A.09 Advanced Stop Lines

Key Principle

The creation of advanced Stop Lines (ASLs) should be considered at all signal controlled junctions. The depth of the reservoir should be designed to take account of all of the manoeuvres cyclists need to make when entering and leaving the ASL as well as the numbers of cyclists.

Design Guidance

Background

Of all the cycle-specific measures available, advanced stop lines (ASLs) at signal controlled junctions are among the most beneficial. They are also popular with cyclists. The standard ASL arrangement consists of a stop line for cyclists, an additional stop line for motor vehicles situated further back from the signals, a reservoir area between the two stop lines for waiting cyclists to occupy, and a lead-in lane which allows cyclists to make their way past waiting motor vehicles and enter the reservoir.

ASLs should extend across all the traffic lanes. Part-width ASLs do exist but they need to be individually authorised as they are not covered by TSRGD. It should be noted that ASLs can only be used at signalised junctions. TSRGD specifically does not authorise their use at signalised cycle and pedestrian crossings i.e. Pelicans, Puffins and Toucans.

Typical ASL installation, Oxford

Picture: Patrick Lingwood ERCDT

ASLs were originally introduced to reduce conflict between cyclists and motorists when pulling away from rest at signal controlled junctions. The conflicting movements generally occur where;-

- cyclists go ahead and motorists turn left, and
- motorists go ahead and cyclists turn right

Cyclists also derive benefit from ASLs in the following ways. They;-

- Give cyclists a visible and practical advantage at signalised junctions and thereby encourage latent and existing cyclists

- Allow cyclists to bypass queuing traffic to get to the front of the queue (via the lead-in lane).
- Place cyclists in a safer and more visible location, ahead of traffic rather than at the blind spot to the left of traffic; this is especially important where there are appreciable numbers of HGVs.
- Allow cyclists to wait in an area relatively free from exhaust fumes.
- Make it easier for right hand turning cyclists to position themselves in the best location.
- Make pedestrian crossing movements at the junction more visible, safer and more comfortable by setting back the line of waiting vehicles.

The two main complaints levelled at ASLs by cyclists are of motor vehicles encroaching into the reservoir when the signals are red and feeling vulnerable when waiting in front of other traffic. There is also evidence that where a reservoir is too shallow, i.e. the distance between stop lines is insufficient, cyclists are inhibited from using it due to the proximity of traffic behind them. Adequate depth and coloured surfacing for the reservoirs can help alleviate those two concerns. TSRGD states that the reservoir must be between 4m and 5m deep.

ASLs have little or no negative impact on traffic congestion or capacity, even where a vehicle lane is at saturation flow, unless a vehicle lane is removed. However, in some cases the installation of ASLs at a junction may result in a need to make minor changes in the signal timings, mainly for the benefit of cyclists clearing larger junctions, but in most circumstances setting back all the stop lines for other traffic by 4m to 5m will not require a longer intergreen period or any other signal timing changes.

Where new signalised junctions are installed or existing installations adapted, the provision of ASLs should be considered, especially for junctions in urban areas where there is a likelihood of traffic queuing.

Lead-in cycle lanes

The ASL should have a lead-in cycle lane so that cyclists can legally gain access to the reservoir ahead of the motorists' stop line. Where space permits and the junction merits it, the provision of two lead in cycle lanes may be appropriate. Using coloured surfacing for cycle lead-in lanes should make them more prominent and thus make encroachment by other vehicles less likely. Where there is a risk of illegal parking or waiting, a mandatory lane should be introduced together with waiting restrictions so that it can be kept clear by enforcement. Where widths are constrained, traffic lanes should be narrowed and a lead-in lane provided as a coloured advisory cycle lane to allow large vehicles to legitimately encroach upon it. These can also be supported by waiting and parking restrictions if necessary.

It is strongly recommended that, wherever possible, nearside lead-in lanes are as long as normal peak time traffic queues, with a minimum length of 30m. If cyclists find it difficult to reach the reservoir because of traffic queues, they may use the footway, weave between vehicles, or ride in the opposing lane.

Non-Nearside Lead-In Lanes

Designing non-nearside lead-in lanes requires more care because of the way in which they operate. The main benefit of nearside lead-in lanes for cyclists is that they make it easier for them to get ahead of rows of stationary vehicles waiting at signals. Non-nearside lead-in lanes also fulfil this purpose, but more importantly they serve as a means of protecting cyclists in potentially vulnerable situations.

Central lead in lane, Bristol

Picture: Sustrans

As non-nearside lanes can take cyclists between two rows of free-flowing motor vehicles, it is important that they are wide enough to provided adequate separation distances. A width of 2m is recommended and this should be generally achievable because there will be two all-purpose lanes from which space can be taken. Widths down to 1.5m may be acceptable but lanes any narrower than this should only be considered where the lane is relatively short and cyclists using them do not need much protection from free-flowing traffic on either side.

