



## Roundabouts with Cycling Traffic

### Roundabouts: Benefits for all road users

In Europe, starting first in the UK and France, an increasing number of intersections have been redesigned as roundabouts since the 1980s. This involved in many cases removing traffic lights and establishing new rules on priority. Roundabouts improve the flow of traffic where vehicle speeds are low. The small distances between vehicles driving at low speeds increase flow capacity. Compared with signal-controlled junctions, roundabouts therefore provide vehicles with less delay/ starting activity (noise and air pollution) and reduce congestion for flows of just above 30,000 vehicles per day. Low vehicle speeds on roundabouts reduce accident rates and casualties. Pedestrian crossing activity on approach and exit arms can be negotiated through eye contact with vehicle drivers offering pedestrians minimal delay. As they drastically reduce motor vehicle speeds, roundabouts are often located at entry points to traffic-calmed streets in city centres and urban access roads

#### Easy to use

The interaction between road users entering the roundabout and those who are on the circulatory carriageway is negotiated in flexible processes. The interaction of road users is not controlled by a central system such as traffic lights at each entry; instead, road users self-organise priority at roundabout entries and exits simultaneously through applying a simple rule: 'Priority is given to traffic on the circulatory carriageway.' While other

schemes typically involve complex interactions including turning movements at various points of conflict at junctions, roundabouts enable simple interactions between road users entering and exiting the roundabout at the same time using the various entries and exits, thus reducing the number of potential points of conflict to two – at entry and exit. Reduced circulatory speeds are achieved especially through significant deflection for motor vehicles. To the same end, the central island of the roundabout is often used to deliberately obstruct visibility through, for example, introducing plantings or sculptures as landmarks.

### Integrating cycle traffic into various types of roundabout

At roundabouts it is essential to take case-specific planning measures to allow for a fluid and safe cycle flow.

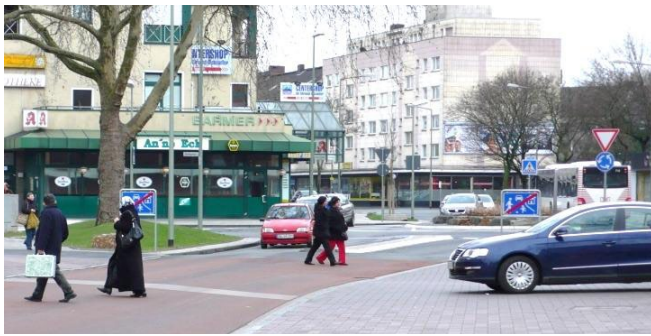
*Photo: Roundabout at the entrance to the main through-road in Wabern (near Bern), Switzerland*

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Roundabout in Duisburg (Germany)

At each roundabout, the specific situation must be considered, including size, geometry and design of the roundabout as well as traffic flows.

On smaller roundabouts cyclists are perceived as equal road users due to the tight and curvy geometry as well as the lower motor vehicle speeds it encourages. Hence, mixing cyclists with general traffic within the circulatory area is recommended as the default option. Off-carriageway cycle facilities around the outside of the roundabout are used in exceptional cases only, for example with single-lane cycle paths outside urban areas.

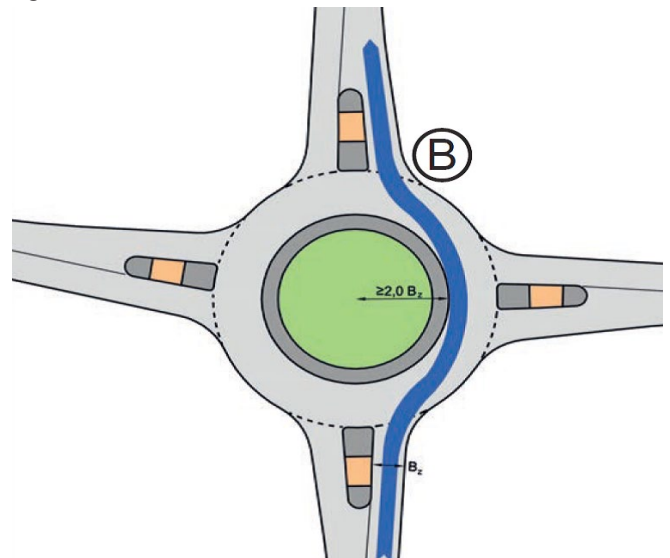
There are currently two options to provide for cyclists on roundabouts: on-carriageway cycling or separate cycle paths and/or shared cycle and pedestrian paths. For safety reasons, on-carriageway cycle lanes and protection lanes must not be provided on roundabouts. The Recommendations for Cycle Facilities (Empfehlungen für Radverkehrsanlagen, ERA) issued by the Road and Transport Research Association (Forschungsgesellschaft für Straßen- und Verkehrswesen, FGSV) include cycle integration options for roundabouts. The various types of roundabout are dealt with in more detail below.



