A.13 Roundabouts

Key Principle

The use of continental-style design should be considered where roundabouts are to be introduced on cycle routes with entry flows of up to 2500 vehicles per hour.

Design Guidance

Background

Roundabouts can act as a real and perceived barrier for cyclists and there are many instances where cyclists dismount voluntarily and walk their bicycles around them or cycle on the footways. 10% of all reported accidents involving pedal cyclists occur at roundabouts. Of that proportion, 11% involve fatal or serious injury to a cyclist. Cyclists' accident rates at roundabouts are 14 times those for motorists.

The most common accident type involves a motor vehicle entering the roundabout colliding with a cyclist on the circulating carriageway. This often appears to be because the motorist fails to see the cyclist because he/she is concentrating on the movements of other motor traffic. This may explain why cyclists' accident rates tend to fall where there are high flows of cyclists.

Continental Roundabouts

Roundabouts have been introduced more recently in mainland Europe and their designs often aim to cater for their higher levels of cycling. These generally seek to reduce entry, exit and circulatory speeds to remove the differential between cyclists and other traffic and to make cyclists more visible.

Key features of continental designs are:

- Arms that are perpendicular, rather than tangential to the roundabout
- Single lane entry and exits (4-5m)
- Minimal flare on entry
- Inscribed circle diameter 25-35m
- Narrow circulatory carriageway 5-7m

The (desirable) reduction of the circulatory carriageway to a single lane circulatory width may result in the need for central over-run areas to accommodate large vehicles. These should have an upstand that discourages over running by cars but hatching may serve as an interim measure.

Dual and multi-lane roundabouts

Multi-lane roundabouts can present the most formidable barriers to cycling. They introduce a range of potential conflict situations that do not occur with single lane roundabouts. It is not possible to achieve sufficient deflection at all times on these roundabouts because, when traffic flows are light, motorists tend to straighten out their path through the junction by using the available lanes.

Where a multi-lane roundabout lies on an existing or a potential cycle route and it needs to be made safer for cyclists, the designer should consider the following questions:

- Would the roundabout still have enough capacity if it were to be reduced to single-lane operation throughout?
- Is there scope for reducing individual entrances or exits to single lane operation (possibly by hatching or the introduction of a bus lane)?
- Can geometric alterations be introduced to reduce vehicle speeds to 12mph (maximum 20mph)
- Is it possible to introduce peripheral cycle tracks including, where necessary, Toucan crossings?

Where traffic flows are high and none of the on-road options above is feasible, the best option may be to signalise the roundabout. If the roundabout is signalised, ASLs and their lead-in lanes should be included.

Signalised roundabout and ASLs, York

Picture: Tony Russell, CTC

Excessive visibility to the right for motorists approaching the roundabout can result in high speeds. Where this is a problem, it can be mitigated by installing sight screens on the right of the entry road so that this visibility is reduced.

Visibility to the right reduced by means of sight screens, Taunton

Picture: Alex Sully, ERCDT

Flat-topped humps across the entrances and exits could be considered for reducing vehicle speeds and helping pedestrians to cross. These could be combined with Zebra crossings if close to the roundabout or Puffins, Pelicans or Toucans if positioned a little further away. Raised crossings can also be used for priority or non-priority cycle crossings.

Annular cycle lanes

Research suggests that annular cycle lanes in themselves offer no safety benefit to cyclists. In fact, unless accompanied by a safe roundabout design they may introduce extra hazards. Some cyclists may feel safer using cycle lanes, but these feelings may be unfounded if the lanes put them in an unsafe position.

Annular cycle lanes have been introduced onto a number of UK roundabouts. Some of these have been very poorly designed, having narrow lanes very close to the perimeter. This is the worst possible position for cyclists to take up if they do not want to leave at the next exit. Others, such as York's "*Magic Roundabout"*, have wide cycle lanes set in from the edge of the roundabout, a reduced circulatory carriageway width, tight geometry and a smaller overall size of roundabout. In this case, the cycle lanes only position a cyclist close to the perimeter when they intend leaving at the next exit; otherwise, the cyclist is positioned away from the perimeter.

Whilst successful in reducing accidents and attracting cyclists to what had previously been a hazardous junction, the York solution, and in particular annular cycle lanes, should not be seen as the solution for every problem site. It is unlikely that any single element would create a cycle-friendly environment. It should be noted that the York design might only be operating so successfully because the large numbers of cyclists using the junction mean that motorists have become accustomed to interacting with them.

Because of the doubts over the potential benefits of annular cycle lanes, a highway authority wishing to improve conditions for cyclists at an existing roundabout should first consider whether changes to the geometry could achieve the required result. Where there are budget constraints, it may be possible to make low cost adaptations by using hatching or overrun areas to reduce the number of lanes, increase deflection, and alter the speed profile. Annular cycle lanes should only be introduced where they are accompanied by measures which reduce the circulatory carriageway to a single lane and encourage low speeds.

