Toolkit on Accessibility

Tools to apply universal design across premises and programs and promote access for all

TOOLBOX:

MISCELLANEOUS TOOLS



Tips for measuring access

Note these tips have been designed as a basic guide to inform accessibility assessments –the assessment team and/or engineers need to consider available resources and standards.

**Disclaimer:** There are a number of approaches that can be used to measure accessibility features. In general, it is important to procure and purchase equipment and features that have already been confirmed by the supplier to meet the required compliance levels, including when purchasing doors, door handles or colour contrasted hazard strips for walking. Note that in many cases, where options are provided for applications that can be installed on an android or iphone or tablet, these applications may provide an indicator but will often have higher fluctuation level and therefore depending on the purpose of the facility and assessment, more advanced or professional tools may be needed.

In addition, some measurements (such as slip resistance) will vary in wet and dry conditions, others (such as the door pressure) will vary in environmental conditions such as wind where the external door is being tested. Therefore the below has been designed to provide a basic overview of some options but should not be used as the definitive test – based on the purpose of the building and at what point the accessibility will be reviewed, it is recommended that architects, designers and accessibility experts are engaged in the process – and in many instances, people with disability may have innovative tools and approaches that can also be considered.

* + - Basic conversion table (mm/cm/m/in/ft) see also [online conversion charts](https://www.rapidtables.com/convert/length/height-converter.html)

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| millimeters (mm) | centimeters (cm) | meters (m) | inches (in) |
| 10 | 1 | 0.01 | 0.3937″ (0.4 in) |
| 70 | 7 | 0.07 | 2.7559 ″ (2 ¾ in) |
| 90 | 9 | 0.09 | 3.5433″ (3.5 in) |
| 100 | 10 | 0.1 | 3.9370″(3.9 in) |
| 304.8 | 30.48 | 0.3048 | 12” |
| 609.6 | 60.96 | 0.6096 | 24” |
| 910.4 | 91.44 | 0.9144 | 36″ |
| 1000 | 100 | 1 | 39.27″ (39.27 in) |
| 1200 | 120 | 1.2 | 47.24″ |
| 1524 | 152.4 | 1.524 | 60 |
| 10000 | 1000 | 10 | 393.7008 |
| 100000 | 10000 | 100 | 3937.008 |
| 1000000 | 100000 | 1000 (1 km) | 39370.08 |

* + - How to measure heights, widths and distances (mm/cm/m/in/ft)

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| **Basic – smaller heights/distances:**   * **Measure using a ruler or measuring tape** – placed on the ground firmly or against the surface edge – noting a ruler may have an additional few mm at the start that may need to be subtracted. * **Measure using string** which could include having string cut out at key measurements or highlighted with braille or other markers at key intervals such as 1000 or 2000mm   **Basic – longer distances:**   * **Measure using a chain** after first place pegs at the beginning and end to stretch between two volunteers across distances – particularly useful for measuring long distances. * **Measure using a laser distance meter** – pointing from one surface at a flat surface on the other side – particularly indoors, but for outdoors, include a board that can be held up and used as the measuring stick. | * **Measure longer distances across a complex landscape** (not on the ground) with measuring tape or a chain, testing that it is level by adding weights on each end, known as “plumb bobs” (which hang perpendicular when the tape is horizontal). * **Use google maps** to measure longer distances by selecting “measure distance”   which will allow you to measure pathways and spaces between buildings where indicated [not recommended for technical level but good for an overview] |

Measuring distances – basic:

* use measuring tape and chalk or small flags (to mark out longer distances)
* measure space when walking an average number of steps (or if using a wheelchair how far per push) then count the number of steps or wheel pushes to approximate – which can also be used to promote participation with children with and without disabilities
* to check maneuvering – or circulation space – consider checking while using a wheelchair while noting that some wheelchairs are larger than others, consider cutting a square or circle out of fabric with the maneuvering dimensions to test the maneuvering space quickly.

