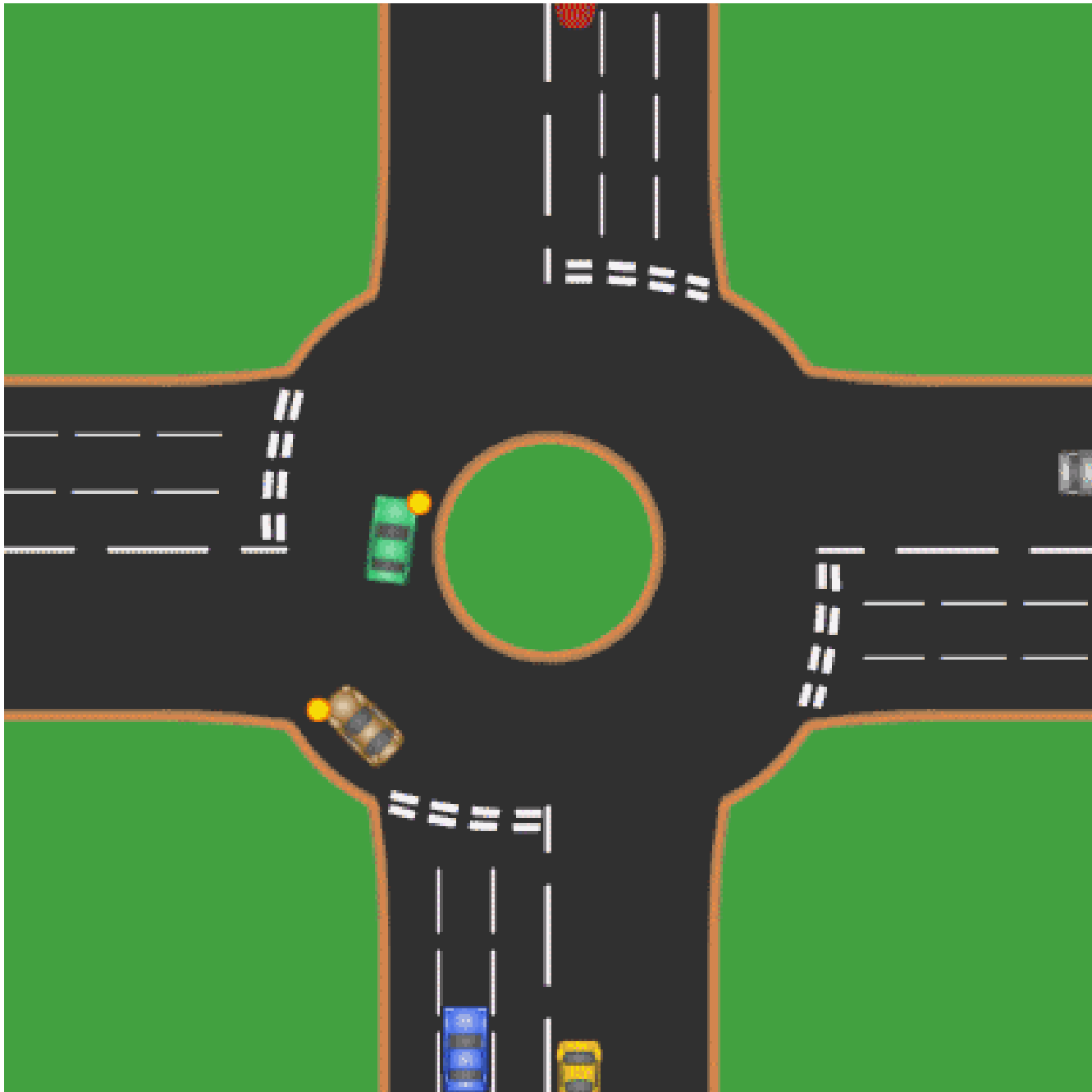


Rotary Intersections

- A **roundabout** or **rotary** - type of road junction (or traffic calming device) at which traffic streams around a central island, after first yielding (giving way) to the circulating traffic
- Roundabouts are statistically safer than traditional intersections, though they do not cope as well with the traffic on highways or similar fast roads.



