button activated both the exterior and interior doors that made for easier entry. The height of the door handles and buttons at each entry of SLC were at levels consistent to other observations.

A ramp next to the newsstand gained access onto the main floor of the building.¹³ The Turnkey desk and a number of food services were on that level. Since there was a large open space on that level, a number of events are held in the space. The carpet in the open space has padding that

¹² External access into the Bombshelter Pub is limited by entry through narrow wooden gates at the top of an incline at the rear of the patio area. Furthermore, on some casual observations, entry into the building required an able-bodied person to alert staff to open the ground level door and rear gate. It was reported that a platform stair-lift is available for entry. The lift does not provide independent access for a person with a disability.

¹³ It was observed that two brackets securing the handrail to the wall have been broken. Upon a recent casual observation the repairs to the handrail have not been made.

increases the friction in forward momentum. The carpeted area took more effort to traverse. The rest of the lower level and main level had smooth concrete flooring. The upper floors had low-rise carpet that did not impede momentum.

The Bike Centre entrance granted access to the lower level of SLC without using an elevator. CIBC, Media.Doc, Student Health Pharmacy, a dentistry, residence life, physiotherapy office and a used bookstore are among the many businesses or services on the lower level. Accessible washrooms were located on the lower level. Due to the remote location of the washrooms they were not preferred.

The second and third floors consist of a few small offices and study space. Observations were conducted in locations of higher activity. The Turnkey and International News are open 24-hours a day. Those and an additional food service location were observed.

International News – Entry into the store was wide without transition of floor surfaces. The gated entry remains open during store hours. The aisle widths were inconsistent. Some were wide enough for a person to pass another in a wheelchair. Others were more confined and narrow. When the store was busy there was greater difficulty navigating in the store.

The checkout and self-service counters (e.g. coffee) were designed for a standing person. The counter heights did not prevent use but were awkward for a person in a seated position. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair.

The AODA mandates customer service training. Upon inquiry the store clerk was positive they received the required training. The clerk made no inquiry to assist a customer with a disability. Previous casual observations found similar results with a few exceptions. When staff was circulating the store to tidy merchandise or replace stock they inquired to see if assistance was required.

Turnkey Desk – The Federation of Students provides the turnkey service to assist students on campus. Acting similar to an information desk the turnkey provides additional services. Bus ticket sales, study room reservations, discounted cinema ticket sales, and board game loans were some of the services that supplement student life.

The desk height was designed for a standing person. A lower counter was available, but staff was not stationed behind the lower section. The counter height would not prevent a customer transaction. A previous casual observation found that staff seating and items on the counter blocked visibility of a person in a wheelchair. The person with a disability went unnoticed for a period until an able bodied

person approached the desk. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair.

A building support column created a narrow passage that was amplified when the Turnkey was busy. On the day of observation a line was formed in front of the desk for students waiting to enter the Bombshelter pub. The line halted passage through the area when students were transacting with turnkey staff.

The AODA mandates customer service training. Upon inquiry the staff member stated they did not receive the training.

Campus Bubble – This food service location serves tea and sushi in an open kiosk located on the main floor of SLC next to the rear accessible entrance. The refrigerated display of prepared sushi had an upper shelf that was nearly out of reach for a seated person. Belt barriers for queuing were set close to the counter and had to be moved to access the counter. The counter height was designed for a standing person. While the counter height did not limit transactions, the card reader for credit or debit transactions had a cord length that was limited for a person in a wheelchair. Extra effort was required to see and manipulate the unit.

The AODA mandates customer service training. Upon inquiry the staff member stated they did not received the training.

Accessible washrooms (#1816) – A variety accessible washrooms in SLC were casually or photographically observed to demonstrate that they are similar to other washrooms on campus. Out of the selection of accessible washrooms, the researchers preferred location was on the lower level next to Tim Horton's. The convenient location in the building near an accessible entrance added to the preference. Furthermore, the unisex washroom granted more privacy and space to move within.

The washroom was not marked with appropriate signage. There was no transition into a lever-handled door with heavy resistance that would benefit from an opener. The fixtures within were at heights similar to washrooms observed elsewhere.

The sink counter had clearance enough for a seated person. However the sink fixtures could be limiting to some. The water had a pull-knob with a resistance that could be a barrier to people with limited dexterity. The adjoining soap dispenser placement was along the left wall of the sink counter.

The sink fixtures may be the reason that the washroom was not marked for accessibility, yet other facilities in the building had limiting issues and were labeled accessible.¹⁴

Dana Porter Library (LIB) Built 1965

Two accessible entrances were marked on the campus maps. The south entrance (main entrance) was correctly labeled. The second, eastern entrance marked on the maps was non-existent. There was an accessible western entrance that was not permitted for use. The design of the library entrance and landscape presented a greater traveling distance for a person with a disability. Approaching the library from the south and west sides of the building required the use of the ramp at AL. North and east approaches were slightly more direct but are longer than the pedestrian route to enter the building. Regardless of direction, access was gained from a ramp at the front of the library.

The automatic doors of the main entrance offered a wide passage into the building. The fully opened doors helped when crossing the threshold. The entry doors are not marked with the international symbol for accessibility. Oddly, the unavailable accessible western entrance had the appropriate signage.

A directory at the left of the open lobby assisted in way finding to various locations on the main floor. Another floor plan was posted in each car of the elevator, which listed the features, books, or services at each level. Additionally, an information desk was located in the lobby to assist students with questions. The information desk itself had an accessible counter along with ramped access into the desk area for personnel that may have a disability. Staffing at the information desk was during a specified set of hours. After hours help was facilitated with a touchscreen information computer. Further assistance may be attained at the circulation desk. The next sub-sections discuss various aspects of the library and their accessibility.

Circulation Desk – The area around the circulation desk had ample room for the flow of students. Staff was seated behind counters designed for a person standing. However, an accessible counter was available to meet customer needs. On previous observations, most transactions were conducted at the higher counters. The card reader for credit or debit transactions had a cord length that was a bit limited for a person in a wheelchair. The cord did not have length that would allow the device to pass

¹⁴ The adjoining washroom in this area (#1815) has an incomplete Hoyer lift. The reasoning for its placement was estimated that it could be used to help people transfer from their wheelchair on to the toilet. The missing harness and yoke render the device unusable. There were no instructions for use or sources to call for assistance.

over the counter. Using the device was awkward but the transaction was completed. On one occasion, a staff member directed the researcher to the accessible counter and adjusted the height to improve the interaction.

A self-check out station at the circulation desk was designed for people in wheelchairs. A touchscreen interface allowed users to check out their own selections. The lower height of the counter granted independent use of the computer.

The AODA mandates customer service training. Upon inquiry a staff member stated they received the necessary training.

Workstations – The library had workstations in many locations. Several were designed to accommodate people with mobility impairments. Accessible desks or computer stations had adjustable height tables. The user could set the table height to accommodate their wheelchair.

Group study space – Group study spaces are provided in the library. Two observed study rooms (#1008 and #1016) had door openers for people with disabilities. Door openers were activated with vertical, elongated push buttons. The new design permitted activation from various heights or abilities. The spaces within had a limited area to circulate. There was insufficient room to navigate between the tables and whiteboards with no one seated around the tables. An alternate arrangement of the tables and chairs may offer more space to circulate. Room 1008 was wider, which offered slightly more accommodation. The coat hooks in the rooms were high for a person in a wheelchair. Yet, there were no major obstacles to a person with a disability participating with others in these spaces.

Stacks – Aisle widths within the stacks (shelves of books) were inconsistent. Wider aisles allowed passage of a wheelchair with room to turn towards the shelves for easier browsing. Narrow aisles had some books that caught on parts of the wheelchair hindering passage in the stacks. Out of twenty-eight measured aisle widths, one was too narrow for the passage of a wheelchair. Two had widths with only 5.08 additional centimeters of space on each side of the rear wheels of a standard wheelchair. The remainder of stacks had room to navigate.

Additionally, the top two shelves within the stacks were out of reach for a seated person. Staff at the circulation desk was willing to assist in any search. However, independent access would allow an individual to discover additional material that may not be located by receiving assistance.

Elevators - Elevators in the library had challenges to use. The announcement of floors was absent. Tones to indicate the floor would be helpful for some users. The illumination of the floor buttons was

not functioning. It was hard to determine what floors had been selected. Finally, the door opening times were too brief. The duration of opening was estimated to be five to six seconds. The short time caused one unnecessary ride to multiple floors because the researcher could not exit the car in time.

Miscellaneous observations – a few items did not fall within a specific category of observations. The pencil sharpener on the tenth floor was at a height for a person standing. The emergency procedures near the elevators were at a similar height. The procedures are posted above eye-level of a person in a wheelchair. A modern water fountain on the third floor had clearance that may be too low for a person in a seated position. There was an automated water bottle filling portion that may offer better accommodation. The Media.doc service counter has a height designed for a standing person.

Browsers Café – The food service counter was in an open area without doors. Most items were attainable for a person in a wheelchair. The coffee carafes were a bit high to reach. Some baked goods, placed on a top shelf, were harder to attain as well. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair.

The station with cream, sugar, and napkins had limited space for customer circulation. Access to a table was difficult due to the congestion of tables and chairs. The arrangement of the furniture needed to be positioned to allow a wider aisle width through the area. On a follow up observation the flow for customers was modified to improve circulation. A wider passage was created for people at the station for coffee accompaniments. The seating area was reorganized to create circulation routes through the space. While noting the improvements a busy cashier inquired to be sure assistance was not needed.

The AODA mandates customer service training. Upon inquiry two staff members stated they received the necessary training.

Accessible washrooms – There were two locations deemed accessible in the library. Washrooms on the third floor offer more accessibility than first floor washrooms with doors lacking openers. The awkward angles to entering the first floor washrooms would be minimized with door openers. The men's washrooms had sinks with knob handles. The women's washroom sinks had lever handled sinks. The greatest limitation was the small size of the accessible stall. Neither was wide enough to accommodate a wheelchair and close the door.

Washrooms on the third floor had door openers for entry. The accessible stalls in each washroom were far more generous in space. A sink basin and fixtures designed for accessibility were found in each washroom along with several standard sinks with lever handles. Similarly noted in other

washrooms, the placement of the trashcan compromised access to the paper towel dispenser and the accessible sink in the women's washroom. The men's room had clear space at the accessible sink and the paper towel dispenser.

Washrooms on other floors had older fixtures and narrow stalls. Retrofit or modern accessible features were not found on other floors. Washrooms on floors other than the third floor had very limited accommodation for people with disabilities.

South Campus Hall (SCH) Built 1967

One accessible entrance was listed on the campus maps when an additional entrance could be listed. The eastside of SCH has an accessible entrance on the ground level, which would be extremely useful for people in wheelchairs to avoid the hill at the west side of the building with the 23.5% slope. Without signage indicating the location of the accessible entrance, people unaware of the entrance ascend a steep pathway in poor condition. Additionally, a third entrance could be easily adapted for accessibility with a door opener on the south facing side of the building. The southern entrance was closer to the building's elevator. Without knowing the entrance location, people may circumnavigate the building to end up passing the entrance that would have saved them time.

The rear entrance, lacking the appropriate signage, had an operational door opener, which was beneficial to traversing over the slight threshold. The button for the door opener was along the preferred path of travel. The height of the door handles and buttons were at levels consistent to other observations. The observed service areas were on the same level as the accessible entry.

Waterloo Store – Entry into the store was simplified from the propped-open doors and no transition between floor surfaces. The doors remain opened during hours of operation. Inside, the circulation routes between merchandise displays had ample room for people to move about. There were wide paths through the store, but getting into some sections of the store had less room between displays. One shelving unit had evidence of impact from passing carts. The broken corner of the shelving display highlighted the narrow passage in some areas.

Two fitting rooms were available for customers to try on apparel prior to purchase. The small stalls had door widths that would allow a wheelchair entry into the chamber. The internal space within, along with the placement of a stool, made the stall unsuitable for a person in a wheelchair.

The checkout counter was a bit high for a person in a wheelchair. However, the height would not prevent a customer transaction. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair.

Staff was helpful by inquiring if assistance was needed. The AODA mandates customer service training. Upon inquiry the store clerk was unsure if they received the necessary training.

Tim Horton's – There was no threshold at the entrance. For convenience, the door was propped open. The cueing area had room for circulation. Yet, circulation on the day of observation was hindered by the closure of the regular customer entrance. During the regular school year, customers enter the store from a wide entrance from the bookstore. Then people cue out of the path of served customers. During orientation week the entrance was closed to control people entering the bookstore.

The service counter was a bit high for a person in a wheelchair, but that did not limit customer interaction with staff. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair. The pick-up location for food and drinks was above the head of a seated person. The height may be precarious for reaching hot drinks. Upon casual observations at other locations, if servers notice a customer in a wheelchair, the staff would transfer hot drinks over the lower counter spaces. On the day of observation, hot coffee was delivered on the higher counter.

The AODA mandates customer service training. Upon inquiry the store clerk stated they did not received the training. It was suspected that they were uncertain of the training in question.

Write Stuff – The store has two entrances. One was a slight ramp from the Waterloo Store and the other led from outside. On warm days the exterior doors were propped open. There was ample room for the circulation of customers in the aisles. The aisle widths permitted a person to pass another in a wheelchair. With few exceptions, most merchandise was within reach of a seated person.

The checkout counter had two cashier stations. One was waist height for a standing person another was lower for a person in a wheelchair. The card reader for credit or debit transactions had a cord length that was useable for a person in a wheelchair. On a follow up observation after Orientation Week, the accessible counter was filled with small displays of merchandise; eliminating any potential use of the lower space.

The AODA mandates customer service training. Staff was attentive to inquire if assistance was necessary. The two store clerks stated they were unsure if they received the necessary training.

Student Success Office – A barrier to the office was deficient way finding. The illuminated entrance from the first floor does not indicate the accessible route to the office. A sign directing people to the elevators (with a small map showing the location of the elevator) would be beneficial. There were signs posted elsewhere to indicate the direction of the elevator, which was helpful to navigate through the maze of corridors. A non-accessible entrance had a sign indicating the location of the elevators and the office. Exiting the elevator on the second floor had a sign that indicated direction. However, on more than one occasion the door that grants access to the corridor leading to the office was locked. On the day of observation the door was unlocked. The corridor leading to the office was congested with food service carts that narrowed the circulation space.

The office doors were propped open during hours of operation in previous observations; however, the office was closed at the time of the current observation. Previous casual observations found no major barrier to the office except for the navigation to the location.

Bookstore – The entry doors were propped open during hours of operation. Observations of the store were conducted when staff controlled customer capacity. Upon entering the store the researcher was advised to go to the information service counter to complete a search for books. The aisles were wide enough for a person to pass another in a wheelchair in most places. The widths of some aisles were inconsistent and some were narrower than others. In places, large piles of textbooks or notebooks narrowed circulation routes. Later in the observation, a staff member was attentive to inquire if assistance was necessary. Furthermore, the researcher was instructed to make their purchase at the customer service desk to avoid the lengthy winding line for transactions. The accommodation was meant to avoid the crowds and any narrow passages in queuing.

The information service counter had a height that was waist high to a standing person and another two spaces were lower for a person in a wheelchair. The publishing counter offered lower accommodation as well. It was stated that when the store was not at capacity there were accessible cashier stations at the exit to the store.

Upon completion of the observation, a lead staff member inquired for ways to improve their service. While there were some circulation issues, there were no major barriers to customers with disabilities. The initial communication by staff to offer assistance reduced any barriers that may have made shopping difficult. The level of attention to accommodation was unmatched by any other service locations on campus.

Accessible washrooms – There were no accessible washrooms in the SCH complex. The basement level had washrooms designated for staff. Three washrooms clusters were on the first floor. A single washroom (#126c) was for employee use at the Waterloo Store and Write Stuff. The remaining two washroom clusters (Women #112/#107, Men #113/#106) were not retrofit with any accessible features. Washrooms on the second floor (Women #221, Men #222) were designated for the food services staff only. There was need for the modification of at least one washroom in the building.

4.3.6 ACCESSABILITY SERVICE'S FACULTY BUILDING INFORMATION

AAS provides brief descriptions of accessibility for campus buildings. Building descriptions provided individuals with useful information on entryways, washrooms, and elevators. Descriptions were collected for each of the observed buildings studied. The content had a good degree of accuracy; however, there were minor inconsistencies between the description and the actual accommodations. There were occasions where inaccurate information could cause misdirection.

Two descriptions had very little annotation. The buildings described are relatively new. Modern accessibility features permitted greater access. The description of features correlated with the accessibility or fixtures in the building.

Several occasions listed washrooms that offered very little accessibility. The washrooms listed in the BMH description are older and less accessible to others observed in the complex. Similarly, washrooms on the first floor of library were less accommodating than the third floor washrooms.

The AL description states there was a tunnel connection to Hagey Hall (via EV1). There is a connection that is not wheelchair accessible. Listing this content on a page designed to describe accessibility was misleading.

The information on accessible entrances could be misleading. In several cases, people are directed to an accessible entrance when there are other convenient accessible entrances. The description for PHY lists a nonexistent entrance. Other buildings had entrances that offer better accessibility. Hagey Hall lists an entrance with a steep incline. A nearby entrance is accessible without an incline.

Each page describing the buildings were printed and annotated. Highlighted comments on the pages describe content that may need greater clarity. Annotated pages of the building descriptions can be found in Appendix H.

4.4 SUMMARY OF FINDINGS

This research has illustrated that disability can be individual or a social concern. However, there is another aspect that should be considered. Many of the interview participants of this study have some influence on the provision of accessibility. It is precisely those people that should be considered in disability rhetoric. The service providers, managers, and PO directors shared their viewpoints as decision-makers. Their perspective illustrated how accessibility is provided at the study site. The adherence to building codes or accessibility legislation guides the thinking of the decision-makers. Their interpretations of the guidelines shape the university's built form. There may be a greater potential for improvements if all three sides of the disability discourse are considered. Figure 4.4.1 illustrates the connections in discourse. The influence, motivation, or actions of those people that provide accessibility shape the built environment. Unfortunately, barriers may be the result of the decision-makers.

Decision-makers may require motivation for action. Often utilitarian thinking influences the decisions made. Perhaps decision makers need to *see* the good their work has done. Executed plans for a new pathway across BMH green improved the mobility for people with wheelchairs. The smoother surface allowed for a greater ease of use. Perhaps decision makers could see that their work improved the experience for the user if they witnessed the benefits of their work. Furthermore, decision makers could “walk a mile” in someone else’s shoes by traversing campus in a wheelchair. The barriers of crumbing or heaved curb cuts would be explicitly clear. Seeing the positive effects of improving accessibility may provide the motivation needed to strengthen accessibility. Figure 5.2 in the next section provides a positive feedback mechanism that would illustrate to users the positive effects of improving accessibility, which may offer other benefits yet unknown.

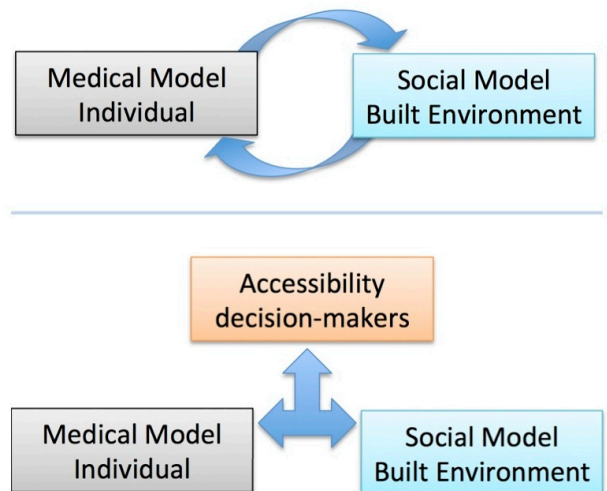


Figure 4.5: Influence on accessibility. *The top illustration highlights the current disability discourse in the social sciences. However, as a result of this study, decision-makers of accessibility can influence the built environment.*

For example, when transit organizations implement new low-floor light rail vehicles (LRV), the initial reason was to accommodate people with disabilities. Unexpectedly, the transit times improved, as passenger boarding was easier for people of all abilities. There may be unforeseen benefits to a systematic approach to improving accessibility. Creating a system that achieves accessibility through management is one result, but more so, motivates actors towards accessibility.

The effects of decision-makers were witnessed in the built environment during observations. Many locations provided examples of the latest in accessibility regulations. Other buildings demonstrated inaccessibility due to their construction prior to legislation. A large proportion of curb cuts around the university's Ring Road do not meet the current standards for a barrier-free path of travel. These barriers were noted to cause the most friction in navigating the campus. However other observed aspects had similar compliance or non-compliance issues. Many entrances to building are not appropriately marked with the international symbol of access. The following tables (Table 4.4.1, Table 4.4.2, Table 4.4.3) illustrate numerous aspects to the washrooms observed in campus buildings.

Washrooms were observed due to their necessity. Numerous aspects of the washrooms have to comply with the OBC standards for barrier-free design. However, many buildings were constructed before accessibility legislation. Organizations are not required to update existing structure with each modification to the OBC. New buildings must comply with the current standards. Many of the observed campus buildings represent the building codes of their times. The PHY building does not have accessible washrooms to be observed. However, older buildings like the LIB or AL have retrofitted accessibility. New buildings like M3 or EV3 reflect the current accessibility standards.

The cells of the table are the measurements or observations of washrooms throughout faculty and service buildings. Specific building code standards have been provided for each category. Cells highlighted in red indicate where the observed feature does not comply with OBC standards. Many cells may be excluded due to the age of the building. However, many of the discrepancies could be potential barriers to a person with a disability. Buildings without accessibility do not provide an equitable experience for students, faculty, or staff with an impairment. It is for that reason that organizations should strive for gradual improvement as proposed in the next section.

