

The Interface Between Highways and Greenways

Introduction

Greenways are traffic-free routes that usually follow disused railways, canal towpaths, green lanes and forest roads. They offer an attractive and memorable experience for a wide range of users, including cyclists and pedestrians.

The start and finish of greenways should be easy to follow and pleasant to use. Creating them often requires a partnership between public and non-public bodies. It is easy for a lack of communication and/or that of the application of a detailed technical knowledge to adversely affect the design of these junctions.

This note aims to provide a menu of good design practice. It is aimed at all those involved in the implementation of greenways – planners, design and maintenance engineers, and consultants, including those who are working on behalf of developers.

The Interface

The interface between greenways and roads is most important in ensuring a safe and smooth transition. Flush dropped kerbs, good surfacing, adequate drainage and appropriate markings are not expensive to get right, but are often not given sufficient attention at the design and installation stage.

Where greenways meet roads, it is often necessary to drop the level of the path to that of the road. Ideally this should be done using a ramp with a desirable maximum gradient of 5% (1:20) where there is sufficient space, or 8% (1:12) as an absolute maximum. Gradients steeper than this cause problems for wheelchair users and can be uncomfortable for cyclists.

Dropped crossings

Cycle facilities, including greenways, often continue to be implemented without flush kerbs at the junction between path and road, resulting in an uncomfortable and possibly dangerous transition.

Highway designers often cite drainage problems as a reason for not specifying flush kerbs where cycle tracks or greenways meet roads. A survey of existing drainage should be carried out as part of the design process, including consideration of worst-case rainfall, while a level survey and localised reconstruction can ensure that water drains adequately. The extra cost of this work is usually minimal in relation to the overall scheme cost, and the resulting smooth transition more than justifies the extra effort.

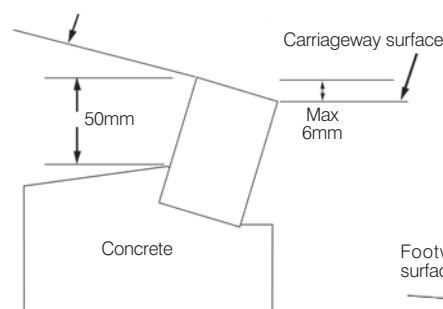


An uncontrolled greenway crossing of a road, National Route 3, Eden Valley

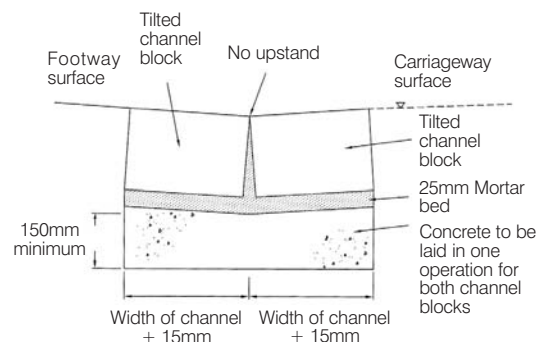


Flush kerb detail at a Toucan crossing

Footway surface
Kerb laid upside down and if necessary at gradient to assist drainage
Carriageway surface



Flush crossing (6mm drainage check)



Flush crossing (no upstand)

Sustrans is the UK's leading sustainable transport charity and works on practical projects to encourage people to walk, cycle and use public transport to benefit health and the environment.

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Future maintenance is also a consideration. Surface dressing is often applied to road surfaces, particularly in rural areas, to protect the road structure and improve skidding resistance. If it is laid right up to a flush dropped kerb, this can again lead to ponding of water. A 100mm-wide channel should therefore be left between the edge of the kerblines and the start of the surface dressing treatment.

Drainage gullies at crossing points should be avoided. If there is no option other than to provide a gully at a crossing point, then the grate design should be sympathetic to the needs of cyclists and wheelchair users. It should also be installed absolutely flush with the road surface.