- Operate with yield control to give priority to circulating traffic and eliminate much of the driver confusion and driver wait associated with junctions that have traffic lights.
- Roughly the same size as signalised intersections with the same capacity

- Separate incoming and outgoing traffic with pedestrian islands and therefore encourage slower and safer speeds
- Roundabouts are safer than both traffic circles and traditional intersections—having 40% fewer vehicle collisions, 80% fewer injuries and 90% fewer serious injuries and fatalities compared with the intersections they replace

- Reduce points of conflict between pedestrians and motor vehicles and are therefore considered to be safer for them
- However, roundabouts, especially large fast moving ones, are unpopular with some cyclists. This problem is sometimes handled on larger roundabouts by taking foot and bicycle traffic through a series of underpasses.

- Roundabouts dramatically outperform traffic circles in terms of vehicle throughput and, because a roundabout's circular traffic is always moving, they outperform ordinary junctions with traffic signals as well.
- However, due to the fact that vehicle traffic must yield instead of stop, and change lanes at speed on the roundabout, there are serious safety concerns for bicyclists who cycle alongside the road

- If the adjacent cross-walks are not properly designed, there are serious risks for persons with visual impairments, because of the speed at which traffic exits the roundabout.
- In addition, roundabouts do not cope well with the traffic on highways or similar roads, thus leading to long queues.

- Roundabouts are not suitable for junctions with high traffic volume. When traffic congestion occurs in one direction, it would quickly block a roundabout and spread to all other entering directions.
- The congestion would be further deteriorated by large number of long vehicles like container trucks.

Types of roundabout

- Large roundabouts typically have two to four lanes around the central hub, and frequently have traffic lights regulating flow during peak hours.
- Some roundabouts have a divider between traffic turning left and other traffic enabling those making left turns to bypass the roundabout entirely.

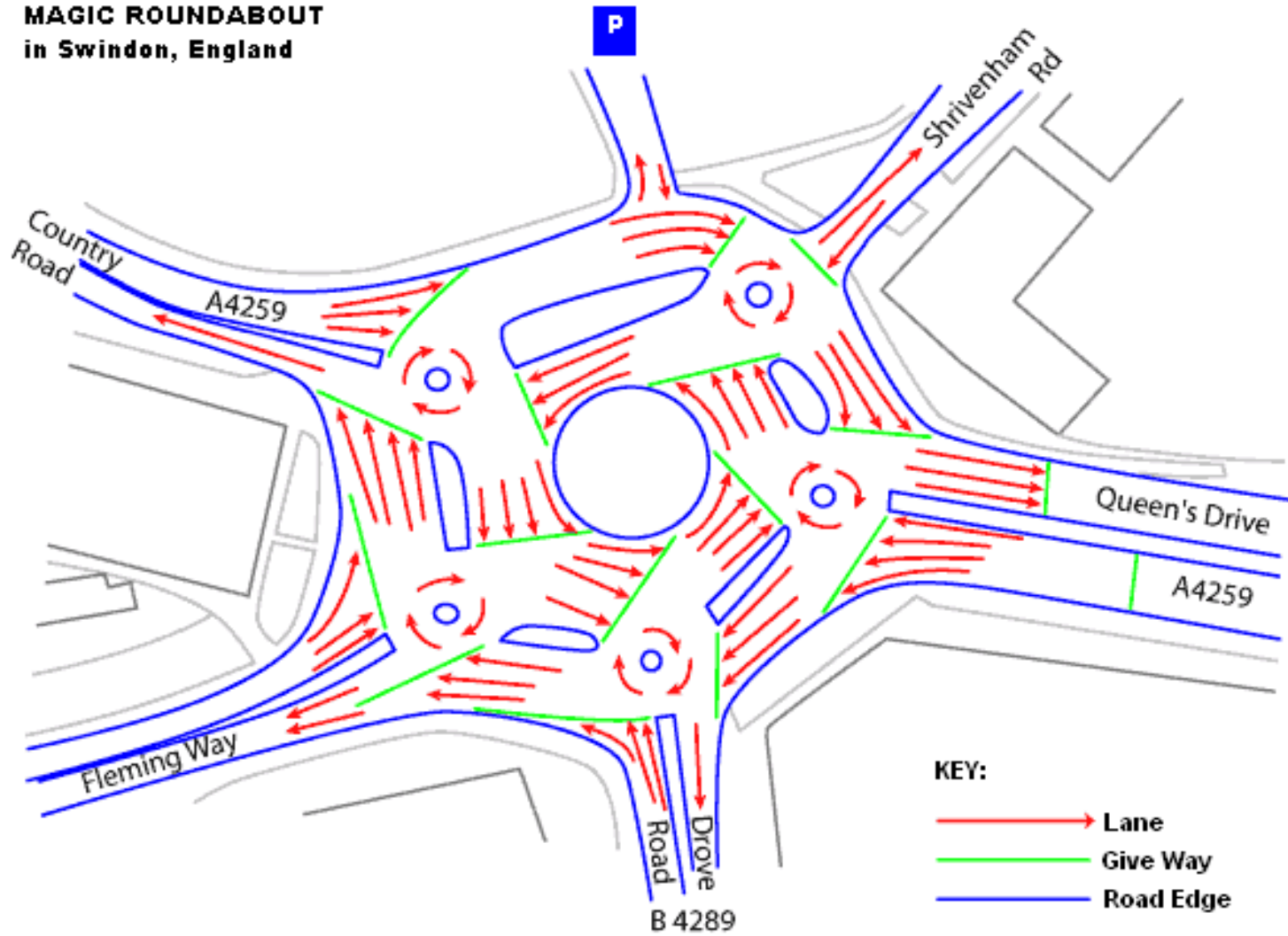
- Another type of roundabout is the through-about roundabout or "hamburger" junction. This type of roundabout enables straight-through traffic on one road to cross over the central island, whilst all other traffic must drive around the island. As a consequence this junction must always be controlled by traffic lights

