



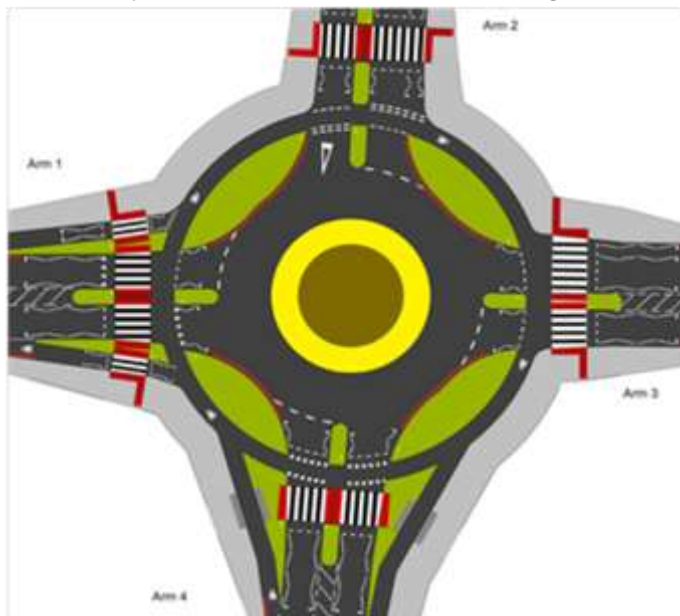
Research into the Capacity of a Dutch-style Roundabout

Background

As part of a major programme of off-street trials of innovative cycling infrastructure, Transport for London (TfL) commissioned TRL to investigate the capacity implications of a 'Dutch style' roundabout with an orbital cycle track, conducted at an off-street build facility at TRL. The trials were part of a wider programme of off-street trials of innovative cycling infrastructure commissioned by Transport for London (TfL) to provide evidence to inform the implementation of the Mayor's Vision for Cycling (GLA, 2013). TfL were interested in understanding the vehicular capacity and delay implications of such roundabouts, and hence commissioned TRL to undertake these trials.

Design

The roundabout layout used for the trials is based upon one of several types of roundabouts that can be found in the Netherlands. It draws upon the CROW (Netherlands) cycling infrastructure design guidance, and uses 'continental geometry' (short turning radii to reduce speeds and a single circulating vehicle lane) and also has a kerb-segregated cycle track at carriageway level, orbiting the roundabout, with priority for orbiting cyclists across the entry and exit lanes. Different arrangements of entry/exit arm treatments were tested.



Trials

A key focus of these capacity trials was to understand the vehicular capacity and delay implications of such a design. The estimation of the capacity of the cycle facilities (orbital cycle track and entry and exit arms) of such a roundabout was not investigated, although the impact that cyclists had on the vehicular capacity of such a roundabout was. Even were such research to be done the findings could not be directly incorporated into current roundabout capacity modelling software because such software are only concerned with vehicular capacity and delay estimation. The impact of the composition of the traffic flow on the vehicular capacity was also not investigated, although a trial was undertaken to investigate the effect of long vehicles on the capacity of the circulating lane.



Findings

- Using tests on a trial layout in an off-street location it has been possible to estimate a UK-based relationship between the vehicle entry-arm capacity and the circulating flow for this type of roundabout -both measured in Passenger Car Units (PCUs).
- It has been found that drivers require greater gaps in the circulating bicycle flow to exit the roundabout than would be estimated simply based on the time it takes a cycle to cross the exit arm. This, additional, perceived gap time amounted to some 5 seconds and can have a significant effect on the capacity of the previous entry arm,
- There will be an increased risk of vehicles, queuing on exiting the roundabout, blocking the exit of the previous entry arm. There was a similar but smaller effect noticed for drivers entering a roundabout. This lesser effect was expected because they tend to have a better view of circulating cyclists than drivers exiting a roundabout.
- The impact of the trialled layout, which would conform to DMRB's 'compact' roundabout definition as far as vehicular capacity is concerned, compared with an equivalent 'conventional' roundabout (DMRB Vol. 6 section 2), with the same travel patterns, was to reduce capacity by a little over 40%.
- Much of this reduction in capacity was due to the trial layout having single-lane entries and exits with little or no flaring.

The table below shows the cumulative impact of the changes from a conventional 4-arm roundabout to a Dutch-style roundabout with adjacent cycle and zebra crossings on each arm.

Model assumptions	Capacity pcus/hr)	As % of conventional
Conventional (two lane entry / exit) roundabout	3000	100%
Dutch style roundabout (single lane entry/exit)	2040	68%
Dutch style roundabout (single lane entry/exit) with pedestrian and cycle crossings modelled.	1700	57%

- The greatest impact is simply the layout, reducing the entry and exit arms to a single lane and tightening-up the geometry so that there is little flaring. This change of layout reduced capacity by 30%.
- The impact of the new vehicular relationship was actually quite small on this roundabout but the provision of new cycle crossings on each arm reduced capacity by a further 11%.

Note that the values in the table above are based on the trialled layout only. The impact of converting other conventional roundabouts with other types of layout or with different travel patterns to a Dutch-style roundabout could well be different.

Further Information

TfL - Better Junctions for Cyclists www.tfl.gov.uk/betterjunctions

TRL - Safer Cycling Innovations www.trl.co.uk/cyclinginnovationtrials/

See TRL Report PPR752 for more detail.