

Making Streets Safer: A Guide To Filtered Permeability



Published by City Infinity.

All rights reserved. We are happy for this document to be shared, but it must be shared complete and not changed in any way, nor can it be charged for commercially. We are happy for this document to be referenced with credit by voluntary, academic and commercial organisations or by individuals.

This document is intended to be guidance and any recommendations given should always be received by the reader 'in light of the facts' of their specialist circumstances and specialist advice obtained or engaged as necessary.

References to legislation discussed within this document are not exhaustive and the reader should be consider them in light of current and future legislation which may be published after the date of this document.

This document is intended as guidance and should not be interpreted as design work for the purposes of the Construction (Design & Management) Regulations 2015. For any design work, the reader is recommended to seek the services of somebody suitably competent to advise them.

No liability for negligence or otherwise in relation to this document and its contents will be accepted by City Infinity.

© City Infinity 2017

First Edition, November 2017.

Traffic signs, the mode share graphic from the National Travel Survey and Table 8 from the Building Regulations 2010 Fire Safety Approved Document Volume 1 Part B5 are reproduced under the terms of the Open Government Licence;

<http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

They say small is beautiful and we can't disagree when it comes to those small-scale interventions which can make it easier and safer for people walking and cycling. That is why we specialise in working to help make those changes to local streets which will enable human-powered transport;

- Assessment and design of pedestrian and cycle crossings,
- Side road entry treatments (from decent dropped kerbs to continuous footways),
- Filtered permeability schemes (close the road – open the street!),
- Access audits for walking and cycling,
- “Barrier bashing” – looking at alternatives to physical barriers,
- Cycle track design,
- Walking and cycling friendly junctions,
- Experimental traffic orders, trialling and interim schemes,
- How travel planning can be used to effect change to streets.

We can also provide tailored training and workshop facilitation for those involved in designing for active urban travel or be a “critical friend” in helping you with your project through design reviews and workshops.

Please contact us for more information or to discuss your project.



Designing for active urban travel

www.cityinfinity.co.uk

@CityInfinityUK

contact@cityinfinity.co.uk



Low traffic neighbourhoods enable children to travel independently.

Making Streets Safer: A Guide To Filtered Permeability

If the UK is to make streets safer for people walking and cycling, we will need to deploy a range of engineering measures to reduce people's exposure to motor vehicles.

People do not feel safe or comfortable where traffic flows are heavy or where speeds are too high and so measures to reduce exposure to such conditions are a vital part of making streets safer.

Safety is not solely a measure of casualty figures – far from it; people like to feel safe and this is often the greatest barrier to walking and cycling which must be addressed.

Filtered Permeability is a catch-all term for measures which can help reduce people's exposure to motor traffic, often in residential areas. The techniques do not prevent necessary motor-vehicle access, but restrain it to make areas more people-friendly.

This guide explores the subject and helps the reader understand the techniques which are available, the processes behind deploying them on-street and a range of considerations linked to making the right choice.

1.0 Introduction

1.1 Overview

The discussion and interaction available in a face to face training environment cannot be replicated in print. However, this document complements City Infinity's filtered permeability training and provides background knowledge on how schemes can be designed and implemented with signposting to other sources for the reader to research.

1.2 Document status

This is just guidance which is a world away from standard and indeed legislation. Some guidance has a relatively short shelf-life because ideas move so quickly, but the basic principles and techniques around filtered permeability are time-served and are easily applicable to many situations.



Vauxhall Walk, London

Access for a small residential car park. No parking allowed and loading only out of hours.

1.3 Areas covered

This document is broken down into a series of easy to digest sections as follows;

- Definitions,
- Principles,
- Traffic evaporation,
- Legislation,
- Traffic signs,
- Configurations,
- Design considerations
- Designing for cycling,
- Designing for service access,
- Added extras,
- Final thoughts



Market Street, Leicester.

This street is a pedestrian zone which permits two-way cycling at all times. The only motor traffic permitted is vehicles being use for loading, but this is only during a morning window and such vehicles are subject to a one-way system.

2.0 Definitions

2.1 Definition of filtered permeability

Dr Steve Melia of the University of the West of England (UWE) is credited with coining the term, which was nicely defined in the Town & Country Planning Association/ Communities & Local Government “Eco Towns Transport Worksheet”, March 2008 [1];

“Filtered permeability is the principle followed in European towns and cities most successful in restraining car use. It means separating the sustainable modes from private motor traffic in order to give them an advantage in terms of speed, distance and convenience. There are many ways in which this can be done: separate cycle and walk ways, bus lanes, bus gates, bridges or tunnels solely for sustainable modes.”

This definition shows that filtered permeability is an incredibly wide subject area and indeed, some of the techniques therein could easily be specialist subjects in their own right!

2.2 Other definitions

There some other terms which often used and which need defining;

Modal Filter – a feature designed to prevent access by certain classes/ types of traffic (usually motor vehicles). This is covered in detail later, but can include bollards, traffic signs, planting etc.

Passive Safety – the design of features to reduce potential for injury in the case of a collision. In many cases, “things” are placed on the highway, often to exclude motors, and in placing them a safety risk is created.

For example, a bollard placed in the centre of a cycle track to prevent car access has the potential to cause an injury to anyone crashing into it, especially those the bollard is being installed to protect – those cycling. Passively safe features reduce the risk of injury in case of a collision.



Clapton Square, Hackney.

Side road closed to motor traffic with a parallel zebra crossing over Lower Clapton Road.

Grade Separation – This is where provision of space is made at different levels for different modes or movements. Many people will be familiar with motorway junctions where moving between motorways is done with slip roads and bridges so that there is no stopping and no conflicts as one might get at a roundabout.

Grade separation as a method of filtered permeability is used to keep people walking and cycling fully separated from motor traffic. A famous UK example is that of the New Town Stevenage which has a grade separated walking and cycling network on its main road network.

Traffic Order – Known as a Traffic Regulation Order (or Traffic Management Order in London), a traffic order is a legal document which formalises a highway authority's ability to regulate or manage traffic. In this case, traffic is applicable in its widest sense to include cycles and pedestrians.

