



“My bike gives me a sense of freedom, it’s amazing. My electric scooter doesn’t get a look in now. It’s changed my life!”
(Ann, who lives near Waterloo & cycles a tricycle)

Towards an Inclusive Cycling Policy for London

Inclusive cycling policy is about making cycling accessible to all. This document identifies key principles for inclusive cycling. It is not an exhaustive list, nor does it pretend to provide all the answers. It is the result of the work of the Inclusive Cycling Network for London, (coordinated by Wheels for Wellbeing, made of cyclists with experience and knowledge of disability and of accessible design). This is aimed to encourage and point to further research and policy development work involving disabled cyclists, with a view to developing definitive standards.

As the Mayor of London's Cycling Vision starts having a direct impact on the physical cycling landscape of London, it is critical that the needs of disabled cyclists and all other non-standard cycle users are at the core of all cycle campaigning, cycling policy and cycle infrastructure design. Getting this wrong has the potential of increasing existing barriers to cycling by high numbers of disabled and older people. Getting it right could turn London the inclusive cycling capital of the world!

In this document we look at how:

1. Disabled people can and do cycle
2. It is against the law to discriminate against disabled people when providing cycling services/infrastructure
3. Disabled people cycle at all levels: not all disabled cyclists are novice cyclists & inclusive cycling principles apply across cycling provision.
4. The bike as a mobility aid: many people cycle who cannot walk nor carry their bikes
5. Space & essential features for cycling
6. Inclusive cycling requires some pavement and in-door cycling for some disabled cyclists
7. Inclusive cycle parking principles
8. Trains are a key part of the inclusive cycling picture
9. Inclusive cycle-signage and other visibility issues
10. With an impairment, first trying out cycling can be the biggest hurdle (access to a variety of options and to specialist support is often crucial to getting going).

In appendix we provide some technical information about footprint and other measurement for some of the most common non-standard bikes used by disabled cyclists (not exhaustive).

1. Disabled people can and do cycle

According to TfL research, whilst 22% of non-disabled people regularly cycle for transport, only 9% of disabled people do so. During 2013, over 1,000 disabled and older people cycled with Wheels for Wellbeing alone in Southwark and Croydon. Disabled and older people can and do cycle, however their needs still go mostly un-acknowledged. This document highlights key principles which must form part of any cycling policy to ensure the needs of disabled cyclists are met, in line with the Equalities Act 2010.

Whilst a cycling network built around the solo bicycle excludes many cyclists, a network which meets disabled cyclists' needs is accessible by everyone else: solo bicycle users as well as individuals, families and businesses who use tricycles, tandems, trailer cycles (tag-alongs) and cargo cycles. These are increasingly being used for the school run, carrying large dogs or other loads or for sociable cycling, and for making commercial deliveries in increasingly congested city centres.

Equally, any measures enabling cycling by disabled and older people are likely to support the growth in cycling by novice cyclists including children and young people. It will also improve condition for those using mobility scooters.

An indicator of a well designed inclusive cycle network is the variety of users from underrepresented groups such as disabled people, women, children and older people using it. The potential for growth in this area is significant.

An inclusive cycle network (from parks to greenways, LCN, quietways and superhighways) needs to accommodate a wide range of cycle types and to not exclude or disadvantage their riders. This includes people with physical, sensory and cognitive impairments who use handcycles, tricycles (both upright and recumbent), tandems, or solo bikes with or without adaptations to suit the rider's specific needs (eg: one handed brakes, shortened crank, crutch holders, power assist, etc).

2. Policy and regulatory framework – it is against the law to discriminate against disabled people when providing cycling services/infrastructure

- The Equality Act 2010 places legal obligations on service providers, employers, landlords and public sector bodies to have due regard to the needs of disabled people in the provision of services and employment and to make reasonable adjustments to the

physical environment where it poses a significant barrier to disabled people making use of the services.

- The public sector Equality Duty places obligations on public authorities to pay due regard to the needs of disabled people in policies and activities they implement, including the design of the public highway.
- Paying due regard to the needs of disabled cyclists is required across all cycling services and infrastructure (see below)
- Safer street environments are important to encourage cycling by all, including by disabled cyclists – eg: segregated cycle lanes, slower speeds and better care by drivers.

3. Disabled people cycle at all levels: not all disabled cyclists are novice cyclists & inclusive cycling principles apply across cycling provision

According to TfL, eleven percent of Londoners consider themselves as disabled. Sixty-two per cent of all disabled Londoners say they are mobility impaired compared to 7% of all Londoners).