- The term "gyratory" is sometimes used in England when a roundabout is large and has non-standard lane markings or priorities; in fact, they are more like traffic circles.

Magic Roundabouts

- This roundabout is at an intersection of five roadways, comprising one large centre roundabout and five smaller (mini) roundabouts. Traffic flow around the larger, inner roundabout is anti-clockwise, whereas traffic flows in the usual clockwise direction around the five mini-roundabouts and the outer loop.
- Magic roundabouts are also known as "Ring Junctions".

**MAGIC ROUNDABOUT
in Swindon, England**



Cycle facilities at roundabouts

- Bicyclists' risk is relatively high in all such intersections, but it is much higher when the intersection has a marked bicycle lane or side path around its outside
- Collisions typically occur when a motorist is entering or leaving the circular roadway

- Cycle lanes on a roundabout in Newbury, Berkshire. This photo shows a roundabout with cycle lanes around the outside.
- The particular example shown is in a country where traffic keeps to the left, and traffic in the circular roadway of the roundabout travels clockwise.

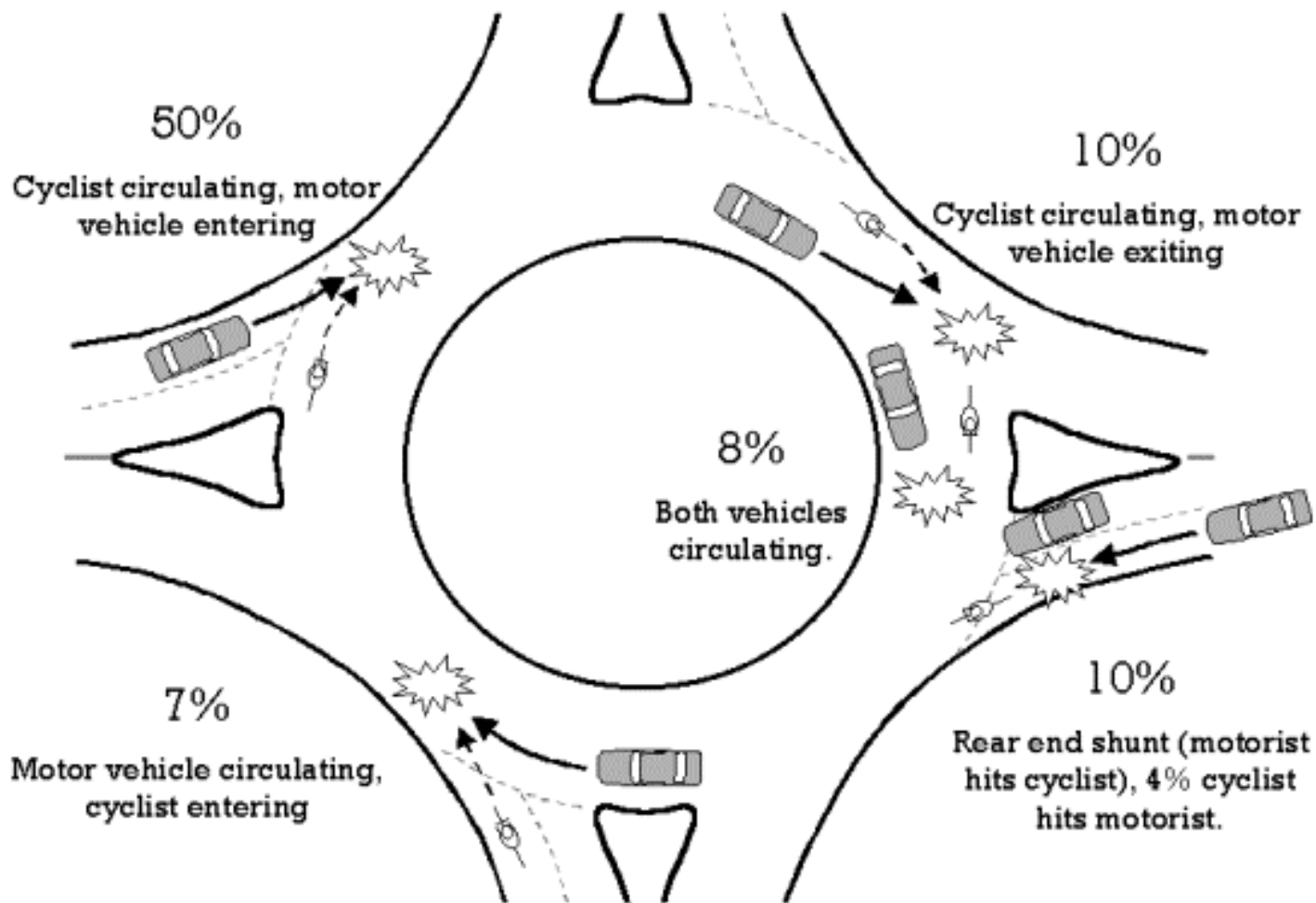


- A motorist entering the circular roadway must yield to traffic in it, but such traffic will generally keep away from the outside of the circular roadway if passing an entrance.
- A bicyclist close to the edge of the roadway is not in the usual position where an entering motorist expects to look for circulating traffic.

- When exiting the circular roadway, a motorist must look ahead to steer, and to avoid colliding with another vehicle ahead or with pedestrians in a crosswalk.
- As the circular roadway curves away from the exit, the path of a vehicle exiting the circular roadway is relatively straight, and so the exiting motorist may often not need to slow substantially.
- However, if it is necessary to yield to a bicyclist riding around the outside, the exiting motorist must look toward the rear, to the outside of the intersection.

- With many vehicles, such as vans, the driver's view in this direction is obstructed.