Sustainable Urban Draining Systems (SUDS)

– are features designed to attenuate and treat rainfall. Many urban sewerage systems are expected to carry more run-off than they were designed for and so slowing the flow of water with tanks, swales, planting and ponds can all help.



Vauxhall Walk, Lambeth.

Rain gardens as part of landscaping.

3.0 Principles

3.1 Overview

In the UK filtered permeability is often used to describe closing existing streets to through (motor) traffic, but we should consider it in the widest sense which covers a variety of techniques.

- Closure of existing streets (including pedestrianisation),
- Short walking & cycling links,
- Walking & cycling crossings between adjacent areas,
- Grade separation of walking & cycling,
- Unravelling walking & cycling from driving,
- Providing distance/ time advantage to walking & cycling,
- Options for emergency access, buses & servicing.

3.2 Closure of existing streets

This generally applies to closures for motorised traffic and in doing so, the subjective safety for people walking and cycling can be greatly enhanced because motor traffic flow is reduced.

The technique is especially applicable to residential side streets which suffer from drivers using them as a de facto part of the main road network. Many streets like this end up with traffic calming (especially road humps) which can actually degrade conditions for people cycling (and sometimes walking).

It can be very controversial, but the “anti” arguments tend to surround the ability of local people to drive unimpeded and concern about emergency access (more on that later). Those in favour often cite community benefits such as road danger reduction and improvements in noise and air pollution.

3.2 Short walking & cycling links

It can be argued that a closing a road to motor access in essence creates short walking and cycling links, but here we are talking about something a little longer. A retrofit scheme could re-purpose a section of street for people walking and cycling only, or a new-build scheme could make walking and cycling the modes of the street.

3.3 Walking & cycling crossings

Take a crossroads and filter the two side streets. Then put a crossing between the two side streets and we essentially create a walking and cycling route on the quieter side streets, but where people can cross the main street. Make the crossing a parallel zebra, parallel signal crossing or a toucan crossing and priority can be given. These are even better where a flat topped road hump is provided for a level crossing of the main street.

3.4 Grade separation

For walking and cycling, this could be bridges or underpasses where roads designed for motor traffic are to be crossed. The best provision will keep people walking and cycling “at grade” (i.e. on the level) with the roads being

lifted or dropped to suit on the basis that motor vehicles are powered and people walking and cycling are not!

3.5 Unravelling walking and cycling

This is a subject area in its own right, but in essence we are looking to separate motoring networks from those used by people walking and cycling. The process also seeks to minimise interaction between motors and people (through grade separation and traffic signals) and will also divert through traffic away from where people live, work and shop.

This is not to stop people being able to drive, they will still have access to their homes and where they park, but the balance moves away from cars being the first choice for short trips.



Riverside Bridge, Cambridge.

Active travel being unravelled from motoring.

3.6 Distance/ time advantages

In developing motoring networks which are distinct from active travel modes, walking and especially cycling will become the easiest,

quickest and most direct way of making local trips. Even a single modal filter in a residential area can make a significant difference in changing behaviour where people might walk to local shops rather than drive around a much longer route.

3.7 Emergency access, buses & servicing

This is dealt with in detail later on, but it is still possible to apply the principles of filtered permeability in such a way as to ensure necessary vehicle access can be provided within a scheme.



Orford Road, Walthamstow.

Local buses are permitted to use the street in a loop around a wider area.

4.0 Traffic evaporation

4.1 Overview

We often hear “where will all the traffic go?” It's a concern that people will be “forced” onto the main roads. As we increase road space or junction capacity, it fills up; this is known as “induced demand.” It turns out the opposite is true and we get “traffic evaporation.

Filtering can lead to people switching to other routes, but many will switch modes or change their habits such as going to local shops by foot rather than driving to superstore (or even driving down the road to get the paper!)

4.2 Journey lengths by mode

To understand how people travel, there is plenty of data available such as the National Travel Survey (England) [2];

- 38% of English trips under 2 miles,
- 66% under 5 miles.
- Most trips under a mile are walked,
- Most trips between 1 and 5 miles are driven.

Mode share of trips by main mode for different trip lengths: England, 2014 [NTS0308]

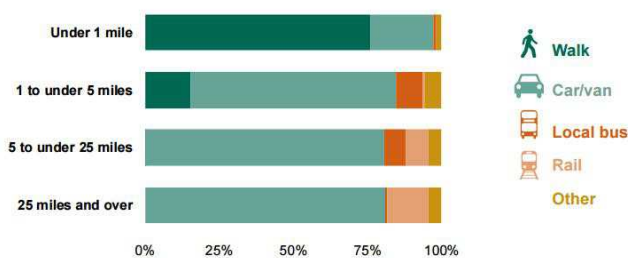


Table from National Travel Survey 2015

As a rule of thumb someone will be able to cycle between 8mph and 12mph (depending on the type of cycle, their mobility, if they are carrying anything etc). This equates to a mile's cycle taking between 5 and 8 minutes or 5 miles taking between 25 and 40 minutes.

In terms of time, walking the shortest journeys and cycling up to 5 miles could so very easily be made a safe, attractive and comfortable choice for many people. People don't like mixing with traffic and schemes which provide filtered permeability are crucial to rebalancing our streets.

4.3 Research

Research undertaken by Cairns, Hass-Klau and Goodwin in 1998 [3] examined the impact of highway capacity reductions; reviewed in 2002 (ICE Municipal Engineer). It concluded;

“...well-designed and well-implemented schemes to reallocate road space away from general traffic can help to improve conditions for pedestrians, cyclists or public transport users, without significantly increasing congestion or other related problems. Moreover, schemes can help in achieving a wide variety of benefits including accident reductions, air-quality improvements, reduced neighbourhood severance, increased business investment, more attractive living and working surroundings and improved retail vitality. The feasibility of scaling up the successes of local schemes into more comprehensive initiatives is currently unclear.”

4.4 Case study – Waltham Forest

As part of its “Mini Holland” project, the London Borough of Waltham Forest has been utilising large filtering schemes within areas bounded by main roads – the areas are known as “villages” [4]. The Mini Holland is a far reaching project, but at its heart is a desire to enable active travel around the borough through infrastructural change.