Table 4.1 : Measured building observations compared to regulatory standards

Washrooms	AL (1965)	BMH (1972)	Rmvd 2005	LIB (1965)	EV1 (1965)	OBC Standards				
Female/Male (F/M)	F #122	M #103	F #1624	M #1625	F #3804	M #3807	F #305	M #307	F & M	
Sign	no	no	yes	yes	no	no	no	yes	yes	required
Threshold	0	0	0	0	0	0	0	0	0	1.3
Opener	no	no	no	no	no	no	no	yes	yes	optional
Handle height (E/I)*	I 109-132	I 109-132	I 91-137	I 91-137	I 91-114	I 91-114	I 91-114	I 97	I 97	E/I 102
Handle type (L/B/O)	B	B	B	B	B	B	B	B	B	L
Pull strength (lbs)	6	6	10	10	10	5	8	8	6	14
Light switch height**	117	119	114	114	na	na	117	117	117	104
Stall door width	79	79	81	84	86	86	76	76	76	86cm
Handle height	95	99	104	104	99-109	99-109	99	96	96	90-110
Lock type (L/D/S)	S	L	L	L	L	L	L	L	D	operable w/closed fist
Stall width	152	152	152	152	178	151	168	178	335	170< between walls of universal washrooms
Stall length	150-109	150	150	147	152	154	132	140	357	150> turn radius, or 82-144 clear floor area
Grab bars type (D/L/H)	D/H	D/H	L/H	L/H	L/H	L/H	D/H	D/H	D/H	L required/H required
Type and height	D 69-107	D 66-107	L 64-138	L 64-138	L 69-145	L 69-145	D 69-109	D 69-109	D 61-112	75>
Type and height	H 97	H 89	H 84	H 84	H 88	H 88	H 99	H 101	H 84	84-92
Toilet Paper height	91	97	97	81	91	97	109/104	102	79	60>
Tit Ppr length (from toilet)	18	15	18	18	28	28	25/18	23	na	30<
Toilet height	42	41	44	44	44	46	41	41	41	43-48.5
Coat hook height	146	na	132	135	110	110	157/99	160/99	100	120<
Sink height top	86	85	84	84	85	85	84	84	81	84<
Sink height bottom	79	77	71	71	75	75	76	76	74	73.5>
Sink length	69	69	53	53	56	56	51	51	51	48.5 to fixtures
Sink handles (L/D/A)	L	L	L	L	L	L	L	L	L	Lever
Soap position (S/B)	B	B	S	S	S	S	S/B	S/B	S/B	61< From sink edge
Hand dryer/towels ht (H/T/B)**	09/112/T113 14/112/T113	T 122	T 119	T 102	T 102	T 102	T 109/14/112/H122	T 124	T 124	120<
Trashcan height	86	55	76	76	76	76	71	76	71	na
Trashcan placement	under towels	by door	by door	by door	by door	by door	by door	by door	under towels	na

(E/I) = E: Exterior of door, I: Interior of door
(L/B/O) = L: Lever, B: Bar, O: Other
(lbs) = Pounds in U.S. Customary Units
(L/D/S) = L: Lever, D: Dial, S: Slide
(D/L/H) = D: Diagonal bar, L: L-shape bar, H: Horizontal bar
(L/D/A) - L: Lever handles, D: Dial or knob handles, A: automatic faucet
* measurements in centimeters and have been rounded up/down for presentation
** measurements indicate the use of a light switch, automatic lighting is indicated by "auto"
** indicates more than one fixture
(S/B) = S: Side wall next to sink, B: Back wall behind sink
(H/T/B) = H: Hand dryer, T: Paper towels, B: Both
Red cells indicate places of noncompliance

Table 4.2: Measured building observations compared to regulatory standards

Washrooms	EV3 (2011)		PHY (1959)		QNC (2011)		SIC (1967)		SCH (1967)		HH (1968)		OBC Standards	
	F #1934	M #1933	F & M	yes	F #2492	M #2493	yes	F & M #1816	F & M	F #167B	HH (1968)	M #169	yes	required
Female/Male (F/M)														
Sign			yes	yes			yes	no	na	na	na	na	yes	required
Threshold			0	0			0	0	na	0	0	0	0	1.3
Opener			na	na			no	no	na	na	na	na	no	optional
Handle height (E/I)*			na	na	191-121	191-121	191-121	102	na	191-132	191-132	191-132	191-132	90-110
Handle type (L/B/O)			na	na			B	L	na	B	B	B	B	operable w/closed fist
Pull strength (lbs)			na	na	12	12	10	14	na	24	24	8	8	4.9 (22-Newtons)
Light switch height**			auto	na	112	112	118	107	na	132	132	130	na	na
Stall door width			84	84	84	84	84	na	na	75	75	76	86cm	na
Handle height			97	97	102	102	102	na	na	99	99	99	99	90-110
Lock type (L/D/S)			L	L	L	L	L	L	na	L	L	L	L	operable w/closed fist
Stall width			147	150	168	168	170	229	na	122	122	124	124	170< between walls of universal washrooms
Stall length			152	150	150	150	149	150/251	na	149	149	149	149	150> turn radius, or 82-144 clear floor area
Grab bars type (D/L/H)			D/H	D/H	D/H	D/H	D/H	L/H	na	D	D	D	D	L required/H required
type and height			D 84-137	D 83-132	na	D 86-122	D 86-122	L 66-140	na	D 69-99/66-99	D 81-112	D 81-112	D 81-112	75>
type and height			H 86	H 86	na	H 83	H 86	H 91	na	na	na	na	na	84-92
Toilet Paper height			64	66	na	66	69	94	na	91	91	91	91	60>
Tilt Ppr length (from toilet)			30	30	na	46	43	13	na	33	33	66	66	30<
Toilet height			39	41	na	41	43	42	na	42	42	43	43	43-48.5
Coat hook height			122	122	na	104	104	130	na	119	119	na	na	120<
Sink height top			84	84	na	84	84	85	na	83	83	83	83	84<
Sink height bottom			74	74	na	76	76	71	na	74	74	74	74	73.5>
Sink length			56	56	na	60	61	56	na	46	46	46	46	48.5 to fixtures
Sink handles (L/D/A)			A	A	na	A	A	D	na	D	D	D	D	Lever
Soap height			104	104	na	99	100	104	na	99	99	97	97	120<
Soap position (S/B)			B	B	na	B	B	S	na	S	S	S	S	61< from sink edge
Hand dryer/towels ht (H/T/B)**			H 81 T 116	H 81 T 116	na	T 122/122	T 123/122	T 122	na	H 126/126	H 124	H 124	H 124	120<
Trashcan height			76	76	na	84	84	61	na	76	76	76	76	na
Trashcan placement			under towels	under towels	na	under counter	under counter	in far corner	na	by door	by door	by door	by door	na

(E/I) = E: Exterior of door, I: Interior of door
(L/B/O) = L: Lever, B: Bar, O: Other
(lbs) = Pounds in U.S. Customary Units
(L/D/S) = L: Lever, D: Dial, S: Slide
(D/L/H) = D: Diagonal bar, L: L-shape bar, H: Horizontal bar
(L/D/A) - L: Lever handles, D: Dial or knob handles, A: automatic faucet

* measurements in centimeters and have been rounded up/down for presentation
** measurements indicate the use of a light switch, automatic lighting is indicated by "auto"
*** indicates more than one fixture
(S/B) = S: Side wall next to sink, B: Back wall behind sink
(H/T/B) = H: Hand dryer, T: Paper towels, B: Both
Red cells indicate places of noncompliance

Table 4.3: Measured building observations compared to regulatory standards

Washrooms	NH old (1972)		NH new (2015)			M3 (2011)		RCH (1967)		ORC Standards
	F #1902	M #1904	F & M #1913	F #1902	M #1903	F & M #126				
Female/Male (F/M)										
Sign	no	no	yes	1.27	yes	0	0	0	1.3	required
Threshold	0	0	0	1.27	0	0	0	0	1.3	required
Opener	yes	yes	yes	1.86-109	na	na	na	na	optional	
Handle height (E/I)*	1.86-127	1.86-126	1.86-109	na	na	na	na	na	97	90-110
Handle type (L/B/O)	B	B	B	B	na	na	na	na	L	operable w/closed fist
Pull strength (lbs)	10	10	10	8	na	na	na	na	0	4.9 (22-Newtons)
Light switch height**	na	na	auto	8	na	na	na	na	137	na
Stall door width	79	80	na	na	79	79	79	79	na	86cm
Handle height	97	98	98	na	97	99	99	99	na	90-110
Lock type (L/D/S)	L	L	L	L	L	L	L	L	na	operable w/closed fist
Stall width	155	165	165	188	188	188	188	188	216	170< between walls of universal washrooms
Stall length	269	259	259	309	149	149	149	149	183	150> turn radius, or 82-144 clear floor area
Grab bars type (D/L/H)	L	L/H	D/H	D/H	D/H	D/H	D/H	D/H	L	L required/H required
type and height	L 76-152	L76-155	D 81-135	D 76-127	D 81-127	D 81-127	L 61-142	L 61-142	75>	
Toilet Paper height	na	H 84	H 86	H 89	H 91	H 91	na	na	84-92	
Toilet height	91	91	69	61	61	61	84	60>	84	60>
Tlt Ppr length (from toilet)	48	36	53	48	48	48	30	30<	30	30<
Toilet height	44	43	43	41	41	41	41	43-48.5	41	43-48.5
Coat hook height	122	127	na	107	104	104	168	120<	168	120<
Sink height top	84	85	84	84	84	84	76	84<	76	84<
Sink height bottom	74	74	74	74	74	74	68	73.5>	68	73.5>
Sink length	64	64	41	58	58	58	46	48.5 to fixtures	46	48.5 to fixtures
Sink handles (L/D/A)	L	L	L	L/D	L	L	D	Lever	D	Lever
Soap height	122	122	113	119	117	117	104	120<	104	120<
Soap position (S/B)	S	S	S	S	S	S	B	61< from sink edge	B	61< from sink edge
Hand dryer/towels ht (H/T/B)**	T 114/135/135	T 122	T 109	T 119	T 122	T 122	T 122	120<	T 122	120<
Trashcan height	76	76	76	76/76/86	76/76/86	76/76/86	76	na	76	na
Trashcan placement	under towels	under towels	under towels	under towels	under towels	under towels	in far corner	na	na	na

* measurements in centimeters and have been rounded up/down for presentation
 ** measurements indicate the use of a light switch, automatic lighting is indicated by "auto"
 *** indicates more than one fixture
 (S/B) = S: Side wall next to sink, B: Back wall behind sink
 (H/T/B) = H: Hand dryer, T: Paper towels, B: Both
 (L/D/A) - L: Lever handles, D: Dial or knob handles, A: automatic faucet
 Red cells indicate places of noncompliance

Chapter 5

Discussion

This study focused on campus accessibility at the University of Waterloo in an attempt to address the following principal research question: *How can a quality management system, enhanced by a smartphone application, improve accessibility?* The researcher systematically observed facilities using experience gained from years of disability. Secondary sources were examined to understand both policy and accessibility standards. Staff members whose work affects accessibility in various ways such as building design and maintenance were interviewed.

In order to facilitate answering the principal research question, six sub-questions were posed each of which dealt with a different aspect. The following discussion outlines the responses to those sub-questions.

1. Are management systems used for maintaining and eliminating barriers to accessibility?

The simple answer is no, management systems are not employed in providing accessibility. There appear to be four reasons for their absence: i) uncertainty that a management system would improve accessibility, ii) present bias against conventions beyond normal operations, iii) the current policies offer adequate guidance for day-to-day operations and emergencies, and iv) the perception of a management system is not an organizational framework designed to improve physical accessibility.

Answering this question was complicated by a general lack of understanding of management systems. Some of those interviewed felt that accessibility, and civil rights policies were, in themselves, management systems used in the operations of the AAS. Clearly that is not the case and if a management system would improve the situation then there would have to be a good deal of organizational learning before it could be implemented.

2. Are there restrictions or organizational barriers limiting accessibility?

There are no major restrictions or organizational barriers that impede a person from attaining an education. However, there are multiple moderately limiting obstacles that make studying much more difficult for an impaired person when compared to the experience of an able-bodied student. These obstacles fall into three categories: reporting of maintenance issues, inconsistent standards, and the tendency to postpone the adequate provision of accessibility measures in older building until they are replaced or undergo major renovation.

With regard to the reporting of maintenance issues that affect students with disabilities it appears that they have to advocate for their own needs while able-bodied people are generally accommodated. Even when issues are reported they may not be remedied.

The inconsistency of standards can be seen in a RCH large lecture hall where there are no accessible tables. Seating for a person with a disability is restricted to the front of the room. The limited options do not prevent learning but they do create an impression of inaccessibility and force a disabled student into a highly visible position.

Finally there is the apparent tendency to postpone the adequate provision of accessibility measures in older building until they are replaced or undergo major renovation. The construction of RCH was prior to accessibility regulations. The dimensions of existing structures complicate retrofitting accessibility into an older building like RCH. Consequently accessibility is advanced by new construction, which need adherence to modern standards. Current accessibility was observed in M3. As buildings reach the end of their lifecycle new construction will yield modern structures with greater access. The university should not wait for new buildings to improve access. Accessibility should be consistently improved regardless of building age to provide access without prompts from students with disabilities. Otherwise, inaction may be a considerable barrier to overcome.

3. How do organizations maintain legal compliance to regulations?

In the case of new facilities, compliance for built environment concerns is facilitated in the design stage. Furthermore, municipalities and code enforcement officers compel adherence to design regulations. Older buildings that predate accessibility standards often contain architectural features that may be limiting to people with disabilities. The integration of old and new buildings presents three aspects that reflect attitude and existing accessibility: pre-accessibility standard buildings, improved action, and greater focus.

Until accessibility was mandated it wasn't a priority, as evidenced in buildings like PHY. Currently, architecture firms and university architects ensure that new buildings comply with current standards through pre-construction design reviews. The building styles prior to the OBC accessibility standards have characteristics of inaccessibility that need attention to improve the user experience.

Codes and standards mandate access when an increase in action could improve older facilities and continuously maintain the current accessibility stock. Research participants expressed a willing attitude for improvement; however, no suggestions were offered on how to move forward.

Highlighting minimum compliance to standards, accessibility was conveyed as, “Look at what we’ve done. Isn’t that great?” The standards guarantee the least possible actions toward accessibility. The bare minimum is not an acceptable standard when it concerns the rights and equity to individuals that live within the confines of the barriers.

At times, less than the minimum standard was observed, which called consideration into question. Compliance needs a greater level of focus that is currently absent. Numerous curb cuts around campus have protruding concrete that hinders accessibility, which does not adhere to the OBC guidelines for a barrier-free path of travel. More attention to compliance could be gained in regular inspections to provide barrier-free experiences. Organizations that recognize the value added in good customer experiences should strive to exceed standards, which shows care, effort, and responsibility.

4. Are there examples from other domains where such obstacles have been successfully overcome?

Accessibility obstacles have been successfully overcome in other fields. Two examples, the Massachusetts Bay Transportation Authority (MBTA) and the restaurant industry, revealed that inclusion of people with disabilities in the accessibility process and the motivation to improve accessibility, generate positive outcomes through effective communication channels.

The MBTA began to proactively address accessibility concerns prior to the passage of national legislation mandating access. The organization worked with community advocacy groups to learn the needs of people with disabilities and to present goals. The advocacy group was able to express their concerns and communicate their accommodation needs for public transportation. The open exchange allowed the MBTA to show that there were limitations to what access could be provided. The communication informed the advocacy group that progress was being made with some limitations and the MBTA could focus their resources on the most pressing concerns of the group. The success resulted in greater support of the MBTA while improving access to the community.

Similarly, a local restaurant manager sought customer feedback to provide a superior dining experience. Their interaction with customers allowed a disclosure of preferences that were quickly accommodated. Additionally, feedback mechanisms were employed to gain further information that improves the experience for the customer’s next visit. Inclusion was essential to reducing barriers for people with disabilities.

The AAS uses inclusion by requiring students to report their needs. But the reporting is limited to that communication channel. University staff relates concerns to human resources as a reporting

outlet. Additionally, there are an underrepresented number of people that manage personal limitations but may find barriers in their day. They may wish to report without being identified as disabled. For greater efficiency, a single-source reporting application to PO could address accessibility concerns more immediately.

A smartphone application would facilitate communication and inclusion. (See Appendix J for a brief outline of the application). Collectively, staff and students could report issues and provide valuable insight into university operations. The user level feedback could be employed into PO improvements plans, which would demonstrate a greater focus on accessibility. The application could provide transparency to PO providing accessibility. Equity and inclusion for people with disabilities could help the university stand out similar to the MBTA and local restaurant.

5. What quality management frameworks are employed within organizations?

The university does not employ quality management frameworks in their operations. However, industry and manufacturing utilize a popular quality management standard ISO-14001, which could provide a method to improve accessibility. Appendix K provides the researcher's outline and simulation of an accessibility management system (AMS)TM that uses ISO-14001 as a foundation for improving access. Based on the ISO standard and principles of quality management (QM), there are elements crucial to implementing quality management on accessibility. Process analysis, communication, and support would provide benefits to the people with disabilities and accessibility providers.

Attitudes are not enough to produce quality. Furthering quality requires analysis of processes that foster, create, and maintain accessibility. An examination of *how* accessibility is provided should result in measures that will improve the process. As new information is gathered, corrective actions can be made for improving the process and accessibility. Repeating analysis allows for incremental refinements. When the process is recurring then a general trend of continual improvements may be expected. Improving the user experience, while creating a more inclusive environment, may be facilitated by upgrades and remediating compliance issue identified through Plan-do-check-act (PDCA). Implementing a quality management framework to improve access could be one process to advance accessibility. The proposed framework is discussed next.

Proposed Accessibility Management System (AMS)TM adapted from ISO-14001

New building construction within the province of Ontario must follow the *Ontario Building Standards barrier-free design 1992* (2012). The adherence to the standards regulates accessibility. In the advent of the AODA's new building specifications, construction starts will need to comply with the new standards. However the building codes do not offer methods for improving accessibility beyond the guidelines. Moreover, building standards tend to accommodate people with mobility impairment; little infrastructure is provided for the benefits of sensory or cognitive impairments.

Communities or businesses may have financial limitations to facilitate accessibility. Shrinking budgets in down economies restrict expansion or renewal projects. Emergency infrastructure replacement and maintenance can consume funds leaving little for accessibility projects. Building standards alone are not enough to create a connection between access and experience (Kaufman-Scarborough, 1999, p. 503). This is especially true since the influence of accessibility decision-makers plays a role in shaping the built environment. It is important to consider the relationship between building access, the user experience, and the people that facilitate accessibility. Each can be considered with the principles of quality management (QM) in an AMSTM.

QM could provide due diligence, improved business image, and compliance to law (Young, 2012). Additionally, a management system can facilitate budget planning for accessibility. Currently, some environmental management systems can be accredited. Quality management imparts elements to identify, categorize, prioritize, remedy and update (Young, 2012). In the application of accessibility, accreditation of a QM would show people with impairment the dedications to improving access beyond legal requirements.

The efficient organization of multiple facets offers great value. Targets and objectives can be achieved in shorter intervals. Management systems reduce incidences of regulatory compliance concerns. Sales and employment growth may increase. In addition, corporations experienced greater longevity compared to entities without a formal management system (Lloyd's, 2012).

An AMSTM will include four components that will manage multiple aspects of accessibility. The following categories for consideration within the framework are adapted from the environmental management system ISO-14001. The order begins with the adoption of an accessibility policy.

Policies may be based on accessibility legislation or Universal Design. Planning, implementation, monitoring, and review are components, which are multidimensional.

The categories are:

- 1) Planning, that will include legalities, objectives, targets, aspects, and impacts.
- 2) Implementation, that will organize structure, training, communication, documentation, operation controls, and document controls.
- 3) Checking and corrective action that will include monitoring and measurement, corrective actions, records, and accessibility audits.
- 4) The last component is a review by management (ISO14001, 2009).

Regulatory adherence to accessibility laws will be addressed in the planning stage. Communication within organizations should improve, as there is a cyclical connection to each component in the AMS™ (Young, 2012).

Entities can evaluate the service life of building to judge best time to plan improvements. The AMS™ can provide attention, timelines, and responsibility for making accessibility improvements. Monitoring and planning should highlight deferred maintenance issues for proper resolution, which may reduce potential barriers.

Facilities personal or engineers using “expertise and judgment” currently make decisions, gather field inspection data, or evaluate needs assessment. An AMS™ would incorporate regulations (like the AODA) with specific measurements that need adherence for inspections beyond what could be argued as subjective analysis. However, the subjective nature of needs assessment could be framed with: the identification of capital needs and priorities for best use of resources; gaining community support through involvement; and finding new revenue sources or generate budget allocations that will address access issues and upgrades. (Developed from Hudson, Haas & Uddin, 1997).

There is no standard for frequency for evaluating infrastructure (Hudson, Haas & Uddin, 1997). The rate of occurrence mandated by an AMS™ will improve the focus on accessibility. Barriers to access may be discovered and mitigated as a result of regular review. Larger entities, which require seasonal maintenance, may benefit from bi-annual inspections. Time between inspections may save money and allow capital reserves to grow. The frequency is set by the participating organization (ISO14001, 2009, p. 4). A structured system should move away from “patchwork solutions targeted on an ad-hoc basis” (Ravichandran, & Rai, 2000, p. 386). Improved accessibility should culminate as a result of an “integrated, systematic organization-wide strategy” (2000, p. 386).

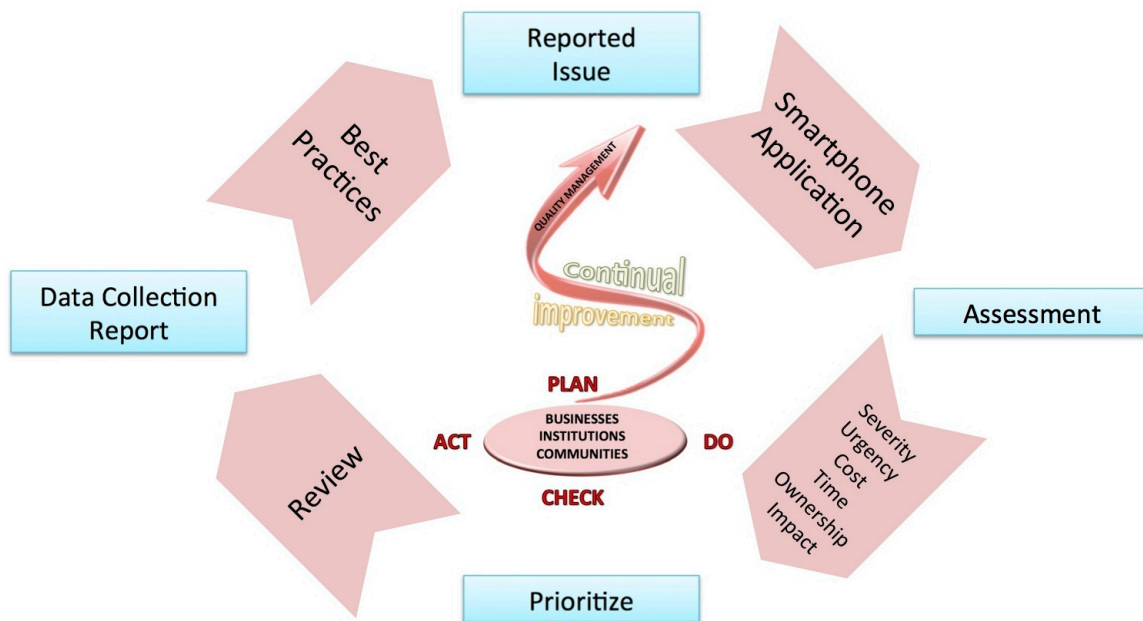


Figure 5.1: Plan-do-check-act feedback mechanism. The diagram illustrates the flow of a reported issue through various stages of remediation. The stages in the process are based on the PDCA principles where a plan is formed then implemented. Checking the progress could reveal problems that may need refinement. The act serves as a review of the process and plan where the results demonstrate the progress or finalization of accessibility issues.

A simplistic rendition of the PDCA cycle is provided in Figure 5.1. If incorporated into the university setting an issue would be reported to PO. The reporting may be through current channels or through the proposed smartphone application. The issue would need to be examined to determine the appropriate action. The assessments will be scrutinized through the lens of: severity, urgency, cost, time, ownership, and impact. Based on the findings the issue will be prioritized for remediation. A review of the ongoing work will allow for any corrective action to avoid unfavorable results. Furthermore, upon completion, the resolution of the issue will serve as a system of monitoring progress. Tracking the progress will provide a level of transparency to accessibility provision. The results of completed progress may imbue a positive benefit where the actors on accessibility can see the rewards of their decisions. The steady development of accessibility may motivate the altruistic spirit in the decision-makers. Their influence on the built environment, using best practices or simply adherence to building codes, could positively affect people with disabilities by creating greater inclusivity. Through each cycle of the PDCA, the upward spiral of continuous improvement may result in fewer issues reported.

