

INTERNATIONAL BEST PRACTICES
IN UNIVERSAL DESIGN:
A COMPARATIVE STUDY

Prepared for
Agriculture and Agri-Food Canada
and the Canadian Food Inspection Agency

BETTY DION ENTERPRISES LTD. in partnership with
The Canadian Institute for Barrier-Free Design
March 2000

DEDICATION

This report is dedicated to the memory of our friend and colleague, Richard St. Pierre who worked tirelessly to improve Accessibility for people, like him, who lived with a disability. Richard, who was a quadriplegic, prepared the drawings in this report in AutoCAD using adaptive equipment that included a mouth stick and a track ball.

ACKNOWLEDGEMENTS

Betty Dion Enterprises Ltd. (BDEL) and the Canadian Institute of Barrier-Free Design (CIBFD) would like to express their thanks to the Kentucky AgrAbility Project, University of Kentucky Cooperative Extension Service for their support and cooperation, Jian Qiu for translating the Beijing Building Code, Dave Rapson for his endless hours of inputting data and to Pierre Legault for his unending support and appreciation.

This project was made possible by the cooperative efforts of three Canadian federal organizations. Funding support for this project was received from Rachelle Lapointe of the Public Service Commission of Canada, as part of the Employment Equity Partnership Fund who generously funded part of the project.

We would also like to thank John Jones of the Canadian Food Inspection Agency and Andrew Graham from Agriculture and Agri-Food Canada who's departments' initiated and contributed funding for this project.

The consultant team was lead by Betty Dion Enterprises Ltd. in partnership with the Canadian Institute on Barrier-Free Design, Murray and Murray & Associates, Architects and Jeff Kaster, Landscape Architect. The drawings were prepared by the late Richard St. Pierre. Photography and cover designed by Aching & Beggs.

This document is available in alternate formats

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1.0 INTRODUCTION

1.6_ GENERAL

The Departments of Agriculture and Agri-Food Canada (AAFC) and the Canadian Food

Inspection Agency (CFIA) have established themselves as lead departments in the areas of Accessibility and promotion of the rights of people with disabilities. Over the last several years AAFC and CFIA initiated a number of innovative projects including hosting a national symposium on disability issues in 1998.

Over 18% of the population of Canada are people who live with a disability, and this percentage is increasing. As the population ages and people are living longer, the face of the public service in Canada continues to change. By next year over 30% of our projected 31.9 million Canadians will be over 50. While not all older people have disabilities, the prevalence is highest among this demographic group.

Universal design makes life easier for everyone, by ensuring that products and environments are safer, more comfortable, more affordable, accessible, adaptable and easier to use, regardless of our diverse sizes, ages and abilities. Universal design is the guiding principle for this project.

One important characteristic of universal design is that design solutions do not segregate users and the environment does not become less usable by persons who are not disabled. Designers and building owners have begun to realize that building codes do not accommodate all individuals. People come in all sizes and have various abilities. The departments are planning to build new headquarters over the next few years, and have recognized this as an opportunity to incorporate universal design principles into the new buildings, not only state-of-the-art universal design principles but “best practices” in universal design.

The task of conducting an international study of accessibility codes and accommodation practices in an illustrated best practice guide is a challenging and exciting one and every effort has been made to search out relevant codes, standards, guidelines and innovative ideas.

1.2 BEST PRACTICES

Best practices in universal design are defined as building practices and procedures that comply with universal design principles and provide affordable design practices that meet the needs of the widest possible range of people who use a facility. Not all best practices apply in the same situation and therefore all recommendations must be carefully considered and discussed together with architects and building owners.

1.3 DISCLAIMER

Every attempt has been made to obtain and document data from the international codes and standards and to present them in a comprehensive manner. As accessibility codes and standards are constantly being upgraded, changed, and evolving, new and different design ideas will continue to emerge.

The information in this report has been obtained from many sources, including

government building codes, accessibility guidelines from municipalities and government organizations, community associations, architects and landscape architects. The consultants have made every reasonable effort to make this reference document accurate and authoritative, but do not warrant, and assume no liability for the accuracy or completeness of the information or its fitness for any particular purpose. It is the responsibility of users to apply their professional knowledge in the use of the information contained in this document, in consultation with their architect or other professional.

Literature from manufacturers and suppliers is included as examples only and any products, services, or organizations that are mentioned, shown, or indirectly implied in this document do not imply endorsement by Betty Dion Enterprises Ltd., the Canadian Institute on Barrier-Free Design, Agriculture and Agri-Food Canada or the Canadian Food Inspection Agency. The material is presented and company name is included for information purposes only.

1.4 FORMAT OF THE REPORT

This report is presented in two volumes as follows:

Volume 1

Section 1	Introduction
Section 2	Building Elements - Summary of the data analysis
Section 3	Methodology for Building Elements
Section 4	Landscape Elements - Summary of the data analysis
Section 5	Landscape Methodology
Section 6	Maintenance
Section 7	Bibliography
Section 8	Appendices
	Appendix I Glossary of Terms
	Appendix II Photographs & Drawings

Volume 2

Section 1	Introduction
Section 2	Building Elements - Data sheets for codes and standards
Section 4	Landscape Elements - Data sheets for codes and standards
	Appendix I Glossary of Terms
	Appendix III Acronyms & Documents

The summary pages present a summary of the findings, with references to the corresponding

sections in the Data Sheets. In order to highlight **the best practice** it is presented in bold. Following the data summaries, comments and suggestions that were extrapolated from the various codes and standards are presented, as it was found that they frequently contained valuable ideas to improve implementation.

The Data Sheets list headings (as abbreviations) horizontally referring to the various codes and standards examined. See 1.5 for just the acronyms, or Appendix III for a listing of the acronyms and the corresponding documents.

Following the series of columns for the various International codes and standards, a column is dedicated to the range of dimensions found, followed by the **Best Practice** and the source document for the best practice. A column entitled BDEL represents additional information or design practices not found in the codes and standards. If there was no information included in the Code or Standard, the blank column has not been included.

Appendix I contains a Glossary of Terms, Appendix II is the photographs and drawings of best practices, Appendix III - Acronyms & Documents and Appendix IV, the product literature that is contained in a separate binder.

1.5 ACRONYMS

ACC.BD. or ACCESS BOARD or ACCESS BOARD - COMMITTEE - The Access Board.
US Architectural and Transportation Barriers Compliance Board

ACCESS or ACCESS MANUAL - The Canadian Institute for Barrier Free Design

ADAAG - Americans with Disabilities Act Accessibility Guidelines

ANSI - American National Standards & International Code Council Inc.

AUSTRALIA - Standards Association of Australia

BDEL - Betty Dion Enterprises Limited

BEIJING - Standards Bureau of Beijing, Beijing Institute of Architectural Design & Beijing
Institute of Urban Construction

CFC - Canadian Fire Code

CIBFD - Canadian Institute for Barrier Free Design

CMHC - Canada Mortgage and Housing Corporation

CSA - Canadian Standards Association

CUD-RBHC - Centre for Universal Design, Removing Barriers to Health Care

ECMT - European Conference of Ministers of Transport

ENGLAND - Department of the Environment, Transport and the Regions. The Building
Regulations

FIJI - Fiji Islands Standard. The Standards Association of Australia

G. ROBINETTE - Gary Robinette.

GLOUCESTER - City of Gloucester

GOING PLACES - The Canadian National Institute for the Blind

IES - Illumination Engineers Society

JAPAN - Ministry of Construction, Japan International Cooperation Agency

KENTUCKY - University of Kentucky Cooperative Extension Service. Kentucky AgrAbility
Project.

MANITOBA - Manitoba League of Persons With Disabilities

NBC -National Building Code

NORDIC - The Nordic Committee on Disability

ONTARIO or ONTARIO MTR - Ontario Ministry of Tourism and Recreation

PARKS CAN. - PARKS CANADA & Public Works and Government Services Canada

TAKING STEPS - University of Victoria

TIME SAVER STANDARD - LA -Time Saver Standard for Landscape Architecture

UFAS - Uniform Federal Accessibility Standards

USFS or US Forest Service - US Department of Agriculture Forest Service

2.0 BUILDING ELEMENTS

See section 3.0 for Building Elements - Process & Methodology

2.1 ANTHROPOMETRICS

Anthropometric data is used as the basis for the development of design criteria in codes and standards but not all of the codes and standards contained in this study included anthropometric data as part of their documents. It is particularly interesting therefore to examine the differences that occur in, for instance, the basic footprint of a wheelchair. The **minimum clear floor space** to accommodate a single stationary wheelchair and occupant (AP-01) varied from 650 x 1100mm in Japan, 750 x 1200 mm in the CSA, to 750 x 1220 mm in the ADA, 900 x 1200 mm in the Nordic countries, and finally in Access 750 x 1200 mm for manual wheelchairs, 750 x 1250 mm for power wheelchairs and 750 x 1300 mm for scooters with the resulting **best practice at 900 x 1300 mm**.

This surprising variation explains why there are such different dimensions found in various codes and standards around the world.