The first filtering scheme around Walthamstow Village has shown encouraging results which appear to show traffic evaporation [5];

- 56% traffic reduction on 12 key roads within,
- 16% reduction including boundary main roads,
- Slight increase on two boundary roads,
- 10,000 fewer vehicles using the area per day,
- Early indication of casualty-reduction.



Orford Road, Walthamstow Village, London

Walthamstow Village is centred around Orford Road which is a local shopping street in the heart of the “village”. The street is one-way for cycling and one-way for driving, including a local bus route (using small vehicles). Apart from the buses (and emergency vehicles), motor traffic is banned between 10am and 10pm (7 days a week).

The adjacent Eden Road has been closed to motor traffic and a modest public square has been created. The wider area contains a variety of filters, many with extensive planting and boundary roads have been treated as part of the wider programme with cycle tracks and continuous footways.



Walthamstow Village Square.

Eden Road (to the right) was closed to motor traffic at the junction with Orford Road and the space re-purposed.

5.0 Legislation

5.1 Overview

The general UK approach is that “Acts” (of Parliament) create the framework for more detailed legislation. Acts are therefore known as “primary legislation”. The detail is usual contained within Regulations which are known as “secondary legislation”.

5.2 Road Traffic Regulation Act 1984

For filtered permeability, the Road Traffic Regulation Act 1984 [6] is an important piece of primary legislation which enables highway authorities to lawfully restrict and manage traffic (in its widest sense). Sections 1 to 8 are key;

Section 1 – Traffic Regulation Orders (TROs) outside Greater London

(1)(c) for facilitating the passage on the road or any other road of any class of traffic (including pedestrians), or

(1)(d) for preventing the use of the road by vehicular traffic of a kind which, or its use by vehicular traffic in a manner which, is unsuitable having regard to the existing character of the road or adjoining property

Section 2 – What a traffic order may provide.

Section 3 – Restrictions on traffic regulation orders. Section 4 – Provisions supplementary to ss. 2 and 3. Section 5 – Contravention of a traffic regulation order.

Sections 6 to 8, apply in Greater London.

Section 6 – Orders similar to traffic regulation orders (called Traffic Management Orders – TMOs); Same as 1(a) to (g) as Section 1 with matters addressed as set out in Schedule 1.

Section 7 – Supplementary provisions as to orders under s. 6. Section 8 – Contravention of order under s. 6

In other words this all sets out what we can do, what we can't do (quite specific on pedestrian and premises access, unless the are proper reasons), the use of traffic signs/ permits etc and contravention being an offence.

5.3 Permanent scheme process

Traffic orders are necessarily bureaucratic in order to ensure people are given an option to object. If we are being absolutely purist, it is only written objections which need to be considered. The general process is as follows.

- Consult with those required by law depending on type of restriction (e.g. emergency services, bus operator etc.),
- Publish notice in local newspaper (London Gazette in London for some matters),
- Provide “adequate” publicity such as site notices, letters to those affected, consultation websites/ surveys (depends on type of scheme, local policy etc.),
- Provide access to documents held “on deposit” until 6 weeks after order made (at principal offices),

- Legal minimum for advertisement 21 days,
- Formal authority decision – could be committee, executive member, delegation to senior staff member (depends on constitution) and only written objections need to be considered,
- Could hold a public inquiry (some proposals where objections not withdrawn could trigger this),
- Decision within 2-years of initial notice,
- Order “made” and “sealed” and “notice of making” advertised within 14 days and objectors informed,
- Traffic signs to be in place before order is made.

It's a lot to remember and so it's worth taking proper advice and to set out a formal plan in advance to nothing is missed.

5.4 Experimental scheme process

Back to the Road Traffic Regulation Act. Section 9 to 11 deals with experimental traffic schemes. Section 9 – Experimental traffic orders (general arrangements). Section 10 – Supplementary provisions. Section 11 – Contravention of an ETO (i.e. an offence). Sections 12 and 13 related to Greater London but were repealed by Greater London Authority Act 1999.

The differences with an ETO as compared to a permanent TO is that there is no statutory requirement to consult before a scheme comes

into force. It is an experimental process designed to allow a scheme to be tried before a decision is made on whether or not it should be made permanent.

Generally an experimental scheme cannot come into force until 7 days after the order is made; there is a 6-month “objection period” from order coming into force; and the decision to make the order permanent is to be within 18-months of it coming into force.



Cedar Road, Romford. Experimental closure to motor traffic using Legato [7] concrete blocks, and a removal bollard with a fire brigade padlock.

5.5 Temporary schemes

It's also worth mentioning that under Section 14 of the Road Traffic Regulation Act, temporary schemes are permitted which can include filtering, although this is only for temporary situations which would have an end date (usually within 18-months, but sometimes longer). For most situations, we are interested in either a permanent scheme or an

experimental scheme which leads to a permanent scheme.



*Tooley Street, Borough.
Temporary contraflow cycle lane, protected with traffic cylinders.*

5.6 Secondary legislation

The Local Authorities' Traffic Orders (Procedure) (England and Wales) Regulations 1996 and The Local Authorities' Traffic Orders (Procedure) (Scotland) Regulations 1999 both set out the procedures for dealing with the traffic order process.

Both have been updated by amendments as other legislation came into effect, but essentially sets out legal minimum required for advertisement and consultation processes, including "statutory consultees". Northern Ireland uses "Statutory Rules" enabled by other primary legislation.

The Traffic Signs Regulations & General Directions 2016 [8] deals with traffic signs; many filtered permeability schemes require

certain traffic signs to make a traffic order enforceable. We also have the Traffic Signs Manual (actually a series of manuals) which explains how signs (including road markings) should be used.



A pedestrian zone with the "no motor vehicles" sign actually permits cycling. Here, two-way for cycling, one-way for motors.

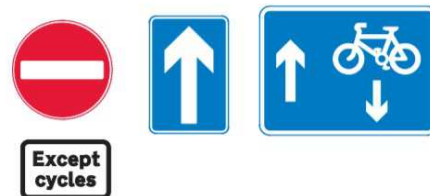
6.0 Traffic signs

6.1 Overview

As explained in the previous section, traffic signs are required to enforce certain aspects of filtered permeability schemes. Highway authorities have powers to install traffic signs and they should be used in accordance with The Traffic Signs Regulations & General Directions 2016.