Disabled people have a variety of impairments, some of which include mental health conditions and visual/hearing impairments, and some of which are as a result of long-term illnesses. In some cases, disabled people have multiple impairments. The vast majority (93%) of disabled people say their impairments limit their ability to travel and get about.

Cycling is practiced by people with all types of impairment and in particular increasingly used by people with mobility related impairments, including lower limb amputations, fatigue illnesses and injuries or genetic conditions affecting “ability to walk more than 100 metres without undue pain or fatigue” (a standard measure of mobility impairment). With the growth of the e-bike market, this is likely to increase dramatically over the coming years.

However, there is a lack of research on cyclists with disabilities. The Sport England’s Active People Survey (APS), <http://www.sportengland.org/research/who-plays-sport/> a continuing survey with semi-annual counts, now into its sixth year (or ‘wave’), covers a number of sports including cycling, but is specifically about sporting or recreational participation, not about utility on-road cycling. This survey finds that **8-10% of 'regular' cyclists have a disability**. This figure is not dissimilar from the figure for disability in the general population. The APS also finds that cycling and swimming are the most significant sports for disabled participation; probably for related reasons, that they allow non-load-bearing exercise which does not put shock or strain onto their joints. Both sports provide gentle, rhythmic exercise

which is good for improving muscle tone and making people more comfortable, as well as improving mood and wellbeing through endorphins and better ventilated respiration.

However at the level of regular participation (at least once a week) quoted in the APS most sports participants will probably be cycling on-road as well, either for utility reasons, training rides or general recreational cycling. It is also likely that there are many cyclists riding for utility or recreationally with a disability, who would not be included in Sport England's figures and that the broad conclusions could be applied, cautiously, to on-road cycling.

The potential for growth in numbers of disabled cyclists is clearly demonstrated by the growth in popularity of regular cycling provision by inclusive cycling hubs in London (eg: Wheels for Wellbeing, Pedal Power, Ecological, Bikeworks, Companion Cycling, etc). Where disabled people are able to access advice and the right equipment, regardless of age or impairment, they take up this opportunity in their thousands.

Disabled cyclists are included at all levels of performance and frequency of use (from total novices to daily commuters, sportive riders, paralympians (such as Dame Tami Grey-Thompson) etc. Whether at the beginning or the top of the cycling pathway, their impairment remains and their ability to access cycle parking, cycle transport etc. is reliant on inclusive provision.

4. Cycling as a mobility aid: many people cycle though cannot walk nor carry their bikes

For many people, cycling has significant advantages over walking, public transport and driving. It is attractive for different reasons for people with a wide range of impairments, including:

- Cycling enables easier movement and independence and has become an increasingly popular and effective way for people with mobility impairments to travel. Cycles can also be designed to take a number of accessories, for example carriers and baskets which some wheelchairs may not be able to. Cycles have brakes whilst wheelchairs rely on the user gripping the rims of their wheels whilst wheeling along... Wheelchair front castors create undue resistance on anything but perfectly smooth wheeling surfaces.
- Many people for whom walking any distance is either impossible or causes pain find they can cycle pain-free.
- For many disabled people being able to move around on a bicycle, either self-propelled or being assisted to do so, provides significant independence, opportunity

for increase mobility, for exercise, and considerable health and well-being benefits. Cycling provides increased opportunities to travel over distances and visit previously places inaccessible.

- Cycling, if fully inclusive, can provide free and flexible door-to-door transport.
- Varying forms of companion cycling (eg: tandems, side-by-side cycles) answer the needs of people with sight loss and of many people with learning difficulties or autism.
- Cycling can be the ideal mode of transport to people who find public transport crowds difficult to cope with.

