

## A.08 Signal Controlled Junctions

### Key Principle

Cyclist's needs should be considered as part of the design of all signalised junctions and, whenever possible, provided with an advantage over motorists (see also [A09 Advance Stop Lines](#)).

## Design Guidance

### Background

Signalised junctions are the most common kind of major junction on busier roads in urban areas. In general, they are safer for cyclists to use than roundabouts, particularly the larger ones. However, without due consideration of their needs, signalised junctions can unnecessarily create difficult conditions or delays for cyclists. Many of these can be designed out if considered early enough. For example, uninterrupted left turns can be enabled by the creation of a cycle by-pass where space permits.

Signalised junctions should be designed with cyclists in mind and, where appropriate, provide them with an advantage over motorists.

### Safety issues

Evidence strongly suggests that signalised junctions are safer for cyclists when compared with the typical UK roundabout even though designed for similar capacities. This difference may not be so marked when compared to continental style roundabouts (see [A13 Roundabouts](#)).

Although they are relatively safe for cyclists, collisions between cyclists and vehicles still occur at signalised junctions. The most serious accidents come from motor vehicles failing to stop at red lights and HGVs or other vehicles turning left across the path of a cyclist proceeding straight on.

### Signal timings

At large junctions, or where a junction arm has an uphill gradient, intergreen periods may need to be extended to ensure that cyclists are able to clear the junction before the other arms receive a green signal. Where it is necessary to extend a green phase for this reason, this can be achieved in two ways. Either the intergreen period can be extended for all signal phases/stages, or cyclists can be detected by detector loops or infra-red/microwave systems that extend the appropriate phase/stage in the signal timings (see below). Where cyclists are infrequent, the latter will have only a small effect on the overall capacity of the junction.

At busy junctions the practice of using cycle times of 120 seconds to maximise capacity can create unacceptable delays for cyclists and possibly contribute to the practice of cyclists ignoring the lights when they judge that they are not putting themselves at risk by doing so. Dutch guidance recommends a maximum 90 second cycle time. The same guidance also suggests that where there are separate cycle signals on each arm of a junction, the use of 'all green' periods will help to enable cyclists to minimise delays. Although this approach not

permissible in the UK, the use of detectors to detect slow-moving cyclists clearing a junction and creating an 'all red' period to enable them to do so can help avoid potential conflicts with other traffic pulling away.

### **Detecting cyclists**

Many cyclists have had the frustrating experience of waiting for a green phase which does not materialise. This can lead to the practice of jumping the signals. Modern loop patterns, well judged siting of detector equipment and the available range of sensitivity settings should mean that no cyclists are left undetected at a signal-controlled junction. Where a cycle track forms one of the arms of a signal controlled junction, loop detectors should be provided in the track at an appropriate distance from the signals so that the green signal coincides with the approaching cyclist's arrival at the signals.

In some cases, a lane exclusively for the use of buses and cycles will be served by the junction. If so, the passive detection system (e.g. loops or microwave detectors) should be supplemented by a push button for cyclists to operate in the event that they have not been detected on the approach.



Loops in the road located to detect cyclists, Taunton

Picture: Alex Sully ERCDT

### **Junction layout**

All junctions should be assessed on their safety and comfort for cyclists. Larger junctions with many arms or phases can be confusing or intimidating to cyclists, especially where there are multi-lane approaches and exits. If the cyclist's route through a signalised junction is unclear, it may be appropriate to provide "elephants' feet" markings (Diagram WBM 294). They are not included in TSRGD and therefore need DfT authorisation.

### **Cycle bypasses**

Cycle by-passes within the layout of a junction can give cyclists an advantage over motorised vehicle users.

A frequent cause of frustration is where traffic lights are at red but cyclists feel that they can make their desired manoeuvre safely. Evidence shows that around 10-20% of cyclists 'jump' the red light. These are mainly left-turning cyclists or

cyclists going straight ahead at a T junction where there are no conflicting vehicle manoeuvres. A study which examined this behaviour found that, of cyclists passing red lights, only 16% were considered to be “somewhat unsafe” and just 2% “definitely unsafe”. Making formal provision for such manoeuvres through the use of cycle by-passes means that delay to cyclists can be reduced while safety is improved. The needs of pedestrians, particularly those whose mobility is impaired, must be taken into account at all stages.



Bypass for cyclists at signal controlled junction, Scunthorpe

Picture: Tim Pheby ERCDT

The preferred approach is to construct cycle by-passes within the carriageway. If there is insufficient carriageway space to do this, the by-pass can be created by guiding cyclists off the carriageway and onto a cycle track. However, the latter may disadvantage pedestrians if the track is taking up what was formerly footway space.

The by-pass may have its own set of signals with their own separate phase, or they may simply be used to give cyclists a green signal in advance of the one given to motorists. An early green signal for cyclists gives them the chance to clear the junction before the other traffic pulls away. The by-pass might end with give-way markings or it could discharge cyclists freely depending on the circumstances.