York "Magic Roundabout"

Picture: Patrick Lingwood, ERCDT

Cycle track crossings

It should be a primary design objective to create roundabouts that can accommodate cyclists safely within the carriageway. Peripheral cycle tracks remove the possibility of cyclists coming into conflict with motor vehicles on the circulatory carriageway.

Cyclists prefer priority crossings in terms of safety, comfort and speed. Although they have rarely been implemented in UK, they are used extensively in urban areas in the Netherlands. Typically these crossings are located around 5m from the junction line, so that motorists entering the roundabout do not have to concentrate on cyclists using the crossing and circulating traffic at the same time.

However, potential safety problems can arise if a peripheral cycle track is connected by 2-way cycle crossings which have priority over traffic on the roundabout arms. Cyclists riding contra-flow (anti-clockwise) are particularly vulnerable to going un-noticed by motorists entering the roundabout.

The design of the roundabout can have a major influence on the safety of such facilities. It is a legal requirement that cycle crossings with priority over other traffic are mounted on a flat-topped road hump constructed in accordance with the Road Hump regulations. The recommended height of the hump is 75mm (100mm max). In order to enhance safety, the crossing point can be surfaced in a contrasting colour. It is also worth considering introducing a lateral deflection or "dogleg" where the cycle track approaches the crossing to slow cyclists down. This gives motorists time to react to the presence of cyclists about to use the crossing.

The Road Hump regulations limit the use of humps to roads with speed limits of 30mph or less. As TSRGD requires cycle-priority crossings to be placed on a road hump, they are similarly limited. Regardless of the speed limit, in rural areas non-priority cycle track crossings are more appropriate and are likely to result in greater safety for cyclists. In urban areas, Toucan crossings can be used.

Peripheral cycle tracks almost invariably result in a greater distance to be travelled, with additional delay and inconvenience for cyclists at crossing points. Because of this, some may decide to remain on the carriageway. Peripheral cycle tracks should therefore not be used as an alternative to modifying the design of a roundabout to make it cycle-friendly if this is practicable. They should only be implemented if other factors preclude modifying the roundabout design or if the tracks match the cyclists' desire line more closely than the route through the roundabout.

Mini-roundabouts

Mini-roundabouts share many characteristics with other roundabouts, the major difference being that the central island is small (normally a radius of 2-4m) and can be over-run, both by larger and smaller vehicles. In this way, mini-roundabouts can be fitted into the space of normal junctions.

Provided they operate with single lane approaches, mini-roundabouts do not generally carry much higher risk to cyclists than signalised junctions. They can be used as a speed reducing feature in urban areas for the benefit of all road users. As with larger roundabout types, there should be adequate deflection on all arms to ensure low entry speeds.

For cyclists, they are particularly useful for facilitating right hand turns off major roads or right turns onto major roads from side roads. A mini-roundabout allows cyclists to make these manoeuvres in relative safety because the stream of traffic being crossed is obliged to give way, whereas it can be difficult for cyclists to cross the main traffic stream at a priority junction.

Mini roundabout, Portsmouth

Picture: Patrick Lingwood, ERCDT

References

LTN 2/08 *Cycle Infrastructure Design* DfT 2008

TAL 9/97 *Cyclists at Roundabouts: continental Geometry* DfT 1997

TD 16/93 *Geometric Design of Roundabouts* Highways Agency 1993

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

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 (part 1, part 2) – 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

Promotion of mobility and safety of vulnerable road users (pdf – 4.5Mb) Wittink R, PROMISING 2001

Sharing road Space Scottish Government, 2001

Cyclists at continental style roundabouts: report on four trial sites *TRL Report 584* Lawton BJ et al. 2003

Accidents at urban mini-roundabouts TRL Report 281 Kennedy JV & Hall RD 1997

Cyclists and Roundabouts: A Review of the Literature Allott & Lomax 1993

Traffic signals at roundabouts cut cycle casualties LTT 409 20 January 2005

Do traffic signals at roundabouts save lives? (pdf – 63kb) TfL Street Management 2005

Heworth Green Roundabout Case Study Pheby T 2004

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

The Safety of Roundabouts in the Netherlands Schoon C & Minnen JV 1994

Collection of Cycle Concepts (pdf - 7.12Mb) Danish Road Directorate 2000

Roundabouts – the state of the Art in Germany Brilon W & Vendehey M 1998

The traffic safety of cyclists at roundabouts – a comparison between Swedish, Danish and Dutch results Brüde U & Larsson J 1997

Sustainable Safety a new approach for road safety in the Netherlands (pdf – 148kb) Vliet P & Schermers G 2000

The influence of strong pedestrian and bicycle flow on the capacity of roundabouts Tollazzi T, Velocity 1999