5. Space and essential features for disabled cyclists

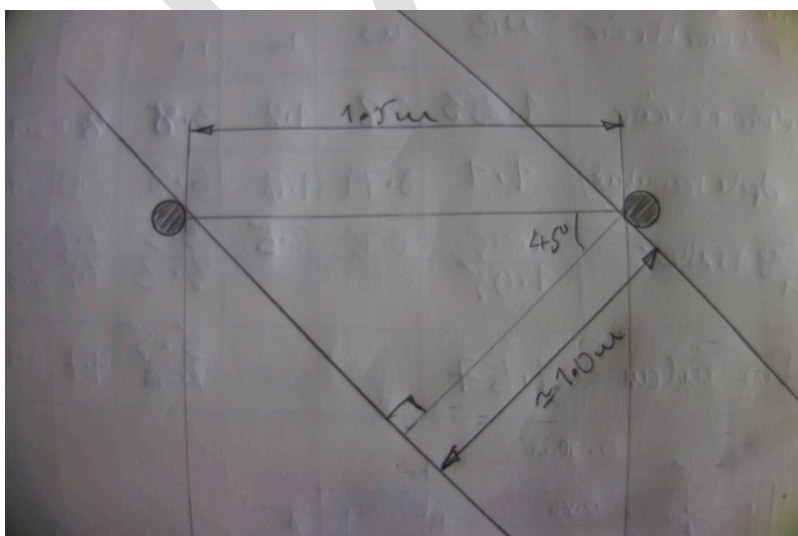
Obstacles

In general, obstacles are a problem if they prevent access or create discomfort. Many people live with painful conditions that are exacerbated by humps, bumps and engineered uneven surfaces.

Bollards, posts and kerb upstands etc

Creating cycling permeability while restricting motor traffic passage through location of obstacles is a common traffic control measure, but this should not restrict cyclists.

Where bollards or kerb upstands are used across a pathway to prevent access to motor vehicles the minimum distance between two bollards, or gaps between kerb upstands should be no less than 1.5m. This allows inclusive bikes to pass between the bollards at an angle of 45° , for example when accessing a restricted road at right angles to a cycle path or when avoiding other users.



Kerbs and segregated cycle lanes

Continuous kerbs lining cycle routes are an important feature of separated cycle infrastructure but they can end up trapping disabled cyclists in a cycle track. If they need to stop and get out of the way quickly they need a kerb-free junction, or a dropped kerb. This tends to be more forgiving for everyone, not just disabled cyclists. A more permeable separation is preferred. If features such as bollards, armadillos or planters are used to create separation, then the minimum spacing between these should be 1.5m to allow wider cycles to emerge at an angle.

Access to the footway from a cycle path

Pushing a bike or a tricycle up a kerb is not an option for many. Like wheelchair users, disabled cyclists need dropped kerbs and step free access. Access to dropped kerbs needs to be at least 1.5m wide and proportionally wider when the approach creates an oblique angle. Kerbs in general should not prevent disabled riders of from pulling over to stop or from getting out of the way of other bikes or other traffic.

Temporary closures of cycle provision

When a cycle route or general carriageway is temporarily closed for any reason, there should be an alternative route signposted that will not involve steps or walking. Whenever possible, there should be enough advance notice of a closure for cyclists to decide upon an alternative route. It is not sufficient to rely upon signage for motorists, since a route that is closed to motorists may still be passable for cyclists.

Where cyclists are allowed through an incident area but asked to dismount, disabled cyclists should be understood as not being able to walk their bikes/trikes/handbikes and entitled to continue cycling or provided with advice as to alternative routes.

Surfaces

Road surfaces are a particular issue for disabled cyclists who can suffer severe discomfort from bumps and shocks. Road surfaces should be free of potholes, badly laid ironworks or other hazards. Handcyclists in particular do not have the option of lifting off the saddle to avoid shocks to their spines when going over potholes or obstacles. Avoiding potholes or other hazards is far harder on 3 wheels and may lead to the cyclist having to swerve, putting themselves at risk.

General maintenance of road surfaces is also important. These should be regularly cleared of leaves and debris which can hide pot-holes, create a slip-hazard.

Cobbled surfaces should be avoided as they can cause discomfort.

Gradients and cambers

The length of climbs, as well as the gradient, is important for disabled and older cyclists. Some will have difficulty with the approach to a river bridge. Gradients should be minimised wherever possible on general routes intended for all cyclists.

Paths used for cycling should have the gentlest camber possible to facilitate comfortable and safe cycling while allowing for drainage. Three wheelers are particularly adversely affected by steep cambers and can end up in the gutter or even overturn. A maximum cross fall of 1:40 is recommended for paths used for cycles.

Speed reduction measures

Speed humps are problematic due to the inconsistency of design and execution. Where they are excessively high or feature straight edges (often cobbled) they can cause handbikes and recumbent tricycles to 'bottom out' and experience discomfort. The sinusoidal design should be the only design used for speed humps.