The continuously upward improving PDCA cycle of the AMS™ will show the public a greater level of consideration. Accreditation, compliance and improved corporate image may capture larger market shares of people with disabilities. Accommodation, restaurant, attractions, retail sectors of industry may find immediate gains from the utilization of the AMS™ framework. People with disabilities are loyal to businesses that provide access (Yau, McKercher, & Packer, 2004). In recognition of the market potential, island countries are improving services to people with impairment (Gooding, 2014). A corporate mandated focus on accessibility may guide against providing the bare minimum of AODA adherence. Gaining the market share of people with impairment may encourage access beyond basic compliance.

In the university context, the management system based on the PDCA would need to permeate through multiple departments, which act as individual systems. It will be important to convey the goals of accessibility throughout the organization as a system of systems. The PDCA should diffuse through each level of operation and not solely exist as a top-down or bottom-up directive.

However, managerial support will be important to furthering the goals that will ultimately improve the university (or overall system). Without the administrative “buy-in” the process may not receive the appropriate attention to facilitate the process. This is where managerial actions are required beyond saying, “we want to improve accessibility.”

A benefit to using an AMS™ could be accountability to the provision of accessibility. Including the input from people with disabilities would add transparency, which would inform the public that concerns are being addressed in a process. Furthermore, the incremental improvements would demonstrate that an organization has assumed responsibility for repairing accessibility issues.

In the university context, the implementation of an AMS™ (Figure 5.1 indicates the AMS™ above in red) and a smartphone reporting application would provide more opportunity for people of any ability to report issues (whether a client of AAS or not). The yellow arrow indicates a potentially more efficient communication path and larger representation of facility users. The reporting app creates a bottom-up avenue of communication to people most impacted by inaccessibility. Furthermore, faculty, staff, and visitors could participate in voicing their accessibility concerns. The improved communication will strengthen the connections between the individual, social and decision-making discourse discussed in the previous chapter. The AMS™ and the reporting application provides a way to embrace new thinking in accessibility as well as new technology for improvement.

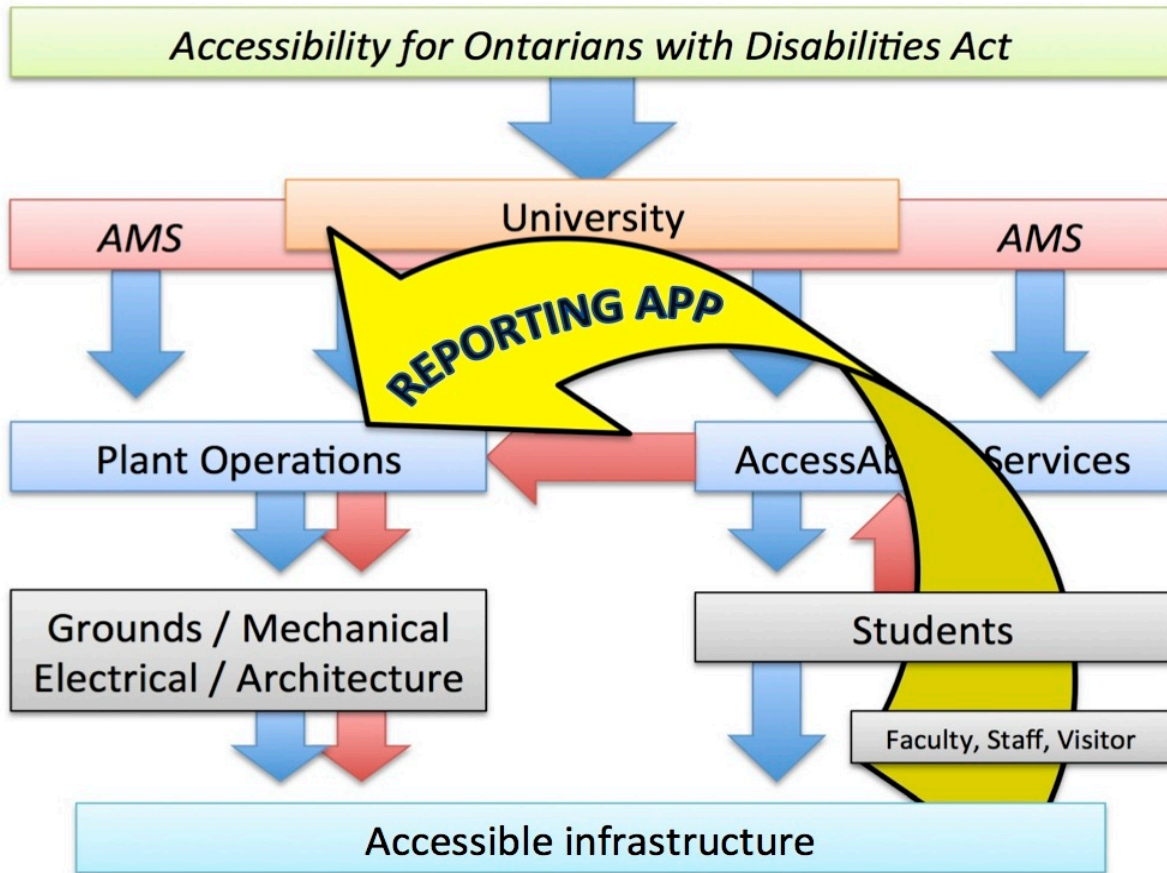


Figure 5.2: Communication flow and inputs. The communication of issues will expand to include faculty, staff, and visitors with the smartphone reporting application. The yellow arrow shows the origin of reports from users that will bypass the current reporting process by students to the AAS.

With the previously mentioned smartphone application, individuals with or without impairments can participate in the process by reporting issues (Appendix J). Providing the reporting application would offer ground-level public participation to supply accessibility issues into the management system. The participation will foster trust and understanding between users and the university. The AMS™ process could increase social inclusion without making disability individual.

6. What organizational methods generate favorable outcomes?

Three methods advanced accessibility on campus. Two establish procedures and one informal mean of communication developed favorable outcomes to accessibility. Facility audits and AAS reporting of concerns revealed access issues that were resolved. One unofficial staff communication link between PO and AAS was important to accessibility planning.

The university employs an auditing firm to evaluate campus systems and facilities. The activity of assessing the current built landscape results in planning that targets issues before they become

catastrophic issues. Often, accessibility is planned as a result of audit findings, but indirectly. Accessibility is not specifically targeted for audit. Accessibility is noted if code violations are observed. However, a gap in flooring would not be reported as an access issue rather an infrastructure issue of a specific building.

The audits provide favorable outcomes with limited budgets. When urgent facility improvements are necessary (new roofs of multiple buildings) there is a sacrifice of other projects that may include accessibility. When access concerns were voiced from the AAS, the concerns were given a greater priority, which may not have resulted in swift remediation.

As a regular practice, PO anticipates access issues emerge from the AAS. Self-advocating students register concerns with the AAS, but the office has moved away from built environment issues. Nevertheless, AAS reported a student's concern for a barrier-free path of travel to PO, which acted upon the report. While the AAS has redirected their focus away from the physical landscape, PO still receives physical modification requests. Such requests will foster PO's expectations that built environment cases will be reported from the AAS. Soon this disconnection may affect accessibility.

Finally, one informal communication link between PO and the AAS generated favorable outcomes to accessibility. However, staffing changes and limitations to the services the office provide eroded the link that has not been restored. Management from each department met periodically to generate a list of accessibility issues for inclusion in budgetary planning. Additionally the AAS staff person advocated for accessibility beyond compliance to codes. Yet, the communication link was not official. Currently, human resources are not devoted to facilitating institutional accessibility as it complies with legislation. The former staff member regularly advocated for physical accessibility on campus and was a resource for PO. New limitations to the AAS may prevent advocacy for building design to provide accessibility greater than the basic standards.

5.1 SUMMARY

The questions and discussion begin to demonstrate how a quality management system could improve accessibility, which includes a crowdsourcing application, Repeated improvements to accessibility while actively gaining user feedback could provide a greater landscape of accessibility. This proactive approach to accessibility would show that the responsibility for access is not on the individual but shared by the organization.

The next chapter will formulate the discussion points to answer the leading research question.

Chapter 6

Conclusion

The University of Waterloo endeavors to provide an equitable experience for all users. It does so with passable success. The built environment, accessibility standards, and university staff illustrated the complexity in providing accessibility for equity. An understanding of accessibility was developed with the insights of research participants, which borrowed from the constructivist paradigm. The researcher's disability experience aided collection of observation data to offer an alternate perspective. Such influence on the study borrows from the postpositivist worldview. Examining secondary source information presented policy and accessibility standards. There is hope that showing the observed misalignments between access and regulations may lead to change in the built form to be more accessible, which is influence of the transformative worldview. Simply this research was a method to understand the built environment in which a person with a disability is bound.

There is accessibility infrastructure that facilitates the attainment of an education. Accessibility is not static. Weather and wear alter the conditions of accessibility, which needs a steady gaze to ensure quality. However, there is not a persistent focus on improving accessibility infrastructure. Adopting a methodical procedure that is designed to improve accessibility could be achieved through an accessibility management system (AMS)TM (as proposed in Appendix K).

Organizational restrictions or barriers did not limit accessibility. Yet, using a management system to improve accessibility would be practical when currently, none are employed. Such usage would fulfill a need for greater attention to accessibility. Analyzing performance and procedure that affect accessibility could lead towards regular improvements. Quality management (QM) frameworks could foster planning that addresses compliance concerns assisted by audits that provide opportunity for corrective actions. The increased priority should assist in achieving accessibility goals set forth by the university and people with disabilities. Such a focus could address the calls for a proactive approach to accessibility.

There is an overall willingness to improve accessibility. However there were few actions that regularly foster improvement. Largely, issues are self-advocated by students required to take extra measures to ensure no obstacles prevent their educational pursuit. The reliance on self-reporting is not a proactive way to advance accessibility. Able-bodied students do not have to complete the same tasks to ensure accommodation. The inequitable extra measures by students with impairment places

disability as an individual concern. Additionally, many discussions were focused on student needs. Publishing this study may create a more accessible environment for faculty and staff.

People with disabilities make extensive effort to avoid barriers in their daily activities. With greater social responsibility, entities should make every effort to limit issues that may be obstacles. To aid in the identification of barriers, other domains have found that including people with disabilities in the provision process is beneficial to the organization and the users. Furthermore, seeking the feedback generated a proactive approach, which in the case of the university could be facilitated with the researcher's proposed smartphone application (as outline in Appendix J). A motivated attitude that embraces improvement of accessibility may begin to close any gaps between the built environment and legislated guidelines. The university should assume greater responsibility for accessibility to improve equity.

A measure of equity is ensured in legislated building guidelines. However, compliance through new construction is not enough to serve the needs of people with disabilities. Even the constructed minimum should be a point to exceed. Enforcement and mandated legislation may be the one way that could make actual progress. Until new regulations implement advanced accessibility technology or improved guidelines the bare minimum may continue as the standard. Champions of accessibility could be vocal to demand more than the minimum. Compliance to legislation may be facilitated when the position of an institutional access coordinator is developed. They could advocate for facility upgrades as well as communicate issues of non-compliance discovered through the monitoring processes in the AMS™.

There was need for regular audits that target access because deficient accessibility was observed. Improvement plans need to be generated and executed from the audit materials, which would include upgrades in the aging building stock. Raising the accessibility in old buildings should be demanded. Monitoring may increase adherence to regulations, reducing issues of inaccessibility. One such deficiency was the failure to report service outages, which was in violation of the AODA's customer service standard. If there is an elevator out of service or a closed pathway, individuals with impairments should receive the mandated notice (as seen in Appendix G). Through regular monitoring, the AMS™ could provide the oversight that is currently lacking by noting that outage notifications are missing. Greater attention to accessibility should create distinctive organizations that result in a competitive market advantage.

Other business sectors found a quality management system beneficial to mitigate production impacts on the environment. Using a Plan-do-check-act approach to operations, their processes allowed for gradual improvements. They are models that can show other organizations how to adopt a QM system. Applying QM to providing accessibility may get positive results where improvements are made regularly at each repetition of the proposed AMS™. Until there are improvements or the promotion of accessibility, there may be aspects of access that may not be equal utility to all users.

The university has some procedures that generate favorable accessibility outcomes. Yet, they are independent of each other and may not concentrate enough on accessibility. While the AAS has shifted from built environment concerns and former communication links have deteriorated, an AMS™ could strengthen those weakened areas. Focusing on the built environment through regular accessibility audits would generate a list of potential concerns that could be reconciled against user feedback from the smartphone application combined with input from student issues reported from the AAS. Moreover, faculty and staff report concerns to human resources. Those concerns should be incorporated into accessibility planning collectively with student access issues. VFA audit materials could be examined to find “hidden” access issues that should be addressed. An AMS™ would integrate existing methods effective in accessibility provision and enhance their processes with incremental improvements by linking the rich information of users and the operations side of providing accessibility.

A quality management system, which includes a crowdsourcing application, could improve accessibility by: Regular monitoring the provision process and accessibility infrastructure to ensure compliance and make corrective actions for a steady improvement of accessibility as evidenced in other domains; Unifying the effective methods currently employed in accessibility provision in one organizational framework; Communicating the goals of the AMS™ throughout the university’s multiple departments which serve as a system of systems, and; Embracing technology to identify and remediate issues on shorter timelines by offering a reporting application to people most affected by inaccessibility for their inclusion in the process.

This research provided insights into the broader values of inclusion and equity. The actions of university staff are, to a large extent, a reflection of public attitudes. Society has recognized that individuals should not be excluded based on ability. Legislation offers proof of support to individual’s rights. However, further actions are needed to move beyond pre-accessibility legislation landscapes. To understand the constructed world of accessibility the decision making perspectives,

the campus, and the regulations were examined. The unfortunate gap is the accessibility that is provided at the boundaries of each those aspects.

The foundation of this research could be applied beyond the scope of the study site. Similar findings are suspected at other universities, businesses, or municipalities. Communities or businesses could benefit from the themes of this research. Entities with a genuine concern for promoting accessibility could develop an internal analysis of their operations. Accessibility should not be handled passively, which is often reactive. The realization of people with impairment as a viable market segment could initiate monitoring programs, infrastructure upgrades, or audits for regular improvements. Such actions could improve equity for people with impairments.

Final Thoughts

I conducted this research to understand the obstacles in my academic pursuits. Measurements, interviews, and policy gave an understanding to the university's built environment. I hope that through that understanding I have provided insights as how to proceed in improving accessibility. Furthermore, any change as a result of this study is to benefit people in the future with their lives and scholarly endeavors.

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Appendix A

Participant Recruitment Content

Email content for interview arrangements is presented here.

Good afternoon,

My name is Jason Angel, a Masters candidate in the School of Planning at the University of Waterloo. Under the supervision of professor Robert Shipley, I am seeking people to participate in an interview about accessibility at the University of Waterloo. I am looking for authority figures that may influence accessibility. As a leader, I believe you are familiar with the operations in your department and in additional areas across campus. My research will examine accessibility from your perspective and the department's.

The interview should take about 40-minutes or less. The interview is to be held at a time of your convenience. With your permission, the interview will be recorded. I am willing to visit your office or we can arrange an alternate meeting place. Please email Jason at jangel@uwaterloo.ca if you are interested with potential dates and times when you could participate.

This project has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. Participants who have concerns or questions about their involvement in the project may contact the Chief Ethics Officer, Office of Research Ethics at 519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

If you have any questions about this research please contact me at this email address.

Any assistance with this project would be greatly appreciated.

Thanks and have a great day.

Jason

Appendix B

Interview Questions

The following are the interview questions asked of most participants. Alternate questions were generated for participants within specific fields – those questions are on the next pages.

Set A

Interview question for most participants:

1. What duties does your department handle that directly relate to accessibility for people with impairment
2. What procedures or systems are employed for infrastructure management? Do any relate directly to accessibility?
3. Is there any kind of systems for providing accessibility on campus?
4. What outlets are there for people with impairment to report accessibility issues?
5. Can you explain access issues that have received your attention and how they were resolved?
6. What management systems are employed in the university's operation?
7. What managerial improvements do you think should be considered to improve accessibility for people with impairment on campus?
8. How is compliance to accessibility standards handled?
9. Who is responsible for filing the AODA Compliance forms to the Ontario Government?
10. Do you know another person within this department or another that may have more experience or knowledge of this subject?

Appendix B cont. – Alternate Interview Questions

Set B

Chris Read Interview Questions:

1. What duties does your department handle that directly relate to accessibility for people with impairment
2. What procedures or systems are employed for infrastructure management? Do any relate directly to accessibility?
3. Is there any kind of systems for providing accessibility on campus?
4. What outlets are there for people with impairment to report accessibility issues?
5. Can you explain access issues that have received your attention and how they were resolved?
6. What management systems are employed in the university's operation?
7. What managerial improvements do you think should be considered to improve accessibility for people with impairment on campus?
8. Communication and a proactive approach to accessibility have emerged in my study. Are there any actions in motion or future plans to improve on such themes?
9. How is compliance to accessibility standards handled?
10. Who is responsible for filing the AODA Compliance forms to the Ontario Government?
11. Is there a single staff person devoted to institutional accessibility in compliance to the AODA? Are there plans for such a staff position?

Appendix B cont. – Alternate Interview Questions

Set C

Interview question for Director of Business Services:

1. What duties does your department handle that directly relate to accessibility for people with impairment
2. What procedures or systems are employed for infrastructure management? Do any relate directly to accessibility?
3. Is there any kind of systems for providing accessibility on campus?
4. What outlets are there for people with impairment to report accessibility issues?
5. Can you explain access issues that have received your attention and how they were resolved?
6. What management systems are employed in the university's operation?
7. What managerial improvements do you think should be considered to improve accessibility for people with impairment on campus?
8. How is compliance to accessibility standards handled?
9. Are there financial mechanisms that would promote accessibility?
10. Are there specific budgets allocated for accessibility?
11. Who is responsible for filing the AODA Compliance forms to the Ontario Government?
12. Do you know another person within this department or another that may have more experience or knowledge of this subject?

Appendix B cont. – Alternate Interview Questions

The next two interview targets offered insight from beyond the study site. Questions were formulated specifically to their perspectives.

Set D

Interview questions for Food Services Manager:

1. What tasks may be specific to handle accessibility for people with impairment?
2. What procedures or systems are employed for infrastructure management? Do any relate directly to accessibility?
3. Is there any kind of competitive advantage for providing accessibility?
4. What outlets are there for customers to provide feedback?
5. Can you explain any access issues that have received your attention and how they were resolved?
6. Are there managerial improvements that you think should be considered to improve customer service for people with impairment?
7. How is compliance to accessibility standards handled?
8. Who is responsible for filing the AODA Compliance forms to the Ontario Government?
9. Do you know another person that may have experience or knowledge of this subject?

Appendix B cont. – Alternate Interview Questions

Set E

Interview Questions for Project Manager Joe Marie, former Massachusetts Bay Transportation Authority employee:

1. Was your attention focused on one aspect of the authority or did you work with all aspects? Buses, ferries, trains, subway?
2. What was accessibility like prior to the ADA?
3. Was there an outlet for people to file complaints about accessibility? Or consumer advocates demanding access?
4. Was there a huge demand?
5. When accessibility was implemented was it like opening a floodgate?
6. How did the MBTA proceed on implementing accessibility?
7. Where there infrastructure management procedures where accessibility was incorporated?
8. Was paratransit vehicles used to provide access until infrastructure or accessible vehicles could be put in place?
9. It was said that the ADA was largely unfunded. Did the MetroPlanningOrg secure a large amount of funds specifically for accessibility?
10. Was there foresight prior to the passage of the ADA where strategies or plans were devised to begin compliance?
11. What was the greatest challenge to implementation?
12. There is a Manager of Fixed Route Disability/Senior Services (Kathy Cox) was that post there during your tenure?
13. In your past and current experience, is there a clear competitive advantage to providing accessibility? How has that advantage manifested itself?
14. You have a unique perspective; you see the performance of the ADA and the AODA. Do you think one is performing better than the other? Why?
15. What do you see as strengths and weaknesses in each legislation from your point of view?

Appendix B cont. – Alternate Interview Questions

Set F

Interview question for Industrial/Operations Professor:

1. What is your experience with Quality Management (QM)?
2. What were some interesting findings of previous research?
3. How was the culture of organization encouraged to incorporate QM?
4. What challenges are there to QM?
5. Are there any leaders in QM?
6. What should be considered when implementing QM?
7. Do you know another person that may have more experience or knowledge of this subject?

Appendix C

Data Collection Forms

The following form was used in the collection of campus observations:

DATE: _____ BUILDING: _____ *(Items left blank were not found or do not apply)*

CHECKLIST FOR BUILDING ENTRANCE

HP ENTRANCE ON MAP (YES / NO) HP SIGNAGE (YES / NO) FLOORPLAN (YES / NO)

DOOR THRESHOLD ht _____ PUSH BUTTON DOOR (YES / NO) OPERATIONAL? (YES / NO) BTTN ht: _____

EXT. DOOR HANDLE ht _____ DOOR PULL STRENGTH _____ lbs. HP BTTN PLCMT: _____
NOTES (OTHER ISSUES AT ENTRANCES):

CHECKLIST FOR CLASSROOM (LARGE BLDNG/RM# _____ / SMALL BLDNG/RM# _____)

DOOR THRESHOLD ht _____ / _____ DOOR OPENER (YES / NO) EXT. DOOR HANDLE TYPE:

EXT. DOOR HANDLE ht _____ / _____ DOOR PULL STRENGTH _____ / _____ lbs.

HP DESK (YES / NO) ht _____ / _____ with _____ / _____ DESK LOCATION (FRONT / BACK / OTHER)

ACCESS TO FRONT (YES / NO) ACCESS TO BACK (YES / NO) RAMPED INCLINE _____ / _____

PODIUM ht _____ / _____ SPC BTWN PODIUM & BRD/WALL _____ / _____ EDGE TO TCHSCRN lgth _____

EMERGENCY PROCEDURE DATA (YES / NO) ht _____ / _____ # OF HP DESKS _____ / _____

DISTANCE TO HP WASHROOM _____ m H₂O FNTN: ht _____ CLRNCE: _____ bttns on side (YES / NO)
NOTES:

CHECKLIST FOR ACCESSIBLE WASHROOM — (WOMEN / MEN / UNISEX)

HP SIGNAGE (YES / NO) / (YES / NO) DOOR THRESHOLD ht _____ / _____ DOOR OPENER (YES / NO) / (YES / NO)

EXT. DR HANDLE ht _____ / _____ SHAPE: _____ DR PULL SGTH _____ / _____ lbs. LIGHT SWITCH ht _____ / _____

STALL DOOR with _____ / _____ HANDLE ht _____ / _____ LOCK TYPE (DIAL / SLIDE / LEVER)

STALL with _____ / _____ length _____ / _____ GRAB BARS ht _____ / _____ TYPE: (ANGLE / L) / (ANGLE / L)

TOILET PAPER ht _____ / _____ TP length to TOILET _____ / _____ TOILET ht _____ / _____ COAT HK: ht _____

SINK ht (top) _____ / _____ (btm) _____ / _____ (dpth) _____ / _____ SINK HANDLES: Levers / Dials / Auto

SOAP ht _____ / _____ PSTN: _____ HD DRYER / TOWELS ht _____ / _____ TSH CAN ht _____ / _____ PLCMT _____
NOTES:

Appendix C cont. – Data Collection Forms

The following form was used in the collection of service buildings:

DATE: _____ BUILDING: _____ *(Items left blank were not found or do not apply)*

CHECKLIST FOR BUILDING ENTRANCE

HP ENTRANCE ON MAP (YES / NO) HP SIGNAGE (YES / NO) FLOORPLAN (YES / NO)

DOOR THRESHOLD ht _____ PUSH BUTTON DOOR (YES / NO) OPERATIONAL? (YES / NO) BTTN ht: _____

EXT. DOOR HANDLE ht _____ DOOR PULL STRENGTH _____ lbs. HP BTTN PLCMT: _____

NOTES (OTHER ISSUES AT ENTRANCES):

CHECKLIST FOR SVC AREA LOCATION:

DOOR THRESHOLD ht ___LG___/___SM___ DOOR OPENER (YES / NO) EXT. DOOR HANDLE TYPE:

EXT. DOOR HANDLE ht ___LG___/___SM___ DOOR PULL STRENGTH ___LG___/___SM___ lbs.