The actual dimensions of a wheelchair were presented in the CSA document but most other standards did not include specific dimensions for wheelchairs. **Japan had a maximum toe height at 450 mm**, considerably more than the CSA at 200 mm..

The comfortable clear width for a person walking using crutches ranged from 900 - 1200 mm (AP-12), with the Japanese **clear width requirement of 1200 mm, the most generous and 900 mm for someone walking with a cane.**

The space for a wheelchair to pass a person ranged from 1200 - 1800 mm, with the **Nordic passing width requirements at 1800 mm and the Beijing standard at 1800 mm for two wheelchairs to pass** allowing the most generous dimensions. (AP-25, AP-26)

The turning radii (360 degrees) for someone using a wheelchair (AP02C) in Fiji was 2250 x 2250 mm, **with 2450 x 2450 mm preferred.**

The maximum side reach height above the floor (AP-08) ranged from 1220 - 1600 mm, with the ANSI specification of **1220 mm judged to be the best**. The minimum side reach varied wildly from 200 - 450 mm with **450 mm (Beijing) allowing for the widest range of people including those with limited balance and for people with shorter arms extensions**. Oddly enough, for the maximum side reach over an obstruction, Japan has 750 mm, while **CSA had 600 mm, a much more inclusive reach range.**

The anthropometric comparison provided interesting data, however, as only a limited number of codes included anthropometrics, this section can not be considered conclusive or comprehensive.

2.2 ACCESS ROUTE

Access routes include all corridors and passageways throughout a facility. Access routes must be

accessible according to the application of the building code or area having jurisdiction. Any rise above 13 mm should be treated as a ramp (D-02C) but if there is a rise between 6 - 13 mm, it should be bevelled (D-02B). **Thresholds at washroom entrances and at other doors should be avoided. CSA also had the best practices for slopes, cross slopes, grates and carpets.**

Carpets should be stored for a few weeks to allow them to “gas-off” so that they are less likely to irritate people with environmental sensitivities. New carpets can cause headaches, nausea and skin irritation in the fast increasing number of people with multiple chemical sensitivity or MCS. **Patterns and sculptured carpets should be avoided** as well as grates. **England specifically recommended that monochromatic colour schemes be avoided.**

Interestingly, Fiji recommended that the carpet pad and pile height should not exceed 6 mm (CSA allows 13 mm) which is an excellent recommendation (D-10).

The minimum clear headroom requirement (D-12) ranged from 1980 mm (CSA) to 2250 mm (Access). It was felt that 2250 mm may be a little high and therefore the recommendation is compliance with ADA, at **2030 mm for clear headroom**. CSA and other codes allowed protrusions of up to 100 mm (D-15).

The minimum clear width for interior accessible routes varied from 900 mm - 1500 mm (D-19), with **1500 mm the best practice for clear width in all interior corridors**. The minimum clear width for indentations should comply with the minimum width for doorways at 850 mm. **Japan had an interesting requirement that passing spaces be located every 50 m (D-33) and ANSI had an equally valid requirement that the maximum distance between short indentations should be 1220 mm (D-19F).**

It was interesting to note that the Canada Fire Code limited the amount of display areas in public corridors to 15%.

There should be no sharp edges on walls, fixtures, furnishings or displays and escalators should not be part of a barrier-free path of travel. Automatic banking machines and other dispensing machines should comply with the new CSA B651.1 Standard for Automated Banking Machines.

An interesting comment from Time-Saver Standards is that pedestrian circulation systems should include loops rather than dead ends.

Comments included that visual clutter and mirrors and all glass or polished metal wall surfaces be avoided and as well as mats, as they can cause tripping.

2.3 ENTRANCES AND DOORS

The CSA and the Japanese Standard called for the main entrance door to be equipped

with an automatic door opener, but obviously the **best practice would be to equip all entrance doors with automatic openers.**

Sliding entrance doors are the best practice for the main entrance of a facility. If there are two doors in a series at the lobby entrance, they can open consecutively to reduce the influx of cold air.

The recommended best practice for the **clear width of doors is 850 mm (G-02)** mentioned by Fiji and Access. Japan recommended **1200 mm for the principle entrance (G-02B)** and that **exit doors (G-05B) open and close automatically**, an innovative idea. An accessibility symbol is not required on every accessible door, but if there is only one or two doors in a group that are accessible, the door should have the symbol.

The Taking Steps publication recommended that **the entrance lobby have slip-resistant flooring, especially when wet and that a rest area with seating be provided in the lobby.**

A directory should provide information in both auditory and visual formats immediately inside the main entrance. It should have characters that are well contrasted and a tactile floor plan or map. A prerecorded directory message was also suggested by Fiji. Access suggested that directories be presented vertically or horizontally, at an angle and that a series of signs be located at decision points throughout the facility such as at intersections, elevators, etc. rather than only one sign at the main entrance.

An interesting recommendation from England is to create a **lighting transition zone** immediately inside the entrance door where people with sight impairments can adjust from the bright outdoors to the more dimly lit interior.

Manoeuvring spaces at doors (G01A -G01F) in both the Australian and Fiji Codes had been updated to accommodate larger wheelchairs and scooters and should be carefully considered for application throughout new facilities.

In examining the differences between **manoeuvring spaces at doors between the various codes, Fiji required (G-01H) 570 mm of space on the latch side of doors that push open, 940 mm on the latch side (G-01I) of doors that pull open and 710 mm on the latch side when approaching from the hinge side of doors that push open, all dimensions greater than those specified in the CSA B651 Standard.** These are manoeuvring spaces which would increasingly accommodate people who use power wheelchairs and scooters. Beijing provided the broader **manoeuvring spaces for the front and side (2000 x 2000 mm)** approaches to sliding doors and, in fact, continued with that dimension for approaches from all directions (G01A-G01F).

The force required to push or pull a door is always an important element in universal design. The **Nordic Code specifies 10 Newtons to push or pull open a door (G08, 09, 09A)**, a best practice that will be appreciated by everyone.

Fiji specified the location for **call buttons (bells) at a height between 900 - 1100 mm, and 500 mm away from interior corners**, important considerations that are not specified in other Standards.

England specified the heights for transparent glazing (G-19) a consideration to allow people to see whether someone is approaching from the other side of the door, which is particularly helpful at washroom doors.

Some CSA comments on doors included that they be equipped with **guard rails** to prevent people from walking into doors that open automatically and that **hardware contrast with their background** but Fiji went further and required that **doors have contrasting frames**.

Kentucky required that **doors leading to potentially dangerous areas have a textured surface on the handle (Comment 26), the same flooring be used throughout a building to indicate the emergency path (Comment 40) and emergency back-up power be provided on emergency doors**, three useful suggestions gathered in the comments. It should be noted that the textured surface on the door handle should be distinctive and easily detected.

An exterior designated smoking area, away from the main entrance is a best practice that will be appreciated by building occupants as they enter and exit the building, an idea that is especially appreciated by people with asthma or those with allergies.

2.4 RAMPS

The slope of ramps are presented in a variety of formats making it somewhat difficult to make comparisons but **best practices indicate a slope between 1:15 - 1:20 for most ramps, (E01 A & B) and the maximum ramp horizontal length between landings (E-01E) at 9000 mm**, a CSA requirement.

The **minimum clear width of a ramp between handrails (E-03) is 1200 mm**, recommended by Japan, Fiji and Beijing. **The minimum landing width (E-07A) is 1500 mm** to accommodate a wide range of users and the **minimum landing size by a door is 1525 x 1525 mm**, similar to Kentucky and the ADA.

The **ramp surface should be non-slip and Japan required that it be of a contrasting colour (E-09A)**. **Tactile cuing similar to that used to warn of an upcoming change in grade at stairs should be provided one step back from the change in slope (Japan and Fiji)**. The minimum height of edge protection (E-12) is 100 mm in England and the **maximum height of the lower edge of a raised barrier is 100 mm**, which is an ANSI requirement, both considered best practices.

Handrails are required on both sides of ramps (E-13A), regardless of their rise, although curb ramps do not require handrails. **Handrail heights varied from 665 - 1000 mm with the range provided by the NBC (865 - 965 mm)** considered to meet the widest range of users. **A second**

handrail at a height of 450 mm is suggested for children and others, which also reduces the risk of people swinging on the handrails. **Handrails that are recessed should have a minimum clearance height of 600 mm (E-20)** above the handrail according to the Australian Standard. **Fiji required that ramps be illuminated to at least 150 lux.**

Tactile cuing on the underside of handrails on ramps that enter to the exit floor should be provided, similar to that required for handrails on stairs that enter onto exit floors. This will alert everyone to the exit floor in emergency situations which may be extremely important if there is a smoky environment.

Interior ramps are preferred as a means of egress to stairs as they accommodate a wider range of building users, including people who use wheelchairs.