If a non-nearside lead-in lane is positioned to the right of a dedicated left-turn all-purpose lane, the behaviour of motorists approaching the junction in free-flowing conditions becomes an especially significant issue with regard to the length of the cycle lane. Vehicles in the left lane may need to move to one on the right, and vice versa. When motorists are weaving in this way, they will be devoting a lot of their attention to merging, and to some extent, traffic coming from behind. The weaving manoeuvre becomes a lot more complicated if they suddenly come across a cyclist between them and the lane they need, especially if the speed differential is large. It is possible that vehicles weaving left to right expose cyclists to more danger than those going from right to left because generally, the driver may be merging into a lane in which the traffic is moving faster than he is.

The designer must take the potential hazards arising from weaving movements into consideration. If possible, non-nearside cycle lead-in lanes should be positioned so as to avoid the section of road where weaving movements are taking place, particularly those from left to right. This may mean that the lane needs to be made shorter than was originally intended.

A good design will always minimise complicated decision processes for motorists but this is particularly important when cyclists are present because the speed differential can significantly exacerbate a difficult situation. Where complication

exists, potential for conflict should be avoided. Signing and marking should be clear and timely, and circumstances leading to late decision making by motorists should be designed out.

Width of Nearside Lead-in Cycle Lanes

Nearside lead-in cycle lanes, like general cycle lanes, should be 2m wide wherever possible. However, the minimum width issue is less straightforward. If there is insufficient space to include a general cycle lane, it can simply be omitted. This is not an option with lead-in lanes. Lead-in lanes perform a different function from general cycle lanes. Apart from the legal requirement (to comply with TSRDG), the main function of a nearside lead-in lane is to allow cyclists to get past stationary traffic. In the main, general cycle lanes serve to maintain a degree of separation between cyclists and motor vehicles passing them in free-flow conditions.

Because of this difference in functions, a nearside lead-in lane can operate at lower widths and 1.2m should therefore be treated as the desirable minimum. Below this, it is likely that even experienced cyclists will start to find it difficult to continue riding despite the fact that vehicles alongside them are stationary and there is a greater risk of cyclists being hit by car doors as passengers may alight from stationary cars. Narrower lead-in lanes cannot be ruled out, but should not be less than 1m. A lead-in lane of some sort is a legal requirement so if an ASL is installed where space is very limited, there may only be enough room to include a very short lead-in lane.

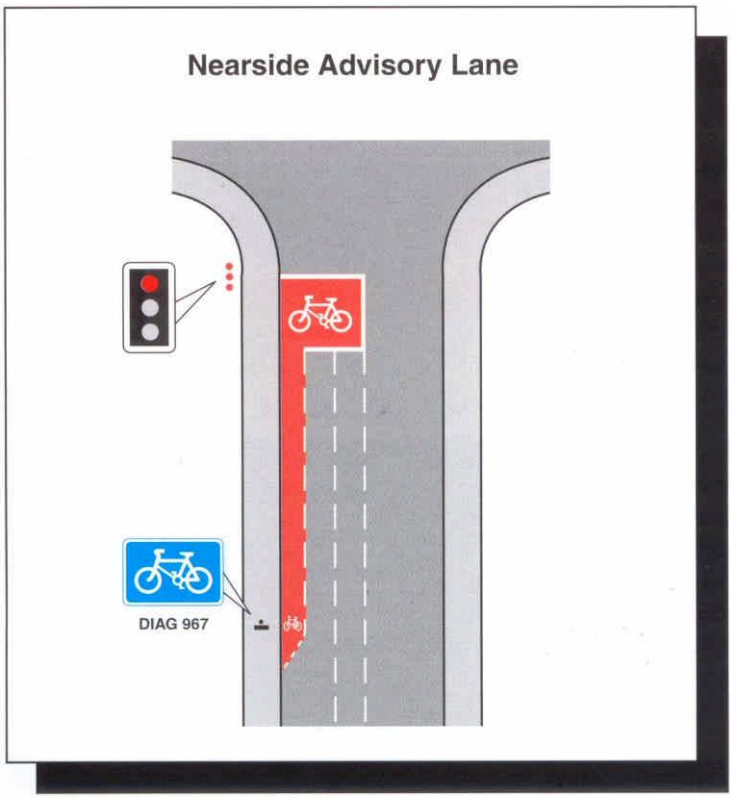
Where road width is limited and circumstances permit, the preferred solution is to maintain the width of the nearside lead-in lane by reducing the width available for other traffic. This can be achieved by reducing the width of the all-purpose lane(s), or by removing one of them if there are two or more. Where vehicle speeds and volumes are low on the approaches to signalised junctions, and buses and HGVs only make up a small percentage of vehicles, all purpose lane widths can be reduced to as little as 2m and still function satisfactorily. In such cases the lead-in lane will normally need to be advisory to allow occasional encroachment by large vehicles.

