UNIVERSITY CAMPUS ACCESSIBILITY MEASURE (UCAM)
Supplementary Notes

Developed by
The Research Alliance for Children with Special Needs*
and
The School of Occupational Therapy^,
The University of Western Ontario

(Linda T. Miller *^, Doreen Bartlett* and Lisa Klinger^)

ACKNOWLEDGEMENTS

Development of The University Campus Accessibility Measure was supported by funds from The Research Alliance for Children with Special Needs. Development was initiated by Dr. Linda Miller, Faculty of Health Sciences, The University of Western Ontario and Dr. Doreen Bartlett, School of Physiotherapy, Faculty of Health Sciences, The University of Western Ontario, initially as the Physical Accessibility Measure for Schools. The following individuals were instrumental in its development, initially under supervision of Dr. Miller and Dr. Bartlett:

Masters of Clinical Science Students in the School of Occupational Therapy, The University of Western Ontario, 2001: Tammy Lee, Rebecca Sillett

Masters of Clinical Science Students in the School of Occupational Therapy, The University of Western Ontario, 2002: Tanya Kobayashi, Marnie Simpson

Masters of Clinical Science Students in the School of Occupational Therapy, The University of Western Ontario, 2003: Sean Ah Yong, Melissa Ings, Alison Kenney, Haley Reems

Students in the School of Physical Therapy, The University of Western Ontario: Dominique Denver, Maura Donohue, Emily MacDonald, Rhonda Masek

Additional work in development and utilization of the tool continued by the following students under supervision of Professor Lisa Klinger, School of Occupational Therapy, The University of Western Ontario:

Masters of Science (Occupational Therapy) Students in the School of Occupational Therapy, 2004: Amandeep Bains, Janet Faulkner, Jennifer Krieger, Melissa Tardiff

Masters of Science (Occupational Therapy) Students in the School of Occupational Therapy, 2005: Michele MacIntosh, Stephanie Taylor

Masters of Science (Occupational Therapy) Students in the School of Occupational Therapy, 2007: Donna Ferreira, Melissa Hoefman, Maria Nikolova, and Alex Priest-Brown

The work of Kaitlyn Bernyk in transcribing and formatting this version of the UCAM is also recognized.

Masters of Science (Occupational Therapy) Student in the School of Occupational Therapy, 2010: Aaron Yuen

The work of Diana Golverk in updating this version of the UCAM is also recognized.

We are grateful to the City of London, Ontario for giving us permission to use diagrams and information from the Facility Accessibility Design Standards.
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Section
**AUTOMATIC DOORS**

**Door width**  
*How to measure:* Have door open to 90 degrees and measure between the face of the door and the opposite stop. See Figure 1 below.  
*Figure 1 – Clear Doorway Width*

**Door Closing Delay**  
*Explanation:* Closers must allow sufficient time for a person to move through the doorway without being struck by the swing of the door. The door should close completely and not be left partially opened which creates opportunities for injury.

**Lighting on Automatic Door Opening Device**  
*How to measure:* Position the lux meter directly over the middle position on the opening-device.
MANUAL DOORS

**Width**

How to measure: Have door open to 90 degrees and measure between the face of the door and the opposite stop. See Figure 3 below.

Figure 3 – Clear Doorway Width

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**Operating Effort**

Operating effort is the amount of force required to open the door. A device will be needed to measure the pressure required to open a door with an automatic closer. Such a pressure gauge can be obtained from The Howard Manufacturing Company of Littleton, Colorado or you can make your own by purchasing an accurate “fish scale” from a hardware store. Attach a lanyard to the “fish” end of the scale, slip the lanyard over the door hardware on the pull-side of the door, and record the maximum pressure required to pull it open (Goltsman, Gilbert, & Wohlford, 1993).

**Space Between Doors in a Series**

Explanation: There must be at least 1220 mm between doors, and this cannot include any area into which either door will swing. Please see Figure 4 to clarify.
Figure 4 – Two Hinged Doors in Sequence
Ramp Slope

General Note: All slopes steeper than 1:20 must be designed following the requirements for ramps. Any slope 1:20 or less steep than 1:20 is not a ramp and does not require handrails, guards, etc., if there is no abrupt drop off. It is always preferred to have gradual sloped changes in level in any barrier-free path. These gentle slopes are negotiable to the widest range of people without assistance or special design requirements. Slope should not exceed 1:12, but it is preferred that ramps be no steeper than 1:16. See Figure 1, below, for reference.