2.5 CURB RAMPS

The design of curb ramps varied considerably with slopes ranging from 1:8 (Australia) to 1:20 preferred, depending on the maximum rise. **The best practice would be not to exceed a slope of 1:12, preferring 1:20, similar to the ADA requirements (C01A-C).** The width of the curb ramp (C-03) varied from 900 mm to 2250 mm (Beijing), with the best practice being **a width of 1500 mm which would allow sufficient space for snow clearance. The maximum slope of the flared side (C-08) in Beijing is 1:12, (an improvement from the CSA 1:10).**

Corner curb ramps are not allowed as they direct people into the centre of an intersection. **Curb ramps should line up directly across from each other on both sides of an intersection. The best practice for the length of a level area (C-14) on an island is 1500 mm and the minimum level walking area at the top of the ramp (C-15) is 1500 mm, both recommended by Access.**

An excellent suggestion from the CUD-RBHC is that **detectable warnings should be provided at curbless walks that cross vehicle traffic lanes to cue pedestrians to a possible hazard.**

A lip is required on curb ramps where they cross a vehicular route as this will provide a cue to people with visual impairments alerting them to whether they are on the sidewalk or in the vehicular route, 13 mm is the usual practice.

2.6 STAIRS

Surprisingly, the design of stairs varied considerably with the maximum height of risers (I-01) varying from 180 mm in Canada and the US to 150 - 165 mm in Fiji and tread depth (I-02) ranging from 280 (CSA) - 325 mm (Access). The gap was very broad when stair nosings are examined (I-04), with maximum nosing projections varying from 15 - 25 mm in England to 38 mm in Canada. As stairs must be consistently designed with predictable treads and risers, it is suggested that CSA requirements be maintained.

The design of handrails ranged from 30 - 50 mm for the diameter (I-11), **the clear space between the rail and the wall varied from 35- 50 mm, with the best practice being the smaller dimension** as this reduces the risk of someone catching their hand in behind the handrail.

The height of the top of the handrail (I-18) ranged from 760 (ANSI) - 1000 mm (Australia) which is quite a wide range. **The middle range suggested by the CSA is recommended, with the addition of a second handrail at a height of 450 mm.**

There was some variation in the treatment of the surface of stair treads where Japan recommended a roughed surface on the treads while England required the use of detectable warning (I-23) for the full width of the stair and extending it 400 mm at each side of the stairs, with **the CSA requiring them one tread width back from the stair, contrasting in colour and texture from their background.** Very few other countries required detectable warnings at stairs.

There were a variety of comments or suggestions on how to warn people with visual impairments when stairs lead them to exit floors. It is important that people who are blind know what floor is the exit floor so that they do not continue down stairs into the lower levels of, for instance, a parking garage. Some building owners have installed **gates to prevent people from descending too far, while others have installed tactile warnings on the underside of handrails, only on exit floors.** Whichever method is used, it is important that everyone be aware of their purpose.

All exterior and interior stairs must have handrails. Circular stairs should be avoided and confusing patterns or colours on the stair treads were considered to be dangerous.

Detectable warnings surfaces which were recommended at the top of stairs, should contrast from the surrounding surfaces by colour, texture, resiliency and sound and should not be used within the building for any other purpose.

2.7 ELEVATORS

Most countries have elevator standards in addition to accessibility codes and standards. The data in the data sheets may not reflect specifications in the accessibility code or standard itself but rather a referenced elevator code.

Most codes allow a 13 mm rise or drop, whereas **the best practice would clearly be a minimal gap.** As it is not possible to bevel the rise or drop, it is even more important that the gap be minimal. This rationale also applies to H-01A, relating to the gap between the floor and the elevator platform.

The **minimum clear width of an elevator door is 915 mm**, an ADA specification. **The best practice for the size of the elevator lobby is 3150 x 3150 mm** based on accommodating all wheeled devices. **Reopening devices**, as specified by the CSA, **at 125 +/- and 735 +/- mm** will detect guide dogs and children as well as ambulatory people walking through the doors.

The minimum time allowances for reopening 20sec. (H-05) and before starting to close, 3 sec. (H-06) and 4 sec. (H-06A) were all judged to be too short to allow sufficient time for some with a mobility or agility impairment or someone who is blind to get to the elevator on time. While it is recognized that elevators need to keep moving people quickly, especially at peak times, it is recommended that **at least one elevator be set with greater time allowances**. The best practice for **the minimum door opening time before the doors start to open is 10 seconds**, where CSA specifies only 4 seconds.

The **minimum centerline height of the lowest control button should be 1200 mm**, rather than the 1370 mm specified in the CSA. **The floor registration buttons should not have the raised characters on the buttons**, as the buttons may be activated when people who are blind read them tactually. It is the best practice to have **the raised characters only on the left**. **The floor number should be raised at least 1.6 mm**. The telephone should be no higher than 1200 mm, (Access) and the telephone cord should be a minimum of 1000 mm (CSA) .

The telephone should be equipped with a flux coil and volume control device, as required by CSA but (H-26A) BDEL recommended that **communication also be provided to people who are deaf or speech impaired by including a TTY or other type of interactive visual communication system**. This is a best practice.

The illumination level (H-31) varied from 54 lux which is quite low to 400 lux, but **200 lux is considered a best practice**. **Audible signals should signal the arrival of the elevator and the direction of travel**. Another best practice to make elevators more Accessible is the **inclusion of a mirror at the top of the back wall of the elevator**. This will assist people who use wheelchairs to see behind them as they back out as well as assist them to see the floor indicators that illuminate as the elevator moves. Mirrors on the back and side walls are not recommended as they can be disorienting for some people.

One recently introduced feature, bells that ring when a door is held open for more than 10 seconds was considered to be very inconvenient and somewhat harassing as doors must frequently be held open to allow sufficient time for some people who need a longer time.

England recommended **seating in the elevator lobby and fold-down seating in the elevator** and CMHC recommended **audio and visual instruction, back-up lighting and a surveillance camera**. It should be noted that **all elevators must have a telephone**, although some provincial building codes do not require them.

The appropriate **use of colour at the door frame, at the edge of the platform and on all controls** will improve safety for all passengers. Elevators should not have keyed Access or require that one summon an operator or security staff as this limits the independence of building occupants.

A best practice allowing a greater number of people to use an elevator is to install **a call button**

that can be activated by the foot of someone using a wheelchair. It should also have appropriate signage. In buildings with only two stories the elevator can be programmed to automatically go to the other floor when someone enters, which increases accessibility as it does not require that a button be pushed.

2.8 FIRE SAFETY

The Regulations Respecting Occupational Safety and Health Under Part II of the Canada Labour Code has numerous requirements that address fire safety requirements for all building occupants, including a requirement for **fire procedures in alternate formats, the need for practising evacuation procedures with all building occupants and the need for the development of fire safety plans in conjunction with building occupants who have a disability or require some assistance.** Only California was found to have similar requirements in the US.

Fire safety must be considered for all users, **visual alarms** should be installed for people who are deaf or hard of hearing (FS-1), a requirement of the ADA. The ADA specifies the placement (FS-2) **(every 15 m)** and the **luminosity of visual alarms (1-4 Hz)**. The ADA and other US Codes require that audible alarms exceed the ambient noise level by at least 15 dB, a best practice.

A fire rated elevator, with it's own elevator shaft, enabling it to be used in the event of a fire, is a best practice and should be incorporated into the initial design of a building.

A best practice to ensure communication during a fire or emergency situation for people who are deaf or speech impaired is to provide a **visual messaging** in addition to an **audible system or voice announce system** (especially if a two stage alarm system is installed).

An area of refuge (a fire safe holding area) served by an exit or firefighter's elevator is required by the CSA. At least two (I-37) areas of refuge are required on each floor by the CSA and each space (I-38) should be at least 900 x 1500 mm, a recommendation of Access, larger than the CSA dimensions of 850 x 1200 mm. Both the NBC and CSA require that (I-34) the area of refuge be separated from the floor by a fire separation of at least equal to an exit, and that it be smoke protected (I-39).

Some other fire safety best practices were found elsewhere in this study including: a different texture for the floor of the fire exit route (Japan), tactile markings on the underside of handrails on stairs and ramps on exit doors to alert people who are blind to the fire exit route; tactile and braille signage at exits.

In reviewing best practices in fire safety preparedness, it was found that an employee at Agriculture Canada had a buddy, a back-up buddy, a customized fire safety plan, an evacuation device that he and his buddies had actually practised using and he and his department participate in regular fire drills. A model best practice for emergency preparedness.

Another best practice to increase the safety of visitors in an emergency is to post a sign at the main entrance inviting visitors to identify themselves as needing some assistance in an emergency.

Another building owner provided **vibro-tactile pagers or beepers** to all visitors who self identify as requiring some assistance in an emergency. An audible and visual message was sent to them in an emergency, wherever they were in the building. **Accessible signage in Braille and tactile characters should indicate the exit route and the accessible fire egress route should be indicated throughout the building.**

2.9 INDIVIDUAL WASHROOMS

Individual accessible washrooms that can be used by both men and women and provide adequate room for an attendant or family member of the opposite sex is a best practice. It is recommended that **each floor** have an individual accessible washroom.

A best practice recommended by BDEL is **to reverse the design of alternate individual washrooms so that the grab bars will be on the right in some washrooms and on the left in others.** This will ensure maximum accessibility to accommodate the preferences of a wide range of users.