Measuring distance - advanced:

* use a laser distance meter (to check distances electronically)
* use a mobile-application based or hand-held distance meter
* use a detailed satellite map
  + - Measuring steepness, or gradient (slope and cross-slope / cross-fall gradient)

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| Gradients, including of pathways and ramps, either in the direction of the slope or the side-slope (also known as cross-fall) it is important not to guess, as these can be inaccurate. It is possible to install a clinometer / bubble level application (e.g. [clinometer and bubble level](https://play.google.com/store/apps/details?id=com.plaincode.clinometer&hl=en_US)) on a tablet or smart phone noting there can be fluctuation.  **Basic:**  Slope may be measured as a ratio or percentage or in degrees - see a conversion [table](https://www.archtoolbox.com/representation/geometry/slope.html) for more information.   * **Use a spirit level** (which may have gas bubbles) placed on the surface of the ramp or pathway in the direction of the slope. | **Advanced**:    **Use a hand-held clinometer or tilt meter to check gradients** – use either a person of around the same height to stand around 10 meters away on flat (level) ground or measure on a stick what is known as a “zero point” which can then be verified.  **Learn more**   * [UK](http://www.sensorytrust.org.uk/information/factsheets/outdoor-access-1-paths.html) sensory trust * [Paths for All UK](https://www.pathsforall.org.uk/pfa/creating-paths/dont-make-the-mistake-of-guessing-a-gradient.html) * Topographic maps – [for slope measures](https://openoregon.pressbooks.pub/forestmeasurements/chapter/1-1-assessing-slope-of-the-land/) * [About cross fall](http://www.pavingexpert.com/gradient_01.htm) [measuring cross-slope]   https://upload.wikimedia.org/wikipedia/en/thumb/5/57/Measuring_Slope_With_a_Clinometer_2.JPG/200px-Measuring_Slope_With_a_Clinometer_2.JPG |

Checking gradients and slopes - basic:

It is possible to use a simplified question is the gradient ☐ very steep ☐ steep ☐ moderate ☐ gentle

* use measuring tape and calculate the gradient from the higher to lower surface
* install an application-based tool on a mobile phone device to check gradients
* promoting participation with children: observe if a small ball will roll, which way, how fast?

Advanced:

* check the gradient with a spirit meter/tilt meter
* use mapping tools to map and understand gradients of key pathways
* use a tool such as a hand-held clinometer

Checking hertz –(Hz)

* check with manufacturer Hz / second
* use a meter to check intensity of light flashes in Hz / second
  + - Measuring luminance contrast (LRV) - more complex

Also known as luminance contrast testing, this can be a little complex, as colors can also change in contrast with wear and tear or if there is dirt. Colour and light contrast is important for people with low vision to see barriers or hazards. A Light Reflectance Value (or LRV) also known as a luminous reflectance factor, is a measurement of contrast, between lighter and darker areas – and how light is absorbed or reflected.

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| **Basic approaches:**   * Check with the manufacturer or architect what the LRV values are when purchasing. * **Take a photo of the area or object needing high contrast in the environment** – the convert the image into black and white to see contrast. * **Use a colour deck/fan-chart** of colours – which indicates different LRV values and try and compare against the surfaces that you are observing – for example, of a door compared to the door frame, the paints may have an LRV number based on standards (e.g. in the United States, E 1477 – 98a) which can be compared with the adjacent colour – for example of the pavement.   **These numbers can be calculated to show LRV = [(L1 - L2)/L1] x 100. Where** L1 = light reflectance value (LRV) lighter area and L2 = LRV of the darker area. | **Advanced**:  The tools for testing LRV may be complex, because it is slightly more complicated notion of considering light and luminance. These inclue:   * Sekonic"meter" * Hand-held colorimeters * Spectrophotometer * tristimulus (filter) colorimeter   **LRV > 50%** are lighter (reflecting more light back).  **LRV ~ 70%** is generally considered good  **In point terms**  **30 LRV points** considered generally good  **20 LRV is acceptable** if lighting is brighter  **<20 LRV is low contrast**, but if the materials are made of a different style, e.g. a door compared to a metallic door handle, the contrast might be also considered appropriate.  **See also:** BS 8300:2009+A1:2010 – *'Design of buildings and their approaches to meet the needs of disabled people – Code of practice'.* |

Checking LRV – contrast of luminance against different surfaces

* Basic: Take a photo of the area and convert to black and white. Where the contrast is no longer there, you have a good indication that the LRV levels are not high enough
* Tip: When purchasing signs, request high LRV point difference against background surfaces

Advanced:

* Use a paint colour chart fan decks (that list LRVs) to minus the LRV calculation that are available based on the materials
* Use a light meter such as handheld luminance meter, a handheld colorimeter or a specialist sphere spectrophotometer (note that two options advanced are provided in the ISO 21542 annex with more details on how to record the luminance reflectance value)

Checking light – basic

* Observe is the lighting (including natural light) ☐ high glare ☐ bright ☐ moderate ☐ low
* A lux meter can be installed on a smart phone to use as a basic measure

Advanced - lux

* A hand-held lux meter can be used specifically to check light levels at different heights.