Figure 1 – Ramp Classification
How to measure: Slope can be determined by dividing rise (height of ramp) by run (length). For example, a slope of 1:12 means that for every cm in height, the ramp is 12 cm long. In documenting the actual measurement for each sloped item, show actual rise over run as shown below. Rise (cm) ___ / Run (cm) ___ = 1: ___

Cross Slope
See glossary for definition.

Handrail Size, Location and Recessed Handrails
Please refer to Figure 2, below for reference.

Figure 2 – Handrails
Ramp – Continuous Length

Measuring force (kN): Using an accurate “fish scale” from a hardware store, attach a lanyard to the “fish” end of the scale, slip the lanyard over the handrail, and record the maximum pressure the handrail can sustain pushing or pulling from any direction (Goltsman, Gilbert, & Wohlford, 1993).

Ramp - lighting
How to measure: Position the lux meter directly parallel to the ramp and at floor level.
Stairways Measurement Instructions & Tips

Tread Depth
How to measure: This is measured from the tread edge to a vertical line projected from the nosing of the tread above. Please refer to Figure 1, below for further clarification.

Figure 1 – Tread Depth

Handrails – Continuous Length

Figure 4 – Continuous Handrails
Handrails – Handrail Length

**Figure 3 – Handrail Length Requirements**

**Measuring force (kN):** Using an accurate “fish scale” from a hardware store, attach a lanyard to the “fish” end of the scale, slip the lanyard over the handrail, and record the maximum pressure the handrail can sustain pushing or pulling from any direction (Goltsman, Gilbert, & Wohlford, 1993).

**Exterior stairways - lighting**
How to measure: Position the lux meter directly on top of each thread.
**Parking Measurement Instructions & Tips**

**Signs**
Figure 1, below depicts a representation of the requirements for an accessible parking space sign.

**Figure 1 – International Symbol of Accessibility**

**Grate Opening**
Figure 2 below depicts a walkway with grates perpendicular to the path of travel.
Drop Off Zones

The drop-off zone is in an area that is designated for dropping off and picking individuals up from personal vehicles. Figure 3a and 3b, below depict a representation of the requirements for an accessible drop off zone.

Figure 3a – Parallel Parking Drop-off Zone for Cars
**Knee Space**

- **How to measure height:** The height should be measured from the ground to the underside of the table.
- **How to measure depth:** The depth should be measured from underneath the table from the edge to the nearest obstruction.
- **How to measure width:** The width should be measured from the inside edge of one table leg to the inside edge of the adjacent table leg (along the edge where the person in the wheelchair would be seated).

Figure 1 below, depicts a representation of the requirements for an accessible table, specifically knee clearance requirements.
Hallways Measurement Instructions & Tips

**Hallway Width**
Hallways should allow comfortable passage and manoeuvring through doors located along the hallway. More space may be required when doors swing into the path of travel and obstruct pedestrians traveling down the hallway.

**Hallway - lighting**
How to measure: Position the lux meter along the hallway and at ground level.

**Benches and Seating Area**
This area is required in order to allow a person in a wheelchair to park near other people sitting down. Please see Figure 4, below for reference.

**Figure 1 – Benches and Seating Areas**

![Diagram of bench and seating area dimensions]
**Controls**

Please refer to Figure 1, below for reference.

**Figure 1 – Control Height Requirements**

**Elevator lobby and car lighting**

How to measure: Position the lux meter directly on the floor of the lobby and the car.
Background noise
How to measure: Measurement of the background noise should be conducted in an unoccupied classroom with normal equipments (e.g. heating, ventilation systems, projectors, computer, lighting, etc) turned on to reflect a more realistic evaluation of the constant background noise level that would be present during a lecture. A sound meter should be mounted in a middle position of the classroom and on a tripod to minimize operator-induced noise. (Jennings, Cheesman, Klinger, & Boody, 2007)

Signal-to-noise ratio
How to measure: The calculation of this value requires the measurement of classroom dimensions and surface areas of all materials in the classroom (e.g. hard surfaces, acoustical tiles, windows, chairs, etc). Classroom dimensions are best measured by using a laser measuring tool and then entering the data into the ClassTalk software program developed by University of British Columbia Acoustics and Noise Research Group. This program allows the simulation of classroom acoustical environment and predicts the signal-to-noise ratios. (Hodgson)

Figure 1 – Isle Width and Tray Slide Height Requirements
**Service/Cashier Counter Height**

Figure 2, below, depicts a representation of the requirements for an accessible counter or bar height.