HP COUNTER (YES / NO) ht _____ wth _____ PAY MACHINE CORD lgth _____ STAFF AODA TRAINED (Y / N)

CLEAR CIRCULATION ROUTE:

NOTES:

CHECKLIST FOR SVC AREA LOCATION:

DOOR THRESHOLD ht ___LG___/___SM___ DOOR OPENER (YES / NO) EXT. DOOR HANDLE TYPE:

EXT. DOOR HANDLE ht ___LG___/___SM___ DOOR PULL STRENGTH ___LG___/___SM___ lbs.

HP COUNTER (YES / NO) ht _____ wth _____ PAY MACHINE CORD lgth _____ STAFF AODA TRAINED (Y / N)

CLEAR CIRCULATION ROUTE:

NOTES:

Appendix C cont. – Data Collection Forms

CHECKLIST FOR SVC AREA LOCATION:

DOOR THRESHOLD ht ___LG___/___SM___ DOOR OPENER (YES / NO) EXT. DOOR HANDLE TYPE:

EXT. DOOR HANDLE ht ___LG___/___SM___ DOOR PULL STRENGTH ___LG___/___SM___ lbs.

HP COUNTER (YES / NO) ht _____ with _____ PAY MACHINE CORD lgth _____ STAFF AODA TRAINED (Y / N)

CLEAR CIRCULATION ROUTE:

NOTES:

CHECKLIST FOR ACCESSIBLE WASHROOM — (WOMEN / MEN / UNISEX)

HP SIGNAGE (YES / NO) / (YES / NO) DOOR THRESHOLD ht ___w___/___m___ DOOR OPENER (YES / NO) / (YES / NO)

EXT. DR HANDLE ht ___w___/___m___ SHAPE: _____ DR PULL SGTH ___w___/___m___ lbs. LIGHT SWITCH ht ___w___/___m___

STALL DOOR wth ___w___/___m___ HANDLE ht ___w___/___m___ STALL wth ___w___/___m___ lgth ___w___/___m___

LOCK TYPE (DIAL / SLIDE / LEVER) GRAB BARS ht ___w___/___m___ TYPE: (ANGLE / L) / (ANGLE / L) BCK WALL ht ___w___/___m___

TOILET PAPER ht ___w___/___m___ TP length to TOILET ___w___/___m___ TOILET ht ___w___/___m___ COAT HK: ht _____

SINK ht (top) ___w___/___m___ (btm) ___w___/___m___ (dpth ___w___/___m___ SINK HANDLES: Levers / Dials / Auto

SOAP ht ___w___/___m___ PSTN: _____ HD DRYER / TOWELS ht ___w___/___m___ TSH CAN ht ___w___/___m___ PLCMT _____

NOTES:

Appendix D

Provision of University Services and Goods to Persons with Disabilities

Under the requirements of the AODA the university is required to have an accessibility plan. According to the AAS web page a policy is being developed. The page can be viewed at: <https://uwaterloo.ca/disability-services/policy>.

Policy

University of Waterloo: Provision of University Services and Goods to Persons with Disabilities Policy

The University of Waterloo has a long standing commitment to support the participation and access to university programs, services, and facilities by persons with disabilities. To continue with this commitment and to honor obligations set by the [Accessibility for Ontarians with Disabilities Act \(AODA\)](#), the University will strive to undertake reasonable efforts to provide goods or services in a way that respects the dignity and independence of persons with disabilities.

The University will ensure that [customer service training](#) is provided to staff, faculty and student leaders who interact with the public and that procedures regarding use of assistive devices, service animals, access to support persons, notice of temporary disruption of services, and what to do if a person is having difficulty accessing university goods or services is communicated to the public. Refer to [Policy 33](#).

Additional University of Waterloo initiatives to promote accessible customer service for students and campus visitors with disabilities can be found at:

[Policies, Procedures and Practices \(DOC\)](#)

University of Waterloo Accessibility Plan (under revision)

Appendix E

Route Findings and Waypoints

The information provided here correlates with the route map data points on the Google MyMaps application named Observed Routes Map (ORM). The listed waypoints here match waypoints on the ORM along a specific, highlighted route. Due to the unfamiliarity with the GPS unit the numbering of waypoints may have slight inconsistencies. Waypoint numbers are based on the assignment by the GPS device. Example: waypoints are shown as WP001. When required, waypoints were added to the ORM as data was collected but the waypoint was not captured.

Details for each waypoint highlight an issue or issues that may affect accessibility. The severity of the issue may be difficult to determine. However, some noted issues could be hazardous to people with mobility impairments. Noting the issue is meant to show places where some form of repair may be necessary.

There are three observed routes with their noted waypoints – EV3 to CPH, SLC to DC, and SCH to BMH. The waypoints were determined using the problem assessment method. When an issue was identified, it was noted. Numerous collection points were observed. Many issues were repeatedly observed. The essence of these findings was discussed in the “Walkways” section of Chapter 4. (Photo credits for all pictures: Jason M. Angel and Patricia S. Robinson-Angel)

ROUTE: EV3 to CPH

WP005 – Start of west to east route.



WP006 – 2 Grates in walkway with large holes dangerous to pedestrians or wheeled mobility.



Appendix E cont. – Route Findings and Waypoints

WP007 – Transition from brick to asphalt 12.7cm to 15.24cm with slopes of 5°, 2°, 10°.



WP008 – Gate and grate (EV1/ML) narrow passage between tree/post/wall. Transition from brick to concrete 0cm to 1.9cm. Grate holes are not horizontal to the incline. Holes are 2.54cm wide and 10.16cm long. Side note: on one occasion the observer's wheels were seized in the grate requiring assistance to get free.



WP009 – Barrier at AL/EV1/ML. Broken asphalt with two 27.94cm x 40.64cm and 20.32cm x 7.62cm holes. Construction blocks the shorter desired route on path between AL and HH – with no notice of service outage.



WP011 – Hole in surface at top of the ramp has 1.27cm - 6.35cm depths.



WP010 – Two seams in pavement across path.



WP011a – Hole in pavement along seam in walkway.



WP012 – Seam in pavement width 137.16cm wide with whole in surface.



WP013 – Seam in pavement with 2.54cm width.



WP014 – Broken pavement with 2.54cm hole in center of walkway. Width of hole was 43.18cm wide and 22.86cm in length.



WP015 – Seam in pavement. Deepest portion has 12.7cm x 60.96cm area. Depth of crack measured down to 10.16cm.



WP016 – Large diagonal crack 360cm across pathway on a 5° downward slope. Broken pavement borders the fractured surface. Widest part of damage was 40.6cm. The downward slope and surface issues could be hazardous.



WP017 – Seam (3.81cm at widest) running downward mid-path had broken pavement. 5.3m away from previous issue on downward slope.



WP018 – Two paths converge. A large 14.93m seam has a transition between grades ranging from 2.54cm to 5.04cm on a downward slope.



WP019 – Broken and heaved pavement with seams. Difference in some surfaces measured 3.17cm. The affected area is at the bottom of a slope.



WP020 – Curb cut had protruding concrete by 3.81cm. Curb cut does not align with the crosswalk. Accessible crossing is 9.5m compared to the pedestrian crossing at 7.8m.



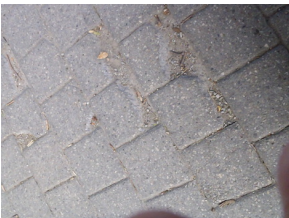
WP021 – Area of heaved pavers.



WP022 – Curb cut slope 10° down to protruding concrete of 2.54cm. Broken pavers also are in the same area.



WP023 – Broken pavers. 2.54cm hole in surface.



WP024 – Curb cut had protruding concrete of 2.54cm with a 3.81cm gap on the street side of concrete.



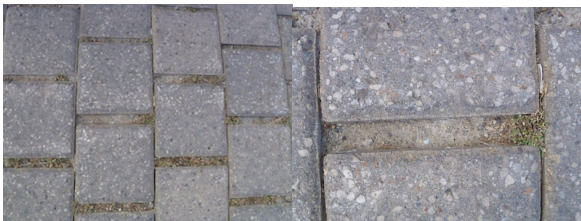
WP025 – Curb cut had protruding concrete ranging from 1.27cm to 6.35cm with a gap of 2.54cm to 5.08cm gap on the street side of concrete. Pavement on street side of curb cut was heaved 3.81cm.



WP026 – Grade difference in pavers with a 12.7cm width with a height of 7.62cm, which ran for 8m.



WP027 – Heaved pavers had gaps of 2.54cm.



WP028 – Two curb cuts cross Ring Road to curbed walkways on far side. No access to sidewalk along University Avenue.



WP028a – End of Route. Curb cut crosses Ring Road. No access to University Ave or University Plaza at this crossing (LRT construction affected access). Nearest semi-accessible crossing was at E5. That crossing was under construction with gravel on each side of rails.



ROUTE: SLC to DC

WP029 – Start of route from SLC area to DC area.



WP029a – Broken pavers. Some have gaps of 2.54cm. Some have depths of 2.54cm.



WP029b – Curb cut with protruding concrete ranging from 1.27cm to 5.08cm in height.



WP030 – Crack in pavement across 325.12cm wide path. Widest gap was 3.17cm wide.



WP031 – Broken pavement at corner of transition between surfaces (pavement to pavers). Broken area affects 106cm into pathway.



WP032 – Broken paver. 3.17cm to 5.71cm opening with 1.27cm depth.



WP033 – Broken pavement and surface transition issue across 304cm pathway. Pavement repair ranged 66.04cm to 76.2cm in length, which was partially below grade.



WP034 – 10m seam in pavement at divergence of two paths (gaps between surfaces of 1.27cm and 1.9cm). The direct path to right does not have curb cut 36m from divergence. Left path leads to curb cut on service road.



WP035 – Curb cut has protruding concrete with heights of 2.54cm to 5.08cm.



WP036 – Curb cut with protruding concrete with heights of 1.9cm to 7.62cm on road side and 1.27cm to 2.54cm on walkway side. Pavement around curb cut is broken. Mud and debris indicated that there was a frequency of standing water.



WP037 – Uneven transition of surfaces. Differences ranged from 1.27cm to 2.54cm.



WP038 – Slope measuring incline of 5° and 10° in different places.



WP039 – Broken paver 1.9cm to 2.54cm in length with 1.27cm depth.



WP040 – First available door into DC along route is not accessible.



WP041 – Accessible entrance has threshold of 3.81cm to 5.08cm. Button for door opener is 2.5m from door with no distinguishing color to highlight location. Position of button is on a slight downward slope with a bench blocking a direct route to the button.



WP041a – Uneven transition between surfaces. Protruding concrete rose 2.54cm to 7.62cm above grade.



WP042 – Transition from pavers into DC entrance had a 3.17cm difference in levels.



WP043 – Observations were meant to examine exterior routes of travel. This waypoint is the continuation of the exterior route picking up from waypoint 35. Waypoints 36 - 42 would be issues on a shorter route that enters and exits DC.

WP044 – The loading bay door at M3 has a large concrete path for vehicles that extends from the building to the roadway. Transition from the walkway onto the vehicle area has a difference in grade of 7.62cm to 10.16cm.



WP045 – Curb cut has protruding concrete of 1.27cm to 1.9cm.



WP046 – Curb cut with protruding concrete and a section of missing concrete. Concrete protrudes 1.9cm on walkway side and 4.44cm on roadside. Missing concrete created a below grade transition.



WP049 – Broken curb cut. Missing material causes a below grade depression creating a transition of 1.27cm to 1.9cm.



WP050 – Curb cut has protruding concrete of 2.54cm to 3.17cm.



WP051 – Curb cut bordered with fractured pavement. Transition of 1.27cm.



WP052 – Uneven transition into bus shelter with a 2.54cm difference in levels. Other two bus shelters in the DC area had smooth transitions.



WP053 – This waypoint begins observations of issues on a shorter accessible route to SLC area (east to west). Since access issues were well examined west to east the return route has simply noted the issue and location. Photo documentation illustrates the similarities with previously reported issues.

WP054 – Curb cut has 3.17cm gap between concrete and pavement.



WP055 – The researcher's preference was to use the roadway to take advantage of the downward slope and smooth paved surface, which reduced time and effort.



WP056 – Broken, uneven curb cut.



WP057 – Curb cut with uneven transition.



WP058 – Curb cut with uneven transition. Concrete bordered by broken pavers on walkway side. Manhole protrudes above grade with missing pavers between the cover and concrete of the curb cut.



WP059 – Curb cut (on alternate walkway) had protruding concrete. Areas on each side of concrete are below grade. Curb cut with uneven transition.



WP059a – Curb cut with uneven transition.



WP060 – Large area of pavement with multiple surface issues. Pavement is fragmented or missing creating an inconsistent surface.



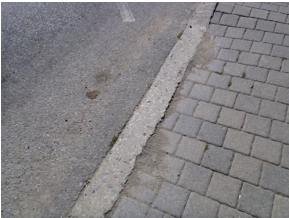
WP061 – Uneven transition between surfaces.



WP062 – Uneven transition between surfaces.



WP063 – Curb cut with protruding concrete.



WP064 – Protruding utilities cover created transition and affected placement of pavers.



The following section was observed because it would connect to student housing pathways. The north to south observation of this stretch highlighted the influence of topography on the researchers route choice. The 205m length of walkway has an elevation change of 12.4m. The advantages of the downward slope were a savings in time and effort. Furthermore, the bottom of the slope connects with the alternate observed route to and from DC. This section of the route was observed on a later date and is highlighted with the pink line marked by waypoint 90 running to waypoint 111. The observed issues were similar to other findings. The location and a description of the issue were noted.

WP090 – Traffic control barrier blocked the curb cut along the path. Researcher was able to reverse direction of the barrier, which resolved the issue.



WP091 – Large seam of broken pavement covers the width of the pathway. The gap in the pavement could be hazardous as its width could halt forward movement of a wheeled mobility device suddenly. Past repair of the seam appeared ineffective.



WP093 – Large seam of broken pavement covers the width of the pathway. The gap in the pavement could be hazardous as its width could halt forward movement of a wheeled mobility device suddenly.



WP094 – This 500cm wide walkway is directed towards the steps of SLC. The 152cm wide walkway along Ring Road is narrower and has a cross slope that requires more effort in forward progress. Neither path would be preferable to the researcher, as the benefit of the downward slope would be diminished. The preferred path would be the walkway on the west side of Ring Road.



WP095 – The University upgraded streetlights along Ring Road. The utilities, concrete supports, and poles were removed. Pavement was used to repair open sections of pavement. The pavement repairs were inconsistent with the rest of the surface. There were a series of repaired pavement patches that either had poor transitions or some form of grade separation (above or below grade).



WP096 – Streetlight pavement repair issue.



WP097 – Large section of pavement repair left a large seam between the old and new sections. Seam width ranged between 1.27cm and 1.9cm.

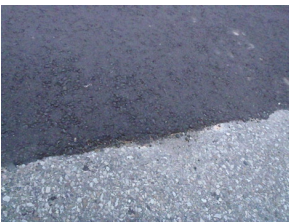


WP098 – Streetlight pavement repair issue.



WP099 – Streetlight pavement repair issue.

WP100 – Transition between surfaces of old and new pavement.



WP105 – Broken pavement. Long fractures in the surface. A portion of missing pavement had 2.54cm to 4.44cm depths.



WP106 – Streetlight pavement repair issue. Hole in pavement within same general location.



WP107 – Hole in pavement.



WP108 – Two water main issues. One rises above grade and the other was below grade.



WP109 – Large seam across pathway. Vegetation had grown in the fissure.



WP110 – Seam in pavement in middle of path leads to section of former pavement repair. Old repair across path had transition between old and new surfaces.



WP111 – Streetlight pavement repair issue.



ROUTE: SCH to BMH

WP065 – Start of SCH to BMH route (south to north) observation. Since the route was partially observed from the northeast corner of TC to the front of SCH, observations began at this waypoint. A visual inspection of the previously observed route (Waypoint 12 to 21 on the green line) was conducted to ensure no additional issues manifested. Large 8m seam of broken pavement crosses pathway.



WP065a – Broken pavement has transition of 0cm to 6.35cm. Large area of dirt or missing pavement adjacent to transition.



WP066 – Widening crack in pavement located in the middle of pathway. Pine needles disguised the severity of the fissure. The opening starts narrow at 0cm and widens to 4.44cm ending at a transition to pavers.



WP067 – Utility cover protruded above grade. Some broken pavers surrounded the cover. 10° slope off edge of affected area.



WP068 – Broken pavers had 1.9cm to 2.54cm depth.

WP069 – Storm grate hazard. Grate fell below grade with a 1.54cm gap between the pavers and grate.



WP070 – Area with broken pavers. 1.27cm to 2.54cm depths in places with broken pieces.



WP071 – Broken paver with 1.27cm to 2.54cm depths.



WP072 – Area of multiple broken pavers. Waypoint 72, 73, and 74 had numerous pavers that needed replacement. The characteristics of the broken pavers are similar to ones observed elsewhere. Observing each incident was prohibitive due to the enormous amount of broken pavers - it is why the waypoints 72, 73, 74 are listed as areas.



WP073 – Area of multiple broken pavers.



WP074 – Area of multiple broken pavers.



WP075 – Uneven transition between concrete and pavers measured 0.63cm to 1.9cm with slight sloping up to grade.



WP076 – Two utility covers rose above grade. Broken and heaved pavers were at edge of first cover. The second cover (third photo) was less of an issue.



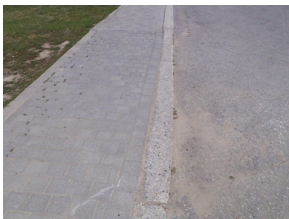
WP077 – Storm grate rose above grade. Grate and surrounding pavers (some broken) created a transition between grades up to 1.9cm. The grade difference caused water to collect at the edges of the grate, which may conceal the hazardous transition issue.



WP078 – Observation of direct accessible route terminated at this point due to construction of the pathway. Over 15 people were observed in 5 minutes crossing the construction unimpeded. There was no notification of this outage. Observations continued to the next nearest accessible route (walkway between M3 and GSC). Third photo is a photo of the completed work.



WP079 – Cross slope on walkway 10°.



WP080 – Transition from pavers to concrete was uneven with a 1.9cm to 2.54cm grade separation.



WP081 – Walkway/curb cut had 10° slope. Transition from walkway to concrete (to enter M3) had a difference of 2.54cm to 3.81cm grade difference with sloping up to concrete level. Curb cut has protruding concrete that rose 1.9cm to 3.17cm.



WP083 – Issue previously noted on waypoint 43.



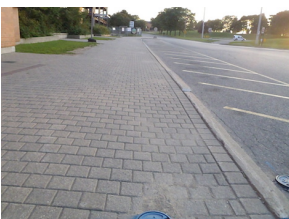
WP084 – Hole in walkway 2.54cm to 4.44cm.



WP085 – Below grade utility cover. One edge had transition of 0.63cm.



WP086 – Uneven walkway.



WP087 – Two water mains protrude above grade.



WP088 – Two curb cuts with protruding, broken concrete. At far side of crossing a storm grate was centered in the walkway.



WP089 – Curb cut with uneven transition from pavement to concrete.



Appendix F

Ontario Building Code Section of Barrier-Free Design

The following is Barrier-Free Design section of the Ontario Building Code. The section provides guidelines that pertained to this study. Washroom, entryways, paths of travel, ramps, and curb cuts have detailed description for designing accessibility. The content applicable to this research is provided to exhibit the intricacies of the language. Several sections of the codes were omitted, as there was limited application to this study. To avoid any misinterpretation by the researcher the content is delivered as it appears from the source. For continuity page breaks were placed to preserve the appearance of tables.

Section 3.8. Barrier-Free Design

3.8.1. General

3.8.1.1. Application

- (1) The requirements of this Section apply to all *buildings* except,
 - (a) houses, including semi-detached houses, duplexes, triplexes, town houses, row houses and boarding or rooming houses with fewer than 8 boarders or roomers,
 - (b) *buildings* of Group F, Division 1 *major occupancy*,
 - (c) *buildings* that are not intended to be occupied on a daily or full time basis, including automatic telephone exchanges, pumphouses and substations, and
 - (d) *camps for housing of workers*.

3.8.1.2. Entrances

- (1) Except as provided in Sentence 3.13.8.1.(2), the number of *barrier-free* entrances into a *building* shall conform to Table 3.8.1.2.

**Table 3.8.1.2.
Minimum Number of Pedestrian Entrances Required to be Barrier-Free**

Forming Part of Sentence 3.8.1.2.(1)

Item	Column 1 Number of Pedestrian Entrances into <i>Building</i>	Column 2 Minimum Number of Pedestrian Entrances Required to Be <i>Barrier-Free</i>
1.	1 to 3	1
2.	4 or 5	2
3.	More than 5	Not less than 50%

- (2) One of the *barrier-free* entrances required by Sentence (1) shall be the principal entrance to the *building*.

- (3) In addition to the *barrier-free* entrances required by Sentence (1), a *suite* of *assembly occupancy*, *business and personal services occupancy* or *mercantile occupancy* that is located in the *first storey* of a *building* or in a *storey* to which a *barrier-free* path of travel is provided, and that is separated from the

remainder of the *building* so that there is no access to the remainder of the *building*, shall have at least one *barrier-free* entrance.

(4) A *barrier-free* entrance shall,

(a) be designed in accordance with Article 3.8.3.3., and

(b) lead from,

(i) the outdoors at sidewalk level, or

(ii) a ramp that conforms to Article 3.8.3.4. and leads from a sidewalk.

(5) At a *barrier-free* entrance that includes more than one doorway, only one of the doorways is required to be designed in accordance with Article 3.8.3.3.

(6) If a *walkway* or pedestrian bridge connects two *barrier-free storeys* in different *buildings*, the path of travel from one *storey* to the other *storey* by means of the *walkway* or bridge shall be *barrier-free*.