The code comparison highlighted the need for a room with a minimum size of 4.37m². This dimension is compatible with a **3150 x 1500 mm room which would accommodate power wheelchairs as well as scooters.**

The height of the toilet seat (K05) varied from **400 - 460 mm (CSA)**, 450 mm in Beijing and 460 - 480 mm in Australia. There is a great deal of controversy about the appropriate height of a toilet seat as many seniors prefer a higher seat, while many people who use wheelchairs prefer the regular height as they can transfer more easily onto the seat. **Therefore the best practice is to maintain the CSA range of 400 - 460 mm.**

Electronic or infrared controls that flush a toilet were not found as a requirement in any codes, but are increasingly becoming a familiar universal design feature.

The **height for the installation of a horizontal grab bar (K-16)** beside the toilet ranged from 700 mm (Beijing) - 920 mm (NBC) above the floor. The **CSA range of 750 - 850 mm remained the best practice.**

The height for the top of the lavatory (K-21) must be carefully considered as it must be weighed against the requirement for the height for adequate kneespace (K-25). If the top of the lavatory is too low, there will not be adequate wheel under space at the lavatory. Therefore **the height for the top of the lavatory remains 820 - 860 and the height for the kneespace has been raised from the CSA of 680 mm to 700 mm recommended by the CIBFD and BDEL.** Similarly, **the width of the kneespace (K-23) is increased to 850 mm and the lavatory toespace (K-27) is increased to Australia's requirement at 290 mm.**

The depth of the lavatory kneespace (K-24) has been increased to 300 mm to accommodate

the longer wheelchairs and scooters.

Australia provided some of the best practices in washroom Accessories, as **the maximum height for all washroom Accessories (K-30) was at 1100 mm, with the maximum height (K-31) for the mirror at 900 mm and a shelf located between a height of 900 - 1100 mm.** The coat hook should be located (K-33B) **500 mm out from the side wall** and should **not be higher than 1200 mm** (CIBFD/BDEL)

The recommended minimum clear opening for the washroom door (K-35) is 850 mm, compatible with the rest of the building. The force required to open the washroom door (K-34A) should be **10 Newtons** (Nordic Code), which is below the 22 Newtons currently identified in the CSA Standard. **Gravity hinges** as a closing mechanism are recommended rather than the self closers frequently installed on individual washroom doors which have made it difficult for many people to get into the washroom before the door closed on them.

A flip-up grab bar is recommended on the transfer side of the toilet. This will not interfere with the required manoeuvring space but can be flipped down and used by people who prefer to have two grab bars.

Shallow sinks that are marketed as Accessible sinks frequently cause problems for wheelchair users as the sink is shallow (and the faucet is high) and the water splashes alot. As well, the taps are well beyond the maximum reach range making them difficult to operate.

An automatic door opener should be installed on individual washroom doors making them accessible to a wide population of users. Emergency call buttons, or signal devices, reachable from the floor should also be installed in all individual washrooms. The emergency call button should be connected to security staff who are trained to assist people in the washroom.

2.10 WASHROOMS

In addition to the Individual Washrooms on each floor, it is recommended that at least one stall in all standard washrooms be Accessible.

The washroom signage should comply with the Federal Identity Program. The code analysis showed that the **minimum size of the Accessible stall (J-02)** varied from 1500 x 1500 mm (CSA) to 1500 x 2000 mm in England to **1600 x 2000 mm in Australia**, to accommodate larger manual and power wheelchairs. J-02B addresses **the minimum clear floor space (1525 X 1525 mm) (ANSI) at washroom entrances**, an area not specifically identified in CSA.

The **recommended maximum height of the coat hook (J-03) is 1200 mm**, similar to Beijing and the ANSI Standard in the US. This will bring it to within reach of a wider number of users. The location and allowable projection (40 mm) from the wall remain the same as CSA. Australia

is the only country that required **the force to open a stall door** at 19.5 Newtons.

Most of the CSA requirements pertaining to grab bars, location of the toilet, etc. remained the best practice. The **minimum clear floor space in front of the urinal (J-26), is 900 x 1500 mm between privacy shields (J-27), and in front of the lavatory (J-30A)** an increase in size. Similarly, the minimum clear width for the vanity (J-31) and kneespace (J-32) is increased from 750 to 850 mm. The **clear width of the washroom door (J-45) is 850 mm, similar to the rest of a facility.** The **minimum height of the kneespace at the lavatory is increased to 700 mm** from 680 mm. This will accommodate taller people who were not able to wheel under the lavatory.

The **Australian Code had a maximum height of 1100 mm for all washroom Accessories** (Item J-39). **England has a lower height for the bottom edge of a mirror at 900 mm (J-40),** rather than the 1000 mm the CSA required and **England also required that the travel distance not exceed 40 m from other facilities, a best practice not found in other codes.**

Automatic **flushing devices and emergency call buttons** are included in the comments from the Japanese Code, both recommended for new facilities. An added best practice from BDEL is that **washrooms have no doors, making it easier for everyone to enter, similar to the washrooms found in airports. Recessed accessories always allow for more manoeuvring room in the washroom.** Baby changing facilities should be provided in at least some washrooms.

To assist people with visual impairments all **controls should contrast with their backgrounds** and be colour contrasted, **a raised vertical marker, 150 mm directly above the urinal should be provided on the wall that will assist people with visual impairments in locating the urinal (Access).**

Deodorizers that emit perfume should be avoided as they cause reactions in people with environmental sensitivities. It is interesting to note that countries such as England and Australia have increased their minimum manoeuvring space requirements but have not yet changed some of their other dimensions in the washrooms to accommodate larger mobility aids.

2.11 SHOWERS

Wherever showers are located, at least one shower should be wheelchair accessible, and if only one is available, it should be accessible.

The **interior dimensions for a wheel-in shower** ranged from 750 x 1500 mm (CSA) to 1600 x 2350 mm (Fiji). It is felt that the larger dimensions might be a little large as scooters and power chairs do not generally go into the shower, therefore **1500 x 1500 mm is recommended. The minimum clear floor space in front of the shower (S-02R) is 900 x 1500 mm and it is recommended that there be no curb or lip (S-03R).**

Grab bar requirements complied with CSA although there was considerable variation in the

height for grab bars (S-13), ranging from 700 - 915 mm, with the middle range **800 - 840 mm judged to accommodate the majority of users.**

If lockers are located in the shower area, **split level lockers are recommended and locker numbers and locks should be well contrasted and easily operable.**

Some excellent comments included the recommendation for a **heat lamp; that controls be offset to the outside of the shower so they can be easily reached; and that faucets be thermostatically controlled with preset temperatures.** Care should be taken to provide a shower seat that is not slippery when wet and is free of sharp edges (padded).

2.12 DRINKING FOUNTAINS

Most dimensions provided in the CSA for height, water flow etc. for drinking fountains are still the best design practice but the requirement for increasing manoeuvring space is noted. **The recommended dimensions for the height of kneespace (L-09) is 700mm-BDEL, the width (L-10) is 850 mm (BDEL) of the kneespace (L-12) as well as the minimum clear floor space 900 x 1300 mm (BDEL) and toe space height at 280-290 mm (Fiji)** all differing from the CSA as additional space is provided to accommodate a wider range of users, including those who use scooters and power chairs.

An interesting provision in the Fiji Standard was the **maximum height for the cup dispenser at 1100 mm**, which is lower than the CSA Standard maximum height of all devices at 1200 mm.

Infrared automatic control devices for fountains were not found in the codes and standards analysis but as they allow a wider range of users, they have been introduced into the market place.

Analysis of the comments from the documents uncovered few surprises as the CSA comments were considered to be the most helpful, i.e. that two drinking fountains be installed and that they be located in an alcove. **The BDEL additions regarding increased space requirements and the use of automatic infrared activators will allow the maximum numbers of users to use the drinking fountain.**

2.13 COMMUNICATION

It is important to reduce unwanted background noise and to design a facility to maximize audition for everyone. The use of white noise or additional sound emitting systems is strongly discouraged as they mask sounds required for orientation by people who are blind and white noise can also cause interference with hearing aids.

The Nordic Code recommended the **use of sound absorbing materials and the suppression of noise from ventilation systems, fans, etc.,** always a good practice.

Japan recommended that **intercom systems be provided at all entrances** and that staff be available to provide assistance. England went even further and recommended that intercom systems be **well illuminated, be undercover and have both auditory and visual instructions.**

Australia suggested that a hearing augmentation system as well as a visual communication system supplement a public address system. Australia also recommended that audio tapes and a tape recorder be available for use by people attending meetings and seminars. A best practice with all communications systems is to provide information in a variety of formats, ensuring both visual and auditory output.

2.14 TELEPHONES

The design of one accessible telephone that can be used by everyone can pose some design challenges as it should be equipped with a teletypewriter (TTY) so that deaf and speech impaired people can use it. The TTY is commonly installed below the telephone which may interfere with the required kneespace for wheelchair users. The telephone should also be recessed so that it does not create a hazardous protrusion in the pedestrian route.