**Figure 2 – Service Counter Height Requirements**
Control Height, Food and Change Return
Figure 3, below, depicts a representation of the requirements for accessible control heights on a vending machine.

Figure 3 – Control, Food and Change Return Height Requirements
(Height of operating controls from a forward reach)

Vending unit lighting
How to measure: Position the lux meter directly over the middle position on the vending unit.

Vending display area - lighting
How to measure: Position the lux meter directly over the middle position on the display area.
Libraries Measurement Instructions & Tips

Check Out Areas
Figure 1, below, depicts a representation of the requirements for an accessible route.

Swimming Pool Measurement Instructions & Tips

Pool Entry
Figure 1, below depicts a representation of the requirements for accessible pool entry.

Figure 1 – Pool Entry
Clear Space
Figure 1, below, depicts a representation of the requirements for an accessible viewing area including the clear space necessary and the clear view requirements.

Figure 1 – Clear Viewing Space
Seating Level and 6.12 Locations

Definition of Locations: the accessible seating must be located in more than one area of the auditorium as represented in Figure 3. There are three separate areas with accessible seating represented. Figure 1, below, depicts a representation of the requirements for accessible seating levels and locations.

Figure 1 – Auditorium Seating Locations
**Height of, and Space Below, Telephone**
Figure 1, below, depicts how the telephone should be arranged and positioned for access to individuals in wheelchairs.

**Figure 1 – Public Telephones Dimensions**

**Telephone area lighting**
How to measure: Position the lux meter directly over the middle position of the telephone controls
Washroom Stall Space

Figure 1, below, depicts a representation of the requirements for an accessible washroom (multiple user) stall structure.

Figure 1 – Stall Space
**Grab Bars**

Explanation: Grab bars must be provided to assist people in/out and on/off of the shower and toilet seat. Figure 2, below depicts a representation of the requirements for accessible grab bars.

**Figure 2 – Grab Bar Requirements**

[Image of a diagram showing grab bar requirements with measurements and specifications.]
**Grab Bar Length**
**How to measure:** Lengths must be measured from the centre of the connection to the wall.

**Grab Bar Spacing**
**How to measure:** The clearance is measured from the wall to the bar’s inner edge.

**Grab bar strength**

**Measuring force (kN):** Using an accurate “fish scale” from a hardware store, attach a lanyard to the “fish” end of the scale, slip the lanyard over the rail, and record the maximum pressure the rail can sustain pushing or pulling from any direction (Goltsman, Gilbert, & Wohlford, 1993).

**Urinal Grab Bars**
Figure 3, below, depicts the requirements for vertical grab bars by urinals.

**Figure 3 – Urinal Grab Bars**

![Diagram of Urinal Grab Bars]
**Sink Height and Depth**
Figure 4, below, depicts a representation of the height and depth requirements of an accessible sink.

**Figure 4 – Sink Dimensions**
Washroom lighting
How to measure: Position the lux meter directly at ground level.

Signage Measurement Instructions & Tips

Signs - lighting
How to measure: Position the lux meter directly over the middle position of the sign.

Card Access Area measurement Instructions & Tips

Card Access lighting
How to measure: Position the lux meter directly over the middle position on the card access device.
Special Considerations and Recommendation
Special Considerations and Recommendations

1. Safety issues were not considered in the formation of the tables in the Accessibility tool. Accessibility to fire related equipment is a sample of these concerns.