6.2 Sign types

The most important signs for filtered permeability schemes will be the regulatory type. These signs are mostly circular and can be used to show banned turns or other movements, restrict vehicles by class (and restrict pedestrians) or show permitted movements or vehicles by class. There are also rectangular one-way signs and variants to show that two-way cycling is permitted.



No entry/ one-way, contraflow cycling (no entry sub plate for contraflow)



Banned turns (can exempt cycles)



No through road for motor vehicles

Traffic signs, continued. All from The Traffic Signs Regulations and General Directions 2016.



Granby Street, Leicester.

Entry into contraflow cycle lane.



Pedestrian & cycle zone



Vehicle class restriction (no vehicles, no motors, weight limit)



Height/ width



Routes for certain classes

Examples of traffic signs which might be used in conjunction with filtered permeability schemes.

7.0 Design considerations

7.1 Overview

This is down to who or which class of vehicles we wish to remove, restrict or manage. There are many combinations and options for restriction or management such as;

- Removal of all vehicles (including cycles),
- Removal of all motor vehicles,
- Restriction of motor vehicles allowing buses, taxis, public service vehicles, “authorised vehicles” etc.
- Restriction of certain vehicles by time of day, day of week etc,
- Restriction of heavy vehicles or vehicles over a certain width,
- Restriction of vehicles by class,
- Prohibition of pedestrians (tunnels, bridges).

7.2 Objective of filtered permeability

Filtered permeability is often (but not exclusively) about protecting and enabling active travel. In setting objectives, we need to be considering who we wish to protect or enable;

- People walking/ using mobility scooters/ wheelchairs,
- People cycling/ using mobility scooters,
- Residential areas – those living or actively travelling through,
- Shopping areas – nice environment for shoppers,

- Schools – reducing motor traffic on school run.

Road danger reduction and environmental issues (air and noise pollution) often feature prominently in the objectives of filtered permeability schemes.

7.3 Key design aspects

A key aspect of design is to use configurations which maintain and improve accessibility for people walking, cycling and using mobility scooters/ wheelchairs and cycles as mobility aids. We also need to be concerned with maintenance and servicing.

In terms of physical layout issues, we need to ensure there is clear space between any filtering features (e.g. bollards), no tight or awkward turns and that cross falls and gradients are gentle. This is important in order to ensure features are accessible to people walking, cycling and using mobility scooters/ wheelchairs.

In terms of safety, we should ensure that there is clear visibility through filters. This is important both in terms of people being able to see each other from safety point of view, but also for the reason of social safety where people may be afraid to use a feature for fear of crime. This extends to layouts being clear and legible so that users understand how they should pass through and also those who should not. Layouts should have forgiving features in case of collision and conspicuity both night and day are important.

Street Lighting



Cycle Lights



Camera Flash



Road markings guide people cycling through this filter which is easily seen at night. The bollards are forgiving in the event anyone hits them.

Where filters are being deployed in areas where on-street parking takes place, care should be taken to ensure there is a low likelihood of blockages created by parked vehicles. This is important for those walking and especially cycling through, but also for buses and emergency use where required. The best layouts are self-enforcing, but in some cases, parking controls will be needed.

From time to time filters will need maintenance work. This could be routine sweeping, cyclical drainage cleansing, grounds maintenance works and so on. Some mechanical plant will fit through/ along filters, but some might require removable bollards or gates for access which may also be suitable to provide emergency and servicing access (which is covered later).



Tavistock Place, Camden.

There are many types of plant available for maintenance work. Here, a mechanical sweeper is being used to clean a one-way cycle track – there is another one-way track on the other side of the street. The street is one-way for motor traffic.

Finally the needs of utilities need consideration. Utilities have a statutory right to install, change and maintain their apparatus and so layouts should consider their access needs, especially if existing utility networks are impacted. Early discussion with providers is essential. In some cases, the filter may need to be removed to facilitate access if a road is closed elsewhere for street works.

8.0 Configurations

8.1 Overview

There are many types and combinations of features which can be deployed for a filtered permeability scheme with potentially three filter types within a spectrum;

- Heavy filters tend to be a complete block on (generally motor) vehicle access.
- Medium filters tend to allow some kind of vehicle access (generally emergency and service access).
- Light filters tend to use signage alone and allows access to some classes of vehicle (often loading/ servicing).

Filters can also be spacial or temporal; i.e. the use of space to provide filtering or filtering which operates at different times (usually part of a day).

The table on the right provides an idea of types of filter and the classification one might put them into, but of course the list isn't exhaustive and you might not agree with all of the classifications.

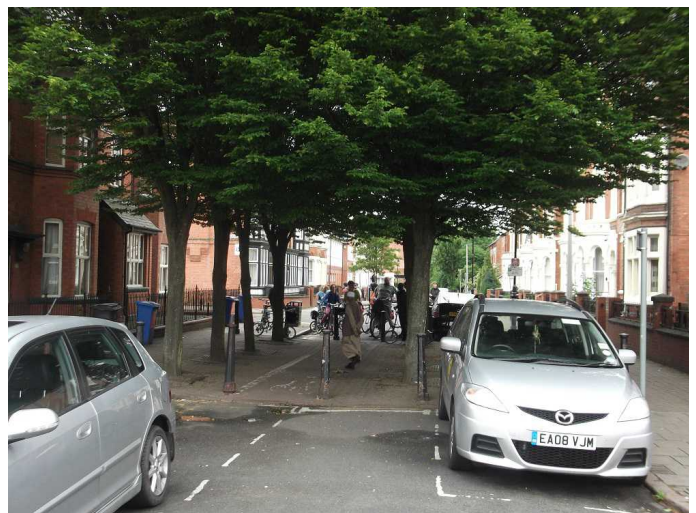
The next several sections will present a series of case studies with some description. Again, they are not exhaustive, but will give an idea of the kind of thing which can be done.

Types of modal filter		
Heavy	Medium	Light
Fixed bollards	Fire gate	Weight limit
Fixed barriers	Lockable bollard	Class limit
Physical obstructions	Collapsible bollard	Camera enforcement
Pedestrianisation	Rising bollard/ barrier	Long traffic through route
Height restriction	Over run area	Bus gate
	Bypass	
	Width restriction	
	One-way traffic	

Classification and types of filter

8.2 Upper Tichborne Street, Leicester

This is one filter within a much larger residential area where through-motor traffic has been removed. The filters include a mixture of fixed bollards and planting which create a series of cul-de-sacs with turning heads. Walking and cycling is permitted throughout.