Speed cushions are particularly problematic because they can tip three wheelers over. Cycling between speed cushions is the most stable solution and can force cyclists into dangerous cycling positions as a result.

Traffic islands and chicanes creating pinchpoints can be difficult for those using wider cycles to negotiate.

Access control barriers

Many cyclists cannot dismount & push their cycles. Sections of the road network that are not continuous or require the cyclist to make awkward manoeuvres or to dismount pose a significant barrier for disabled cyclists. This is particularly so for handcycles, where it is not an option for the rider to get off and walk at a barrier or hazard and also applies to many people who use cycles as a mobility aid.

Access control measures and barriers that prevent access to motorbikes, mopeds and scooters also prevent access to inclusive bikes, eg, A-frames, K-frames, York Chicanes and kissing gates. Kissing gates cannot be used by cyclists who cannot dismount.

It is not recommended to have any barriers along a path that is used by cycles. If it is necessary to prevent access for livestock, use cycle (and wheelchair) friendly cattle grids. In addition provide with a firm, smooth path section and gate for those who are able to operate gates.

Additional space for turning

Wider cycles such as handcycles and tricycles require a wider lane and a wider turning circle. Also as they are lower, they may be less visible and more space around them is necessary to allow drivers to see them.

Bus stop bypasses for cyclists

Currently cycle lanes with bus stop bypasses have a narrow width with high vertical kerbs to slow cyclists on approach to the rear of the bus stop. The width and restricted corner radii, and the high kerbs are a barrier to those riding wider cycles.

These need to be designed with regard to those using wider and heavier cycles with a lower level of manoeuvrability, using a more forgiving kerb edge that is chamfered.

The needs and potential conflicts with pedestrians crossing the cycle lane behind the bus stop need to be considered, with trials including both disabled cyclists and disabled pedestrians including visually impaired pedestrians.

6. Access to pedestrianised areas - Door-to-door cycling = some pavement and in-door cycling for some disabled cyclists

Many cyclists cannot mount kerbs or negotiate other barriers. Many, including existing two-wheeler cyclists do not have the option to dismount and carry their bikes over curbs, steps etc. or to park their bikes long distances away and walk to their ultimate destination. This also applies to tricycle and handcycle users. It is important that routes to destinations are step-free, smooth and continuous.

Cyclists using their bikes as mobility aids need access to restricted, pedestrian areas in the same way wheelchair and mobility scooter users do. This includes bus and train stations, public buildings, lifts, including to get to cycle parking or destinations on the inside of buildings.

Training is necessary for enforcers of pedestrianised areas to understand about cycles being used as mobility aids. Not all disabled cyclists look disabled when on their bikes. Many are challenged by enforcers, and some have been told 'if you were disabled you would be in a wheelchair'.

Consideration needs to be given to the blue badge scheme being extended to cycle use / cycle parking concessions (in the same way as with car parking concessions).

Potential conflicts with visually impaired and other pedestrians

Discussions with visually impaired pedestrians (negatively affected by and therefore against cycling in pedestrianised areas) highlighted the need for awareness of each other's needs and concrete proposals for compromise:

- Visually impaired pedestrians, once aware of cycling sometimes being a mobility aid, are generally accepting of disabled cyclists with mobility impairments using pedestrian areas on the following conditions:
- the need for disabled cyclists to maintain a slow, walking speed in pedestrian areas and to be aware that not all pedestrians can see or hear them approaching
- pedestrian priority to be maintained at all times with cyclists always expected to give way to pedestrians
- Pedestrians with sight loss would welcome audible indication of cyclists approaching (using continuous beepers rather than bells).
- Low intensity flashing lights would be helpful to some to indicate a cyclist approaching
- preference for a shared area for disabled cyclists and pedestrians (with pedestrian priority) rather than routes demarcated by lines or tactile paving, which can cause confusion and conflict.
- two-way cycling on separated cycle tracks that need to be crossed by pedestrians are a real problem for pedestrians with sight loss as they are extremely confusing.

7. Inclusive cycle parking & storage

Being sure of finding secure cycle storage at both end of a journey is crucial to any cyclist deciding whether or not to set off on their bike. Where a cycle is a mobility aid, and given the cost of most non-standard cycles, this is all the more crucial to most disabled cyclists.

Some disabled cyclists use folding cycles because they are fairly light and can more easily be taken into buildings and on trains or buses or transported by car. Cloakroom provision for folding bike and tricycles and for clip-on handcycle attachments would be desirable.