The telephone should have **push button controls with characters that contrast with their background and a telephone cord at least 1000 mm long (M-03)(CSA). The maximum height of the coin slot should be no higher than 1200 mm (M-05),** a recommendation of the NBC and Access. The minimum floor space in front of the telephone (M-06) should be 900 x 1300 mm, similar to in other locations.

The minimum height of kneespace under the telephone (M-07) ranged from 640 - 737 mm but it was felt that **700 mm would be a best practice to accommodate a wider range people using wheelchairs (Access).** Both a flux coil and a volume control device are required (M-10,11) to ensure that telephones can be used by people who are hard of hearing.

A flat shelf for the telephone books is also considered a best practice. Fiji recommended a **seat adjacent to the telephone** and if it is located in front of the telephone, it should be a flip-up seat.

At least one telephone in each bank of telephones should be equipped with a TTY, a best practice. (Note the requirement for a TTY in elevators as well.) Care should be taken to ensure appropriate kneespace is provided (700 mm), if this is not possible at the telephone with the TTY, a second telephone should be designated as wheelchair accessible. The appropriate signage should be provided for telephones accessible to those with hearing impairments and to those who use wheelchairs (CSA).

2.15 SIGNAGE

Within the federal government work environment, the Federal Identity Program provides specifications on the style, type, size and location for interior signage.

The stroke width to height ratio of letters and numbers (SI-03,04) ranged from 1:5 to 1:10 - 1:6 to 1:1 with the large numbers coming from Access. The character height to maximum viewing distance (SI-08) complied with the CSA requirements as did the illumination level (SI-13) at 200 lux.

The most significant data relevant to signage was the **recommended height of the signage (SI-17)**, on the latch side of the door, with CSA at 1500 mm, the ANSI Standard allowing 1220 - 1525 mm, and Fiji allowing 1400 - 1600 mm, but the best practice was judged to be at **1350 mm**, recommended by BDEL as that height brings the tactile signage to within the reach range of people who of short stature and those who use wheelchairs.

Comments included that signage be **glare free, have uniform illumination, be free of shadows and that it be located on the latch sides of doors and where there are double doors, it be placed on the right of the right hand door**. All of these comments comply with the Federal Identity Program.

2.16 PARKING

The requirements for the number of accessible parking spaces (O2A-02L) ranged from 0 - 5%, **5% being the best practice**, except in small parking areas where the numbers were specified. Kentucky specifically addressed medical facilities where 20% of spaces must be accessible. **Kentucky also specified 1 of every 8 Accessible car spaces be designed for van use**. All codes required that the accessible parking be located near the building entrance, with the Nordic countries specifying **within 10 metres**.

The CSA specified the best practices regarding parking signage requirements but significant differences were found in the stall lengths (05D) where **2600 x 9400 mm and the minimum height clearance (D-17) is 2900 mm**, recommended by Access.

Important comments included that **persons in wheelchairs should not have to travel behind other cars**, a consideration important for everyone. **Wheel stops should be provided where the fronts of cars may project onto the pedestrian route, another excellent suggestion that will prevent hazards in the pedestrian route**.

The best practice is to have a clearly marked pedestrian route that is outside of the vehicular route so that everyone can move safely, free from their cars, to a facility. Contrasting visual and tactile surfaces can be used to reinforce the pedestrian route.

2.17 TRAINING CENTRE/CLASS ROOM

All aspects of the training centre should be Accessible to all users. If raised seating is provided, then an accessible ramp and manoeuvring space should be provided to a seating area. **Similarly, access to a raised podium or stage should be accessible via a ramp. The podium itself should be accessible to people of various heights and should be equipped with a light that illuminates to a minimum of 200 lux.** Care should be taken to also ensure that adequate illumination is provided on the face of the speaker to allow for lipreading. **An assistive listening system (N-02) is required in rooms over 100 sq./m. by the CSA but the best practice is to have an assistive listening system in all training facilities.**

An excellent suggestion from Fiji is a coloured and textured floor surface or a barrier to delineate the edge of the podium or stage.

The minimum number of Accessible seating spaces is 2, specified by the NBC but it is recommended that **at least 5% or more be accessible. The best practice would be to have all seating areas accessible.** Special attention should be taken to **provide adequate manoeuvring space into the training room, beside and behind the accessible seating areas, specified at 900 x 1500 mm by Fiji and others.** Fiji also recommends that 800 mm be provided for the width of kneespace (N-07), with a depth of 600 mm and a height of between 710 - 865 mm (N-09) specified by the ADA. **The accessible seating areas should be interspersed throughout the room, at all levels.** Accessible seating areas should be designed to provide clear site lines for both the person in the wheelchair and the person seated behind them.

Coat storage should be provided at a maximum height of 1200 mm and shelving at a variety of heights is recommended. (N-13).

A well-illuminated area at the front of the room should be provided where the sign language interpreter will stand. Separate lighting should be provided for this area so that it can remain illuminated when the room lighting is dimmed for audio visual presentations.

2.18 WORK STATIONS

While it is recognized that the design of individual workstations for employees is an accommodation issue and would be undertaken with the individual employee, together with the Employment Equity Department, the following best practice design considerations will increase accessibility and accommodate the maximum number of users.

Best practices dimensions relating to **the wheelchair footprint (900 x 1500 mm), kneespace height (W-04) at 700 mm and clear width of kneespace (900 mm), and depth of kneespace**

(600 mm) are increased from the CSA B651 as reflected in other sections such as drinking fountains, vanities, etc. This allows for a greater range of users, particularly people who use mobility aids such as scooters and power wheelchairs.

The maximum height for controls in a workstation is an important consideration and therefore the Fiji requirement of 830 - 870 mm is considered a best practice. This is well below the CSA maximum height of 1200 mm as reaching over a workstations can be difficult.

The comments on the workstation section were plentiful and very useful. **Adjustable shelving and desk height was widely recommended. Supplementary lighting** that can provide increased illumination up to 400 lux will accommodate people with limited vision and other design considerations such as **sound absorption materials and freedom from glare** will assist all users to comfortably use the workstation. **Lateral access file drawers, rotating storage units and moveable storage** are all universal design elements that allow for maximum freedom and individual use.

2.19 LIBRARY

Issues relating exclusively to libraries in the code comparisons were very slim. All areas of the library should be accessible, including the catalogue work stations and reading areas. **The minimum clear width between the stacks (N-14) should be 1065 mm (ADA).** The ADA recommended a best practice that at least 5% or a minimum of one of each element of fixed seating, table or study carrels be accessible.

An excellent example of a space-saving mechanism that will also provide accessibility for a greater number of people is **moveable stacks** that can be stored close together but can be moved to create wide access routes between them.

There is a resource book entitled [The Accessible Canadian Library II](#), available from the National Library of Canada which is listed in the Bibliography, which provides more details on the design of the accessible libraries.

2.20 CAFETERIA & RESTAURANTS

All areas of the cafeteria or restaurant should be accessible to all customers. **The clear width for the food service line (N-16) ranged from 914 - 1065 mm, with the ADA recommendation of 1065 mm considered a best practice.**

It is important that all service areas, condiment and cutlery dispensers and food service areas (N-18) be at a **maximum height of 1200 mm**, a CSA requirement. The service areas must also comply with the CSA **maximum reach depth of 500 mm**. Tray rails in the cafeteria and at salad

bars should have a **maximum tray height of 700 - 850 mm**, a best practice from the Fiji Standard.

A good design practice in a cafeteria is a **continuous tray rail** that will allow people to receive a full range of services, without having to carry their trays to another counter area.. The recent trend towards a variety of “counter areas” provides a more challenging environment.

The footprint area (N-20) in front of counters and vending machines is 900 x 1300 mm to accommodate a greater range of customers. Controls on dispensing machines (N-22) should be illuminated at 200 lux, be colour contrasted and require minimal force to operate (N-24). Kentucky recommended Braille and large print menus be available. Menus and menu boards should be well contrasted and located at eye level.

A best practice, from Access was that **colour contrasted stops be provided at the end of tray slides**. Staff should be willing to provide assistance to customers. A wide range of foods are recommended, some **free of common allergens such as dairy and wheat**. **Seating should be well designed so that moveable seats as well as fixed seating is available, clear pathways at least 920 mm wide should be provided through the cafeteria and eating area and colour wayfinding cues** can be useful to assist people in making their way through a cafeteria or restaurant.

3. BUILDING ELEMENTS - PROCESS AND METHODOLOGY

The Canadian Institute for Barrier-Free Design was contracted to develop the data base for the international code and standard review for the building elements. A variety of building codes, barrier-free standards and guidelines were researched and ordered from a number of sources. The documents reviewed came from Canada, the United States, United Kingdom, The Nordic countries (Denmark, Sweden, Norway, Finland and Iceland), Australia, New Zealand, Fiji, Japan, Beijing (China) and Europe.

The Canadian Standards Association document CAN/CSA B651-M95 Barrier-Free Design Standard - Public Safety, A National Standard of Canada was used as the base standard of comparison to other barrier-free codes, standards and guidelines.

A database utilizing Microsoft Access 97 was created. Two basic files were created for each element considered in the barrier-free codes, standards and guideline comparisons. The first file dealt with dimensional notations from the documents; the second file laid out the pertinent best practice comments as noted in the documents.