Upper Tichbourne Street

8.3 Chaucer Drive, Bermondsey

This short walking and cycling link is part of a network of residential streets which have had filters for many years. Most recently, many were upgraded to form part of London's Cycling Quietway 1 between the South Bank and Greenwich.



Chaucer Drive

8.4 St. Philips Road, Cambridge

This residential area has been filtered using a network of one-way streets (for motor traffic) within which two-way cycling is permitted. Wherever there is a “no entry” for drivers, bypasses have been built for people cycling the other way. This is largely because of old Regulations not permitting “except cycles” to be applied to no entries and so a bypass was needed.

The bypasses have created space for planting, but many are narrow and some are not suitable for non-standard and adapted cycles.



St. Philips Road

8.5 Ross Street, Cambridge

Ross Street is part of the same system as St Philips Road, but usefully shows the traffic sign which should be used to show one-way driving with two-way cycling.



Ross Street

8.6 Copeland Road, Walthamstow

This filter is another Mini-Holland feature which uses bollards and timber planters. The area between the sections of street has been paved to create clear “ends” for drivers. The use of the double yellow lines assists with providing a visual reminder to drivers. The signs shown are remnants of the scheme's relatively quick

installation and probably need changing to exclude motorcycles.



Copeland Road

8.7 Highfield Gardens, Upminster

This filter prevented residential streets from being used by drivers to bypass a busy main road junction. For many years, it was a fire gate and bollard arrangement. As can be seen from the photo below, the filter did permit cycling, but it was certainly not accessible to all.



Highfield Gardens (before)

The filter was replaced with simple bollards and a footway build-out to reinforce the point that it was not for driving through and space was released for planting. The centre bollard can be

unlocked for fire brigade access.



Highfield Gardens (after)

8.8 Bolina Road, South Bermondsey

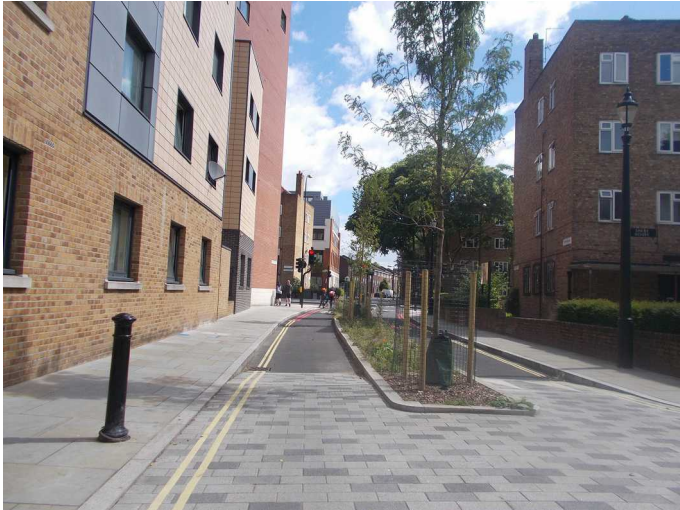
Bolina Road used to be an unkempt and dingy motor traffic cut through between a residential area and an industrial area (right next to the Millwall football ground). As part of a major scheme to increase railway capacity approaching London Bridge, the various railway structures were rebuilt in negotiation with the local council to leave a motor-traffic-free walking and cycling link.



Bolina Road

8.9 Globe Street, Borough

A slightly different take on the physical type of filter has been provided here. Another part of London's Quietway 1 has this side street ending at a set of traffic signals which provide a crossing over the A2 Great Dover Street to another filtered estate beyond.



Globe Road

8.10 Fairlands Way, Stevenage

The ultimate in filtering can be found in the New Town of Stevenage where there is a grade separated walking and cycling network. The good thing about Stevenage is that this network means that one can ride a long way without interacting with motor traffic.

Unfortunately, as the town is very spread out it takes a long time to get between places, plus the town centre has no cycling infrastructure to speak of.



Fairlands Way

9.0 Designing for cycling

9.1 Overview

One compelling reason for filtered permeability is to create quieter streets which are safe and comfortable for cycling along without any specific provision. Filtering is only part of the story, as there is international evidence and experience which shows that protection is also needed on main roads. However, from a design point of view, there are important considerations when designing for cycling which also have wider accessibility implications.

9.2 Key design considerations

Cycles need more than their footprint within which to operate. When being used, they have a dynamic envelope and because they are wheeled, sudden changes in level are not conducive for safety and comfort. Key points to remember are;

- Cycles are vehicles designed for speed,
- Cycles need space to slow down and turn,
- Cycles can have more than two-wheels,
- Huge variety in cycle configuration,
- Cycles can be mobility aids,
- People's mobility can change over time,
- Not everyone can dismount.

In reality these design considerations should be taken together when designing for cycling and where modal filters are being provided, they are absolutely crucial to ensure access for all. In

designing for all, the features are also likely to be helpful for mobility scooter users who also need space within which to move.

Of course, we should not forget people who are walking, as they will also benefit from clear space and easier to use filters, it is just that people need comparatively more space while cycling because of the dynamic envelope within which cycling takes place.

9.3 The design cycle

Not a clever process, this is literally a “standard vehicle” which can be used to represent all of the different configurations of cycles. The design cycle appears in Interim Advice Note (IAN) 195/16 Cycle Traffic & The Strategic Road Network [9] which forms part of the Design Manual for Roads & Bridges (DMRB).

Eventually it should be absorbed into the main manual. The DMRB is not mandatory for the non-strategic road network, but this IAN is very useful for defining a design cycle.

In essence, the IAN refers to three key points for a design cycle and is certainly worth a read;

- 2.8m long by 1.2m wide (standard cycle & trailer),
- Relationship between speed and forward visibility, visibility at junctions, stopping distances etc.,
- Crossfalls and gradients (maximum ramp lengths).