3.8.1.3. Barrier-Free Path of Travel

(1) Except as required in Sentence (4) and except as permitted in Subsection 3.8.3., every *barrier-free* path of travel shall provide an unobstructed width of at least 1 100 mm for the passage of wheelchairs.

(2) Interior and exterior walking surfaces that are within a *barrier-free* path of travel shall,

(a) have no opening that will permit the passage of a sphere more than 13 mm in diam,

(b) have any elongated openings oriented approximately perpendicular to the direction of travel,

(c) be stable, firm and slip-resistant,

(d) be bevelled at a maximum slope of 1 in 2 at changes in level not more than 13 mm, and

(e) be provided with sloped floors or ramps at changes in level more than 13 mm.

(3) A *barrier-free* path of travel is permitted to include ramps, passenger elevators or other platform equipped passenger elevating devices to overcome a difference in level.

(4) Every *barrier-free* path of travel less than 1 600 mm in width shall be provided with an unobstructed space not less than 1 800 mm in width and 1 800 mm in length located not more than 30 m apart.

(5) Where the headroom of an area in a *barrier-free* path of travel is reduced to less than 1 980 mm, a guardrail or other barrier with its leading edge at or below 680 mm from the finished floor shall be provided.

(6) A normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel shall meet the following requirements:

(a) interior walking surfaces throughout the normally occupied *floor area* shall comply with Clauses (2)(a) to (e), and

(b) where the headroom of an area in a corridor or aisle in the normally occupied *floor area* is reduced to less than 1 980 mm, a guardrail or other barrier with its leading edge at or below 680 mm from the finished floor shall be provided.

3.8.1.4. Escalators and Moving Walks

(1) In a *building* in which an escalator or inclined moving walk provides access to any floor level above or below the entrance floor level, an interior *barrier-free* path of travel shall be provided to that floor level.

(2) The route from the escalator or inclined moving walk to the *barrier-free* path of travel required by Sentence (1) shall be clearly indicated by appropriate signs.

(3) In a *building* in which a moving walk provides access between areas on the same floor level, a *barrier-free* path of travel shall be provided between the areas served by the moving walk.

3.8.1.5. Controls

(1) Except as required by Sentences 3.5.2.2.(1) and 3.8.3.5.(1) for elevators and Sentence 3.8.3.3.(17) for power door operator controls, controls for the operation of *building* services or safety devices, including

electrical switches, thermostats and intercom switches, intended to be operated by the occupant and located in a *barrier-free* path of travel shall,

- (a) be accessible to a person in a wheelchair using a side approach,
- (b) be operable,
 - (i) using one hand and with a force of not more than 22.2 N, in the case of a manual pull station, and
 - (ii) using a closed fist and with a force of not more than 22.2 N, in the case of all other controls, and
- (c) be mounted,
 - (i) 1 200 mm above the finished floor, in the case of a thermostat or a manual pull station, and
 - (ii) not less than 900 mm and not more than 1 100 mm above the finished floor, in the case of all other controls.

(2) A signal intended for the public to indicate the operation of a *building* security system that controls access to a *building* shall consist of an audible and visual signal.

3.8.1.6. Illumination

(1) All portions of a *barrier-free* path of travel shall be equipped to provide a level of illumination in accordance with Sentence 3.2.7.1.(1).

3.8.2. Occupancy Requirements

3.8.2.1. Areas Requiring Barrier-Free Path of Travel

(1) Except as permitted by Sentence (3), a *barrier-free* path of travel from the entrances required by Sentences 3.8.1.2.(1) and (3) to be *barrier-free* shall be provided,

- (a) throughout the entrance *storey*,
- (b) except as permitted by Sentence (2), to and throughout all normally occupied *floor areas* and rooftop amenity spaces, and
- (c) throughout all normally occupied *floor areas* and rooftop amenity spaces that,
 - (i) are exempt from the application of Clause (b), and
 - (ii) are served by a passenger elevator, escalator, inclined moving walk, or other platform equipped passenger elevating device.

(2) A *barrier-free* path of travel described in Clause (1)(b) is not required to extend,

- (a) to *floor areas* or portions of *floor areas* containing a Group B, Division 2 or 3 *occupancy* that are not required by Article 3.5.2.1. to be connected by a ramp or served by an elevator,
- (b) to Group C or Group D *occupancies* that are in *floor areas* in a *building* that,
 - (i) is three or fewer *storeys* in *building height*, and
 - (ii) has a *building area* not exceeding 600 m²,
- (c) to Group F, Division 2 or 3 *occupancies* that are not required by Sentence 3.8.2.2.(1) to be served by an elevator,
- (d) to portions of restaurants and licensed beverage establishments where the same amenities and uses are provided on other *floor areas* that have a *barrier-free* path of travel, or
- (e) to portions of child care facilities that have all entrance doors at floor levels that do not have a *barrier-free* path of travel.

(3) A *barrier-free* path of travel described in Sentence (1) is not required to extend,

- (a) into *service rooms*,
- (b) into elevator machine rooms,
- (c) into janitors' rooms,

- (d) into *service spaces*,
 - (e) into crawl spaces,
 - (f) into *attic or roof spaces*,
 - (g) into *high hazard industrial occupancies*,
 - (h) to portions of a *floor area* with fixed seats in an *assembly occupancy* where these portions are not part of the *barrier-free* path of travel to,
 - (i) spaces designated for wheelchair use,
 - (ii) seats designated for *adaptable seating*, or
 - (iii) spaces for the storage of wheelchairs and *mobility assistive devices*,
 - (i) to *suites of residential occupancy* that are in *storeys* other than the entrance *storey* and that have all entrance doors at floor levels that are not required to have a *barrier-free* path of travel,
 - (j) except as required by Sentence (5), on the inside of a *suite of residential occupancy*, or
 - (k) to portions of a *floor area* that are not at the same level as the entry level, provided amenities and uses provided on any raised or sunken level are accessible on the entry level by means of a *barrier-free* path of travel.
- (4) In an *assembly occupancy* with fixed seats, the minimum number of spaces designated for wheelchair use and the minimum number of fixed seats designated for *adaptable seating* shall conform to Table 3.8.2.1.

**Table 3.8.2.1.
Designated Wheelchair Spaces and Adaptable Seating**

Forming Part of Sentence 3.8.2.1.(4)

Item	Column 1 Number of Fixed Seats in Seating Area	Column 2 Minimum Number of Spaces Designated for Wheelchairs	Column 3 Minimum Number of Fixed Seats Designated for <i>Adaptable Seating</i>
1.	Up to 20	2	1
2.	21 to 40	2	2
3.	41 to 60	2	3
4.	61 to 80	2	4
5.	81 to 100	3	5
6.	Over 100	3% of the seating capacity	The greater of 5 seats or 5% of the aisle seating capacity

- (5) In a Group C *major occupancy apartment building*, not less than 15% of all *suites of residential occupancy* shall be provided with a *barrier-free* path of travel from the *suite* entrance door into the following rooms and spaces that shall be located at the same level as the *barrier-free* path of travel:
- (a) at least one bedroom,
 - (b) at least one bathroom conforming to Sentence (6),
 - (c) a kitchen or kitchen space, and
 - (d) a living room or space.
- (6) Bathrooms required by Clause (5)(b) shall,
- (a) contain a lavatory,
 - (b) contain a water closet,
 - (c) contain a bathtub or a shower,

- (d) have wall reinforcement installed in conformance with Sentence 3.3.4.9.(1), and
- (e) be designed to permit a wheelchair to turn in an open space not less than 1 500 mm in diameter.

(7) The number of *suites* described in Sentence (5) having 1, 2 or 3 or more bedrooms shall be in proportion to the number of *suites* of *residential occupancy* having 1, 2 or 3 or more bedrooms in the remainder of the *building*.

(8) The *suites* described in Sentence (5) shall be distributed among *storeys* that are required by Article 3.8.2.1. to have a *barrier-free* path of travel, having regard to the height of the *suite* above *grade*.

3.8.2.2. Access to Parking Areas

- (1) A *barrier-free* path of travel shall be provided from the entrance described in Article 3.8.1.2. to,
- (a) an exterior parking area, where exterior parking is provided, and
 - (b) at least one parking level, where a passenger elevator serves an indoor parking level.

(2) The vehicular entrance to and egress from at least one parking level described in Sentence (1) and all areas intended to be used by wheelchair accessible vehicles to gain access to a parking space on that level shall have a vertical clearance of not less than 2 100 mm.

- (3) If an exterior passenger loading zone is provided, it shall have,
- (a) an access aisle not less than 2 440 mm wide and 7 400 mm long adjacent and parallel to the vehicle pull-up space,
 - (b) a curb ramp, where there are curbs between the access aisle and the vehicle pull-up space, and
 - (c) a clearance height of not less than 3 600 mm at the vehicle pull-up space and along the vehicle access and egress routes.

3.8.2.3. Washrooms Required to be Barrier-Free

(1) A *barrier-free* path of travel shall be provided to *barrier-free* washrooms designed to accommodate persons with disabilities in conformance with the requirements in Articles 3.8.3.8. to 3.8.3.12.

(2) The number of universal washrooms conforming to Article 3.8.3.12. provided in a *building* in which a washroom is required by Subsection 3.7.4. shall conform to Table 3.8.2.3.A.

**Table 3.8.2.3.A.
Minimum Number of Universal Washrooms per Building**

Forming Part of Sentence 3.8.2.3.(2)

Item	Column 1 Number of <i>Storeys</i> in <i>Building</i>	Column 2 Minimum Number of Universal Washrooms per <i>Building</i>
1.	1 to 3	1
2.	4 to 6	2
3.	Over 6	3, plus 1 for each additional increment of 3 <i>storeys</i> in excess of 6 <i>storeys</i>

(3) Where a washroom required by Subsection 3.7.4. is provided in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel,

- (a) the washroom shall conform to Articles 3.8.3.8. to 3.8.3.11., and
- (b) the number of *barrier-free* water closet stalls provided in the washroom shall conform to Table 3.8.2.3.B.

**Table 3.8.2.3.B.
Minimum Number of Water Closet Stalls Required to be Barrier-Free**

Forming Part of Sentence 3.8.2.3.(3)

Item	Column 1 Number of Water Closets per Washroom	Column 2 Minimum Number of <i>Barrier-Free</i> Water Closet Stalls per Washroom
1.	1 to 3	0, where a universal washroom is provided on the same floor level within 45 m of the washroom, or 1, where a universal washroom is not provided on the same floor level within 45 m of the washroom
2.	4 to 9	1
3.	10 to 16	2
4.	17 to 20	3
5.	21 to 30	4
6.	Over 30	5, plus 1 for each additional increment of 10 water closets per washroom in excess of 30 water closets per washroom

(4) Except as permitted in Sentence (5), where washrooms in excess of those required by Subsection 3.7.4. are provided in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel, the additional washrooms shall be designed to accommodate persons with disabilities in conformance with the requirements of,

- (a) Articles 3.8.3.8. to 3.8.3.11., or
- (b) Article 3.8.3.12.

(5) Washrooms need not conform to Sentence (4) provided,

- (a) they are located within *suites* of *residential occupancy*,
- (b) other *barrier-free* washrooms are provided on the same floor level within 45 m, or
- (c) they are located in an individual *suite* that is,
 - (i) used for a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy*,
 - (ii) less than 300 m² in area, and
 - (iii) completely separated from, and without access to, the remainder of the *building*.

(6) Where a washroom required by Subsection 3.7.4. is provided in a *storey* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, the washroom shall,

- (a) conform to Article 3.8.3.9. and Sentences 3.8.3.10.(5) and 3.8.3.11.(5), and
- (b) be provided with at least one ambulatory water closet stall conforming to Sentence 3.8.3.8.(10).

3.8.2.4. Hotels

(1) Except as permitted in Sentence (2), at least 10% of the *suites* of a *hotel* shall,

- (a) have a *barrier-free* path of travel extending to,
 - (i) the inside of each room, and
 - (ii) a balcony where required by Sentence 3.3.1.7.(2), and

- (b) be distributed among *storeys* that are required by Article 3.8.2.1. to have a *barrier-free* path of travel, having regard to the height of the *suite* above *grade*.
- (2) Not more than 20 *suites* need comply with Sentence (1).
- (3) A *suite* having a *barrier-free* path of travel required by Sentence (1) shall have a bathroom that,
 - (a) conforms to Clauses 3.8.3.12.(1)(a) to (h) and (j),
 - (b) has an unobstructed area at least 1 200 mm in diameter extending the full height of the room, except that a door is permitted to open on the inside if it does not reduce the unobstructed area, and
 - (c) has a bathtub or shower that conforms to Article 3.8.3.13.
- (4) Except as required by Sentence 3.8.3.3.(17) for power door operator controls, controls for the operation of *building* services or safety devices, including electrical switches, thermostats and intercom switches, intended to be operated by the occupant and located within a *suite* having a *barrier-free* path of travel required by Sentence (1) shall conform to Sentence 3.8.1.5.(1).
- (5) An entrance door to a *suite* having a *barrier-free* path of travel required by Sentence (1) shall have,
 - (a) a power door operator conforming to Article 3.8.3.3., and
 - (b) a door viewer located at a height no higher than 1 100 mm above the finished floor.
- (6) Where a door is provided between a *suite* having a *barrier-free* path of travel required by Sentence (1) and an adjoining *suite*, the door shall conform to Sentences 3.8.3.3. (1) and (3).
- (7) Where an emergency power supply is supplied by a generator, it shall supply at least one emergency power receptacle in at least one of the *suites* having a *barrier-free* path of travel required by Sentence (1).
- (8) The emergency power receptacle described in Sentence (7) shall be identified with a legible sign having the words **EMERGENCY POWER OUTLET** permanently mounted on the wall beside the receptacle.

3.8.3. Design Standards

3.8.3.1. Accessibility Signs

- (1) Where a *building* is required to have a *barrier-free* entrance, signs incorporating the International Symbol of Access shall be installed to indicate the location of,
 - (a) that entrance,
 - (b) ramps located in a required *barrier-free* path of travel serving that entrance, and
 - (c) an exterior passenger loading zone conforming to Sentence 3.8.2.2.(3), if one is provided.
- (2) Where a washroom, elevator, telephone or parking area is required to accommodate persons with disabilities, it shall be identified by a sign consisting of the International Symbol of Access and such other graphic, tactile or written directions as are needed to indicate clearly the type of facility available.
- (3) Where a washroom is not designed to accommodate persons with disabilities in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel, signs shall be provided to indicate the location of a washroom required to be *barrier-free*.
- (4) Signs incorporating the International Symbol of Access shall be installed where necessary to indicate the location of a *barrier-free means of egress*.
- (5) Where a wall mounted tactile sign is provided in a *building*, characters, symbols or pictographs on the sign shall be located not less than 1 200 mm and not more than 1 500 mm above the finished floor.
- (6) Where a wall mounted tactile sign is provided in a *storey* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, characters, symbols or pictographs on the sign shall conform to Sentence (5).

3.8.3.2. Exterior Walks

- (1) Except as provided in Sentence (2), exterior walks that form part of a *barrier-free* path of travel shall,
 - (a) be provided by means of a continuous plane not interrupted by steps or abrupt changes in level,
 - (b) have a permanent, firm and slip-resistant surface,

- (c) except as required in Sentence 3.8.1.3.(4), have an uninterrupted width of not less than 1 100 mm and a gradient not exceeding 1 in 20,
 - (d) be designed as a ramp where the gradient is greater than 1 in 20,
 - (e) have not less than 1 100 mm wide surface of a different texture to that surrounding it, where the line of travel is level and even with adjacent walking surfaces,
 - (f) be free from obstructions for the full width of the walk to a minimum height of 1 980 mm, except that handrails are permitted to project not more than 100 mm from either side into the clear area,
 - (g) have a level area adjacent to the entrance doorway conforming to Clause 3.8.3.4.(1)(c), and
 - (h) have a tactile attention indicator conforming to Article 3.8.3.18. that is located to identify an entry into a vehicular route or area where no curbs or any other element separate the vehicular route or area from a pedestrian route.
- (2) Where a difference in elevation between levels in a walkway is not more than 200 mm, a curb ramp conforming to Sentences (3) and (4) may be provided.
- (3) The curb ramp permitted by Sentence (2) shall,
- (a) have a running slope conforming to Table 3.8.3.2.,
 - (b) have a width of not less than 1 500 mm exclusive of flared sides,
 - (c) have a surface including flared sides that shall,
 - (i) be slip-resistant,
 - (ii) have a detectable warning surface that is colour- and texture-contrasted with the adjacent surfaces, and
 - (iii) have a smooth transition from the ramp and adjacent surfaces, and
 - (d) have flared sides with a slope of not more than 1:10 where pedestrians are likely to walk across them.

**Table 3.8.3.2.
Ramp Rise and Slope**

Forming Part of Sentence 3.8.3.2.(3)

Item	Column 1 Vertical Rise Between Surfaces, mm	Column 2 Slope
1.	75 to 200	1:10 to 1:12
2.	less than 75	1:8 to 1:10

- (4) Curb ramps described in Sentence (3) do not require handrails or *guards*.

3.8.3.3. Doorways and Doors

(1) Every doorway that is located in a *barrier-free* path of travel shall have a clear width of not less than 860 mm when the door is in the open position.

(2) Except where no bathroom within the *suite* is at the level of the *suite* entrance door to which a *barrier-free* path of travel is provided in accordance with Sentence 3.8.2.1.(1), the doorway to at least one bathroom and to each bedroom at the same level as such bathroom within a *suite* of *residential occupancy* shall have, when the door is in the open position, a clear width of not less than,

- (a) 760 mm where the door is served by a corridor or space not less than 1 060 mm wide, and
- (b) 810 mm where the door is served by a corridor or space less than 1 060 mm wide.

(3) Door opening devices that are the only means of operation shall,

- (a) be designed to be operable using a closed fist, and
- (b) be mounted not less than 900 mm and not more than 1 100 mm above the finished floor.

(4) Except as permitted by Sentence (12), every door that provides a *barrier-free* path of travel through a *barrier-free* entrance required by Article 3.8.1.2. shall be equipped with a power door operator if the entrance serves a *building* containing a Group A, Group B, Division 2 or 3, Group C, Group D or Group E *occupancy*.

(5) Except as permitted by Sentence (12), where a *barrier-free* entrance required by Article 3.8.1.2. incorporates a vestibule, a door leading from the vestibule into the *floor area* shall be equipped with a power door operator in a *building* containing a Group A, Group B, Division 2 or 3, Group C, Group D or Group E *occupancy*.

(6) A door shall be equipped with a power door operator where the door serves,

(a) a washroom for *public use* required to be *barrier-free*, or

(b) a Group A *occupancy* within a Group C *major occupancy* apartment *building*.

(7) Except as permitted in Sentence (8), and except for doors with power operators, closers for doors in a *barrier-free* path of travel shall be designed to permit doors to open when a force of not more than 38 N is applied to the handles, push plates or latch-releasing devices in the case of exterior doors and 22 N in the case of interior doors.

(8) Sentence (7) does not apply to doors at the entrances to *dwelling units*, or where greater forces are required in order to close and latch the doors against prevailing differences in air pressures on opposite sides of the doors.

(9) Except for doors at the entrances to *dwelling units*, closers for interior doors in a *barrier-free* path of travel shall have a closing period of not less than 3 seconds measured from when the door is in an open position of 70° to the doorway, to when the door reaches a point 75 mm from the closed position, measured from the leading edge of the latch side of the door.

(10) Unless equipped with a power door operator, a door in a *barrier-free* path of travel shall have a clear space on the latch side extending the height of the doorway and not less than,

(a) 600 mm beyond the edge of the door opening if the door swings toward the approach side,

(b) 300 mm beyond the edge of the door opening if the door swings away from the approach side, and

(c) 300 mm beyond both sides of a sliding door.

(11) Vestibules located in a *barrier-free* path of travel,

(a) shall be arranged to allow the movement of wheelchairs between doors, and

(b) shall provide,

(i) where the doors into the vestibule are in series, a distance between the doors of at least 1 500 mm plus the width of any door that swings into the space in the path of travel from one door to another, and

(ii) where the doors into the vestibule are not aligned, a turning diameter of 1 500 mm within the vestibule clear of any door swing.

(12) Only the active leaf in a multiple leaf door in a *barrier-free* path of travel need conform to the requirements of this Article.

(13) Except as provided in Clause 3.8.3.4.(1)(c), the floor surface on each side of a door in a *barrier-free* path of travel shall be level within a rectangular area,

(a) as wide as the door plus the clearance required on the latch side by Sentence (10), and

(b) whose dimension perpendicular to the closed door is not less than the width of the *barrier-free* path of travel but need not exceed 1 500 mm.

(14) Where a vision panel is provided in a door in a *barrier-free* path of travel, such panel shall be at least 75 mm in width and be located so that,

(a) the bottom of the panel is not more than 900 mm above the finished floor, and

(b) the edge of the panel closest to the latch is not more than 250 mm from the latch side of the door.

(15) A door in a *barrier-free* path of travel consisting of a sheet of glass shall be marked with a continuous opaque strip that,

- (a) shall be colour and brightness contrasted to the background of the door,
- (b) shall be at least 50 mm wide,
- (c) shall be located across the width of the door at a height of 1 350 mm to 1 500 mm above the finished floor, and
- (d) may incorporate a logo or symbol provided such logo or symbol does not diminish,
 - (i) the opacity of the strip,
 - (ii) the width of the strip,
 - (iii) the colour and brightness contrast of the strip to the background of the door, and
 - (iv) the continuity of the strip across the width of the door.

(16) Where a power door operator is provided, it shall be installed on the latch side so as to allow persons to activate the opening of the door from either side.

(17) Except where a proximity scanning device is installed in conformance with Sentence (18), the control for a power door operator required by Sentence (4), (5) or (6) shall,

- (a) have a face dimension of not less than,
 - (i) 150 mm in diameter where the control is circular, or
 - (ii) 50 mm by 100 mm where the control is rectangular,
- (b) be operable using a closed fist,
- (c) be located so that,
 - (i) its centre is located not less than 900 mm and not more than 1 100 mm from the finished floor or ground, or
 - (ii) it extends from not more than 200 mm to not less than 900 mm above the finished floor or ground,
- (d) be located not less than 600 mm and not more than 1 500 mm beyond the door swing where the door opens towards the control,
- (e) be located in a clearly visible position, and
- (f) contain a sign incorporating the International Symbol of Access.

(18) A proximity scanning device that activates a power door shall be capable of detecting a person in a wheelchair.

(19) A normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel shall comply with the following requirements:

- (a) all doorways in *public corridors* in the normally occupied *floor area* shall comply with Sentence (1),
- (b) door opening devices that are the only means of operation on doors in the normally occupied *floor area* shall comply with Sentence (3),
- (c) where a vision panel is provided in a door in the normally occupied *floor area*, the panel shall comply with Sentence (14),
- (d) doors consisting of a sheet of glass in the normally occupied *floor area* shall comply with Sentence (15), and
- (e) where a power door operator is installed for doors in the normally occupied *floor area*, it shall comply with Sentences (16) and (17).