Urban wheelchair using commuters often use clip-on attachments so they can cycle into their destination and have use of their wheelchair at both end of their journey. Some disabled people are not able to lock bicycles (bending might not be possible or lack of dexterity). As part of reasonable adjustments, employers and public buildings should be making the best possible arrangements for disabled staff and visitors who need to cycle and store their cycles inside buildings.

General cycle parking should include an adequate element of parking suitable for inclusive cycles and tricycles. All cycle parking facilities should preferably be located at ground floor

level and be covered, secure and well-lit. These should be conveniently located for destinations. They should be served by a step and kerb-free route with a minimum of 1500mm width.

Sheffield style stands are the most appropriate style of cycle parking for most tricycle and tandem users. Double-decker racks will not be able to be used by many disabled, older, smaller cyclists, including many 2 wheeler users. Wider and longer than standard bicycle parking spaces should be provided at the ends of racks of cycle parking and designated for disabled cyclists (enforcement issues need to be looked into). A minimum width of 1200mm for an adapted cycle parking space is recommended (fuller standards to be developed).

Where lift access is provided to cycle parking, the lift should have step-free access to it, with automatic doors providing access without needing to get off the cycle. The size of the lift should be large enough to accommodate larger cycles and a minimum of 2.4m long and 1.4m wide. Lifts which do not require turning round to exit are preferable (enabling to ride on and ride off in the same direction).

Where large areas of cycle parking are provided at stations, within residential apartment blocks, or in office developments, at hospitals etc., accessible cycle parking spaces should be a minimum of 5% of all provision.

Where main cycle parking facilities provision cannot be step-free (including with lift access) or close to end destination, alternative convenient accessible cycle parking spaces should be provided (and clearly signposted), with some way of enforcing exclusive use by disabled cyclists (radar key locks, lockers etc).

In summary:

- Safety and surveillance are key
- space and appropriate locking design for tricycles, tandems and handcycles
- Step-free location close to destination (20m max)
- Policy to allow disabled cyclists to bring bicycles into halls and other public areas where they will be overseen. Cloakroom provisions to allow for looking after cycles for disabled people.

8. Trains - a key part of the inclusive cycling picture

The large scale solution to integrating bikes and passenger transport is to store or hire a bike at either end of the public transport journey. For disabled people using cycles as mobility aids this is rarely an option. Where a cycle is modified or specifically designed to suit a person's disability, it will very likely be too expensive to allow the luxury of keeping a spare,

and there will not be a suitable bike available to hire. Being able to transport one's cycle on the train is therefore crucial.

Inclusive bikes are often longer than a standard wheelchair and a reasonably large, multi-purpose area incorporating flip up seats and easy access is the simplest solution to accommodate them. Also required is step-free access to the carriage at both ends of the journey.

Currently, train operators policies on transporting non-standard bikes is extremely variable and this element needs to be tackled as part of rail-franchise tendering processes.

9. Inclusive cycle-signage and other visibility issues

Signage should always be of the best possible quality, to enhance the public realm, at cyclist friendly heights, including being visible to recumbent and handcycle users.

Signage on the road surface, as used in parts of the LCN to indicate a route number and direction, is recommended because it is easy for cyclists to see, does not contribute to visual clutter and cannot be vandalised to point in the wrong direction. However attention should be given to on-road markings also being visible from a lower cycling position (in particular where inclines or bends are involved). It could be supplemented with other signs showing destinations and distances (or times), linked to the route number.

Ensure cycling signage is clear and conspicuous following guidance from the Sign Design Guide with large size font, good visual (tonal) contrast of font against background, non-reflective background and use of symbols and well as text.

Text should be a combination of lower and upper case which is easier to read than text in upper case.

Cyclists with sight loss

Many people who are unable to drive due to poor eyesight are able to cycle and enjoy the benefits of the independent mobility that cycling provides. Cyclists with sight loss might cycle solo or in tandem, depending on the degree of sight loss. Amongst our aging population, gradual or rapid sight loss are extremely frequent and many cyclists have some level of sight loss without being registered as such.

Tandem riding is very popular with though not limited to visually impaired people. Cycle provision must take tandems length into account.