Checking sound – e.g. background noise –

* + - Measuring sound and background noise (dB)

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| **Basic:**   * **Observe** (however note this is not for use in definitive assessments as different people will have very different hearing levels) **light/moderate/loud/very loud** * **Use applications** downloaded to a smart phone or tablet such as Decibel 10th, Decibel Meter Pro, dB Meter, Sound Level Meter, Noise Meter, Decibel Meter Free, Decibel Meter Pro (see a [review on accuracy here](https://elacin.com/blog/elacin-wiki/how-accurate-are-db-meter-apps/))   Based on CDC consider ([data here](http://www.dangerousdecibels.org/virtualexhibit/6measuringsound.html)):  **0 decibels** (dBA) sound pressure = soft  **65 dBA** = speaking level  **85 dBA** = loud traffic – above this level, exposure after 8 hours can cause permanent damage  **91 dBA** = alarms, trains, hair dryer noise 2 hours is considered permissible  **100 dBA** = permissible for 15 minutes – after 30 minutes, the ear hair cells can experience damage  **120 dBA** = concert levels | **Advanced:**  **Professional sound level meter**  Or decibel meter tester (may cost between $20 and $200). This will usually have a digital display and a microphone-style feature.   1. **Turn the meter on** 2. **Take measurements in key areas** – such as at reception – noting this can also fluctuate with background noise and depending on the time of day. 3. **Record key measurements or ranges**.   Note there is an international standard for sound level meters. IEC 61672-1:2013. Example sound level meter: |

Basic sound or noise checks:

* Ask people who work in the area, if the area is usually noisy, or see how much sound echoes
* A dB meter can be installed on a smart phone to use as a basic measure

Advanced sound or noise checks:

* Use a sound level meter/induction loop tester (to test hearing loops and sound) to check dB levels.
  + - Measuring slip resistance (SRV) – more complex

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| **Basic:**  **Recommended** that the manufacturer or surfaces like ramps, or tiles, or flooring or pavements – or architect, provides the slip-resistance value as this can be complicated.  At a basic level it is possible to   * observe – does the surface feel slippery? If outdoors and an area likely to have rain?   Very slippery / Slightly slippery / Not much slip  Can the surface be roughed slightly to make it less slippery? | **Advanced:**  **A pendulum test (e.g. BOT-3000E, Tortus)**  This is portable and replicates the movement of a heel, would usually be tested in wet and dry conditions, or in a lab.    Image: [(link)](http://www.hse.gov.uk/slips/step/general/advanced/8E7F777B-3B84-49FE-A3D6-D0324E25A801/HSLCourseTemplate/28531/slidetype1_280757.htm) |

Checking slip resistance – basic

* Ask: Has anyone reported slipping or tripping, or found the surface slippery?
* Check: Using either a crutch, or a shoe, to scuff the surface, does it slide easily?

Check slip resistance - advanced

* Ideally, floors will have a slip resistance test prior to purchase as part of the design phase, check with the manufacturer – note SRV values – sometimes these will be listed on products
* Use a pendulum tester for floors/surfaces in a coefficient of friction (CoF) test to document the resistance
* Check slip resistance based on a surface microroughness meter.
* See also guides on checking slip resistance, e.g. a [technical guide from the UK](http://www.hse.gov.uk/pubns/geis2.pdf)

Check weight of doors – measure pressure (N/kn)

* + - Measuring pressure (N/kn)

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| **Basic:**  **Observe** – it should take around 5 seconds at least for a door to close, can you open a door with an elbow or a few fingers (or with limited strength, such as a child) – noting that main entrance doors will likely be heavier – and wind can cause fluctuation. | **Advanced**:  **Use a door pressure gauge** – (commonly used by accessibility experts)  **1. Unlatch the door.**  **2. Push the door pressure guage against the door.**  **3. Push until the door fully opens.**  **4. Record the result displayed** (force needed to open the door). |

* Basic: use an elbow to try and open a door and see how much weight is required
* Advanced: use a push-balance or door pressure gauge/meter (to identify pressure of door-opening)