Depending upon the specific type of drainage system employed, it may be necessary to lay the dropped kerbs at a gradient to ensure water continues to flow past the crossing, rather than into it. Again, careful design and adequate supervision of works at the construction stage is required. Two design options for flush crossings are provided, the type used being determined by the existing drainage conditions.

Signing

Clear signing of cycling and walking routes, including key destinations and distances, is essential if we are to encourage more people to use them. Continuity is particularly important when the nature of the route changes, for example where a greenway joins a road. Direction signs confirming the route should be used to provide reassurance to path users that they are taking the correct route, without having to consult a map (see photo).

Relevant 'cycle route ahead' warning signs should be provided on the highway approaches to greenway crossings (not controlled by traffic signals), in accordance with diagrams 950 and 950.1 as detailed in the Traffic Signs Manual ⁽¹³⁾. Coloured surfacing across the road at the point where the greenway crosses can help to highlight the presence of the crossing to approaching vehicles,

although care should be taken that this does not suggest priority to the path users, particularly on higher speed roads (40mph limit or more). Direction signing can also help to draw motorists' attention to an approaching greenway access, as well as advertising the greenway route to potential users.

It may be necessary to provide advanced warning signs for greenway users where the route approaches a busy road on a downward gradient, or where the road is located soon after a sharp bend. Signs incorporating both warning and route information can be useful in these circumstances.

Sustrans Information Sheet FF26 (Direction Signing on the NCN) deals with signing issues on cycle routes in more detail.

Speed Reduction

Measures to reduce traffic speeds at points where greenways meet highways can remove the need for a formal crossing, or may affect the type of crossing required. In all cases, low vehicle speeds on the approach to a greenway crossing are desirable for both the comfort and safety of path users. Many of the techniques available for general traffic calming in rural areas are equally applicable to crossing points. Specific features such as signing, road markings, speed limit reductions and coloured surfacing can all be employed on the immediate highway approach to greenway crossing points. Sustrans Information Sheet FF38 (Rural Minor Road Traffic Calming) deals with this issue in more detail ⁽¹⁴⁾.



Direction signing on a greenway, National Route 4, Machen



Advanced direction sign on the highway approach to a National Cycle Network route, Diag. 2105.1 (1)



Sign used on off-road sections of Hadrian's Cycleway (National Route 72), warning of the need to give way at a junction

Barriers, Bollards and Chicanes

There should be a presumption against the use of any access barriers on greenways because of the difficulties they can cause for users. However, on the immediate approach to a highway, the speed of cyclists may have to be controlled where the greenway has a downward gradient, where visibility is restricted or where the road to be crossed has heavy traffic flows or high speeds.

Simple bollards with 1.2m clear space between may be enough to restrict cyclists' speeds sufficiently, and these offer the least difficulty for cyclists and wheelchair users. Staggered barriers can be introduced to provide a chicane effect, constructed from materials which are sympathetic to the local environment. Again, there should be 1.2m clear space between barriers. The use of natural materials and colours may be appropriate for greenways in rural locations, and there may also be an opportunity to incorporate artwork into the barriers. More urban settings with higher use may require brighter colours (typically yellow) or a well-defined colour contrast to help the partially sighted.

It should be remembered that cyclists may not be inclined to use routes that add to their journey time or repeatedly require them to slow down or dismount. Similarly those with tandems, panniers etc. can find chicanes difficult, and chicanes with too tight a layout may prevent disabled users with electric buggies from accessing the greenway. Two suitable chicane designs to reduce cyclists' speed on the approach to road junctions are shown. These layouts were developed using a variety of different types of cycle and involved disabled groups to ensure reasonable access by all potential users.