3.8.3.4. Ramps

- (1) Ramps located in a *barrier-free* path of travel shall,

- (a) have a minimum width of 900 mm between handrails,
 - (b) have a maximum gradient of 1 in 12,
 - (c) have a level area of at least 1 670 mm by 1 670 mm at the top and bottom of a ramp and where a door is located in a ramp, so that the level area extends at least 600 mm beyond the latch side of the door opening, except that where the door opens away from the ramp, the area extending beyond the latch side of the door opening may be reduced to 300 mm,
 - (d) have a level area at least 1 670 mm long and at least the same width as the ramp,
 - (i) at intervals of not more than 9 m along its length, and
 - (ii) where there is an abrupt change in the direction of the ramp,
 - (ii) where there is a change of 90° or more in the direction of the ramp,
 - (e) except as provided in Sentence (2), be equipped with handrails on both sides that shall,
 - (i) be continuously graspable along their entire length and have circular cross-section with an outside diameter not less than 30 mm and not more than 40 mm, or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm and not more than 155 mm and whose largest cross-sectional dimension is not more than 57 mm,
 - (ii) be not less than 865 mm and not more than 965 mm high, measured vertically from the surface of the ramp, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrail,
 - (iii) be terminated in a manner that will not obstruct pedestrian travel or create a hazard,
 - (iv) extend horizontally not less than 300 mm beyond the top and bottom of the ramp,
 - (v) be provided with a clearance of not less than 50 mm between the handrail and any wall or *guard* to which it is attached, and
 - (vi) be designed and constructed such that handrails and their supports will withstand the loading values obtained from the nonconcurrent application of a concentrated load not less than 0.9 kN applied at any point and in any direction for all handrails and a uniform load not less than 0.7 kN/m applied in any direction to the handrail,
 - (f) except as provided in Sentence (2), have a wall or a *guard* on both sides and where a *guard* is provided the *guard* shall,
 - (i) be not less than 1 070 mm measured vertically to the top of the *guard* from the ramp surface, and
 - (ii) be designed so that no member, attachment or opening located between 140 mm and 900 mm above the ramp surface being protected by the *guard* will facilitate climbing,
 - (g) be provided,
 - (i) with a curb at least 50 mm high on any side of the ramp where no solid enclosure or solid *guard* is provided, and
 - (ii) with railings or other barriers that extend to within 50 mm of the finished ramp surface or have a curb not less than 50 mm high, and
 - (h) except as provided in Sentence (2), where the ramp is wider than 2 200 mm, have an intermediate handrail with a clear width of 900 mm between the intermediate handrail and one of the handrails described in Clause (e).
- (2) Where a ramp serves as an aisleway for fixed seating, the requirements for handrails in Clauses (1)(e) and (h) and for walls or *guards* in Clause (1)(f) need not apply.
- (3) Floors or walks in a *barrier-free* path of travel having a slope steeper than 1 in 20 shall be designed as ramps.

3.8.3.5. Passenger Elevating Devices

(1) A passenger elevating device referred to in Article 3.8.2.1. shall conform to CSA B355, “Lifts for Persons with Physical Disabilities”.

3.8.3.6. Wheelchair Spaces and Adaptable Seating

(1) Spaces designated for wheelchair use required by Sentence 3.8.2.1.(4) shall be,

- (a) clear and level or level with removable seats,
- (b) not less than 900 mm wide and not less than,
 - (i) 1 525 mm long where designed to permit a wheelchair to enter from a side approach, and
 - (ii) 1 220 mm long where designed to permit a wheelchair to enter from the front or rear of the space,
- (c) arranged so that,
 - (i) at least two of the designated spaces are side by side, and
 - (ii) at least one fixed seat for a companion is located beside,
 - (A) each group of designated spaces, if two or more designated spaces are arranged side by side in a group, and
 - (B) each designated space that is not part of a group described in Sub-subclause (A),
- (d) located adjoining a *barrier-free* path of travel without infringing on egress from any row of seating or any aisle requirements, and
- (e) situated, as part of the designated seating plan, to provide a choice of viewing location and a clear view of the event taking place.

(2) Fixed seats designated for *adaptable seating* required by Sentence 3.8.2.1.(4) shall be,

- (a) located adjoining a *barrier-free* path of travel without infringing on egress from any row of seating or any aisle requirements,
- (b) equipped with a movable or removable armrest on the side of the seat adjoining the *barrier-free* path of travel, and
- (c) situated, as part of the designated seating plan, to provide a choice of viewing location and a clear view of the event taking place.

(3) In an *assembly occupancy* with fixed seats, space shall be provided for the storage of wheelchairs and *mobility assistive devices* in accordance with the following requirements:

- (a) at least one storage space not less than 810 mm by 1 370 mm shall be provided where the *assembly occupancy* has not more than 200 fixed seats and at least two such storage spaces shall be provided where the *assembly occupancy* has more than 200 fixed seats, and
- (b) the storage space or spaces shall be located on the same level and in proximity to the spaces designated for wheelchair use and seats designated for *adaptable seating*.

3.8.3.7. Assistive Listening Devices

(1) In *buildings* of *assembly occupancy*, all classrooms, auditoria, meeting rooms and *theatres* with an area of more than 100 m² and an *occupant load* of more than 75 shall be equipped with assistive listening systems encompassing the entire seating area.

3.8.3.8. Water Closet Stalls

(1) Every *barrier-free* water closet stall in a washroom described in Sentence 3.8.2.3.(3) or (4) shall,

- (a) have a clear turning space at least 1 500 mm in diameter,
- (b) be equipped with a door that shall,
 - (i) be capable of being latched from the inside with a mechanism that is operable using a closed fist,
 - (ii) when the door is in an open position, have a clear opening of at least 860 mm,

- (iii) swing outward, unless 820 mm by 1 440 mm clear floor area is provided within the stall to permit the door to be closed without interfering with the wheelchair,
 - (iv) be provided with spring-type or gravity hinges so that the door closes automatically,
 - (v) be provided with a door pull on both sides of the door, near the latch side of the door, located at a height not less than 900 mm and not more than 1 100 mm above the finished floor,
 - (vi) be aligned with a clear transfer space required by Subclause (2)(a)(ii) or Clause (2)(b), and
 - (vii) be capable of having the latch required by Subclause (i) released from the outside in case of an emergency,
- (c) be equipped with a water closet conforming to Article 3.8.3.9. that is located in accordance with Clause (2)(a) or (b),
- (d) Reserved
- (e) be equipped with a coat hook mounted not more than 1 200 mm above the finished floor on a side wall and projecting not more than 50 mm from the wall,
- (f) have a clearance of at least 1 700 mm between the outside of the stall face and the face of an in-swinging washroom door and 1 400 mm between the outside of the stall face and any wall-mounted fixture or other obstruction, and
- (g) where a toilet paper dispenser is provided, provide a dispenser that is,
- (i) wall mounted,
 - (ii) located below the grab bar,
 - (iii) in line with or not more than 300 mm in front of the seat, and
 - (iv) not less than 600 mm above the finished floor.
- (2)** A water closet described in Clause (1)(c) shall be,
- (a) located so that,
- (i) the centre line of the water closet is not less than 460 mm and not more than 480 mm from one side wall, and
 - (ii) a clear transfer space at least 900 mm wide and 1 500 mm deep is provided on the other side of the water closet, or
- (b) located so that a clear transfer space at least 900 mm wide and 1 500 mm deep is provided on each side of the water closet.
- (3)** Where a water closet is located in accordance with Clause (2)(a),
- (a) a grab bar conforming to Sentences (5) and (7) shall be provided on the side wall referred to in Subclause (2)(a)(i),
- (b) a fold-down grab bar may be provided and, if one is provided, it shall conform to Sentence (8) and be provided on the side of the water closet opposite the grab bar described in Clause (a), and
- (c) a grab bar conforming to Sentences (6) and (7) shall be provided on the wall behind the water closet.
- (4)** Where a water closet is located in accordance with Clause (2)(b),
- (a) a fold-down grab bar conforming to Sentence (8) shall be provided on each side of the water closet, and
- (b) a grab bar conforming to Sentences (6) and (7) shall be provided on the wall behind the water closet.
- (5)** A grab bar described in Clause (3)(a) shall,
- (a) be continuous L-shaped with 750 mm long horizontal and vertical components, and
- (b) be wall mounted with the horizontal component 750 mm above the finished floor and the vertical component 150 mm in front of the water closet.
- (6)** A grab bar described in Clause (3)(c) or (4)(b) shall,

- (a) be at least 600 mm in length, and
- (b) be wall mounted horizontally from 840 mm to 920 mm above the finished floor and, where the water closet has a water tank, be wall mounted 150 mm above the tank.
- (7)** A grab bar described in Clause (3)(a) or (c) or (4)(b) shall,
 - (a) be installed to resist a load of at least 1.3 kN applied vertically or horizontally,
 - (b) be not less than 35 mm and not more than 40 mm in diameter,
 - (c) have a clearance of not less than 38 mm and not more than 50 mm from the wall to the inside surface of the grab bar, and
 - (d) have a slip-resistant surface.
- (8)** A fold-down grab bar described in Clause (3)(b) or (4)(a) shall,
 - (a) be mounted on the wall behind the water closet,
 - (i) with the horizontal component 750 mm above the finished floor, and
 - (ii) not less than 390 mm and not more than 410 mm from the centre line of the water closet,
 - (b) not require a force of more than 22.2 N to pull it down,
 - (c) be at least 750 mm in length,
 - (d) be installed to resist a load of at least 1.3 kN applied vertically or horizontally,
 - (e) be not less than 35 mm and not more than 40 mm in diameter, and
 - (f) have a slip-resistant surface.
- (9)** A fold-down grab bar installed in accordance with Sentence (8) is permitted to encroach into,
 - (a) the clear turning space described in Clause (1)(a), or
 - (b) a clear transfer space described in Subclause (2)(a)(ii) or Clause (2)(b).
- (10)** Where an ambulatory water closet stall is required by Sentence 3.8.2.3.(6), it shall,
 - (a) be at least 1 500 mm in depth and be not less than 890 mm and not more than 940 mm in width,
 - (b) be equipped with a door that shall,
 - (i) be capable of being latched from the inside with a mechanism that is operable using a closed fist,
 - (ii) when the door is in an open position, have a clear opening of at least 810 mm,
 - (iii) swing outward, unless the minimum dimensions in Clause (a) are not located within the door swing,
 - (iv) be provided with spring-type or gravity hinges so that the door closes automatically,
 - (v) be provided with a door pull on both sides of the door, near the latch side of the door, located at a height not less than 900 mm and not more than 1 100 mm above the finished floor, and
 - (vi) be capable of having the latch required by Subclause (i) released from the outside in the case of an emergency,
 - (c) be equipped with a water closet conforming to Article 3.8.3.9. and located so that its centre line is centred between the partition walls,
 - (d) be equipped on each side of the water closet with grab bars conforming to Clause (3)(a), and
 - (e) be equipped with a coat hook conforming to Clause (1)(e).

3.8.3.9. Water Closets

- (1)** A water closet described in Clause 3.8.3.8.(1)(c) or (10)(c) or 3.8.3.12.(1)(d) shall,
 - (a) be equipped with a seat located at not less than 430 mm and not more than 485 mm above the finished floor,

- (b) be equipped with hand-operated flushing controls that are easily accessible to a wheelchair user or be automatically operable,
- (c) be equipped with a back support where there is no seat lid or tank, and
- (d) not have a spring-activated seat.

(2) Hand-operated flushing controls required by Clause (1)(b) shall be operable using a closed fist and with a force of not more than 22.2 N.

3.8.3.10. Urinals

(1) Where more than one urinal is provided in a washroom described in Sentence 3.8.2.3.(3) or (4), at least one urinal shall be,

- (a) wall mounted, with the rim located not more than 430 mm above the finished floor, or
- (b) floor mounted, with the rim level with the finished floor.

(2) A urinal described in Sentence (1) shall have,

- (a) no step in front,
- (b) a vertically mounted grab bar installed on each side of the urinal that,
 - (i) is not less than 300 mm long,
 - (ii) has its centre line 1 000 mm above the finished floor,
 - (iii) is located not less than 380 mm and not more than 450 mm measured horizontally from the vertical centre line of the urinal, and
 - (iv) complies with Sentence 3.8.3.8.(7), and
- (c) a minimum depth of 345 mm measured from the outer face of the urinal rim to the back of the fixture.

(3) Where manual flush controls are provided for a urinal described in Sentence (1), the flush controls shall be,

- (a) operable using a closed fist, and
- (b) mounted no higher than 1 200 mm above the finished floor.

(4) Where privacy screens are installed for a urinal described in Sentence (1), they shall,

- (a) be mounted a minimum of 460 mm from the centre line of the urinal, and
- (b) have a clearance of at least 50 mm from the grab bars required by Clause (2)(b).

(5) Where more than one urinal is provided in a washroom described in Sentence 3.8.2.3.(6), at least one urinal conforming to Sentences (1) to (4) shall be provided in the washroom.

3.8.3.11. Lavatories

(1) A washroom described in Sentence 3.8.2.3.(2), (3) or (4) shall be provided with a lavatory that shall,

- (a) be located so that the distance between the centre line of the lavatory and the side wall is not less than 460 mm,
- (b) be mounted so that the top of the lavatory is not more than 840 mm above the finished floor,
- (c) have a clearance beneath the lavatory not less than,
 - (i) 920 mm wide,
 - (ii) 735 mm high at the front edge,
 - (iii) 685 mm high at a point 205 mm back from the front edge, and
 - (iv) 350 mm high from a point 300 mm back from the front edge to the wall,
- (d) have insulated pipes where they would otherwise present a burn hazard or have water supply temperature limited to a maximum of 43°C,

- (e) be equipped with faucets that have lever type handles without spring loading or operate automatically and that are located so that the distance from the centre line of the faucet to the edge of the basin or, where the basin is mounted in a vanity, to the front edge of the vanity, is not more than 485 mm,
 - (f) have a minimum 1 370 mm deep floor space to allow for a forward approach, of which a maximum of 500 mm can be located under the lavatory,
 - (g) have a soap dispenser that is,
 - (i) located to be accessible to persons in wheelchairs,
 - (ii) located so that the dispensing height is not more than 1 200 mm above the finished floor,
 - (iii) located not more than 610 mm, measured horizontally, from the edge of the lavatory, and
 - (iv) operable with one hand, and
 - (h) have a towel dispenser or other hand drying equipment that is,
 - (i) located to be accessible to persons in wheelchairs,
 - (ii) located so that the dispensing height is not more than 1 200 mm above the finished floor,
 - (iii) operable with one hand, and
 - (iv) located not more than 610 mm, measured horizontally, from the edge of the lavatory.
- (2)** If mirrors are installed in a washroom described in Sentence 3.8.2.3.(2), (3) or (4), at least one mirror shall be,
- (a) installed above a lavatory required by Sentence (1), and
 - (b) mounted with its bottom edge not more than 1 000 mm above the finished floor or inclined to the vertical to be usable by a person in a wheelchair.
- (3)** If dispensing or hand-operated washroom accessories, except those located in water closet stalls or described in Clause (1)(g), are provided, they shall be mounted so that,
- (a) the dispensing height is not less than 900 mm and not more than 1 200 mm above the finished floor,
 - (b) the controls or operating mechanisms are mounted not less than 900 mm and not more than 1 200 mm above the finished floor, and
 - (c) a minimum 1 370 mm deep floor space is provided in front of the controls or operating mechanisms to allow for a front approach.
- (4)** Where a shelf is installed above a lavatory required by Sentence (1), it shall,
- (a) be located not more than 200 mm above the top of the lavatory and not more than 1 100 mm above the finished floor, and
 - (b) project not more than 100 mm from the wall.
- (5)** A washroom described in Sentence 3.8.2.3.(6) shall be provided with a lavatory conforming to Clauses (1)(e), (g) and (h).

3.8.3.12. Universal Washrooms

- (1)** A universal washroom shall,
 - (a) be served by a *barrier-free* path of travel,
 - (b) have a door that is capable of being locked from the inside and released from the outside in case of emergency and that has,
 - (i) a graspable latch-operating mechanism located not less than 900 mm and not more than 1 000 mm above the finished floor,
 - (ii) if it is an outward swinging door, a door pull not less than 140 mm long located on the inside so that its midpoint is not less than 200 mm and not more than 300 mm from the latch side of the door and not less than 900 mm and not more than 1 100 mm above the finished floor, and

- (iii) if it is an outward swinging door, a door closer, spring hinges or gravity hinges, so that the door closes automatically,
- (c) have one lavatory conforming to Sentences 3.8.3.11.(1), (3) and (4),
- (d) have one water closet conforming to Article 3.8.3.9. that is located in accordance with Clause 3.8.3.8.(2)(a) or (b),
- (e) have grab bars conforming to,
 - (i) Sentence 3.8.3.8.(3), if the water closet is located in accordance with Clause 3.8.3.8.(2)(a), or
 - (ii) Sentence 3.8.3.8.(4), if the water closet is located in accordance with Clause 3.8.3.8.(2)(b),
- (f) have no internal dimension between walls that is less than 1 700 mm,
- (g) have a coat hook that conforms to Clause 3.8.3.8.(1)(e) and a shelf that is located not more than 1 100 mm above the finished floor and projects not more than 100 mm from the wall,
- (h) be designed to permit a wheelchair to turn in an open space not less than 1 700 mm in diameter,
- (i) be provided with a door equipped with a power door operator if the door is equipped with a self-closing device,
- (j) be provided with a mirror,
 - (i) installed above a lavatory described in Clause (1)(c), and
 - (ii) mounted with its bottom edge not more than 1 000 mm above the finished floor or inclined to the vertical to be usable by a person in a wheelchair, and
- (k) have lighting controlled by a motion sensor conforming to Sentence 12.2.4.1.(2).
- (2) A universal washroom shall have,
 - (a) an emergency call system that consists of audible and visual signal devices inside and outside of the washroom that are activated by a control device inside the washroom, and
 - (b) an emergency sign that contains the words **IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE** in letters at least 25 mm high with a 5 mm stroke and that is posted above the emergency button.
- (3) A clear space not less than 810 mm wide and 1 830 mm long shall be provided in each universal washroom for an adult-size change table.
- (4) Where the clear space provided for an adult-size change table is adjacent to a wall, reinforcement shall be installed in the wall to permit the future installation of the change table.
- (5) Where an adult-size change table is installed, it shall,
 - (a) when fully loaded, have a surface height above the finished floor that can be adjusted from between 450 mm and 500 mm at the low range to between 850 mm and 900 mm at the high range,
 - (b) be designed to carry a minimum load of 1.33 kN,
 - (c) have a clear floor space parallel to the long side of the table not less than 760 mm wide and 1 500 mm long, and
 - (d) in the case of a fold-down table,
 - (i) be installed so that it does not encroach into a clear transfer space described in Clause 3.8.3.8.(2)(a) or (b), and
 - (ii) have no operating mechanisms higher than 1 200 mm.
- (6) A universal washroom need not conform to Sentences (3) and (4) if,
 - (a) it is located in an individual *suite* that,
 - (i) is used for an *assembly occupancy*, a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy*, and

(ii) meets one of the following requirements,

(A) it is located in a *building* that is less than 300 m² in *building area*, or

(B) it is less than 300 m² in area, if located in a *building* that is at least 300 m² in *building area*, or

(b) another universal washroom conforming to this Article is provided on the same floor level within 45 m.

3.8.3.13. Showers and Bathtubs

(1) Except within a *suite of residential occupancy*, if showers are provided in a *building*, the number of *barrier-free* showers shall conform to Table 3.8.3.13.

Table 3.8.3.13.
Minimum Number of Barrier-Free Showers

Forming Part of Sentence 3.8.3.13.(1)

Item	Column 1 Number of Showers provided in a Group	Column 2 Minimum Number of Showers Required to Be <i>Barrier-Free</i>
1.	1	0
2.	2 to 7	1
3.	Over 7	1, plus 1 for each additional increment of 7 showers in a group

(2) A *barrier-free* shower required by Sentence (1) shall,

(a) be not less than 1 500 mm wide and 900 mm deep,

(b) have a clear floor space at the entrance to the shower not less than 900 mm deep and the same width as the shower, except that fixtures are permitted to project into that space provided they do not restrict access to the shower,

(c) have a slip-resistant floor surface,

(d) have a threshold that is level with the adjacent finished floor or a bevelled threshold not more than 13 mm higher than the adjacent finished floor,

(e) have a hinged seat that is not spring-loaded or a fixed seat that shall be,

(i) not less than 450 mm wide and 400 mm deep,

(ii) mounted not less than 430 mm and not more than 485 mm above the finished floor,

(iii) designed to carry a minimum load of 1.3 kN, and

(iv) located so that the edge of the seat is within 500 mm of the shower controls,

(f) have a wall mounted continuous L-shaped grab bar conforming to Sentence 3.8.3.8.(7) located on the same wall as the controls, with the horizontal component of the grab bar,

(i) mounted not more than 850 mm above the finished floor, and

(ii) located so that the end of the horizontal component is within 100 mm from the edge of the shower seat,

(g) have a pressure-equalizing or thermostatic mixing valve controlled by a lever or other device operable using a closed fist from the seated position,

(h) have a hand-held shower head with not less than 1 500 mm of flexible hose located so that it can be reached from the seated position and equipped with a support so that it can operate as a fixed shower head, and

(i) have fully recessed soap holders that can be reached from the seated position.

(3) Individual showers that are provided for use by patients or residents in *buildings* of Group B, Division 2 or 3 *occupancy* shall conform to Sentence (2).

(4) Individual bathtubs that are provided for the use of patients or residents in *buildings* of Group B, Division 2 or 3 *occupancy* shall have,

- (a) faucets that have lever type handles without spring loading or that operate automatically,
- (b) faucet handles that are located so as to be usable by a person seated in the bathtub,
- (c) unless the bathtub is free-standing, a continuous L-shaped grab bar conforming to Sentence 3.8.3.8.(7) with 900 mm long horizontal and vertical components mounted with,
 - (i) the horizontal component located not less than 150 mm and not more than 200 mm above and parallel to the rim of the bathtub, and
 - (ii) the vertical component located not less than 300 mm and not more than 450 mm from the control end of the bathtub, and
- (d) unless the bathtub is free-standing, a grab bar conforming to Sentence 3.8.3.8.(7) that is located at each end of the bathtub and is,
 - (i) at least 750 mm long,
 - (ii) mounted vertically from a point 200 mm above the rim of the bathtub, and
 - (iii) mounted within 150 mm from the edge of the bathtub, measured horizontally.

(5) Where a *barrier-free* bathtub is provided, a clear floor space at least 900 mm wide and 1 440 mm long shall be provided along the full length of the bathtub.

3.8.3.14. Reserved

3.8.3.15. Shelves or Counters for Telephones

(1) Where more than one telephone is provided for public use, a built-in shelf or counter shall be provided for at least one telephone.

- (2) A shelf or counter described in Sentence (1) shall,
 - (a) be level,
 - (b) be not less than 500 mm wide and 350 mm deep, and
 - (c) have, for each telephone provided, a clear space that,
 - (i) is not less than 810 mm wide and 1 370 mm deep, centred on the telephone, and
 - (ii) has no obstruction within 250 mm above the surface.

- (3) The top surface of a section of the shelf or counter described in Sentence (1) shall,
 - (a) be located not less than 775 mm and not more than 875 mm from the finished floor, and
 - (b) have a knee space not less than 740 mm high.