9.4 Real cycles

The concept of a design cycle is a little abstract and so it is helpful to show some contrasting configurations so we can understand that people might be using different types of cycle and they may also have specific needs from the infrastructure. There of course all sorts of other types of cycle with tandems, tricycles, quad-cycles, trailers, and cargo-bikes. If you can imagine a type of cycle, the chances are it exists!



Below is a Christiania box-trike. The box portion pivots between the wheels and although slow turns are recommended, it still needs quite a bit of space within which to manoeuvre. Although the trailer makes the whole thing 3 metres long, it generally follows the cycle.



Next we have a hand cycle. In fact, this is a electric assist front wheel unit which attaches to the user's wheelchair to allow her to switch between cycling and using the wheelchair. Steering is at the front, but again, space to turn is needed. The user is also sat lower than is the case with a standard bicycle. This configuration also reminds us that not everyone is able to dismount, despite designers often expecting it.



This is a recumbent tricycle which has two wheels at the front, but there are those with two wheels at the back. This particular one has an electric assist and is used as a longer distance mobility aid. Also note that the rider is very low to the ground which affects rider visibility.

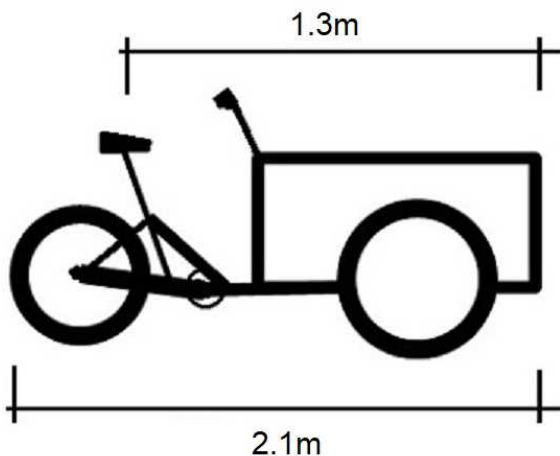


Cargo-bikes come in many configurations. This is an Omnium Cargo which is longer than a standard cycle, but still manoeuvrable.



You will note two other points from these examples;

- Riders might be at a lower level than one might expect (hand cycle, recumbent cycle),
- Riders might be sitting further back than one might expect (cargo cycle).



This impacts on what the rider is able to see in terms of looking through filters as they approach and pass through, especially if they are joining another road.

Of course, there are other considerations such

as the need to keep turns gentle (an inside radius of 4 metres is a useful minimum) and very importantly, there should be no chicanes, barriers or other convoluted arrangements. Sometimes barriers and chicanes are used to slow people cycling down or to prevent use by motorcycles. All these features really achieve is to frustrate and sometimes exclude people from cycling.

- Good modal filter designs will take the following into account;
- At least 1.5m clear space between bollards,
- Odd numbers of bollards used,
- Passively safe bollards,
- Allow full turns to be made before having to pass bollards,
- Physical bypasses to cater for design cycle,
- Good visibility to see other people walking and cycling.



Clear views within a grade-separated network. Stevenage.

10.0 Designing for servicing

10.1 Overview

Servicing is a necessary part of modern life, but sometimes the size and configuration of service vehicles can create design challenges. We're broadly interested in access for;

- Emergency vehicles (especially fire),
- Buses,
- Refuse collection,
- Deliveries,
- Works/ utilities,

10.2 Key design considerations

There are a number of things to consider when designing for servicing access within filtered permeability schemes;

- Emergency response times are often cited in objections to filtering schemes,
- Concerns may be perceived rather than real,
- Engagement with emergency services vital,
- Emergency drivers are trained to deal with traffic,
- What about the health and safety improvements which come from low traffic environments such as more people walking & cycling, reduced collisions?
- Bus routes often very difficult to get changed,
- Buses and fire engines need lots of space,
- Refuse trucks, fire engines and delivery

lorries are hard to turn round (design for forward gear),

- Utility and maintenance works can require road closures and diversions which may affect permanent filters which should be adaptable.

An interesting set of comments were made by the London Fire Brigade in response to a Freedom of Information request in connection with the Waltham Forest Mini-Holland scheme [9];

"I think it would be fair to say that road closures can cause delays to the arrival of LFB appliances at emergency incidents. Those closures would need to reflect the main traffic routes used by Brigade vehicles, and the extent of delay that might arise from the closure of minor (or side) roads, would depend on the numbers of incidents we expect to attend in the areas affected by the closure."

"Road closures are a frequently occurring feature of London's infrastructure and, so far, they have never caused a detrimental delay to our emergency response. We know from analysis that the cause of most delays in our response is the time it takes for people to call the Brigade. An analysis of fires shows that on nearly half of occasions it takes more than 10 minutes from the start of the fire for the Brigade to be called (and it taking us less than 6 minutes, on average, to arrive)."

In general terms, the emergency services will access a site through unfiltered streets because it is more straight-forward than stopping to unlock a gate or remove a bollard. However, if access to the emergency is blocked or additional resources are required, then the ability to open a filter is very useful. In common with many traffic management schemes, early engagement is vital.

10.3 Types of servicing-accessible filters

We can design features to assist with some access, but they all have pros and cons;

- Fire gates,
- Lockable bollards,
- Collapsible bollards,
- Over run areas,
- Sump breakers,
- Rising bollards,
- Camera enforcement,
- Fire paths.

Traffic orders can include exemptions for emergency vehicles, refuse collection etc. The issues will surround what we need to get into or

through a filtered area, when is access needed and how will it be controlled or managed.

The table at the bottom of the page is from Approved Document B – Part 1 of the Building Regulations [10]. It is useful from a modal filter design point of view as it gives useful dimensions for fire brigade access.

The photo below shows that as well as the vehicle width, fire appliances have equipment accessed from the sides which require space to open and for fire fighters to work around.



Fire appliance (London Fire Brigade) showing equipment access from the side of the vehicle.