The initial questions that were to be considered in the analysis were taken from the Accessibility Evaluation Guide, produced by Public Works and Government Services Canada, which is based on CSA B651-M95. As different questions or different ways of dimensioning or considering an element were found in the various documents, new questions were added as required.

Together the consultant team analyzed the data, discussed, brain stormed and generally reviewed all aspects of the comparisons together with the comments to come up with what could be considered “a best practice”, that is a dimension or group of dimensions that would allow for the inclusion of the greatest number of people.

4.0 LANDSCAPE ELEMENTS

See section 5.0 for Landscape Elements - Process & Methodology

4.1 OUTDOOR RAMPS

The design of outdoor ramps is similar to interior ramps but with some special considerations such as snow removal. **The best practice for the slope of outdoor ramps should be no greater than 1:20**, regardless of the rise with a maximum cross slope of 1:50, a CSA requirement.

The **minimum clear width of a ramp (OR-7)** ranged from 865 - 2000 mm, with the US Forest Service recommending **1220 mm**.

The **width of the landing** in most codes and standards is generally tied to the width of the ramp itself (OR-13), but to accommodate people using larger wheelchairs, **a width of 1500 mm is recommended as a best practice**. The **minimum size for the length of the landing (OR-14) is 1525**, a recommendation of ADAAG, and **if served by a doorway it should be 1525 x 1525 mm, also an ADAAG requirement**. Access went even further and required a **landing at switchbacks at 2250 mm deep**, clearly an example of a best practice.

Detectable warnings are recommended at the top and bottom of ramps to warn pedestrians of the upcoming change in grade.

Edge protection on the side of the ramp was recommended by many codes (OR-21), with the **ECMT requiring it to be a minimum of 100 mm in height** and BDEL was the only document that specified that **snow and ice removal be removed from the ramp**. Again, while many guidelines only required handrails on ramps over 150 mm, BDEL recommended that **handrails be provided on all ramps** as a best practice and the CIBFD recommended **handrails on both sides of the ramp and a middle handrail on wide ramps over 2200 mm in width**.

Minimum illumination of 100 lux is recommended on all ramps. Parks Canada was the only document that limited the **design load of the ramp to 488 kg** and the US Forest Service specified **112 N for the design load for handrails**. Other interesting suggestions included that handrails be designed so that they not become hot, BDEL recommended **weather protection** and the CIBFD recommended **guards in addition to handrails**.

4.2 SIDEWALKS & WALKWAYS

Sidewalks are required to provide a safe route of travel between all facilities (SW-2), parking lots, drop off areas and the route from public transportation. This stipulation was found in numerous municipal documents, including the City of Gloucester while the Manitoba document stipulated that **sidewalk be for the exclusive use of pedestrians, a best practice to ensure the safety of all pedestrians (SW-4).**

The **minimum clear width for sidewalks** varied from 915 to **1800 mm**, a requirement of both the City of Gloucester Accessibility Guidelines and the European Community, while other guidelines suggested basing the minimum clear width on the volume of traffic. Gloucester also required that **shoulders be provided on both sides of a sidewalk (SW-8)**, and if this was not possible, a guard or barrier was required if there was a drop-off. **Level rest areas were required where the longitudinal slope was between 3 - 5% by the ECMT (SW-11) but the interval varied considerably from 10,000 - 30,000 mm, with 10,000 mm being the best practice.** Seating or rest areas are appreciated by everyone.

The **size of the level landing** at doorways varied depending on the different types of wheelchairs, with the CIBFD specifying **1500 mm for manual wheelchairs, 2250 mm for power wheelchairs and 3150 mm for scooters, with the larger dimension accommodating all (SW-14).** All guidelines required sidewalks that were continuous, hard, smooth, stable and non-slip.

Snow clearing is very important to maintain accessible routes of travel, it is important to **coordinate snow clearing** between different agencies and a high priority must be given to **clearing a safe accessible route in all directions.** Two best practices included **an alternate to the use of salt to reduce it's impact on guide dogs and the installation of handrails on areas prone to ice (SW-27).**

Minimum overhead clearance varied from 1980 - 2500 mm, with the larger number preferred.

Two documents recommended textural warning where protrusions occurred, but clearly **the best practice is to not allow any protrusions to be included in the pedestrian route.** Most guidelines specified a maximum gap of 13 mm between grates but Access allowed **only a 6 mm gap (SW-36).** Clearly a best practice is to **install grates flush with the walkway surface,** which was mentioned by the ECMT and **catch basins outside of the pedestrian route** was recommended by Gloucester and Taking Steps.

The Gloucester and CIBFD documents both specified that **thorny or prickly plants (SW-47) be avoided, that plants that drop fruit or pods and plants that tend to have invasive roots be avoided,** all excellent practices.

Both the Gloucester and Manitoba documents recommended the use of **textured and coloured pavers to assist in wayfinding**. **A exterior wayfinding system is recommended as a best practice leading from the bus stops to the main facility**. It should be carefully designed to provide information in all weather conditions. Another suggestion is to provide **coloured banding on poles or bollards to identify the route from the bus stop to the main entrance**. **This best design practice can be combined with the use of wayfinding lighting on bollards**.

4.3 PASSENGER DROP-OFF

The passenger drop-off area must be accessible to all vehicles including buses, taxis and vans. The **recommended minimum size for passenger loading zones** varied little with the best practice being **6000 mm per car**. **The recommended length where buses were expected was increased to 9100 x 12000 mm and for areas required on the sidewalk for buses with side lifts, the dimensions are 2400 x 1800 mm**.

The maximum cross slope was 1:50 and all codes and standards included a requirement for a curb ramp. A best practice recommended by the CIBFD is that **bollards be located where the vehicle lane is on the same level as the adjacent walk**. This will clearly differentiate the pedestrian route from the vehicular route.

The best practice for the clearance height above the vehicle access route was 2900 mm, and 3600 mm where buses were expected. BDEL recommended a covered canopy and a **contrasting texture and colour for the passenger loading area**. The CIBFD recommended **signage for the designated drop-off route and waiting time limits**.

4.4 WAYFINDING & DETECTABLE WARNINGS

The jury is still out on **detectable warnings** in the US, some blind people feel that they are not required while others feel that all cues including a raised lip, a detectable surface and the slope of a curb ramp will assist in providing information to assist blind people in wayfinding. **If they are of benefit to some people, then they are considered a best practice (WF-2)**.

Detectable warnings should have a highly contrasted and textured surface that provides information. They should be used consistently throughout the facility and a specific texture should be used **to alert people to an up coming change in grade such as upcoming stairs or a ramp (DW-1)**. If detectable warnings are to be used for something other than to warn people of an upcoming change in grade, they should have a different texture and colour so that they can be differentiated. Detectable warnings should be installed **900 mm back from the change in grade (DW-3)**. The maximum grade change between materials was listed at 6 mm by Parks Canada and the Access Board, and 3 mm by CIBFD. Of course **a minimum rise is best**. Sound and resiliency changes are also recommended for detectable warnings. They **should be constructed of stable, firm and slip-resistant materials and should contrast with the sidewalk materials**.

Truncated domes at the edge of platforms are in wide use in the US and Canada and should be provided wherever a platform or drop-off occurs (DW-14). The ADA specifies that truncated domes have a **diameter of 23 mm, 5 mm in height and spacing of 60 mm.**

Wayfinding can be enhanced with the use of redundant cues such as landmarks, contrasting colour, brightness, resiliency, audition and texture. Lighting and signage should also be used (WF-4).

All codes and standards address in different ways the requirements for coloured and textured wayfinding guiding systems, called a “guide route” in the Nordic code, where the Beijing code mentions “a strip shape or circle spot shape” to warn people who are blind. **Contrasting colours should be used for doors, door hardware, between walls and floors and on the floor surface. Lighting should be constant and should be designed to compliment the use of colour.** It should be non-glare, non-reflective and non-blinking or flashing.

Both texture and colour can be used effectively as a wayfinding guide for all building users. Different textures together with different colours on walls and floors can be used to denote different directions (north, etc.) or components of a facility. Colour and texture wherever there is a change in grade is recommended by BDEL, Fiji and others.

4.5 LIGHTING OF OUTDOOR AREAS

Appropriate lighting will assist everyone to feel safe and comfortable in the outdoor environment. **Lighting is recommended for high use areas and where night use is appropriate (OL-2)** by most documents. **Minimum illumination of 200 lux is recommended on signage** by BDEL, the CSA and Ontario MTR (OL-3).

Illumination of 50 lux on stairs was recommended by Parks Canada but BDEL recommended a **minimum level of 100 lux on stairs.** Illumination of 20 lux on **bridges and broadwalks** is recommended by Parks Canada but BDEL recommends **100 lux here as well (OL-6).** Lighting levels varied from 6 lux on pedestrian routes to 100 lux. **Full white spectrum lighting is preferred** by the Illuminating Engineers Society.