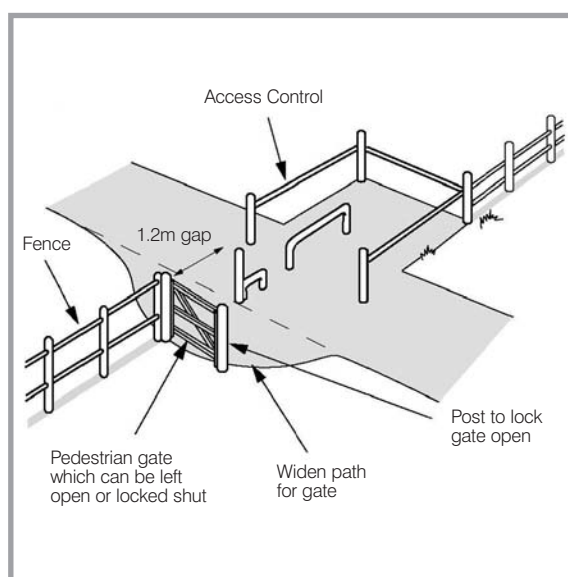
One advantage of providing such chicanes or bollards at greenway/highway junctions is that they prevent illegal access by cars, vans and 4x4 vehicles. Preventing illegal access to greenways by motorcycles is a difficult issue. The layouts depicted may deter motorcycles

but will not prevent them, as illegitimate off road motorcyclists are often determined to get past barriers. An attractive, barrier-free route, which is well used by pedestrians and cyclists, is the best deterrent against illegal motorcycle use.

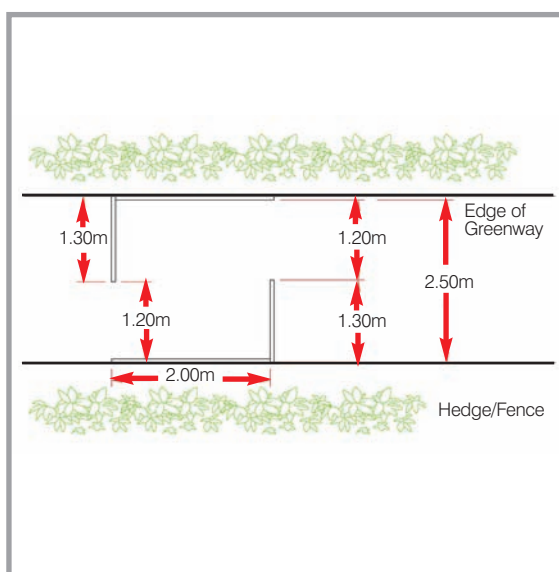
In all cases where barriers are being considered, consultation with local user and disability groups over the type and method of access control is recommended. This issue is dealt with in more detail in the Sustrans Information Sheet FF22 'Access Controls' ⁽²⁾.



Effective chicane incorporating artwork to reduce cyclist speeds approaching a road crossing, National Route 15, Nottingham to Skegness



York style barrier with bypass gate



Standard chicane

Crossing The Highway

Any break in a greenway has the potential to deter use given the inconvenience and danger (perceived or actual) involved in having to cross the road. Former railway lines often have bridges remaining intact, and at these locations new access points to the greenway are particularly useful. Realistically, however, there will always be the need to join or to cross roads at some point.

The responsibility for provision of crossing facilities rests with the relevant highway authority. The assessment of the appropriate form of crossing depends on a number of factors, including the level and speed of traffic on the road and the likely number of pedestrians and cyclists crossing. A methodology for assessing road-crossing sites can be found in Local Transport Note 1/95⁽³⁾. This methodology must be used and the highest level of provision made in line with the results of the assessment. However, the following table of speed/flow criteria is a useful guide to help determine the appropriate type of crossing, prior to following the full LTN1/95 procedure:

Uncontrolled crossings

These include: a) conventional 'give way' junctions at the normal level of the road; b) raised crossing points, providing a level surface for cyclists and pedestrians crossing the road; and c) central refuge islands.

a) Conventional 'give way' junctions

With this arrangement, care must be taken to ensure that cyclists approaching the crossing point have adequate warning of any requirement to give way. This need not always be in the form of 'give way' signs, but could involve careful use of bollards and similar features. Sufficient forward visibility of the road on the approach from the greenway is also important to prevent cyclists suddenly emerging on to a road. The application of a contrasting coloured surfacing material or rumble strips on the greenway approach to a road should be considered to warn cyclists of the crossing.