(4) Where a wall-hung telephone is provided above the shelf or counter section described in Sentence (3), it shall be located so that the receiver and coin or card slot are not more than 1 200 mm from the finished floor.

(5) Where more than one telephone is provided for public use in a normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, a built-in shelf or counter that conforms to Sentences (2), (3) and (4) shall be provided for at least one telephone.

3.8.3.16. Drinking Fountains

(1) Where more than one drinking fountain is provided, at least one shall be a *barrier-free* fountain that conforms to Sentences (2) and (3).

- (2) A *barrier-free* drinking fountain shall,
 - (a) have a spout located near the front of the unit not more than 915 mm above the finished floor,

- (b) be equipped with controls that are easily operated from a wheelchair using one hand with a force of not more than 22 N or shall operate automatically,
- (c) project the water at least 100 mm high,
- (d) provide the water stream at a vertical angle of up to,
 - (i) 30°, where the spout is located less than 75 mm from the front of the fountain, or
 - (ii) 15°, where the spout is located not less than 75 mm and not more than 125 mm from the front of the fountain,
- (e) be detectable by a cane at a level at or below 680 mm from the finished floor, and
- (f) where the drinking fountain is cantilevered, meet the following requirements:
 - (i) be mounted not more than 915 mm above the finished floor,
 - (ii) provide a clearance height under the fountain of not less than 735 mm above the finished floor,
 - (iii) have a clear depth under the fountain of not less than 450 mm,
 - (iv) have a clear width under the fountain of not less than 760 mm,
 - (v) have a toe clearance height under the fountain of at least 350 mm above the finished floor from a point 300 mm back from the front edge to the wall, and
 - (vi) have a depth at the base of the fountain of at least 700 mm.

(3) A *barrier-free* drinking fountain required by Sentence (1) shall have a clear floor space in front of, or adjacent to, the fountain that is a minimum of 810 mm deep and 1 370 mm wide.

(4) Where more than one drinking fountain is provided in a normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, at least one shall be a *barrier-free* fountain that conforms to Sentences (2) and (3).

3.8.3.17. Platforms

(1) A tactile attention indicator conforming to Article 3.8.3.18. shall be installed along any edge of a platform that is,

- (a) not protected by a *guard*, and
- (b) higher than 250 mm above the finished floor or ground or sloped steeper than 1 in 3.

(2) Sentence (1) does not apply to the front edges of *stages*.

3.8.3.18. Tactile Attention Indicators

(1) Where a tactile attention indicator is required, it shall conform to Sentence (2) and Clauses 4.1.1. and 4.1.2. of ISO 23599, “Assistive Products for Blind and Vision-Impaired Persons – Tactile Walking Surface Indicators”.

(2) The depth of the tactile attention indicator shall be not less than 300 mm and not more than 610 mm.

Appendix F cont. – Accessibility for Ontarians with Disabilities Guidelines

The following is excerpts from the Accessibility for Ontarians with Disabilities Act guidelines for exterior paths of travel, ramps, and curb cuts. The content applicable to this research is provided to exhibit the intricacies of the language. Several sections of the codes were omitted, as there was limited application to this study. To avoid any misinterpretation by the researcher the content is delivered as it appears from the source (exception: the point size and line spacing was reduced).

Exterior Paths of Travel

Exterior paths of travel, application

80.21 (1) This Part applies to newly constructed and redeveloped exterior paths of travel that are outdoor sidewalks or walkways designed and constructed for pedestrian travel and are intended to serve a functional purpose and not to provide a recreational experience. O. Reg. 413/12, s. 6.

(2) This Part does not apply to paths of travel regulated under Ontario Regulation 350/06 (Building Code) made under the *Building Code Act, 1992*. O. Reg. 413/12, s. 6.

Exterior paths of travel, general obligation

80.22 Obligated organizations, other than small organizations, shall ensure that any exterior paths of travel that they construct or redevelop and intend to maintain meet the requirements set out in this Part. O. Reg. 413/12, s. 6.

Exterior paths of travel, technical requirements

80.23 When constructing new or redeveloping existing exterior paths of travel that they intend to maintain, obligated organizations, other than small organizations, shall ensure that new and redeveloped exterior paths of travel meet the following requirements:

1. The exterior path must have a minimum clear width of 1,500 mm, but this clear width can be reduced to 1,200 mm to serve as a turning space where the exterior path connects with a curb ramp.
2. Where the head room clearance is less than 2,100 mm over a portion of the exterior path, a rail or other barrier with a leading edge that is cane detectable must be provided around the object that is obstructing the head room clearance.
3. The surface must be firm and stable.
4. The surface must be slip resistant.
5. Where an exterior path has openings in its surface,
 - i. the openings must not allow passage of an object that has a diameter of more than 20 mm, and
 - ii. any elongated openings must be oriented approximately perpendicular to the direction of travel.
6. The maximum running slope of the exterior path must be no more than 1:20, but where the exterior path is a sidewalk, it can have a slope of greater than 1:20, but it

cannot be steeper than the slope of the adjacent roadway.

7. The maximum cross slope of the exterior path must be no more than 1:20, where the surface is asphalt, concrete or some other hard surface, or no more than 1:10 in all other cases.
8. The exterior path must meet the following requirements:
 - i. It must have a 1:2 bevel at changes in level between 6 mm and 13 mm.
 - ii. It must have a maximum running slope of 1:8 or a curb ramp that meets the requirement of section 80.26 at changes in level of greater than 13 mm and less than 75 mm.
 - iii. It must have a maximum running slope of 1:10 or a curb ramp that meets the requirement of section 80.26 at changes in level of 75 mm or greater and 200 mm or less.
 - iv. It must have a ramp that meets the requirements of section 80.24 at changes in level of greater than 200 mm.
9. The entrance to the exterior path of travel must provide a minimum clear opening of 850 mm, whether the entrance includes a gate, bollard or other entrance design.
O. Reg. 413/12, s. 6.

Exterior paths of travel, ramps

80.24 (1) Where an exterior path of travel is equipped with a ramp, the ramp must meet the following requirements:

1. The ramp must have a minimum clear width of 900 mm.
2. The surface of the ramp must be firm and stable.
3. The surface of the ramp must be slip resistant.
4. The ramp must have a maximum running slope of no more than 1:15.
5. The ramp must be provided with landings that meet the following requirements:
 - i. Landings must be provided,
 - A. at the top and bottom of the ramp,
 - B. where there is an abrupt change in direction of the ramp, and
 - C. at horizontal intervals not greater than nine metres apart.
 - ii. Landings must be a minimum of 1,670 mm by 1,670 mm at the top and bottom of the ramp and where there is an abrupt change in direction of the ramp.
 - iii. Landings must be a minimum of 1,670 mm in length and at least the same width of the ramp for an in-line ramp.
 - iv. Landings must have a cross slope that is not steeper than 1:50.
6. Where a ramp has openings in its surface,
 - i. the openings must not allow passage of an object that has a diameter of more than 20 mm, and
 - ii. any elongated openings must be oriented approximately perpendicular to the direction of travel.
7. A ramp must be equipped with handrails on both sides of the ramp and the handrails

must,

- i. be continuously graspable along their entire length and have circular cross-section with an outside diameter not less than 30 mm and not more than 40 mm, or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm and not more than 155 mm and whose largest cross-sectional dimension is not more than 57 mm,
 - ii. be not less than 865 mm and not more than 965 mm high, measured vertically from the surface of the ramp, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrail,
 - iii. terminate in a manner that will not obstruct pedestrian travel or create a hazard,
 - iv. extend horizontally not less than 300 mm beyond the top and bottom of the ramp,
 - v. be provided with a clearance of not less than 50 mm between the handrail and any wall to which it is attached, and
 - vi. be designed and constructed such that handrails and their supports will withstand the loading values obtained from the non-concurrent application of a concentrated load not less than 0.9 kN applied at any point and in any direction for all handrails and a uniform load not less than 0.7 kN/metre applied in any direction to the handrail.
8. Where the ramp is more than 2,200 mm in width,
- i. one or more intermediate handrails which are continuous between landings shall be provided and located so that there is no more than 1,650 mm between handrails, and
 - ii. the handrails must meet the requirements set out in paragraph 7.
9. The ramp must have a wall or guard on both sides and where a guard is provided, it must,
- i. be not less than 1,070 mm measured vertically to the top of the guard from the ramp surface, and
 - ii. be designed so that no member, attachment or opening located between 140 mm and 900 mm above the ramp surface being protected by the guard will facilitate climbing.
10. The ramp must have edge protection that is provided,
- i. with a curb at least 50 mm high on any side of the ramp where no solid enclosure or solid guard is provided, or
 - ii. with railings or other barriers that extend to within 50 mm of the finished ramp surface. O. Reg. 413/12, s. 6.

(2) In this section,

“kN” means kilonewtons. O. Reg. 413/12, s. 6.

Exterior paths of travel, curb ramps

80.26 (1) Where a curb ramp is provided on an exterior path of travel, the curb ramp must align with the direction of travel and meet the following requirements:

1. The curb ramp must have a minimum clear width of 1,200 mm, exclusive of any flared

sides.

2. The running slope of the curb ramp must,
 - i. be a maximum of 1:8, where elevation is less than 75 mm, and
 - ii. be a maximum of 1:10, where elevation is 75 mm or greater and 200 mm or less.
3. The maximum cross slope of the curb ramp must be no more than 1:50.
4. The maximum slope on the flared side of the curb ramp must be no more than 1:10.
5. Where the curb ramp is provided at a pedestrian crossing, it must have tactile walking surface indicators that,
 - i. have raised tactile profiles,
 - ii. have a high tonal contrast with the adjacent surface,
 - iii. are located at the bottom of the curb ramp,
 - iv. are set back between 150 mm and 200 mm from the curb edge,
 - v. extend the full width of the curb ramp, and
 - vi. are a minimum of 610 mm in depth. O. Reg. 413/12, s. 6.

(2) In this section,

“curb ramp” means a ramp that is cut through a curb or that is built up to a curb. O. Reg. 413/12, s. 6.

Exterior paths of travel, depressed curbs

80.27 (1) Where a depressed curb is provided on an exterior path of travel, the depressed curb must meet the following requirements:

1. The depressed curb must have a maximum running slope of 1:20.
2. The depressed curb must be aligned with the direction of travel.
3. Where the depressed curb is provided at a pedestrian crossing, it must have tactile walking surface indicators that,
 - i. have raised tactile profiles,
 - ii. have high tonal contrast with the adjacent surface,
 - iii. are located at the bottom portion of the depressed curb that is flush with the roadway,
 - iv. are set back between 150 mm and 200 mm from the curb edge, and
 - v. are a minimum of 610 mm in depth. O. Reg. 413/12, s. 6.

(2) In this section,

“depressed curb” means a seamless gradual slope at transitions between sidewalks and walkways and highways, and is usually found at intersections. O. Reg. 413/12, s. 6.

Appendix G

AODA Service Outage Notification Form

One participant stated that outages are reported to AAS. There was no notification to the researcher when construction closed pathways or elevators were out of service. Minimally, email should have to communicated outages.

Appendix C - Temporary Service Disruption Template A

NOTICE OF TEMPORARY SERVICE DISRUPTION

We apologize for any inconvenience this may have caused you.

Service has been disrupted because:

Service is expected to resume:

The closest alternate service provider is:

**Dignity
Equity
Independence**



Appendix H

AAS Building Descriptions of Accessibility

Building descriptions are from the AAS website. The arrangement in this section has been altered for the efficient use of space. Some descriptions have been combined onto one page.

Arts Lecture Hall (AL)

Accessible Entrance(s)

Door facing Dana Porter Library is ramped and automated

Elevator(s)

- Centrally located

Washroom(s)

- Inside entrance #1, main floor, 122 (W) / 103 (M)

Telephone(s)

- Inside entrance facing Environment 1

Comments

- Vending machines are located on the main floor
- The Arts Student Union (ASU) tuck shop is located on the first floor across from the stairs
- Elevator access to ground floor which connects via a tunnel to Hagey Hall, Modern Languages and the Tatham Centre - tunnel doors are not automated

Access to the lower front of the lecture halls AL113 and AL116 is gained from the corridor 007 located on the basement level.

Tunnel connection to Hagey Hall is not wheelchair accessible. Listing it on this page is misleading.

Dana Porter Arts Library (LIB)

Accessible Entrance(s)

- Main door facing Arts Lecture Hall is ramped and automated.

Elevator(s)

- Two elevators are located in the centre of the lobby

Washroom(s)

- 134 (W) / 135 (M)
- 305 (W) / 307 (M)

Washrooms on the first floor are less accessible than the facilities on the third floor. The upper washrooms have door openers and the accessible stalls have more room within.

Telephone(s)

- 1st floor beside the women's washroom
- Main floor next to information desk
- Payphone on 3rd floor next to stairway in centre of building (staircase C)
- Safety phones are located beside the elevator on each floor 5 through 10.

Food & Drink

Brower's Cafe is just inside the main entrance #1

Comments

- Adaptive Technology Centre is located on the main floor behind the information desk to the right.
- There are accessible workstations on the main floor, as well as floors 3 and 5.

The main entrance is the only accessible entrance to the building. There is another accessible entrance at ground level on the west side, but it is not open for public use. Students with disabilities should be granted access.

B.C. Matthews Hall (BMH)

Accessible Entrance(s)

1. Door facing Columbia St. entrance to the University and Optometry bldg. (automated) Student Access Van drop-off location.
2. Door facing Math and Computer bldg. (automated)
3. AHS Research Wing: Door facing Columbia St., turn left to get to BMH

Access to AHS Research Wing described in line 3 is blocked by construction. There was no notice of a service disruption (closed access).

Elevator(s)

1. Corner of main lobby opposite room 1016 (accesses three floors)
2. Turn left near entrance #2, midway down the hallway (elevator accesses only two floors)

Washroom(s)

- 1518(M)/1519(W)
- 1438(W)/1439(M)
- doors not automated

Individuals are directed to these washrooms that have limited accessibility. There are two other sets of accessible washrooms on the first and second floor of the adjacent BMH wing.

Telephone(s)

- Campus telephone located near room 1056.
- 2nd floor near Rec & Leisure Studies
- Student Lounge, room 1035

Food and Drink

- A tuck shop, operated by campus Food Services, is located in room 1033.
- Vending machines are located at entrance #2.

Parking

Closest parking is in lot M across from entrance #1

Comments

* Washrooms in the AHS Research Wing are equipped with accessible showers. AHS Research Wing is locked after 4:30 p.m.

If you have a class in the Research wing after 4:30 p.m., please make arrangements with your professor to access the building or contact AccessAbility Services to obtain further information about obtaining a key.

The entrance to the Lyle Hallman Institute is automated.

Needles Hall (NH)

Accessible Entrance(s)

1. Entrance from parking lot beneath building is automated and is near an elevator.
2. Side door facing Modern Languages is automated and is the Student access van drop-off location.

Elevator(s)

- Located in centre of building

The lower NH entrance has an uneven curb cut and unreliable door opener (opener was not working on one observation day).

Washroom(s)

- 1902 (W) / 1904 (M)
- 2110 (W) / 2113 (M)

Washrooms on the first floor offer more accessibility. The second floor men's washroom does not have a door opener. The accessible stall is smaller. The sink fixtures have knob handles, which is an issue for people with limited dexterity.

Telephone(s)

- Located on main floor across from Student Accounts

Comments

- AccessAbility Services is located on the main floor.
- Pastry Plus is located on the main floor. Access involves stairs but assistance with both purchases and entrance may be requested at the AccessAbility Services office.

There is no perceptible accessibility available at Pastry Plus. The clerk will assist with purchases.

Environment 1 (EV1)

Accessible Entrance(s)

1. Enter EV1 through EV2 or EV3 - Student Access Van drop-off location at Ring Road entrance to EV2
2. Internal connection to Environment 2 (on 1st and 2nd floor)
3. Internal connection (tunnel) near room 109 on lower level to Modern Languages, Arts Lecture, and Tatham Centre

Elevator(s)

The aged elevator in EV1 takes longer to get to other floors than modern elevators.

1. Located beside centre stairway

Washroom(s)

- Room #321 (Unisex)

This washroom would be preferred; however, exiting the washroom is narrowed by a partition that constrains the area for a wheelchair to navigate. The location is a good distance from any lower floors or the classroom on the same floor. Modification of existing, centrally located washrooms could be done with limited expense.

Telephone(s)

- Located in the main foyer near the courtyard

Food and Drink

- Environmental Society Coffee Shop located in room #138 (lower level)

Parking

- There are designated accessible parking spots located at entrance #1

Parking services requires attainment of a pass prior to using accessible spaces. Entrance #1 is not specified on any map. The nearest accessible entrance is the rear of EV3.

Comments

From Ring Road, access is most convenient through Environment 2.

Environment 2 (EV2)

Accessible Entrance(s)

1. Door facing Ring Road (automatic) - Student Access Van drop-off location
2. Door facing Modern Languages is entrance to EV3 - Student Access Van drop-off location
3. Internal connection to EV1 (1st and 2nd floors) - 2nd floor is automated
4. Door facing Hagey Hall/PAS bldg. (ramped)

Elevator(s)

- Use elevator located in Environment 1 or 3

Washroom(s)

- 1903 (M) / 1901 (W)
- 2901 (M) / 2903 (W)

The men's washroom #2901 stall's door opens inward and does not close if used by a person in a wheelchair.

Telephone(s)

- inside entrance #1

Food and Drink

- Vending machines on the 2nd floor near the washrooms
- Access to cafeteria in Modern Languages is through the tunnel from Environment 1
- Access to Williams Cafe via connection to EV3

Parking

- Accessible parking spots located outside entrance #2

Parking is not free. Passes have to be attained from parking services prior to use. Accessibility parking tags does not allow use of the space.

Comments

There is no access to offices on 3rd floor (Rooms 380-387).

Environment 3 (EV3)

Accessible Entrance(s)

1. Door facing Ring Road
2. Door facing EV1 - Student Access Van drop off location

The Ring Road facing doors have door opener buttons placed in locations that discourage use.

Elevator(s)

- clearly visible in main lobby by the central staircase and accessible from either entrance

Washrooms

- located between elevators and classroom 1408 on main floor
- 3934 (W) / 3933 (M)
- 4934 (W) / 4933 (M)
- turn left when you come out of the elevator and take the first hallway on the left

Food and Drink

Williams Fresh Cafe is located on the left inside entrance #1.

Comments

There is an internal connection to EV2 which has a connection to EV1. Accessible parking spaces are located at entrance #2. A lounge area is located on the 4th floor.

Connections from EV3 to EV2 have two sets of heavy doors without door openers.

Hagey Hall of the Humanities (HH)

Accessible Entrance(s)

1. Door facing Arts lecture Hall (automated door) - Student Access Van drop-off location - internal doors from vestibule leading to elevator area and theatre area are automated
2. Theatre door facing University Avenue (automated and ramped)
3. Door facing Arts Lecture Hall in Accountancy Wing (automated and ramped)

The door facing AL has an incline of 15% leading to the accessible door. Other entrances offer accessibility without such inclines.

Elevator(s)

- Main lobby near the Humanities Theatre
- Accountancy wing (2nd and 3rd floors) accessible by links - use elevator in main building

Washroom(s)

- Main Lobby near the Humanities Theatre - 167 (W) / 169 (M)
- Accountancy wing - 1903 (W) / 1902 (M), 2902 (W) / 2903 (M), 3901 (W) / 3902 (M)

The washrooms #167/169 are the only moderately accessible facilities in the original building.

Telephone(s)

- Main lobby near the Humanities Theatre (at entrance #2)

Food and Drink

Liquid Assets, smart food, fair trade outlet is located in the Accountancy wing.

Comments

Long hallways have many fire doors, but they are not too difficult to open.

J.R. Coutts Engineering Lecture Hall (RCH)

Accessible Entrance(s)

1. On right side of building - closest to Dwight Engineering bldg. (automatic and ramped) - Student Access Van drop-off location
2. Connected to E2 by small elevator (refer to elevator description in E2)
3. Connected to DWE through room 1501

The content on the E2 description page does not use the conventional names for the RCH.

Elevator(s)

- Enter door #1 and turn right - centrally located on all floors

The description refers to "door #1" but does not correlate with any map or floor plans. Furthermore, after entering the one accessible entrance there is a short hallway before turning right towards the elevators.

Washroom(s)

- 3rd Floor - 303 (W) / 311 (M)
- 1st Floor - unisex/accessible 126

The first floor washroom offers the most accommodation. The third floor washrooms have accessible stalls and a closer proximity to the large classrooms on this floor.

Telephone(s)

- 2nd Floor - pay phone near room 212
- 1st Floor - pay phone in lounge near Helix lab

Food and Drink

- 1st Floor - four Vending Machines (snacks and drinks) beside elevator

Comments

- first floor restrooms best to use - fully accessible
- Access to Engineering Lecture Hall via small lift (elevator #2) is on the main floor at the west end of the building. A key can be signed out on a per-term basis from the office of AccessAbility Services

Mathematics 3 (M3)

Accessible Entrance(s)

1. Main door facing the Math & Computer building is ramped and automatic.

The curb cut leading into this building has protruding concrete that creates a poor transition of surfaces.

Elevators

- Located in main foyer opposite entrance #1

Washroom(s)

- 1902 (W) / 1903 (M)
- 2902 (W) / 2903 (M)
- 3902 (W) / 3903 (M)
- 4902 (W) / 4903 (M)

Beginning on the 2nd floor, there is a water fountain located between the washrooms.

Food and Drink

- Vending machines on ground level near north entrance

Comments

There is an overpass connecting M3 on the 3rd floor to MC and from MC you can connect to DC.

Physics (PHY)

Accessible Entrance(s)

1. Door facing parking lot B1
2. Door facing rear of Dana Porter Library - Student Access Van drop-off location
3. Door facing Engineering 2
4. Elevators from EIT access all levels of Physics

The relative location descriptors add confusion to way finding. The first descriptor does not exist. The second descriptor is inaccurate. The entrance faces Grad House Green. Finally, since the last descriptor directs people into EIT the sentence should include where the accessible locations are in that building as well.

Elevator(s)

- Located in the centre of the main hallway

Washroom(s)

- Accessible washrooms in EIT building are the closest via indoor route

Telephone(s)

- Main floor lobby

Food and Drink

- Vending machines are located on the main level near room #145.

Comments

- Doors facing rear of Dana Porter Library provides the easiest access but they are very heavy.
- There is a link between PHY and EIT on multiple floors
- there is a link from the 3rd floor of PHY to ENG 2

The universal washroom in E2 is closer to the smallest classroom (PHY#313) than EIT washrooms.

Quantum Nano Centre (QNC)

The content aligns with the observed building features.

Accessible Entrance(s)

1. Main entrance facing ring road (automated)
2. Side entrance facing SLC (ramped & automated)
3. Side entrance facing MC (automated)
4. Side entrance facing B1/B2
5. Overpass located on the 2nd floor of QNC leading to the 3rd floor of MC (automated)
6. Overpass located on the 2nd floor of QNC leading to B2 2nd floor (automated)

Elevator(s)

- Located beside the entrance facing the SLC to the left of the main entrance
- Located near the B1/B2 side entrance

Washrooms

Nanotech Area

(W) 1942 (M) 1943

(W) 2942 (M) 2943

Unisex: 3943/3944/3946/3947

Unisex: 4943/4944/4946/4947

Unisex: 5943/5947/5944/5946

IQC Area

(A) designates a family bathroom found on each level - rooms B917, 1917, 2917, 3917, 4917

0903 (W) 0902 (M)

Food & Drink

Vending machines located between elevator 2 and entrance 4 on the main level.