Roundabout in Haaren (Netherlands)

### Smaller, single-lane roundabouts

A small roundabout with an inscribed circle diameter of about 30 metres is the most common type and allows for on-carriageway cycling traffic. Cycling and motor vehicle speeds on the circulatory area do not differ much, thus providing the required safety. Another benefit is that on-carriageway cycling uses up less space than cycle paths around the outside of the roundabout. In order to provide safety for cyclists on the circulatory carriageway, roundabouts should be designed with consideration of the following: Circulatory widths must be minimised in order to reduce the risk of cyclists being overtaken or cut off by motor vehicles. On the other hand, roundabouts also have to accommodate heavy goods vehicles. This is helped by providing low-kerbed, central overrun areas with high-friction surfacing that will be used by heavy goods vehicles but avoided by light vehicles.



Necessary spatial delimitation of motor-vehicles

The entry and exit angle design is also critical to vehicle speeds and road safety. Protection lanes on approach arms should end a sufficient distance in advance of the entry, for example at the splitter island (with approach lane width of 3.25 metres) to make abreast entering of motor vehicles and cyclists into the roundabout impossible. Transitions from cycle approach lane to protection lane should be applied about 20 metres in advance of the roundabout with protection lanes ending at the splitter island. On the exit arm, the protection lane may be introduced right behind the pedestrian crossing (with minimum carriageway width of 3.75 metres). On exit arms, transitions from protection lane to cycle lane

#### Sources

FGSV (2010): Empfehlungen für Radverkehrsanlagen (ERA) (German)

Blog contribution about Eindhoven's Hovenring, <http://bicycledutch.wordpress.com/2012/08/23/spectacular-new-floating-cycle-roundabout/>

GDV (2012): Sicherheit innerörtlicher Kreisverkehre, in: Unfallforschung kommunal, Nr. 15, Berlin, [www. http://www.udv.de/uploads/tx\\_udvpublications/Uka15\\_Kreisverkehre\\_\\_1\\_.pdf](http://www.udv.de/uploads/tx_udvpublications/Uka15_Kreisverkehre__1_.pdf) (German)



Roundabout in Rotterdam (Netherlands) with a segregated cycle path

should be applied at a distance of about 10 metres behind the splitter island. Separated cycle paths should already be truncated on approach arms, so that cyclists join the carriageway. This requires infrastructural facilities for protection at the end of the cycle path followed by a short strip of protection lane.

In higher traffic flow situations the acceptance of on-carriageway cycling may dwindle significantly. In this case it may be considered to open up pavements to cycling traffic or introduce cycle paths. It must be taken into account, however, that providing segregated cycle paths around the outside of the roundabout will create additional conflict points on the crossing areas on approach and exit arms. Cycle crossings should be provided parallel to pedestrian crossings passing across the splitter island at a distance of about 4 metres (length of one motor vehicle) from the circulatory carriageway. For safety reasons the minimum distance should be 2 metres and should not exceed 5 metres. Winding cycle paths with abrupt changes in direction leading onto the approach must be avoided in any case. Where space is lacking, the provision of on-carriageway cycle facilities rather than inadequate cycle paths is recommended. Outside urban areas, however, existing segregated cycle paths should always be maintained.