The approach to a crossing point should incorporate an adequate visibility splay to ensure cyclists are able to be seen and to see both the road and any approaching traffic clearly. Splays should be kept free



A Toucan crossing where a greenway crosses a busy road, National Route 1, Fakenham



Rumble strips on the greenway approach to a road

Crossing Facility	85 %ile Speed mph	Vehicle flow 2-way VPD
Cycle Track Priority Crossing	< 30	< 4000
Cycles Give Way to Cars	< 50	< 6000
Cycles Give way to Cars (with Central Refuge)	< 50	< 8000
Signal Control	< 60* rural	< 10000 rural
Grade Separated	> 50	> 8000
	> 60* rural	> 10000 rural

**The criteria have been extended for rural areas where the provision of signal control is likely to be unacceptable, and where grade separated crossings may also be problematic, such as in Areas of Outstanding Natural Beauty or National Parks*

Cyclists should not be required to dismount in order to cross roads, as signs will be largely ignored and will devalue the greenway facility. 'Give way' signs should be avoided on rural greenways except at locations that are heavily trafficked, have restricted visibility or a particularly sharp downhill approach; however, 'give way' markings should be used. Greenways should be designed to approach roads at or near 90 degrees to ensure maximum inter-visibility between drivers and cyclists.

from high or fast growing vegetation that will cause a barrier to visibility. The extent of the required visibility splay is dependent upon the speed and volume of road traffic; the relevant recommended dimensions for splays can be found in refs 4 & 5. If these visibility requirements cannot be achieved, the alternative is to use the full range of markings and signs available to make clear the need for cyclists to slow down and give way.

'Give way' markings to Diagram 1023 (see ref 1) as shown should be considered where road traffic is heavy or fast. If the road to be crossed also has a footway adjacent to it, the markings should be placed at the back of the footway to indicate that cyclists should give way to pedestrians.

b) Raised crossing points

This arrangement involves the construction of a flat-top road hump or 'speed table' across the full width of the road, a design that has a number of advantages from the point of view of greenway users. Firstly, it provides a level running surface for cyclists and wheelchair users, without the need to drop down to road level and then climb back up the other side. Secondly, it highlights the presence of the greenway to road traffic and draws drivers' attention to the fact that pedestrians and cyclists may be crossing. The raised areas can be coloured, to further draw drivers' attention to the crossing point; pigmented tarmac can be used, or a coloured anti-skid surfacing applied over an asphalt hump. Thirdly, the crossing point itself acts as a self-enforcing traffic calming device. All raised crossings or humps on the public highway must comply with the Highways (Road Humps) Regulations 1996 and Traffic Calming Regulations 1993 (see 6 & 7). The emergency services and local bus operators should be consulted in all cases.

c) Central refuge islands

These can be installed in the centre of the road where a greenway crosses a highway to protect cyclists, wheelchair users, or those with prams/pushchairs and allow them to cross in two stages. Refuge islands can also protect cyclists from traffic whilst they carry out a right turn to join the greenway. Care should be taken to ensure any islands are wide enough to provide adequate shelter from passing traffic without one end of a cycle having to overhang into the road. The preferred minimum width is 2m, with 1.8m as an absolute minimum. They should also be long enough (in the direction of traffic) to fit a family of cyclists. 4m is ideal; 2.5m is the absolute minimum. Flush kerbs should be provided at both sides of the crossing, and in the centre if applicable, although it is best if the gap in the island remains as carriageway.