Comments

Please note: This building has 2 sections, the Nanotech area which houses lecture rooms and the Institute for Quantum Computing (IQC). The IQC has a security guard.

South Campus Hall (SCH)

Accessible Entrance(s)

1. Basement level from driveway off of Ring Road, beside shipping and receiving area (automated)
2. Main level door facing Grad House (automated)* Student Access Van drop-off location

The basement level entry is not marked on campus maps.

Elevator(s)

- Located near main level washrooms
- Elevator can be accessed from basement and main levels. Enter building via entrance #1, elevator is located at the end of the main corridor. Elevator also accesses upper level.

Washroom(s)

- Rooms 112 (W) and 113 (M)

There are other washrooms on the same level. None offer accessibility. None have been retrofit with accessible features.

Telephone(s)

- Located by stairs leading to the Student Success Office
- Near upper main washrooms

Food and Drink

- Tim Hortons located on the main floor across from the Waterloo Store.
- Vending machines are located across from the BookStore.
- Festival Room is located on 2nd floor. Please note, to access this take elevator to 2nd floor. The elevator opens into the restaurant kitchen. To reach the Festival Room you have to pass through the kitchen.

Comments

The South Campus Hall houses the Book Store, Waterloo Store, Student Success Office, and Visitor's Centre.

The upper level houses the Student Success Office, Writing Centre, Laurel Room and Festival Room.

It should be noted that the second floor door to access the Student Success Office and the Writing Centre has been locked on previous observations. Information should be provided to assist in those situations.

Student Life Centre (SLC)

Accessible Entrance(s)

1. Lower level door beside Service Lane and Bicycle Centre (automated) - Student Access Van drop-off location.
2. Main level door facing Health Services Building (automatic)
3. Connected to Physical Activity Centre by above-ground link on second floor (automatic)
4. Doors facing courtyard/Math and Computer bldg. - southern most doors near Wasabi Sushi Bar & Campus Bubble (automatic)
5. Main floor door facing PAC (automatic)

Elevator(s)

- Located near entrance #3 (near food court)
- Wheelchair stair lift by entrance #2
- Ramp by entrance 2 connecting to main level

Two elevators are located at the #3 entrance. One is not available to the general public. The ramp may be important to mention but perhaps not in the discussion of elevators.

Washroom(s)

- Lower level 801 (M) / 806 (W) - family washrooms, accessible
- Main level 1802 (W); 1801 (M) (accessible, no doors)
1815 (W) 1816 (M) near entrance #2;
- Upper level 2802(M)/2801(W), near elevator

The lower level washrooms do not have any elements that would indicate its status as a family washroom. The unisex washrooms (#1815 and #1816) would be more conducive to aiding children. None have a diaper changing station, as a family washroom would indicate. The washrooms on the second and third floor have aspects of accessibility (stall, grab bars) but not all aspects are accessible. Lever handles on sinks and heavy resistance of doors limit accessibility.

Telephone(s)

- Main floor: near turnkey desk, by the elevator and by Wasabi Sushi Bar & Campus Bubble
- Lower floor: near Feds Used Books and another near the prayer room
- Second floor: next to elevator

Food and Drink

- The Bombshelter Pub (not wheelchair accessible), Brubakers, Subway, and Wasabi Sushi Bar & Campus Bubble are located in the SLC and offer a wide selection of food items.
- Turnkey desk has assortment of snack items.
- International News, on-campus convenience store
- Tim Horton's

The Bombshelter Pub does offer accessibility. A Patio entrance grants independent access. Gates entering the patio are on an incline that adds difficulty. A stair lift near the Ring Road entrance of SLC was reported to provide access from the main floor.

Comments

Ramp links entrance #2 and Great Hall level. There is also a ramp linking the main and upper floors at entrance #4.

The SLC houses the Bombshelter Pub, a food court, Turnkey desk, and Student Access Van office, the Imprint and Federation of Students offices. Use the elevator to access the lower level (FEDS Used Bookstore, Dentist Office, Pharmacy, Copy centre, CIBC bank, SOS Physiotherapy, WATCARD office(located in CampusTech), CampusTech etc.).

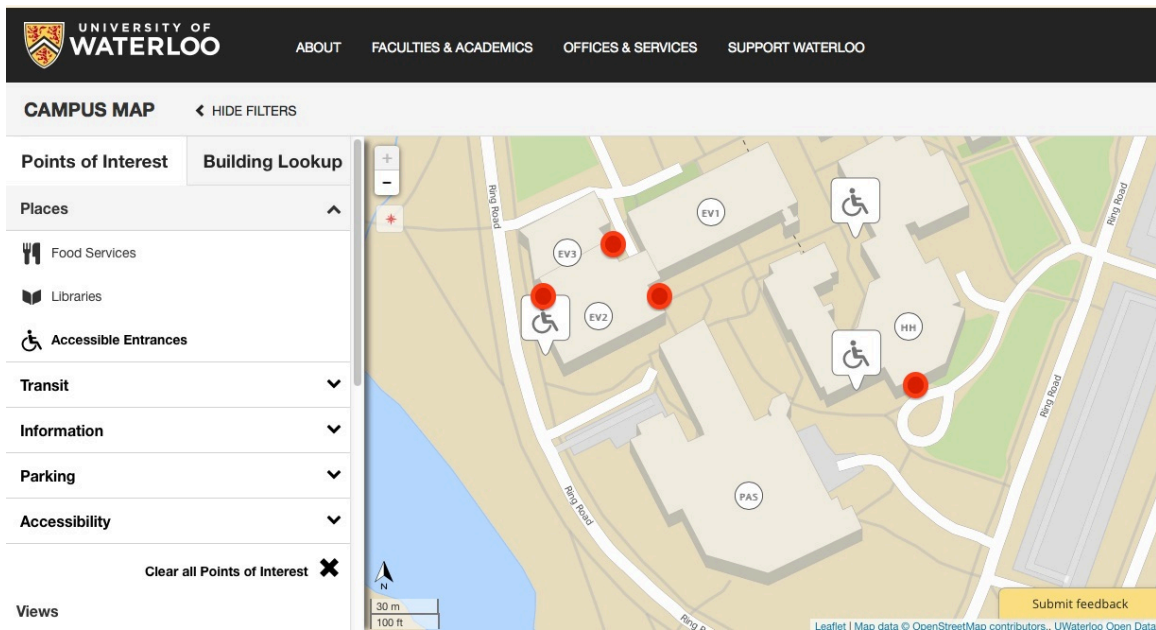
Rooms 2103 to 2109 accessible via ramp from SLC (door is sometimes locked). Access to Student Services area (Ombudsman's office, etc.) via elevator (inner door is automated).

Elevator 2809 could also facilitate access to rooms 2103 to 2109. Ground level access to the elevator is along corridor that begins at the basement level men's washroom #801.

Appendix I

Map of Accessible Entrances

The image below taken from the university's website has red dots added to indicate where accessible entrances were not marked. Several other map locations had similar labeling issues. The printed campus map, given to students and visitors, had the same issue. The map information should be the easiest to correct to prevent misdirection of students and visitors.



Appendix J

Outline of Smartphone Application™

Merging accessibility and technology may lead to fewer barriers. With the ubiquity of cellphones, it makes sense to develop an application for people directly affected by inaccessibility. A smartphone application could assist in the improvement of accessibility. The application would allow users identify issues or barriers; that once remediated would increase equity. Furthermore, users could receive updates on service interruptions that would impact access. The following is a brief description of the application's function.

Issue identified by the user.

The user captures an image of the issue on their smartphone.
The photo is uploaded to the application where it is tagged with gps coordinates for location identification by staff of the participating organization.
In the application the date and time is documented.
The user enters the type of issue: mobility, sensory, cognitive barrier they've encountered.
Further information can be entered into a 250 character-field to add notes for clarification.

Issue transferred to participating organization

Hitting the send button transmits the data to a server where a file on the issue is created.
An assessment of the file/issue can be performed to assess if an immediate onsite investigation needs to be executed. Alternatively, investigations can be added to work orders in neighboring areas to increase efficiency.
Site assessments determine the level of priority for remediation.

Prioritization

A prioritization of the file is performed by operations managers based on service interruption criteria. The categories for interruption are:

1. Impedes use.
2. Issue that limits but does not eliminate use; or
3. Concern that situation may deteriorate limiting future use. If it is a high use area? High traffic? A core? A periphery? Who's impacted?

Resolution of the issue

Based on assessments planning for remediation can be prescribed.

1. Immediate action is taken to resolve the issue.
2. Short term plans are made to resolve the solution in weeks or months; or,
3. Long terms plans are generated to allow for budgetary allocations that may be required (typically resolving large scale issues).

Feedback loop

To complement the app, an update section may be provided to connect with users. The app will then have two purposes – one aspect of reporting and the second updating user impacted by deficient accessibility.

Formulated plans and decisions made by actors on accessibility can then be communicated back to the app user. Furthermore, general service disruption updates can be communicated to the user. Road/sidewalk closures, service outages of elevators, doors, classrooms, water, fire alarm testing, water flushing/servicing

Appendix K

Proposed Accessibility Management System (AMS)TM adapted from ISO-14001

Below, the researcher's proposed AMSTM is based on the environmental management system ISO-14001. Much of the language and content has been replicated in the adaptation to accessibility. Additional definitions were added to provide clarity in terminology. However, other changes were minimal due to the strength of the original document (punctuation and slight sentence structure improvements were made). The proposed AMSTM is not to be considered original work. The originality comes in the application of a quality management framework to accessibility. The language of ISO-14001 was design for users to apply the framework to their business. Preserving the content allows users to apply accessibility management in their specific circumstances. More development of the guide is necessary; however the content offers the potential for improving accessibility.

Accessibility Management SystemTM

1 Scope

This standard specifies requirements for an accessibility management system to enable an organization to develop and implement a policy and objectives which take into account legal requirements and other requirements to which the organization subscribes, and information about significant accessibility aspects. It applies to those accessibility aspects that the organization identifies as those, which it can control and those, which it can influence. It does not itself state specific accessibility performance criteria.

This standard is applicable to any organization that wishes to

- a) establish, implement, maintain, and improve an accessibility management system,
- b) assure itself of conformity with its stated accessibility policy.
- c) demonstrate conformity with this standard by
 - 1) making a self-determination and self-declaration or
 - 2) seeking confirmation of its conformance by parties having an interest in the organization, such as customers, or
 - 3) seeking confirmation of its self-declaration by a party external to the organization, or
 - 4) seeking certification/registration of its accessibility management system by an external organization.

All the requirements in this standard are intended to be incorporated into any accessibility management system. The extent of the application depends on factors such as the accessibility policy of the organization, the nature of its activities, products or services and the location where and the conditions in which it functions.

2 Normative references

No normative references are cited. This clause is included in order to retain clause numbering identical with ISO 14001:2004.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Auditor: person with the competence to conduct an audit.

3.2 Accessibility: the unobstructed use of an environment, goods or services.

3.3 Accessibility aspect: element of an organization's activities or products or services that can impact accessibility.

NOTE: A significant accessibility aspect has or can have a significant accessibility impact.

3.4 Accessibility impact: any change to accessibility whether adverse or beneficial, wholly or partially resulting from an organization's accessibility aspects.

3.5 Accessibility management system: AMS, part of an organization's management system used to develop and implement its accessibility policy and manage its accessibility aspects.

NOTE: A management system is a set of interrelated elements used to establish policy and objective and to achieve those objectives. A management system includes organization structure, planning activities, responsibilities, practices, procedures, processes, and resources.

3.6 Accessibility objective: overall accessibility goal, consistent with the accessibility policy, that an organization sets itself to achieve.

3.7 Accessibility performance: measurable results of an organization's management of its accessibility aspects.

NOTE: In the context of accessibility management systems, results can be measured against the organization's accessibility policy, accessibility objectives, accessibility targets, and other accessibility performance requirements.

3.8 Accessibility policy: overall intentions and direction of an organization related to its accessibility performance as formally expressed by top management.

NOTE: The accessibility policy provides a framework for action and for the setting of accessibility objectives and accessibility targets.

3.9 Accessibility target: detailed performance requirement, applicable to the organization or parts thereof, that arises from the accessibility objectives and that needs to be set and met in order to achieve those objectives.

3.10 interested party: person or group concerned with or affected by the accessibility performance of an organization.

3.11 Continual improvement: recurring process of enhancing the accessibility management system in order to achieve improvements in overall accessibility performance consistent with the organization's accessibility policy.

NOTE: The process need not take place in all areas of activity simultaneously.

3.12 Corrective actions: action to eliminate the cause of a detected nonconformity.

3.13 Document: information and its supporting medium.

NOTE: The medium can be paper, magnetic, electronic, or optical computer disc, photograph or master sample or a combination thereof.

3.14 Internal audit: systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the accessibility management system audit criteria set by the organization are fulfilled.

NOTE: In many cases, particularly in smaller organizations, independence can be demonstrated by the freedom from responsibility for the activity being audited.

3.15 Nonconformity: non-fulfillment of a requirement.

3.16 Organization: company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

NOTE: For organizations with more than one operating unit, a single operating unit may be defined as an organization.

3.17 Preventive action: action to eliminate the cause of a potential nonconformity.

3.18 Prevention of inaccessibility: use of processes, practices, techniques, materials, products, or services to avoid, reduce or control (separately or in combination) the creation of inaccessibility to reduce adverse accessibility impacts (3.4)

NOTE: Prevention of inaccessibility can include process, product, or service changes, material substitutions, retrofitting or repairs.

3.19 Procedure: specified way to carry out an activity or a process.

NOTE: Procedures can be documented or not.

3.20 Record: document stating results achieved or providing evidence of activities performed.

4 Accessibility management system requirements

4.1 General requirements

The organization shall establish, document, implement, maintain and continually improve an accessibility management system in accordance with the requirements of this standard and determine how it will fulfill these requirements.

The organization shall define and document the scope of its accessibility management system.

4.2 Accessibility policy

Top management shall define the organization's accessibility policy and ensure that, within the defined scope of its accessibility management system, it

- a) is appropriate to the nature, scale and accessibility impacts of its activities, products and services,
- b) includes a commitment to continual improvement and prevention of inaccessibility,
- c) includes a commitment to comply with applicable legal requirements and with other requirements to which the organization subscribes which relate to its accessibility aspects,

- d) provides the framework for setting and reviewing accessibility objectives and targets,
- e) is documented, implemented and maintained,
- f) is communicated to all persons working for or on behalf of the organization, and
- g) is available to the public.

4.3 Planning

4.3.1 Accessibility aspects

The organization shall establish, implement and maintain a procedure(s)

- a) to identify the accessibility aspects of its activities, products and services within the defined scope of the accessibility management system that it can control and those that it can influence taking into account planned or new developments, or new or modified activities, products and services, and
- b) to determine those aspects that have or can have significant impact(s) on the accessibility (i.e. significant accessibility aspects).

The organization shall document this information and keep it up to date.

The organization shall ensure that the significant accessibility aspects are taken into account in establishing, implementing and maintaining its accessibility management system.

4.3.2 Legal and other requirements

The organization shall establish, implement and maintain a procedure(s)

- a) to identify and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its accessibility aspects, and
- b) to determine how these requirements apply to its accessibility aspects.

The organization shall ensure that these applicable legal requirements and other requirements to which the organization subscribes are taken into account in establishing, implementing and maintaining its accessibility management system.

4.3.3 Objectives, targets and program(s)

The organization shall establish, implement and maintain documented accessibility objectives and targets, at relevant functions and levels within the organization.

The objectives and targets shall be measurable, where practicable, and consistent with the accessibility policy, including the commitments to prevention of inaccessibility, to compliance with applicable legal requirements and with other requirements to which the organization subscribes, and to continual improvement.

When establishing and reviewing its objectives and targets, an organization shall take into account the legal requirements and other requirements to which the organization subscribes, and its significant accessibility aspects. It shall also consider its technological options, its financial, operational and business requirements, and the views of interested parties.

The organization shall establish, implement and maintain a program(s) for achieving its objectives and targets. Program(s) shall include

- a) designation of responsibility for achieving objectives and targets at relevant functions and levels of the organization, and
- b) the means and time-frame by which they are to be achieved.

4.4 Implementation and operation

4.4.1 Resources, roles, responsibility and authority

Management shall ensure the availability of resources essential to establish, implement, maintain and improve the accessibility management system. Resources include human resources and specialized skills, organizational infrastructure, technology and financial resources.

Roles, responsibilities and authorities shall be defined, documented and communicated in order to facilitate effective accessibility management.

The organization's top management shall appoint a specific management representative(s) who, irrespective of other responsibilities, shall have defined roles, responsibilities and authority for

- a) ensuring that an accessibility management system is established, implemented and maintained in accordance with the requirements of this standard,
- b) reporting to top management on the performance of the accessibility management system for review, including recommendations for improvement.

4.4.2 Competence, training and awareness

The organization shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant accessibility impact(s) identified by the organization is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.

The organization shall identify training needs associated with its accessibility aspects and its accessibility management system. It shall provide training or take other action to meet these needs, and shall retain associated records.

The organization shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of

- a) the importance of conformity with the accessibility policy and procedures and with the requirements of the accessibility management system,
- b) the significant accessibility aspects and related actual or potential impacts associated with their work, and the benefits of improved personal performance,
- c) their roles and responsibilities in achieving conformity with the requirements of the accessibility management system, and
- d) the potential consequences of departure from specified procedures.

4.4.3 Communication

With regard to its accessibility aspects and accessibility management system, the organization shall establish, implement and maintain a procedure(s) for

- a) internal communication among the various levels and functions of the organization,
- b) receiving, documenting and responding to relevant communication from external interested parties.

The organization shall decide whether to communicate externally about its significant accessibility aspects, and shall document its decision. If the decision is to communicate, the organization shall establish and implement a method(s) for this external communication.

4.4.4 Documentation

The accessibility management system documentation shall include

- a) the accessibility policy, objectives and targets,
- b) description of the scope of the accessibility management system,
- c) description of the main elements of the accessibility management system and their interaction, and reference to related documents,
- d) documents, including records, required by this standard, and
- e) documents, including records, determined by the organization to be necessary to ensure the effective planning, operation and control of processes that relate to its significant accessibility aspects.

4.4.5 Control of documents

Documents required by the accessibility management system and by this standard shall be controlled. Records are a special type of document and shall be controlled in accordance with the requirements given in 4.5.4.

The organization shall establish, implement and maintain a procedure(s) to

- a) approve documents for adequacy prior to issue,
- b) review and update as necessary and re-approve documents,
- c) ensure that changes and the current revision status of documents are identified,
- d) ensure that relevant versions of applicable documents are available at points of use,
- e) ensure that documents remain legible and readily identifiable,
- f) ensure that documents of external origin determined by the organization to be necessary for the planning and operation of the accessibility management system are identified and their distribution controlled, and
- g) prevent the unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

4.4.6 Operational control

The organization shall identify and plan those operations that are associated with the identified significant accessibility aspects consistent with its accessibility policy, objectives and targets, in order to ensure that they are carried out under specified conditions, by

- a) establishing, implementing and maintaining a documented procedure(s) to control situations where their absence could lead to deviation from the accessibility policy, objectives and targets, and
- b) stipulating the operating criteria in the procedure(s), and
- c) establishing, implementing and maintaining procedures related to the identified significant accessibility aspects of goods and services used by the organization and communicating applicable procedures and requirements to suppliers, including contractors.

4.4.7 Emergency preparedness and response

The organization shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on accessibility and how it will respond to them.

The organization shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse accessibility impacts.

The organization shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.

The organization shall also periodically test such procedures where practicable.

4.5 Checking

4.5.1 Monitoring and measurement

The organization shall establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of its operations that can have a significant accessibility impact. The procedure(s) shall include the documenting of information to monitor performance, applicable operational controls and conformity with the organization's accessibility objectives and targets.

The organization shall ensure that calibrated or verified monitoring and measurement equipment is used and maintained and shall retain associated records.

4.5.2 Evaluation of compliance

4.5.2.1 Consistent with its commitment to compliance, the organization shall establish, implement and maintain a procedure(s) for periodically evaluating compliance with applicable legal requirements.

The organization shall keep records of the results of the periodic evaluations.

4.5.2.2 The organization shall evaluate compliance with other requirements to which it subscribes. The organization may wish to combine this evaluation with the evaluation of legal compliance referred to in 4.5.2.1 or to establish a separate procedure(s).

The organization shall keep records of the results of the periodic evaluations.

4.5.3 Nonconformity, corrective action and preventive action

The organization shall establish, implement and maintain a procedure(s) for dealing with actual and potential nonconformity(ies) and for taking corrective action and preventive action. The procedure(s) shall define requirements for

- a) identifying and correcting nonconformity(ies) and taking action(s) to mitigate their accessibility impacts,
- b) investigating nonconformity(ies), determining their cause(s) and taking actions in order to avoid their recurrence,
- c) evaluating the need for action(s) to prevent nonconformity(ies) and implementing appropriate actions designed to avoid their occurrence,
- d) recording the results of corrective action(s) and preventive action(s) taken, and
- e) reviewing the effectiveness of corrective action(s) and preventive action(s) taken.

Actions taken shall be appropriate to the magnitude of the problems and the accessibility impacts encountered.

The organization shall ensure that any necessary changes are made to accessibility management system documentation.

4.5.4 Control of records

The organization shall establish and maintain records as necessary to demonstrate conformity to the requirements of its accessibility management system and of this standard, and the results achieved.

The organization shall establish, implement and maintain a procedure(s) for the identification, storage, protection, retrieval, retention and disposal of records.

Records shall be and remain legible, identifiable and traceable.

4.5.5 Internal audit

The organization shall ensure that internal audits of the accessibility management system are conducted at planned intervals to

- a) determine whether the accessibility management system
 - 1) conforms to planned arrangements for accessibility management including the requirements of this standard, and
 - 2) has been properly implemented and is maintained, and
- b) provide information on the results of audits to management.

Audit program(s) shall be planned, established, implemented and maintained by the organization, taking into consideration the accessibility importance of the operation(s) concerned and the results of previous audits.

Audit procedure(s) shall be established, implemented and maintained that address — the responsibilities and requirements for planning and conducting audits, reporting results and

retaining associated records, — the determination of audit criteria, scope, frequency and methods.

Selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process.

4.6 Management review

Top management shall review the organization's accessibility management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews shall include assessing opportunities for improvement and the need for changes to the accessibility management system, including the accessibility policy and accessibility objectives and targets. Records of the management reviews shall be retained.

Input to management reviews shall include

- a) results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes,
- b) communication(s) from external interested parties, including complaints,
- c) the accessibility performance of the organization,
- d) the extent to which objectives and targets have been met,
- e) status of corrective and preventive actions,
- f) follow-up actions from previous management reviews,
- g) changing circumstances, including developments in legal and other requirements related to its accessibility aspects, and
- h) recommendations for improvement.

The outputs from management reviews shall include any decisions and actions related to possible changes to accessibility policy, objectives, targets and other elements of the accessibility management system, consistent with the commitment to continual improvement.