Issues for cyclists with sight loss include:

- Ensure cycle routes, where provided, are visually distinguished from the vehicular routes with clear tonal contrast.
- Preference for segregated routes, not shared with pedestrians.
- Light controlled junctions are preferred, but visibility depends on the height, angle and is affected by glare.
- Surfaces and maintenance of the route surface are particularly important. Surfaces need to be cleared of leaves, gravel and debris such as glass.
- Posts and bollards located within the route are hazardous for all and particularly so for cyclists with sight loss
- Kerb edges to cycle paths should be highlighted with good visual contrast. Fading road markings are a hazard for visually impaired cyclists who need strong visual contrast. A measure of visual contrast is difference in Light Reflectance Values (LRV levels) of adjacent surfaces. While a 30 point LRV level difference is considered sufficient in an internal environment, a much higher LRV differential is required in an external environment with lower lighting levels and with glare in the sunlight.

10. The beginning of the pathway – inclusive introduction (or re-introduction) to cycling

Ensuring that disabled people have a realistic opportunity to take up cycling necessitates the following:

- Increased visibility of disabled and older people as part of the cycling population
- Facilitate participation by disabled cyclists in all cycling events – issues in some high profile events around bicycle type restrictions, minimum speeds and distances to be covered. For example rules for *Ride London Surrey 100* in 2013 restricted participants to those who can travel at a minimum speed and a particular type of bicycle, which prevented handcyclists and others from participating in this significant public event.
- Increased capacity across London for more venues to host a range of cycles and make them available for people to try and practice cycling safely, with support.
- Increased information about types of bicycles available, training, funding and inclusive cycling peer networks.
- The cycling world to develop their disability confidence so it can better support disabled members of the cycling community
- Parity with motor vehicle provision (Motability/blue badge scheme)

Appendix: key measurements of frequently used non-standard bikes

Applied to cycling the term *inclusive* has been used to mean inclusive of people with disabilities, and “inclusive bikes” can be trikes, both upright and recumbent, handcycles, tandems or solo bikes adapted to suit the rider’s disability. Because of size, or the limitations of the rider, “inclusive bikes” require a more forgiving environment than the one normally designed around the standard bicycle. But that’s not only true of the bikes used by disabled people, it also applies to families using trailers, trailer bikes, tandems, Christiania trikes, Bakfiets bikes and to companies using cargo bikes and trikes. So in order to specify and create a truly inclusive cycle network the designer needs to include the requirements of all the popular bikes that differ from the classic solo bicycle in width, length, number of wheels or number of riders/passengers.

In an inclusive cycle network the majority of bikes will still be solo bicycles, the network doesn’t need to have the capacity to carry thousands of inclusive bikes at once, however it does need to be tolerant of them and to not exclude or disadvantage their riders. An indicator of a well-designed cycle network is the number of users from underrepresented groups using it.

Bikes used as mobility aids also need access to stations, buildings, lifts and restricted pedestrian areas in the same way wheelchairs and mobility scooters do. This isn’t true of all inclusive bikes and requires the specification of a “Mobility Bike” which fits within the footprint of a “Standard Inclusive Bike”.

We have provided measurements for typical cycles below for:

Footprints

Space requirements for a 'Mobility Bicycle' and a 'Standard Inclusive Bicycle'. The dimensions of these two reference bikes have been defined by measuring the most commonly used adapted cycles.

Handling Characteristics

Two figures for turning radii have been defined from measurements derived in some fairly rough and ready experiments using a tape measure, a piece of chalk and a variety of bikes. One for maneuverability and one for cornering. More precise standards need to be developed.

Obstacles

A minimum distance for access between obstacles has been defined and recommendations made for the use of commonly used obstacles.

Footprints

Mobility Bike

Bike model	Width (cm)	Length (cm)
Stricker Handbike clip-on and chair	80	180
Top End Exceleator Handbike	80	165
Draison Trici	75*	177
Pashley TR-1	?	?
Brompton	75*	150
Standard Solo Bicycle	75*	175
Greenspeed GT5 Recumbent Trike	83	175
Hase Kettwiesel	86	160-205
Hase Kettwiesel Handbike	86	160-205
Hase Lepus	85	169-213
Hase Trix	86	160-205
Hase Trets Trike	75*	142-176
Ice QNT Recumbent Trike	79	170-210
Ice Adventure FS+HD	86	167-193
Ice Sprint FS	84	174-198
HP Velotechnik Scorpion	83	170-200
HP Velotechnik Gekko	83	165-197
HP VElootechnik Spirit	75*	175