Cycle bypass leading into a segregated contra-flow cycle lane, Cambridge

Picture: Steve Essex ERCDT



Cycle bypass leading to Give Way for left-turning cyclists, Ipswich

Picture: David Kemp

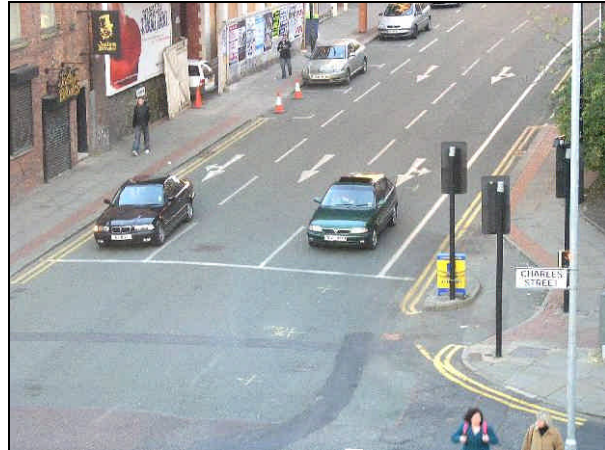


'Early Green' facility, Glasgow

Picture: Tony Russell, (CTC)

Separately signalled slip in place of three lane ASL at right turn, Manchester

Picture © Alex Sully



Where lack of space dictates the need to create a by-pass away from the carriageway, the transition from road to track and back will need careful detailing. Ramps onto and off of the cycle track should have no upstand between changes in surface (see [B06 Flush Kerbs](#)), and ramps which discharge cyclists back to the carriageway should do so safely. A good way of achieving this is to place the end of the cycle track on a build out so that cyclists are moving parallel to the kerb when they re-join the general traffic flow. Converting part of the footway to a cycle track to create a by-pass may not be appropriate if there are large numbers of pedestrian crossing movements taking place which could conflict with cyclists using it.

Sometimes, side roads which have been closed to motor vehicles can be used to bypass signals. Cycle gaps in the closure will be required together with signing to direct cyclists away from the signals.



Residential road link for cyclists avoiding traffic lights, Iffley Road, Oxford

Picture: Patrick Lingwood ERCDT

## Urban Traffic Management Control

In urban areas, traffic signals are often co-ordinated by Urban Traffic Management & Control systems (UTMC). The timing between adjacent signals can have a significant effect on the journey times for vehicles. As cyclists tend to travel at lower speeds than motorised traffic, signals timed to provide a "green wave" at 30mph may lead to significant delay for cyclists.

Instead of timing the signals for 30mph, an alternative approach is to adjust the timing to accommodate cyclists. This reduces the number of stops which they have to make and minimises the amount of time spent queuing. The same principle can be applied to combinations of cycle track crossings and signalised junctions. Technical guidance and other options are also available. It should be remembered that cycle flows on major roads are generally more concentrated over the morning and evening peak periods than for motorised traffic.

### Separate cycle phase

Where a cycle track or any other route used exclusively by cyclists joins a signalised junction, it is appropriate to give cyclists a cycle phase on demand at the traffic lights, preferably by means of detectors that ensure that the beginning of the green phase coincides with the cyclists' arrival at the end of the cycle track. Unless there are very large flows of cyclists, the cyclists' green time need only be short – the minimum for vehicles. It should be followed by a sufficiently long inter-green phase to allow all permitted cycle movements to be completed safely.



Separate cycle lights avoid conflict with left turning traffic, Cambridge

Picture: Patrick Lingwood

**Note:** Some of the illustrations used in this document feature poor and non-standard markings. Designers should identify the correct signs within *Traffic Signs Regulations and General Directions* DfT 2002

### Publications

[Capacity implications of ASLs for cyclists](#) TRL Report 585 2003

[TAL 1/06 General Principles of Traffic Control by Light Signals](#) DfT 1998

[TAL 16/99 The Use of Above Ground Vehicle Detectors](#) DfT 1999

[Design manual for bicycle traffic](#) CROW 2007

[Manual for Streets](#) DfT, Communities & Local Government 2007

[Policy, Planning and Design for Walking and Cycling](#) – Local Transport Note 1/04, Public consultation Draft, DfT 2004

[Traffic Signs Regulations and General Directions](#) DfT 2002

[Cycling England Gallery](#) pictorial examples

[London Cycling Design Standards – A guide to the design of a better cycling environment](#) (Sections 3.4, 3.5, and 3.6) TfL 2005

[Lancashire - The Cyclists' County](#) (pdf - 5.45Mb) (Section 3) – creating pleasant road conditions Lancashire County Council, 2005

[CTC Benchmarking – Best practice case studies](#)

[National Cycle Network – Guidelines and Practical details, Issue 2](#) Sustrans 1997

### **Other references**

*Cyclists and Roundabouts: A Review of Literature* Allott and Lomax 1991

*What roundabout design provides the highest possible safety?* Brude U & Larsson J 2000

*A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes: Final Report* FHWA 1999

*The Potential for Incorporating Consideration of Bicycle Traffic in Urban Traffic Management and Control Systems* Institute for Transport Studies 2000

*A Fair Modal Share for Cyclists* Sommer 2003

*Cycling and Urban Traffic Management and Control Systems* Clark SD and Page MW

[Cycle Friendly Infrastructure - Guidelines for Planning and Design](#), Bicycle Association et al 1996