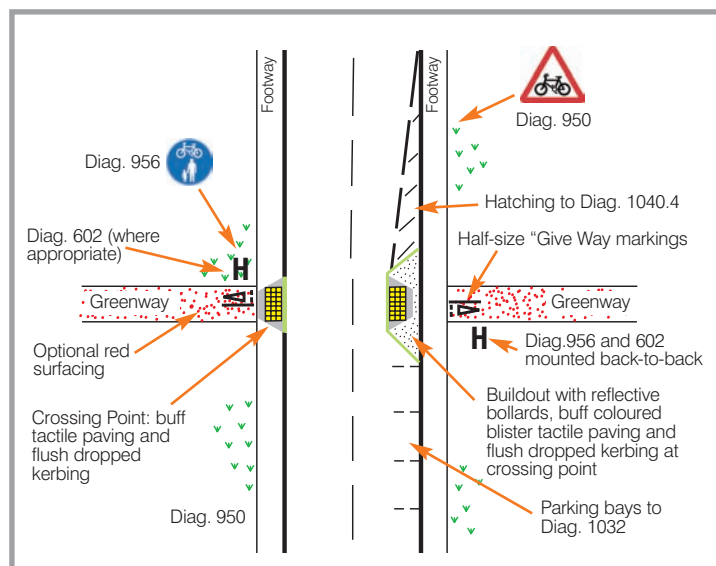
Consideration must be given to the effect that the installation of refuge islands has on cyclists riding on the road. Unless sufficient carriageway lane width is retained, islands can act as pinch points making cyclists feel 'squeezed' by motor vehicles overtaking them. Options include localised road widening, cycle bypasses or the introduction of cycle lanes on the road. With localised widening, care must be taken to ensure it is carried out over a sufficient length to avoid sharp deviations for cyclists. Similarly, cycle bypasses should have smooth transitions back into



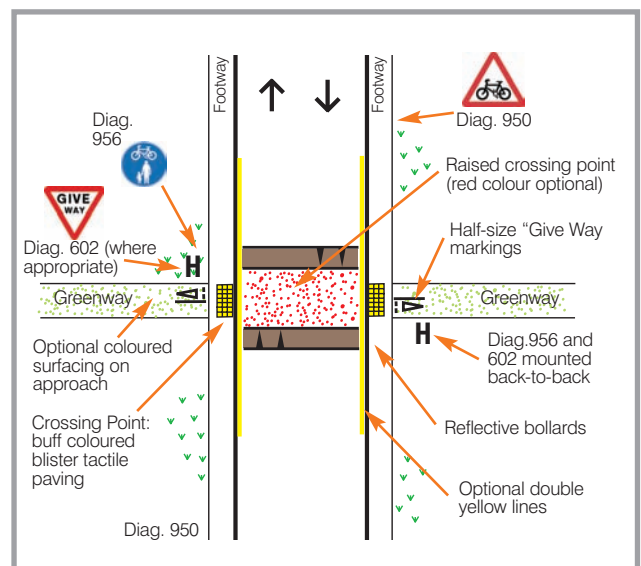
Cycle route crossing of a minor road, with buildout and priority working for vehicles, National Route 65, Hull



Raised crossing point where a greenway crosses a road, National Route 65, Hull to Hornsea



Suggested layout for a conventional 'give way' crossing (buildout optional)



Suggested layout for a flush crossing (priority to the road)

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the main carriageway and should not require cyclists to give way. Traffic calming features that reduce vehicle speeds such as road humps or speed cushions can help improve conditions for cyclists in the vicinity of islands. For further guidance on this issue, see ref 8.

Greenway priority crossings

If two-way traffic flows on the road to be crossed are below 4000 vehicles per day and average speeds are below 30mph, then consideration should be given to according priority to cyclists on the greenway. This may be possible with both conventional (at grade) and raised uncontrolled crossings, although ideally a crossing that is raised, and within a 20mph speed limit zone, is better. Priority can be afforded to the greenway by the use of appropriate 'give way' markings on the carriageway, and coloured surfacing applied to emphasise the priority. Care needs to be taken if there are other similar crossings of the highway in close proximity which retain priority to the road, to ensure there is no confusion as to who has priority at which crossing points. Clear 'give way' signing and road marking for vehicular traffic in accordance with TSRGD 2002 is necessary in all cases ⁽¹⁾.