Table 8 Typical fire and rescue service vehicle access route specification

Appliance type	Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
Pump	3.7	3.1	16.8	19.2	3.7	12.5
High reach	3.7	3.1	26.0	29.0	4.0	17.0

Notes:

1. Fire appliances are not standardised. Some fire and rescue services have appliances of greater weight or different size. In consultation with the Fire and Rescue Authority, the Building Control Body may adopt other dimensions in such circumstances.
2. Because the weight of high reach appliances is distributed over a number of axles, it is considered that their infrequent use of a carriageway or route designed to 12.5 tonnes should not cause damage. It would therefore be reasonable to design the roadbase to 12.5 tonnes, although structures such as bridges should have the full 17 tonnes capacity.

It is helpful to consider some examples of how servicing can be accommodated within filtered permeability schemes.

Fire gates have been used for decades and they are pretty simple, robust and conspicuous (but rarely attractive). The gap between the posts need to be at least 3.1 metres for fire appliance access. They are often used with bollards to stop people driving round them and as well as keeping a clear gap of 1.5 metres, it is important not to place them to the detriment of people walking.

Fire gates can be awkward for people to cycle past if enough space isn't left and parking needs to be kept away. They can be dangerous if left open in terms of people not seeing and then hitting the end of the gate and the universal padlocks are easily obtainable by the public which can lead to abuse.



*The Ridgeway, Romford.
Fire Gate.*

Lockable bollards provide a much better opportunity to create permeability for cycling than fire gates. They are still secured with universal padlocks which makes them open to abuse. Care is also needed to ensure that they are conspicuous to all highway users otherwise they risk being damaged by motor vehicles or presenting a safety risk to people cycling and even passing through on a motorcycle (whether or not it is permitted or tolerated).

It is helpful to use road markings to guide people cycling to the right place to avoid clipping the bollards. Both fire gates and lockable bollards are quite flexible if utility works close a street and an alternative route is needed, so such a provision is normally written into the traffic order.



*Queens Park Road, Romford.
Lockable bollard (centre).*

Collapsible bollards have the same advantages as lockable bollards for cycling, but they are also passively safer than steel bollards in the event of a collision. For emergency access, an emergency vehicle (generally fire appliances, but also ambulances) can be driven over them with care.



*Park End Road, Romford.
Collapsible bollard.*

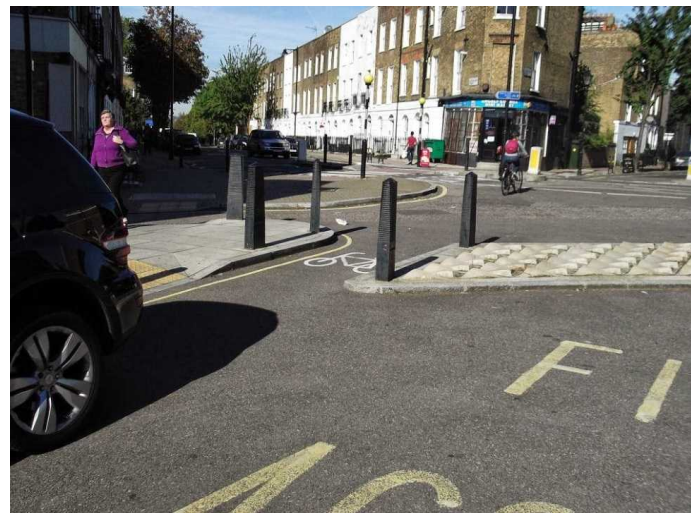
The photo above shows a Glasdon Advanced Neopolitan bollard [11] being driven over slowly (other products are available). Once the vehicle has passed, it self-rights and regains its shape. Unauthorised people may try and drive through, so the use of the “no motor vehicles” sign and traffic enforcement might assist.



General view of the layout.

One downside to using bollards is that they don't discourage motorcycle access if they are properly designed to enable cycling. The solution has to either be traffic enforcement which would require the use of a “no motor vehicles” traffic sign or perhaps pragmatically allow motorcycle access. Unlicensed riding would be a matter for the police.

In some cases, there may be a real need for unobstructed emergency access that a gate or bollard would be unsuitable. A raised over-run area can be used to discourage/ prevent access by cars, but accessible for fire appliances and ambulances. In fact, if the traffic order is correctly worded, then refuse and other service vehicles can be given access which might prevent the need for reversing in some situations.



*Cloudesley Road, Islington.
Over-run area.*

Sump breakers are access points which can be used by large emergency vehicles, refuse trucks and other large service vehicles. The

wheels of larger vehicles straddle islands while smaller vehicles cannot pass. The nickname comes from oil sumps under smaller vehicles getting cracked by the features!



*Eric Street, Mile End.
Sump breaker.*

Rising bollards are sometimes used in pedestrianised town centres or high security areas to control access. They can be either controlled via an intercom or an electronic tag.



*High Street, Leicester.
Rising bollard access to a pedestrianised area.*

It is possible to just rely on traffic signs and then enforce filters using fixed or mobile CCTV cameras. The use of cameras can also reinforce some of the other techniques set out above.



*Oldchurch Rise, Romford.
Traffic signed bus gate with fixed CCTV enforcement cameras.*



*College Lane, Hatfield.
Rising bollard-controlled bus gate.*

Fire paths are in essence elongated filters, but they can provide important secondary access to an area if the main access is blocked or if resources need to be brought in from a different direction. If designed appropriately, they can also provide high quality traffic-free walking and cycling links!



Flame Tree Path, Romford.

Cycle track and footway between two residential areas. The cycle track has been designed as a fire path and is controlled with lockable bollards.



From the other end.

11.0 Added extras

11.1 Overview

We have been through the legal, design and practical considerations of designing filtered permeability features, but it is true to say that some installations are not always attractive.

Filtering might be the primary objective, but there is plenty we can do in reclaiming the space which is often released;

- Planting and landscaping,
- Public space,
- Streets for people,
- Cycle parking,
- Seating,
- Incidental play,
- Rain gardens/ SUDS

In some cases, the filtered permeability is just a small part of a larger piece of urban street renewable, but it at it's heart is about removing through-motor traffic and returning streets to active travel.

11.2 Planting and landscaping

The removal of through motor-traffic often yields highway space which is no longer needed to accommodate motor traffic and this can be “de-paved” and re-purposed for planting and landscaping. Whether it's space for a new tree or a whole street being treated, there are opportunities to be had.



Van Gogh Walk in Lambeth is a street which has been transformed from a drab back-street mainly used for parking into a mini-park, complete with seating, planting and trees. There's even a basket ball hoop! Motor access is permitted on a part of the street, but only in one direction.