Where cycle lanes 2.0m wide can be provided, measures may be needed to prevent motor vehicles from using them informally. These could include physical segregation or a localised carriageway narrowing and should be determined on a case by case basis.

The conversion of part of an adjoining wide footway to a cycle track to provide a cycle lead-in lane to the ASL is rarely a satisfactory solution. In particular, a design solution needs to be found to ensure the safety and convenience of cyclists re-entering the carriageway at or near the junction and possibly turning right, when traffic is moving in free-flowing conditions.

Position of lead-in lane

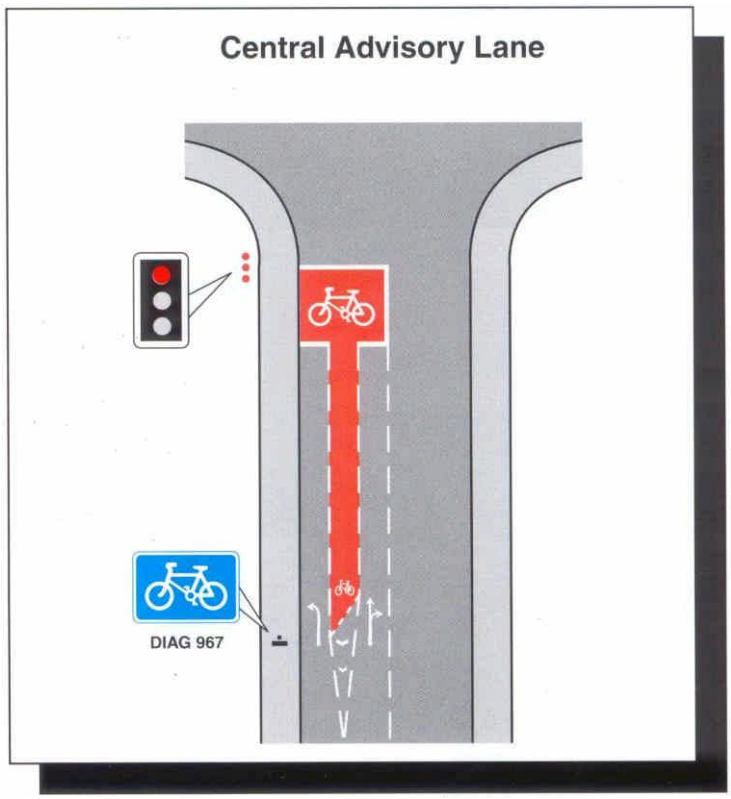
Typically, cycle lead-in lanes are positioned by the nearside kerb and the majority of cyclists find this most comfortable.



From Traffic Advisory Leaflet TAL 5/96

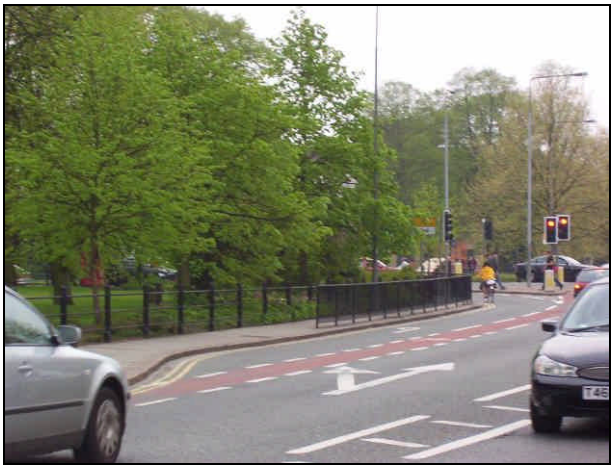
Where signalised junctions have two or more all-purpose lanes leading to them, it may be more appropriate to position the lead-in cycle lane between the other lanes. This is particularly relevant where there is a dedicated left turning lane for vehicles and the predominant cycle flows are straight ahead or turning right. All non-nearside lead-in lanes must be advisory.

Where traffic signal phases are short and queues rarely form cyclists are likely to arrive at the signal head at green with other moving traffic. In these circumstances a nearside lane may encourage right-turning cyclists to position themselves badly within the reservoir. A non-nearside lead-in lane may be beneficial in these circumstances.