On a clearly segregated, two-way cycle highway running around the outside of the roundabout, cyclists may be given priority over minor side road traffic.

### Mini-Roundabouts

Mini-roundabouts with an inscribed circle diameter between 13 and 22 metres are mainly used in the minor side road network with narrow roads. Mini-roundabouts have coloured central markings or a raised central island capable of being driven over by motor vehicles.



Separate level for cycling traffic in Houten (Netherlands)

On-carriageway cycling is again the default option with cyclists already mixing with traffic on the approach to the roundabout. The central island should be unattractive to cars to deter them from overrunning and thus making it impossible for cars to pass cycling traffic.

### Turbo-Roundabouts' with a two-lane approach

Roundabouts with two lanes may achieve better capacity for motor-vehicle traffic, but also introduce accident risks to cyclists. Similar to the situation at roundabouts with excessive lane width, turbo-roundabouts are not suitable for on-carriageway cycling. Consequently segregated cycle paths around the outside of the roundabout are recommended by the ERA. The questions whether priority should be given to cycle path users and whether a second level (underpasses for cycling traffic) might be appropriate in some cases are contested, especially in the Netherlands, because so-called turbo-roundabouts are very rare.



Turbo-Roundabout in Hilversum (Netherlands)

### Large roundabouts

Large roundabouts with high traffic flows have an inscribed circle diameter of 50 metres or more. They have often been built decades ago and survived as square design or at the end of express roads. Their geometry primarily caters to the needs of high-speed motor vehicle

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traffic. Cycling conditions fundamentally differ between such large roundabouts and small ones: Large roundabouts, for example, have multi-lane dual carriageway approaches and exits for motor-vehicle traffic; the entry angle allows for high speeds creating motorway-like situations at entries where drivers merge with circulating traffic. The circular design is often the only feature such large junctions have in common with the smaller roundabouts; but they function very differently and expose cyclists to almost insurmountable accident risks. An adequate solution for this matter is still to be found, regardless of the provisions for cycling traffic. Some large roundabouts are signal-controlled and also provide for the safety of cyclists on the cycle path around it. In these cases, a segregated two-way cycle path with junctions where signal timings are optimised for cyclists is an option. Otherwise, the accident risks that cyclists are exposed to is manageable only in very high cycle flow situations (such as at the so-called 'Stern', a major traffic junction in the German city of Bremen), where there are clear road markings indicating cycle traffic to entering or exiting drivers, and where motor vehicle speeds are low.

Grade-separation for cyclists can be a comfortable and safe alternative, such as well-lit underpasses providing adequate visibility and a minimal slope. In addition physically separated facilities enabling cyclists and pedestrians to cross the roundabout are an option in some cases. In the Dutch city of Eindhoven, pedestrians and cyclists can use the 'Hovenring', a suspension bridge, to cross a very busy lowered at-grade junction for

*Turbo-Roundabout in Hilversum (Niederlande)*



motorised traffic since 2011. A roundabout just for cyclists has been introduced in Gdask, a Polish city on the Baltic coast where a number of cycle routes meet that are very busy in summer.



*Roundabout just for cyclists in Danzig (Poland)*

## Conclusion

The numerous innovative street designs that follow the shared-space approach, which is even anchored in the road traffic laws of some countries, are based on mutual respect between the road-users who share the street environment. Sophisticated street layouts encourage drivers to reduce their speeds, similar to the driving behaviour in pedestrian zones. In such environments large areas of road surface can be won for public space and other uses. The freedom of movement for cyclists is optimal. An important condition, however, is the limitation of parking spaces for cars in order to ensure that eye contact can be made between road users. For a future mobility structure, a flexible street design is the right investment, already today.



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More informations can be found in  
I-1 State of Art Design for Cycling Facilities  
„ERA 2010“ Guidelines  
I-2 Cycling in Urban Main Streets  
S-9 Road Traffic Safety Campaigning  
“Cycling Expertise“ is available online:  
[www.nrvp.de/en/transferstelle](http://www.nrvp.de/en/transferstelle)

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