Formal crossings

It is unlikely that cyclists will be able to safely cross single carriageway roads with

2-way traffic flows above 1000 vehicles per hour without some form of formal crossing. There are a number of options for controlled crossings where greenways cross roads as follows:

a) Parallel crossing

This is a segregated pedestrian/cycle crossing and may be of use at locations where there are high pedestrian and cycle crossing flows that are likely to conflict with each other. The shared use Toucan crossing has tended to be used instead due to its added flexibility, and because it requires less signalling equipment and takes up less space.

b) Toucan crossing

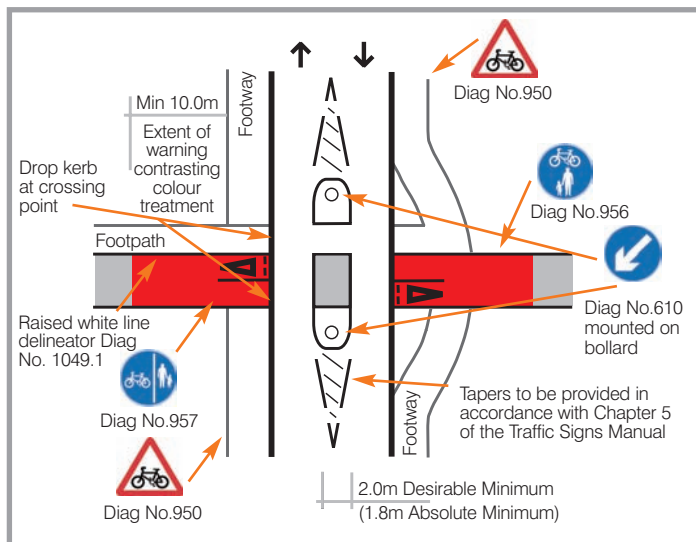
This is an unsegregated signal controlled crossing for cyclists and pedestrians. The Toucan enables cyclists to cross without dismounting and can help with route continuity where a greenway has to cross a busy road. Cyclists and pedestrians on the approaches may be segregated right up to the kerb line, but on greenways it is more usual to continue shared use (without segregation) up to the waiting areas. It is important that there is enough width on the approaches and on the crossing itself to minimise the potential for conflict between users. Toucans can be up to 10m wide and can therefore accommodate large numbers of pedestrians and cyclists. In most cases where a formal signalled crossing is required on a greenway route, a Toucan



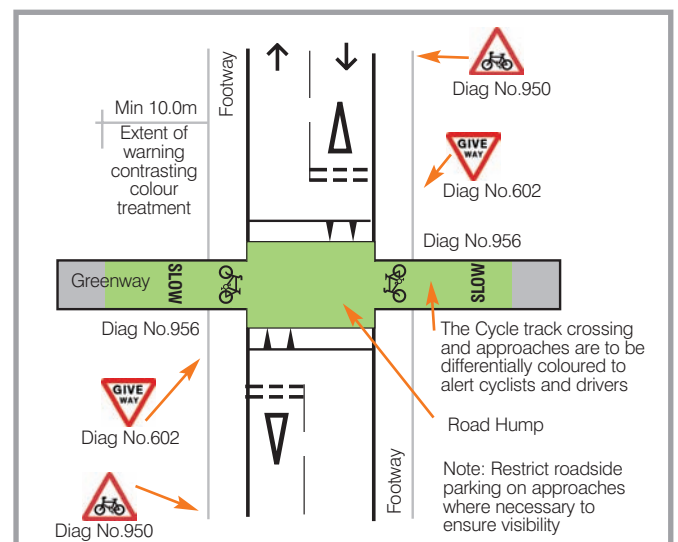
Central island crossing, National Route 1, Sittingbourne to Canterbury



Cycle priority crossing, Bath



General arrangement for central refuge island crossing



Typical layout for a greenway priority crossing

should be the preferred crossing type.