2. Other items that may be considered in this category are:
   a. Safe egress in emergency
   b. Alternate routes of travel
   c. Reachability of windows

3. The Mobility in Special Classrooms section has not been completed. These classrooms would include:
   a. Chemistry labs
   b. Biology labs
   c. Home economics classrooms
   d. Technical classrooms (automobile shop, woodworking shop)
   e. Computer labs

4. Cognitive issues were not considered in the Accessibility tool (e.g.: ability to read signages)

5. The measures in this Accessibility tool are based on measurements for a standard, adult manual wheelchair. They do not consider the different dimensions required for power chairs or scooters.
6. Issues concerning support persons for persons with disabilities are not explicitly dealt with in the current version of the tool. These are considered administration issues, but may be very important to staff, faculty or students with special needs.
Glossary of Terms
Glossary of Terms

Audible Warning Signal (w/c lift): An audible warning signal alerts individuals nearby that the wheelchair lift is in use.

Call Buttons (outside elevator): The buttons outside the elevator that summon the elevator car.

Call-Send Button (w/c lift): These control buttons are provided for the lift user to call for assistance in the operation of the wheelchair lift.

Clear Floor Space: This minimum unobstructed floor or grounded space required for an individual in a manual wheelchair to complete a 360-degree turn. The minimum clear floor space for a manual wheelchair is 1525 mm by 1525 mm; the clear floor space for a power wheelchair is 2225 mm by 2250 mm and for a scooter is 3150 mm by 3150 mm.

![360° Turning Space](image)

Companion Seat: Companion seats are seats located adjacent to an accessible wheelchair seat space, to allow a friend to accompany and sit next to the person in the wheelchair seating.

Continuous/Straight Ramps: Ramps that do not change direction and have no landings throughout.

Cross Slope: The slope that is perpendicular to the direction of travel. A cross slope makes ramps hard to navigate for wheelchair users because the chair has a tendency to head down the cross slope, rather than straight.

dB: Decibel – a unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level (decibel, 2009).
Door Closer: Closers must allow sufficient time for a person to move through the doorway without being struck by the swing of the door. The door should close completely and not be left partially opened which creates opportunities for injury (Universal Design Institute, 2000).

Door Opening Space: The space into which the door swings. See diagram below. The area shaded in light grey is the door swing space and the area shaded in dark grey is the door opening space. The door opening space must not be obstructed by any objects (fixed or non-fixed) to meet the requirements.

Door Pull: A door pull (preferably with a D-shaped handle) is needed on the inside of doors that swing outward to reduce the distance needed to pull it closed from inside the stall.

Door Sensor (elevator): A mechanical device or laser beam that detects if there is an individual or object in the path of the door. The door sensors prevent the door from closing on a person.

Door Width: The doorway width is the width of the usable passage through the door (Goltsman, Gilbert & Wohlford, 1993).* (See also Measurement Instructions)

Fixed Objects/Seating: Fixed objects are items that cannot be moved. Examples of fixed objects include: chalk ledges, counters, built-in shelves, drinking fountains, tables and/or chairs that are fixed to the ground.

Gate/Turnstile: See below for a diagram of a security gate, turnstile, and a gate. These are often found at the entrance to a library.
Indicator Stripping: Indicator stripping is a strip of material to indicate changes in elevation. The colour of the stripping material should contrast with the colour of the tread surface. See figure below.

International Symbol of Accessibility: The International Symbol of Accessibility (see figure below) is an indication of an ‘accessible’ facility. This sign may be found on a parking space, auditorium seating, washroom doors or on a door, for example.
Kick Plates: Many individuals in wheelchairs push doors open with their footrests, hence 255 mm of smooth surface at the bottom of the door is required to aid them with this action (Goltsman, Gilbert & Wohlford, 1993).

kN (kilo-Newton): - A unit of measurement for force applied to an object. To measure, a device will be needed to measure the pressure required to open a door with an automatic closer. Such a pressure gauge can be obtained from The Howard Manufacturing Company of Littleton, Colourado or you can make you own by purchasing an accurate “fish scale” from a hardware store. Attach a lanyard to the “fish” end of the scale, slip the lanyard over the door hardware on the pull-side of the door, and record the maximum pressure required to pull it open (Goltsman, Gilbert, & Wohlford, 1993).

Knee Space: An individual in a wheelchair must be able to pull under a sink, table, fountain or phone booth without hitting his or her knees on any protruding object. See Measurement Instructions for method of measurement.