From Traffic Advisory Leaflet TAL 8/93

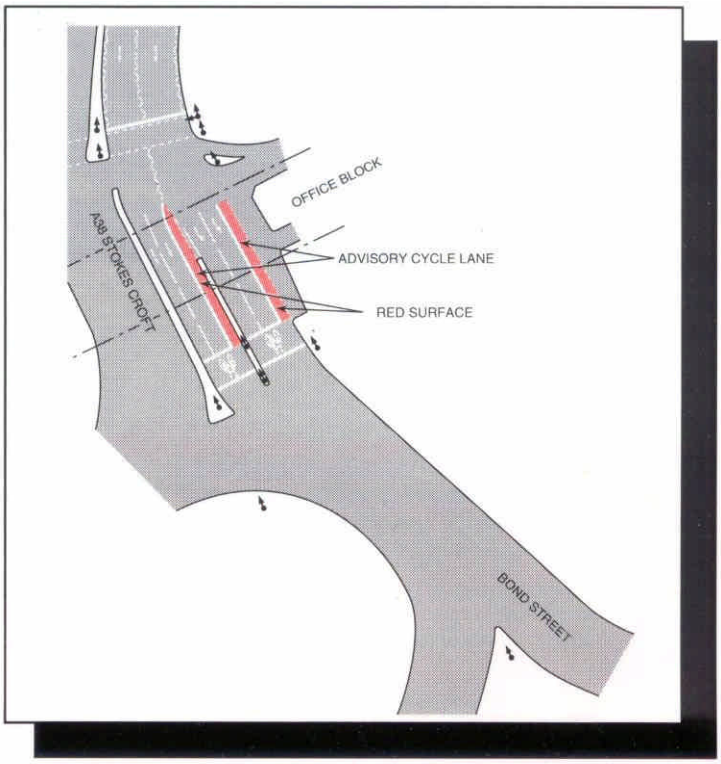
In determining the best solution the designer needs to consider how difficult it is for cyclists to position themselves correctly at the reservoir (partly dependent on the width and depth of the ASL) against how difficult it is for cyclists to move from the nearside into a central or off-side cycle lane. In cases where there is localised widening or flaring on the approach to the junction from one lane to two lanes, the best option is sometimes for the advisory lane to move from the nearside to the middle of the two vehicle lanes at the point of widening, so that motorists moving into the left lane have to cross the cycle lane. The cycle lane should have a coloured surface to make it conspicuous (see picture below).



Cycle lane on the off side of a filter lane, Cambridge

Picture: Patrick Lingwood ERCDT

In cases where there is a heavy right turn cycle movement, it might be appropriate to position the cycle lane to the off-side of the vehicle lane or lanes. In others it may be appropriate to have two lead-in cycle lanes for left and right turning cyclists, especially where there are filter lights.



Layout of ASL's on the Stokes Croft entry to St James Barton Roundabout, Bristol

From Traffic Advisory Leaflet TAL 8/93

Where there are filter lights for left or right turning traffic, cyclists should be able to safely reach the reservoir when the filter signal is green. Waiting cyclists should not be put in a position where they obstruct traffic moving off on the green filter. One innovative solution has been to create a split cycle reservoir with additional markings to indicate on which side cyclists should wait (see picture below). Adopting such a solution requires special authorisation.

ASL at signals with filter, Swindon

Picture: Patrick Lingwood ERCDT

Other factors

Traffic lights should be easily visible to cyclists waiting at the front of the ASL. Achieving this may entail siting an extra signal head on the opposite side of the junction or setting back the stop line. If cyclists are unable to clearly see the signal head they will have to rely on the movement of other traffic as a clue to the phasing of the lights. This may be dangerous or cause delays to traffic waiting to move off behind them.

Care should also be taken at signals where there are large numbers of HGVs turning left because of the potential for cyclists to move into the driver's blind spot. In some cases warning signs have been posted for both cyclists and lorry drivers. Another potential hazard is where car occupants open the nearside door into the path of a cyclist. Typical locations may be where car drivers drop off passengers, e.g. at rail or coach stations. If there is a high incidence of this, a non-nearside lead-in lane might be the solution.

Sign warning cyclists of left turning vehicles, Oxford

Picture: Patrick Lingwood ERCDT

Publications

TAL 8/93 *Advanced stop lines for cyclists* DfT 1993

TAL 5/96 *Further development of Advanced Stop Lines* DfT 1996

Traffic Signs regulations and General Directions DfT 2002

Capacity implications of ASLs for cyclists TRL Report 585 2003

Advanced stop line findings report (pdf - 1282kb) TfL 2006

Advanced Stop Lines TfL (John Lee), Velo City 2005

TAL 1/06 *General Principles of Traffic Control by Light Signals* DfT 1998

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

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

Sharing road Space Scottish Government, 2001

National Cycle Network – Guidelines and Practical details, Issue 2 Sustrans 1997

Other references

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

Cycle Friendly Infrastructure - Guidelines for Planning and Design, Bicycle Association et al 1996