* : Minimum width set by rider

200 : out of specification

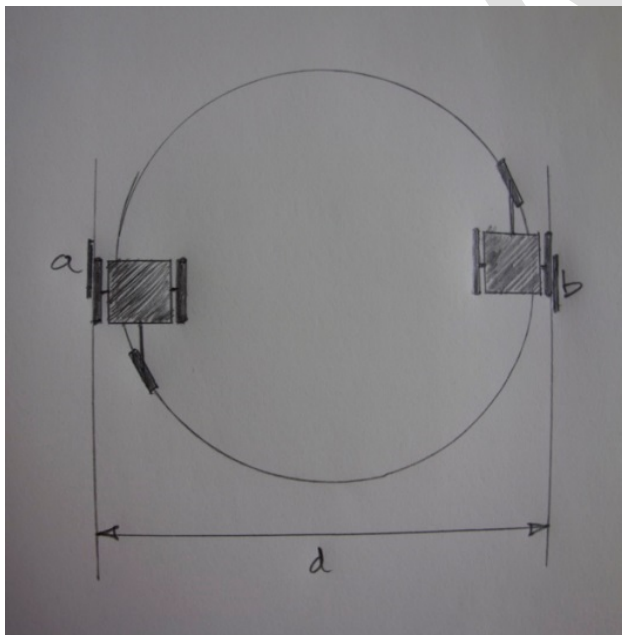
Standard Inclusive Bike

Bike model	Width (cm)	Length (cm)
The Mobility Bike	86	190
Hase Pino Tandem	75*	210-237
Ice Vortex Recumbent Trike	75	199-224

Brompton + City Trailer	75*	250
Draisin Duo Tandem Trike	75	230
Circe Helios Duo Tandem	75*	215
General Tandem	75*	250
Christiania Trike	85	208
Bakfiets Cargo Bike	63	225
Bakfiets Cargo Bike Long	63	255
Bakfiets Cargo Trike	82	220
Bullitt Cargo Bike	75*	245

* : Minimum width set by rider
 255 : out of specification

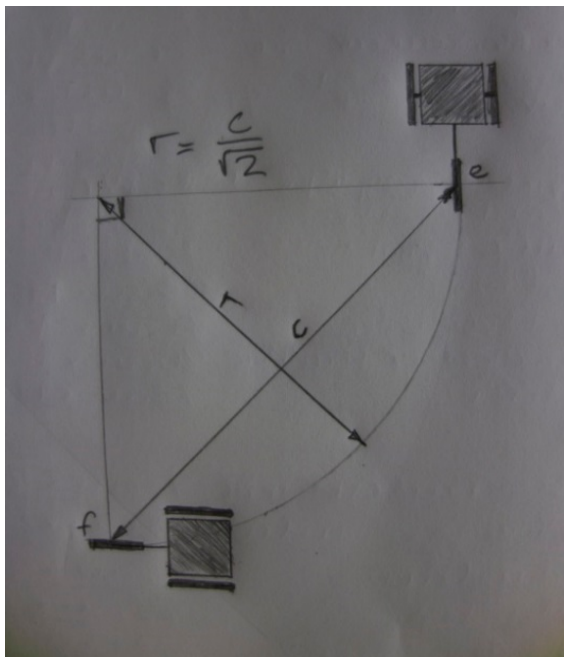
Handling Characteristics



Maneuverability

Method: Rode round in the tightest repeatable circle between two chalk marks a and b then measured the distance d between the marks. Repeated for various bikes.

Maneuverability radius $R_m = d/2$



Cornering

Method: Rode at about 10mph to chalk mark e where turned through arc stopping having moved through 90°. Marked f and measured distance c between chalk marks e and f. Repeated for various bikes.

Cornering radius $R_c = c/\sqrt{2}$

(Huge margin of error, an indicative figure at best)

Bike Model	Wheelbase (cm)	Width (cm)	Length (cm)	d (m)	Rm (m)	c (m)	Rc (m)
Stricker Handbike	130	80	180	3.8	1.9	8.0	5.7
Ice QNT Recumbent Trike	110	79	198	6.8	3.4	8.0	5.7
Brompton	105	75*	150	3.3	1.7	7.5	5.3
Brompton + City Trailer	105	75*	250	3.3	1.7	7.5	5.3
Circe Helios Duo Tandem	167	75*	215	5.5	2.8	9.7	6.9

Specification