Other options for greenway crossings of roads include signalled cycle and pedestrian phases at traffic signal junctions, Pelican and Puffin (pedestrian) crossings, Pegasus (equestrian) crossings and Zebra crossings. The Parallel and Toucan crossing are the only types which cater specifically for cyclists and permit them to cross the road legally whilst still mounted. With all signal controlled crossings, it is important to ensure that sufficient time is allocated to greenway users to cross, and that they do not experience undue delay because of signal timings which favour traffic. Due consideration also needs to be given to the impact of signals on the landscape and vandalism/maintenance issues, particularly in rural locations.

c) Zebra crossing

Zebra crossings have been used successfully at locations where cycle routes cross roads, for example in Hull⁽⁹⁾. Here, a 4m wide Zebra crossing was installed where there was high demand to cross a busy road by both cyclists and pedestrians. A Zebra was chosen rather than a Toucan because there were other Zebra crossings in close proximity, and it was not considered good practice to 'mix and match' different types of crossings. Zebras are also considerably less expensive to install than Toucan crossings. The cycle tracks on both approaches to the Hull Zebra include a sharp deviation in the route to ensure cyclists cannot ride straight out onto the crossing. 'Cycle Dismount' signs had to be erected as cycling across Zebra crossings is still illegal (although they can be used in private developments which are off the public highway).

The Hull Zebra was installed in 2003, and preliminary research carried out since suggests that it is working well. A significant proportion of cyclists remain mounted, and vehicles give way to mounted cyclists in a similar way to pedestrians. It should be noted that Zebra crossings should not be installed on roads

with an 85th %ile speed of 35mph or above, and legally cyclists must dismount in order to use such crossings.

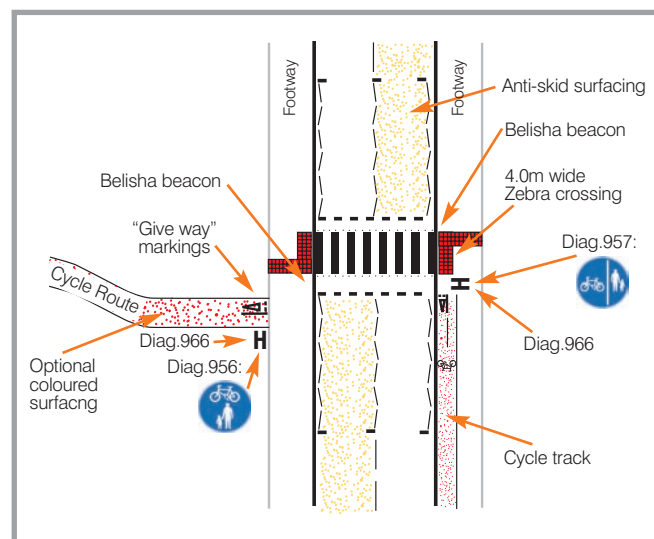
There are numerous sources of information on the assessment and design of all of the above types of crossings (see refs. 3, 10, 11 & 12).

Bridges and Underpasses

On high speed and heavily trafficked roads, full separation between cyclists and motor vehicles by a bridge or underpass will usually be the best option. Bridges and underpasses can provide a high quality, continuous route across or under a road which would otherwise be a serious deterrent to cycle or pedestrian use. Care must be taken to ensure gradients on ramps do not exceed 1 in 12. Greenway schemes should try to make use of existing infrastructure wherever possible. Though expensive, there may be potential for new bridges to be funded as part of new roads, road improvement schemes or new developments.