Leg Clearance (auditorium): The space between the edge of the extended seat to the seat directly in front of it. If there is no seat, measure to the closest edge of the nearest object.

Lux: A unit of illumination equal to the direct illumination on a surface that is everywhere one meter from a uniform point source of one candle intensity, or equal to one lumen per square meter. (lux, 2009).

Nosings: A nosing in an overhanging edge of tread, usually half rounded. See figure below for examples of appropriate nosings.
Power-Assisted Doors: For heavy doors, power-assisted units can be used to decrease the amount of force required to open the door.

Protruding Objects: Any object that enters the walkway, regardless of vertical location (Golstman, Gilbert & Wohlford, 1993).

Priority System:
- Class A: This classification category indicates items that *must* be changed for safety reasons and/or the accessibility of a primary pathway.
- Class B: This classification category indicates items that *should* be changed to enhance accessibility and quality of life.
- Class C: This classification category indicates items that can be changed if time and funds are available.
- Class X: This classification category indicates items that are not feasible to change unless a major reconstruction takes place.

Ramp Edges: Ramp edges prevent an individual in a wheelchair from falling off the edge of the ramp. See below for acceptable ramp edges.

Ramps that Change Directions: For ramps that change direction, there must be an intermediate level (i.e. free from slope) landing whenever a ramp changes direction. The inner handrail must be continuous through the changes of direction (Golstman, Gilbert & Wohlford, 1993). See the figure below for a diagram of a ramp that changes direction.
Riser: A riser is a vertical surface of the stair.

Route: A continuous unobstructed path connecting all accessible elements and spaces of a building or facility. Interior accessible routes may include corridors, floors, ramps, elevators, lifts and clear floor space at fixtures. Exterior accessible routes may include parking access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps and lifts (U.S. Department of Justice, 1991). See figure below.
Seat Pan: The seat pan is the area of the chair that is in direct contact with the individual’s buttocks.

Seat to Floor Height: The seat to floor height is the distance from the floor to the chair/toilet’s seating surface.

Security Gate: Usually found at the entrance and/or exit of a library, they control the access by having a bar or barrier that must be pushed open to provide a clear path. See ‘Gate/Turnstile’ for a diagram of a security gate.

Serving Line: The area in the cafeteria where food and beverages can be purchased, excluding all vending machines.

Slope: Slope is defined as the rise of the ramp over the run of the ramp. See the figure below for clarification. A ramp with a run of 1:10 has a greater slope than a ramp with a run of 1:16. Therefore, a ramp with a slope that is greater than 1:12 would have a run with a numerical value less than 12 (i.e. 1:10). Conversely, a ramp with a slope less than 1:12 would have a run with a numerical value greater than 12 (i.e. 1:16).
Textured Surface: A textured surface is a surface that increases friction between two contacting surfaces. Examples of textured surfaces include, but are not limited to, asphalt, brushed concrete, textured adhesive striping for stairs, etc. Examples of surfaces that are not textured include, but are not limited to, wood, linoleum, marble, etc.

Threshold: A threshold is the part of the floor where a closed door meets the ground. Often they are raised to seal the door (Goltsman, Gilbert, & Wohlford, 1993).

Toe Clearance: This is the space from the bottom edge of the stall walls to the floor. The toe clearance provides a person in a wheelchair with more space to make a 360-degree turn in the stall.

Transfer Side (of toilet): The side space to the left or right side of the toilet that is greater than the opposite side of the toilet.

Tray Slide: The section of counter space that is dedicated to the placement of a cafeteria tray during movement through the service line.

Tread: A tread is the horizontal surface of the step.

Turnstile/Gate: See Gate/Turnstile for diagram of a turnstile, security gate, and accessible gate.

Visual Warning Signal (w/c lift): A visual warning signal alerts individuals nearby that the wheelchair lift is in use or is overhead. These may be in the form of a light or hash-line marks on the floor.

Walkway: An accessible route from the vehicle to the entrance of the destination.

Wheelchair Lift: A mechanically-operated platform that transports a person in a wheelchair from one level to another level. NOTE: It is enclosed within a shaft, like an elevator.
References