The mounting height for lighting fixtures in parking areas is recommended at 6000 - 10000 mm, and 3000 - 9000 mm for walkways. Lighting that is well positioned does not cause glare and is appreciated by everyone (OL13,14). To minimize the effect of shade, **a height of 2100 mm is recommended from grade for the intersection of light patterns. This will provide a safer and more accessible environment.**

4.6 CONSTRUCTION ZONES

A number of guidelines, in particular the City of Gloucester Accessible Guidelines, the ECMT

and BDEL have very well defined criteria to ensure the safety of pedestrians in construction zones. **A cane detectable barrier or barricade is clearly a best practice to warn blind people away from construction areas.** The Manitoba League recommended a construction barricade with three barriers at heights of 150 , 600 and 1050 mm (CS-3) but the most important consideration was that **a completely enclosing barrier be provided.** Flexible barriers, such as the orange snow fencing, should not be used, nor the familiar yellow tape. Barriers should be well contrasted and accompanied by audible warnings.

The best practice is to provide an alternate pedestrian route (1200 mm wide, ECMT) around the complete construction zone. It must be safe and the route must be clearly indicated in all formats (print, audible), not signs such as “use other sidewalk” which blind people will not see. Going Places specified that the route be straightforward and easy to follow with right hand angles (CS-9). **The Taking Steps document suggested that construction not be allowed to begin until an alternate safe pedestrian route is provided (CS-24).**

Enclosed pedestrian walkways must be free of overhead protrusions with a maximum clear height of 2250 mm and well contrasted poles should be installed to assist in wayfinding along the route that are well contrasted (CS-17), with the lower edge of bands at a height of 1200 - 1500 mm (BDEL) (CS-19). Padding on scaffolding and guy wires (ECMT) is another excellent practice (CS-20).

Concrete barricades should be used on the edge of pathways and sidewalks to protect pedestrians from parked cars that extend into the pedestrian route.

4.7 CROSSWALK CONTROLS

A variety of accessible pedestrian signals are available around the world that assist people to safely cross the road, but there are two or three that are judged to offer the best features. It is important to **use signal controls consistently at crosswalks** and to **provide a clear level area in front of the button or signal activator.** Parks Canada specified a clear level area (CS-5) of 750 x 1200 mm but a larger space of **900 x 1300 mm is preferred.** Pedestrian crossing time in Toronto is based on 1.2 m per second, and the Access Board specified half a metre per second but the best device was found in the European Community document that use **electronic monitoring of the pedestrian’s crossing speed** and adjusted the light accordingly. The ECMT (CS-8) also included a feature that would **automatically detect the presence of a person at the crosswalk and activate the light accordingly.**

The mounting height of the push button (CS-11) varied from 650 mm in Gloucester to 1200 mm in Access but the **optimum height of 1070 mm** was specified in the Going Places document. **The size of the button varied from 25 - 50 -100 mm, the larger size would likely serve a larger population.** And it is preferred that buttons be placed on **separate poles, where possible.** **Push buttons are also specified on islands and medians (CS-17) in the Australian and Toronto documents.**

An auditory tone is emitted by the push-button to assist people in locating it. Once pushed, the device emits a different sound to inform the pedestrian that they can cross the street. Although the Toronto installations emit a sound from both sides of the street, this feature was judged to be distracting as it masks the sounds blind people use to assist them in crossing the street. A distinct sound for north-south versus east-west intersections was another feature used in Toronto but this was not recommended, as it presumed that people already knew which streets go in which direction.

Some other interesting features are found in Australia where there is **vibro-tactile arrow and street announcer**. A Montreal firm has also developed a **pedestrian countdown system** that informs the pedestrian how many seconds remain until the walk signal. This feature may be of assistance to people who have a slow gait but it is not accessible to people without sight. Pedestrian signals should be installed at the request of the local community.

4.8 GARDENS & OPEN SPACE

An outdoor garden or well designed open area would be an appropriate and impressive compliment to the new facilities.

The outdoor garden could be designed to be accessible and particularly enjoyable for everyone. In order to ensure that there is something for everyone, **a multi-sensory approach is suggested. A fragrant garden (G-6) is suggested in addition to a garden with flowers and/or vegetables with different textures and colours, that can be touched.**

A review of the various guidelines indicated that the **an accessible raised garden with hand-holds (G-2) and kneelers as well as large pots that be approached from a variety of sides is preferred.** BDEL suggested a height of 460 mm - the 1991 Ontario document suggest **600 mm for digging into, in addition to a wheel-under potting shelf at a height of 800 mm, (and maximum reach depth of 500 mm)** with plenty of storage area nearby. A ready water source should be available from the work shelf. Plenty of seating areas (G-8), both shaded and protected should be provided both in the work area and in the garden itself (see benches).

In addition to the garden, the outdoor space might also incorporate a fountain or sculpture garden. Overhead clearances and detectable warning surfaces should all be included. **A barrier curb or guard should delineate the edge of the fountain area (G-18)** or other changes in grade, which can also be visually enhanced by the use of different materials and textures, which was suggested in most documents.

Interpretative signage should be an integral part of the design of the outside space with information provided using simple language, with characters in a variety of formats such as well contrasted large print, braille and audio formats. **Glare-free bold (G-30) simple characters**

and images should be considered for signage which is set back from the pedestrian route, mounted at an incline with a 30 - 45 degree angle set from the horizontal plane.

4.9 BENCHES

Benches should be positioned adjacent to the accessible pedestrian route. The recommended seating height varied from 430 -500 mm, quite a wide range (OB-3) with the best practice being the **provision of benches at a variety of heights** to accommodate the preferences of different people. Armrests were preferred by most documents but the ADAAG recommended that armrests be provided on only 40% of benches. Seat depths (OB-5) varied from 450 (CIBFD) to 482 mm (ADAAG), **with a range of seat depths accommodating the largest number of people.** The ADAAG specified many details about the design of a bench.

The minimum space requirements for an adjacent space varied considerably from 760 x 1220 mm (USFS) **to 900 x 1500 mm**, recommended by the CIBFD and most documents recommended that **benches be set back a maximum of 600 mm.** **A different texture to orient people to the existence of benches** was recommended by BDEL and CIBFD and a bench contrasting in colour to it's surroundings (OB-15) was recommended by ECMT and BDEL. The ECMT specified that sharp corners and edges be avoided (OB-16) and BDEL recommended that **some benches be located in the shade**, and the CSA specifies materials that do not retain heat as a best practice.

The Ontario MTR **specified a level area 840 x 1200 mm in front of benches (OB-19)**, an excellent idea. ADAAG specified the allowable force of 113 kg for materials. ADAAG specified that at least 50% of benches be Accessible while the best practice is that **all benches be accessible.**

5. Landscape Components - Methodology and Approach

There are a number of codes and regulations governing accessibility to the built environment, however, these documents focus mainly on access into buildings and building interiors. For example, the CSA, and National Building Code all include detailed specifications for ramps but provide limited coverage of outdoor facilities such as crosswalks or benches. Some elements found in the International Codes and Standards are included in the data analysis sheets. In the US, this gap has been recognized to a certain extent by the Access Board and guidelines pertaining to the Public Rights of Way are pending.

As a result, many organizations that own and maintain significant public lands have developed their own policies and Accessibility guidelines applicable to their property and clientele. Examples in Canada include Parks Canada, the National Capital Commission, Queen's University, and various municipalities, though many of these guidelines cannot be considered instruments for truly "universal" design. These documents, however, do provide a good source

of information in terms of checking for consistency and best practices.

The outdoor environment in most of Canada presents an additional challenge that is not often a consideration of American and European Accessibility documents. Winter has a significant impact on facilitating accessibility and requires careful consideration from a facility design and maintenance standpoint. Snow, ice, cold temperatures, wind and short day length are obvious factors that can influence accessibility.

For the purpose of comparing codes and guidelines pertaining to the accessibility of the outdoor environment, the documents are listed as abbreviations and acronyms in the data sheets, and can be found in Appendix III. The recommendations under the heading “BDEL” are a composite from work undertaken by Betty Dion Enterprises Ltd. for various clients, including Canadian universities and municipalities and the Canadian Human Rights Commission.

Reference books from various advocacy groups and stakeholder organizations were used to supplement the information provided by the codes and guidelines. These documents were all published in the last 2 years.

Together the consultants analysed the data, discussed, brain stormed and generally reviewed all aspects of the comparisons together with the comments to come up with what could be considered “a best practice”, that is a dimension or group of dimensions that would allow for the inclusion of the greatest number of people.

6.0 MAINTENANCE ISSUES

6.1 WASHROOMS

Maintenance systems or staff can compromise an accessible facility that has incorporated universal design best practices. Three examples include entrance doors, washroom stalls and the placement of the waste receptacle in washrooms.

A heavy door that is difficult to open has been experienced by everyone. The majority of doors have a mechanism that can adjust the pressure making it easier to open.

A well designed washroom stall will have a stall door with a clear width of 810 mm or greater and appropriate manoeuvring space beside the toilet to position a wheelchair to allow someone to transfer onto the toilet. Unfortunately, if a chair or waste dispenser is placed in the stall, the stall becomes inaccessible to people who use wheelchairs.