'Cycle Zebra', Hull



Layout of Hull 'Cycle Zebra' crossing

Other Issues to Consider

Safety Audit

The interface between greenways and highways can be a point of potential conflict between fast moving traffic and vulnerable road users. As such, safety should be a prime consideration in the selection and design of all interface and crossing points. Safety audit is a formal procedure to minimise casualties and reduce risk in the provision of new schemes affecting the highway. It is carried out by a person, or team of people, who are independent from the design process. Though only mandatory for schemes affecting Trunk Roads, it is considered good practice to carry out a safety audit on all schemes where the proposed changes have the potential to increase conflict and hence casualties - the intersection of a busy road and a greenway being a good example. For further information on safety audit, see refs. 15 & 16.

Lighting

Many greenways run through rural areas and are used mainly during daylight hours, so it is usually unnecessary to provide a system of lighting. However, where greenways run through urban areas they are used for journeys of all kinds, and the greenway route can be lit to ensure it is available for people who want to use the route during hours of darkness, particularly in the winter months. In these cases it is important to ensure that the issue of lighting is considered at the junction point between the greenway and road, and the local Street Lighting Engineer should be consulted. Adequate provision for lighting the crossing point should be made in accordance with the relevant British Standards (B.S.5489-

1:2003 and B.S.EN13201:2003). Localised floodlighting can also be considered to highlight the crossing point, similar to that which is often used on Zebra crossings.

Car Parking

Thought should be given to the car parking situation near greenway accesses. Parked vehicles can often make it awkward or impossible for greenway users to gain access to the route. This is particularly an issue where greenways run through urban areas. Road markings to Diag. 1026.1 (TSRGD, 2002) can be used to good effect. Consideration could also be given to implementing a Traffic Regulation Order for double yellow lines in the vicinity of road/greenway junctions, where it is anticipated that parking will be a problem. These should run for a minimum of 15m on each approach to ensure adequate visibility for path users when crossing the road. In Special Enforcement Areas, as defined in the Traffic Management Act 2004, it is an offence for vehicles to park adjacent to a footway or cycle track where the kerb has been lowered to meet the level of the carriageway, (or the carriageway has been raised to that of the footway). In these cases, no waiting restrictions are required in order for enforcement action to be taken, though it may still be worthwhile installing them for their visual deterrent in areas where enforcement is unlikely to take place regularly and the road markings do not conflict with planning considerations, e.g. conservation area.

Sustrans are constantly seeking new methods and examples of best practice, and are willing to work with other organisations to design innovative new treatments to help increase the appeal of greenways for all users, and to ensure their interface with the road network is as safe as can be.

References

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- 2 Sustrans, 1998, 'Access Controls', Sustrans Information Sheet FF22
- 3 Department of Transport, 1995, 'The Assessment of Pedestrian Crossings', LTN 1/95
- 4 HMSO, 1998, 'Design Bulletin 32, Layout of Residential Roads'
- 5 Sustrans, Ove Arup and Partners, 1997, 'The National Cycle Network: Guidelines and Practical Details', Issue 2
- 6 Department of Transport, 1996, 'Highways (Road Humps) Regulations, 1996'
- 7 Department for Transport, 2005, 'Traffic Calming Bibliography', Traffic Advisory Leaflet 2/05
- 8 TRL Report 241, 'Cyclists at Road Narrowings', 1997
- 9 Hull City Council, contact: Allan Davidson, 01482 612086
- 10 Department of Transport, 1995, 'The Design of Pedestrian Crossings', LTN 2/95
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- 15 Institution of Highways & Transportation, 1996, 'The Safety Audit of Highways'
- 16 Highways Agency Design Manual for Roads and Bridges (DMRB), 2003, 'Road Safety Audits' TA19/03.

Further information

For further information on the National Cycle Network, visit www.nationalcyclenetwork.org.uk, or call the Information Line on **0845 113 0065**