11.3 Civic space

Planting and landscaping is a great addition to a filtered permeability scheme, but in some cases, the space released can be used for a more formal, civic space. Such space can be used for public events and markets, or just be a quiet place for contemplation!



Walthamstow village square is space created at the end of Eden Road where it meets Orford Road.

11.4 Streets for people

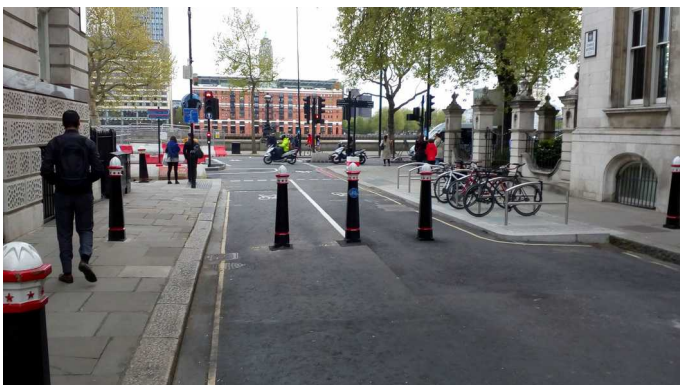
Where through motor-traffic is filtered out, there will often be the opportunity to re-purpose some of the tarmac for wider footways, pocket parks, cycle parking or seating. It will be context-specific of course, but highway space can be released to put things back to a human scale.



Exmouth Market, Clerkenwell. A one-way street where the carriageway is a minimum giving space which is being used in all sorts of ways.

11.5 Cycle parking

Where a filter is installed in a side road, the width needed for cycling and indeed emergency access will be less than two-way motor traffic and so some of the space can be turned over to cycle parking without taking from walking space.



Temple Avenue. City of London.

11.6 Seating

It's pretty straight-forward, but seating is useful for people making local walking trips where they might wish to rest for a few minutes or where they can watch the world go by.



West Avenue, Walthamstow. This railway bridge is essentially a large modal filter which was closed to motor traffic because of structural issues. It's now a place to sit and think as well as walk and cycle through.

11.7 Incidental play

If there is something for kids to climb on or hide behind, they'll find it. A filtered permeability scheme doesn't have to build in play equipment (it could), but stepping stones, planks to walk along or even boulders are useful additions.



Van Gogh Walk, Lambeth. These little bollards form part of the landscaping and being numbered, they create a little street game.



West Avenue, Walthamstow. More numbered bollards!

11.8 Rain gardens/ SUDS

Even a modest space can be transformed with planting, but even that can be improved by

designing the planting to deal with surface water run-off in terms of slowing the flow and using appropriate the planting to biologically treat the water.



This huge SUDS scheme at Australia Road [12], White City, reconnected two parts of a school which was bisected by a road used as a motor traffic cut through. A fire gate has been installed at one end and the other end with an "except access" motor traffic restriction at the other to allow staff access to the school car park and for deliveries to be made. There are a series of wetland basins with permeable paving feeding them which can then overflow into the local sewer system if required.

12.0 Final thoughts

12.1 Not the whole solution

Filtered permeability alone is not going to rebalance streets for active travel and it must be borne in mind that the techniques set out in this document are only part of the story.

Filtered permeability can deal with residential and local streets, but on main roads, high streets and boulevards, active travel needs decent protected space for walking and cycling.

12.2 The future

Autonomous Vehicles (AVs) are being held up as the future of transport which is an entire subject in its own right. However, in theory, having vehicles under connected control will mean that it should be possible to use “virtual filters”; that is instead of physical measures on our streets the mapping and GPS systems which are part of AV systems mean that traffic or classes of traffic can be restricted on the maps they rely on. This could be a real advantage to locations where private car access isn't wanted, but emergency, bus or servicing access could continue unimpeded.

However, this would only truly work where all vehicles are AV and this aspect of the future is far from certain. For the foreseeable future, we are likely to need the techniques set out in this guide and certainly, a virtual filter doesn't necessarily free up street space for people oriented re-purposing!

12.3 Change is difficult

The UK has taken generations to develop highway networks which prioritise moving motor-traffic and there are many people who want the status-quo to persist.

In putting the case for filtered permeability, we must be sensitive to people's concerns that they may be losing a perceived right to drive where they wish and therefore it is important to explain the wider benefits and to build community buy-in.

People like safe and peaceful streets and so where filtered permeability has been successfully deployed, people will soon “own” the new layouts and in general, people don't want a return to the previous arrangements.

References

[1]
www.tcpa.org.uk/eco-towns-advice-worksheets

[2]
www.gov.uk/government/statistics/national-travel-survey-2015

[3]
www.landor.co.uk/downloads/cairns%20hass-klau-goodwin-1998.pdf

[4]
www.enjoywalthamforest.co.uk/about-mini-holland/

[5]
www.h2020-flow.eu/news/news-detail/the-mini-holland-scheme-in-east-london-traffic-evaporation-and-more-space-for-cyclists/

[6]
www.legislation.gov.uk/ukpga/1984/27/contents

[7]
www.eliteprecast.co.uk/interlocking-precast-concrete-blocks/legato-interlocking-concrete-blocks/

[8]
www.legislation.gov.uk/uksi/2016/362/contents/made

[9]
www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian195.pdf

[10]
www.planningportal.co.uk/info/200135/approved_documents

[11]
<https://uk.glasdon.com/advanced-neopolitan-tm-150-bollard>

[12]
www.robertbrayassociates.co.uk/projects/australia-road/

Useful resources

Unravelling traffic modes

<https://bicycledutch.wordpress.com/2012/11/29/unravelling-modes/>

Design guidance

<http://www.enjoywalthamforest.co.uk/wp-content/uploads/2015/01/Waltham-Forest-Mini-Holland-Design-Guide.pdf>

<https://nacto.org/publication/urban-bikeway-design-guide/bicycle-boulevards/green-infrastructure/>



Designing for active urban travel
www.cityinfinity.co.uk

[@CityInfinityUK](https://twitter.com/CityInfinityUK)

contact@cityinfinity.co.uk