The placement of a waste receptacle in the kneespace under a sink or underneath a hand dryer is another common practice that makes it impossible to use the features. These are some of the examples of maintenance issues that compromise the original design of the facility.

6.2 ACCESSIBLE ENTRANCES

The whole spirit of welcoming people to one's facility is compromised if the first encounter at the entrance is difficult. A door that requires a great deal of force to open or a parking garage that has maintenance materials stored in the accessible parking space are two examples of unwelcoming practices.

6.3 SLIP-RESISTANT MATS

Mats or temporary carpeting can be a tripping hazard for people walking and can also cause dangerous situations for people who use canes or crutches. Temporary carpeting can also get caught between the front and rear wheels of wheelchairs and, in fact, if they are not permanently installed, they are hazardous to everyone.

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8.0 APPENDICES

APPENDIX II - PHOTOGRAPHS & DRAWINGS

APPENDIX I - GLOSSARY OF TERMS

Access Aisle - Clear, level area parallel to a parking space for people with mobility disabilities to get in or out of a car or van.

Accessible Parking - Parking spaces which are useable by people with mobility and stamina limitations.

Accessible Route - A continuous, unobstructed path connecting all accessible elements and spaces of a building or facility.

ADA (Americans with Disabilities Act) - A US Federal law prohibiting discrimination against people with disabilities. Requires public entities and public accommodations to provide Accessible accommodations for people with disabilities.

Adaptable Design - Easily renovated to become barrier-free.

Areas of Refuge - An area separate from the floor area by a fire separation having a fire-resistance rating at least equal to that required for an exit, that is smoke protected and served by an exit or a firefighters' elevator. It should also be a size that allows a minimum floor space per non-ambulatory occupant, with no fewer than 2 such spaces.

Assistive Device - A device assists users in accomplishing day-to-day functions. For example. A wheelchair, walker, cane.

Assistive Listening Systems - Improves sound reception for persons with hearing disabilities by providing amplification while blocking out unwanted background noise.

Barrier Free-Design - Creating environments that are approachable and useable by people with disabilities.

Bollard - Usually a 900 mm high post to mark pedestrian path from vehicular traffic.

Clear Width - Horizontal opening with no obstructions.

Cognitive Disability - Limitation of the ability to perceive, recognize, understand, interpret, and/or respond to information.

Curb Ramps - sloped area cut into curb.

Detectable Warning - a standardized surface feature built in or applied to walking surfaces or other elements to warn people, including those with visual impairments of upcoming hazards.

Edge Protection - a raised edge or barrier that ensures that the wheels of a wheelchair do not veer off a ramp or landing when the sides of ramps and landings are not at grade or adjacent to a wall.

Flare - A sloped surface that flanks a curb ramp and provides a graded transition between the ramp and the sidewalk. Flares bridge differences in elevation and are intended to prevent ambulatory pedestrians from tripping. Flares are not considered part of the accessible route.

Grade - The slope parallel to the direction of travel that is calculated by dividing the vertical

change in elevation by the horizontal distance covered.

Guard - Protective barrier to prevent accidental falls at openings in floors and at the open sides of stairs, landings, balconies, mezzanines and ramps. Handrail supports often act as guards.

Infrared System - Specialized sound system that converts sound into infrared light; the light is reconverted into sound by a portable receiver.

Multiple Leaf Doors - Two or more doors separated only by a door frame. Each door is called a leaf.

Nosing - Overhanging edge of a stair tread, usually half rounded.

Obstacle - An object that limits the vertical passage space, protrudes into the circulation route, or reduces the clearance width of a sidewalk or trail.

Principal Entrance - an entrance used most frequently by the public and building occupants.

Ramp - Any slope greater than 1:20 (5%)

Riser - Vertical portion of a step.

Run - Horizontal distance of a stair or ramp.

Roll-in Shower - A shower with no lip or raised edge that can be used while seated in a wheelchair, standing, or sitting (by adding a seat).

Sensory Deficit - Impairment of one of the five senses; includes partial or complete loss of hearing or vision, colour blindness, loss of sensation in some part of the body or the loss of the sense of balance.

Slope - The slope of a ramp is expressed as the ratio of the height to the length. (ie. 1:16 indicates for each 1 m in height, there is 16 m in length).

Tactile Cuing/Warning - A change in surface condition that provides a tactile cue to alert pedestrians.

Tactile Signs - Signs having raised letters which are interpreted or read by tracing with fingers over the surfaces.

Telecommunication Device for the Deaf or Teletypewriter (TDD/TTY) - an interactive visual communication system with a keyboard and screen that is connected to the telephone to allow communication through typed messages.

Tread - Horizontal surface of a step.

Truncated Domes - Small raised domes with flattened tops that are used as tactile warnings at transit platforms, vertical drops and curb edges.

Universal Design - Concept used to create products, services and environments that respond to the widest range of the population possible.

Wayfinding - Finding one's way to a destination.

Winder - Tread wider at one end than the other, as in circular stairs.

APPENDIX III - ACRONYMS & DOCUMENTS

ACC.BD. *or* ACCESS BOARD - The Access Board. US Architectural and Transportation Barriers Compliance Board
Accessible Rights-Of-Way: Sidewalks-Street Crossings-Other Pedestrian Facilities

ACCESS *or* Access - The Canadian Institute for Barrier Free Design
Access: A Guide to Accessible Design For Designers, Builders, Facility Owners and Managers

ACCESS BOARD - COMMITTEE. Regulatory Negotiation Committee on Accessibility. Guidelines for Outdoor Developed Areas.

ADAAG - Americans with Disabilities Act Accessibility Guidelines
Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barrier Act (ABA) Accessibility Guidelines; Proposed Rule.

ANSI - American National Standards & International Code Council Inc.
Accessible and Usable Buildings and Facilities. ICC/ANSI A117.1-1988

AUSTRALIA - Standards Association of Australia
Australian Standard - Design for Access and mobility, Part: General requirements for Access - New building work. AS 1428.1-1988

BDEL - Betty Dion Enterprises Limited

BEIJING - Standards Bureau of Beijing, Beijing Institute of Architectural Design & Beijing Institute of Urban Construction
Detail of The Regulation of Urban Construction and Architectural Design for The Convenience of People With Disabilities

CFC - Canadian Fire Code
National Fire Code of Canada 1995

CIBFD - Canadian Institute for Barrier Free Design
Access: A Guide to Accessible Design For Designers, Builders, Facility Owners and Managers

CSA - Canadian Standards Association, Public Safety, A National Standard of Canada.
CAN/CSA-B651-95 Barrier Free Design

CUD-RBHC - Centre for Universal Design, Removing Barriers to Health Care
Removing Barriers to Health Care: A Guide for Health Professionals

ECMT - European Conference of Ministers of Transport
ECMT: A GUIDE TO GOOD PRACTICE

ENGLAND - Department of the Environment, Transport and the Regions. The Building Regulations
The Building Regulations 1991. Access and facilities for disabled people. APPROVED DOCUMENT M -1999 Edition

FIJI - Fiji Islands Standard. The Standards Association of Australia

Fiji Islands Standard - Design for Access and mobility, Part 2: Enhanced and additional requirements - Building and facilities. FJS 1428.2-1988

G. ROBINETTE - Gary Robinette.
Barrier Free Exterior Design: anyone can go anywhere

GLOUCESTER - City of Gloucester
The City of Gloucester - Accessibility Design Guidelines

GOING PLACES - The Canadian National Institute for the Blind
Going Places - Access Needs of Visually Impaired Travellers in Transportation Terminals: Design Guidelines

IES - Illumination Engineers Society

JAPAN - Ministry of Construction, Japan International Cooperation Agency
The Act on Buildings Accessible and Usable for the Elderly and Physically Disabled

KENTUCKY - University of Kentucky Cooperative Extension Service. Kentucky AgrAbility Project.
Accessibility Checklist

MANITOBA - Manitoba League of Persons With Disabilities
Supplement to UNIVERSAL DESIGN GUIDELINES - Focusing on the Needs of People with Visual Impairments

NBC -National Building Code
National Building Code Of Canada -1995

NORDIC - The Nordic Committee on Disability
ACCESSIBILITY IN THE BUILT ENVIRONMENT

ONTARIO or ONTARIO MTR - Ontario Ministry of Tourism and Recreation
Ontario: Open for Business

PARKS CAN. - PARKS CANADA & Public Works and Government Services Canada
Design Guidelines for Accessible Outdoor Recreation Facilities
Access Series - Accessibility: Requirements and Recommendations
Access Series - Design and Parks Programs

TAKING STEPS - University of Victoria
Taking STEPS - Modifying Pedestrian Environments to Reduce the Risk of Missteps and Falls

TIME SAVER STANDARD - LA

Time Saver Standard for Landscape Architecture

UFAS - Uniform Federal Accessibility Standards

UFAS ACCESSIBILITY CHECKLIST

USFS *or* US Forest Service - US Department of Agriculture Forest Service

APPENDIX IV - PRODUCT INFORMATION

See accompanying binder titled

Agriculture and Agri-Food Canada
and the
Canadian Food Inspection Agency

Best Practices Guide