



FACT SHEET H-04 – INTERSECTIONS

Particular relevance of intersections

Designing and planning intersections demands consideration for every transport mode. Ensuring safety and accessibility for all, rather than increasing car flows, has to be prioritised. General requirements for intersections include [FGSV (2006) and FGSV (2010)]:

- recognizable, understandable and easily and safely usable by all transport modes,
- clear sight-lines between cyclists/pedestrians and drivers,
- easily traversable, falling hazards such as high kerbs should be avoided and
- clearly indicate expected cyclist behaviour (meaning of any related sign, e.g. for indirect left turns, has to be obvious)

Particular attention should be paid to conflicts between turning cars and through cyclists. Small turning radii for motorised traffic are recommended for reducing car speeds. In addition, the use of coloured surfacing can increase drivers' awareness of cyclists.

It should be noted that the attractiveness of cycling decreases as the number of required stops increases – number of stops and waiting time at intersections for cyclists should be minimised.

The varying and complex needs of transport users (especially cyclists and pedestrians) at intersections require a more detailed discussion than is

possible in this fact sheet. Further information can be found in the Central MeetBike Strategy Recommendations for local level (CMB 3.4.1) and other sources listed below.

Signalised intersections

Signalised intersections are standard for junctions between urban main roads with high traffic volumes or special safety requirements. Cyclists travelling straight or turning left are particularly endangered due to inattentive drivers. Crash risk can be minimized through special signalisation or road markings.

Signalisation measures require that cyclists have their own traffic signals, as they would otherwise have to obey the same signals as motorised traffic. Signaling can be used to give cyclists an advanced green phase, ensuring them a time advantage; they enter the intersection before motorised traffic, putting them in front of turning drivers and making them more visible.

A similar effect can be achieved through road markings with an advanced stop line. This gives cyclists a spatial advantage over drivers. The queuing area for cyclists is extended at least 3,00 m in front of waiting drivers. A feeder bicycle lane is recommended so that cyclists can pass queuing motorists to reach the advanced stop line.

Markings for turning cyclists include a dedicated left turn lane adjacent to the motor vehicle turn lane for direct left

turns. This enables direct sight-lines between cyclists and drivers and increases driver awareness of cyclists. If space is not available, a waiting box is recommended in front of queuing motorists that extends across the entire width of the car travel lane. Cyclists are then in front of motorists and highly visible and can turn left directly.

Alternatively, an indirect left turn facility can be provided as described below.

Grade-separated intersections

Grade-separated intersections (tunnels and bridges) can be used to overcome major barriers where avoiding the disruption of car traffic is the main goal. However, tunnels and bridges are more costly than at-grade junctions and require more physical effort for bicyclists and pedestrians. In addition, tunnels can be an environment in which cyclists and pedestrians feel personally unsafe. Current planning generally tries to avoid grade separation, however if used, high design standards concerning gradient, width and lighting are necessary in order to ensure social safety and comfort for cyclists.

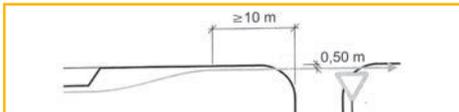
Right-of-way intersections

Right-of-way intersections give one road priority over the other and are not signalised. They are the standard solution for the junction of main roads with

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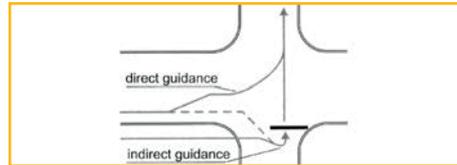
secondary roads. The type of cycling provision depends on the type of provision leading up to the intersection and traffic volumes and should prioritise safety issues, especially turning conflicts.

An essential safety aspect is increasing the visibility of cyclists. If cyclists and drivers are travelling in close vicinity (e.g. in the case of cycle and advisory lanes or mixed traffic) no special treatment is necessary as cyclists are on the carriageway and in drivers' field of view. But often cyclists are obliged to use a cycle path separated from the carriageway. The path should therefore be aligned directly alongside the carriageway at least 10 m before the intersection in order to improve sight-lines.



Realignment of the cycle path at intersections (source: FGSV (2010), p.38)

Attention also has to be paid to cyclists turning left. In general there are two main treatments for left-turning cyclists: a direct and indirect left turn. Turning left directly through the junction is recommended, as long as the road's speed limit does not exceed 50km/h, the traffic volume is less than 800 cars/h and there is only one lane to cross. In all other situations it is more appropriate to ensure safety at the junction by providing an indirect left turn for cyclists. Therefore a dedicated cyclist waiting area needs to be provided in front of queuing motorists on the cross street. Cyclists then cross with the next green phase for cross traffic.



Direct and indirect intersection treatments for left-turning cyclists (source: FGSV (2010), p.39)

At right-of-way intersections, the road user required to give way usually approaches the intersection at low speeds. However, should the situation require special treatment (e.g. due to high crash rates) German recommendations suggest implementing a continued, raised crossing in order to slow down motorists and increase driver awareness.

Intersections without priority direction

Cycling-specific infrastructure is generally not recommended for streets with low traffic volumes or zonal speed limits up to 30 km/h. In this environment, which is generally found in the secondary road network, the safe and cost-efficient solution is to have bicycle traffic mix with cars on the carriageway. At intersections, there are no control devices (signs or signals); the vehicle approaching from the right has priority.

Roundabouts

Roundabouts are also standard in the urban road network. Depending on diameter, they can handle medium or high traffic volumes with or without signalisation. They are primarily used to increase safety by fulfilling three gene-

ral principles: perpendicular approach arms, clear deflection of traffic travelling straight due to central island and single lane exits.

Roundabouts are divided into three types according to diameter. Mini-roundabouts have a diameter of 13-22 m and can handle traffic volumes up to 15.000 veh/d. The central island can be overrun by HGV and buses. Cyclists should ride in the circulatory area.

Small roundabouts have a diameter of 26-50 m. In general, cyclists should ride on the carriageway in mixed traffic to increase their visibility and driver awareness. Cyclists approaching the roundabout on a cycle lane should be able to slowly and safely merge with motorists before entering the roundabout. If there is a relatively high number of HGV or if cyclists are already on a cycle path in the approach arm, the path can continue around the outside of the roundabout.

Large roundabouts (diameters >40 m) often have more than one circulatory lane and should therefore have separate cycle facilities. Cyclists should give way to motorists at entries and exits.

For safety reasons advisory lanes and cycle lanes should not be provided in the circulatory area. Lanes force cyclists to the outside of the carriageway, thus giving drivers the false impression that the cyclist can be overtaken. This results in dangerous situations when drivers cut off cyclists when exiting. In fact, cyclists should be encouraged to ride in the middle of the circulatory area in order to avoid such dangerous situations.

Lessons learned: The main considerations when designing cycling provision at intersections are junction type (road classification), traffic volumes and vehicular speeds. It is important to always ensure clear fields of view between all road users and make sure expected behaviour is easily understandable. Conflict situations such as motorists turning right where cyclists continue straight or in the case of cyclists turning left require special consideration.

For further resources, links and best practice examples visit the Sustainable Urban Transport Project website: <http://www.sutp.org/>

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Sources:

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