- The task burden of the motorist is therefore substantially increased if bicyclists ride around the outside.
- The resulting conflicts, and more frequent requirements for motorists to slow or stop, also reduce the efficiency of traffic flow which is one of the major advantages of the circular intersections

Motor vehicle/pedal cycle collisions at roundabouts.



Note: 68% of cycle motor vehicle collisions involve circulating cyclists (who have right of way) Source: Pedal Cyclists at Roundabouts, Layfield R.E. and Maycock G., Traffic Engineering and Control, June 1986

Solutions to roundabouts

- Replace with signalised intersection
- Install full time signal control on the roundabout
- Physically change roundabout geometry, the latter two options may be combined.

- Recommended geometric modifications include changes to entry/exit layouts, circulatory lanes and visibility parameters.
- A "radial" format is used, with entry/exit lanes made perpendicular, rather than tangential, to the central island by removing flares and modifying splitter islands.
- A narrowed circulatory lane is used and/or separate lanes are marked.
- If enforceable, there may also be scope for the application of special speed limits on roundabouts

Modern design guidance

- The special features of modern roundabouts, including splitter/diverter islands and relatively small diameter of the circular roadway, decrease the speed of motor traffic and so reduce the risk of collisions for bicyclists as well as motorists below that of conventional intersections.
- Design guidance for modern roundabouts recommends terminating cycle lanes (if any) well before the entrances, so bicyclists merge into the stream of motor traffic.

- Bicyclists who lack the skill and confidence to do this may use the crosswalks as pedestrians.
- Modern design guidance also recommends placing the crosswalks far enough from the roundabout so that at least one exiting vehicle can wait without blocking the circular roadway

- *Yield at Entry.* Traffic entering the roundabout yields the right-of-way to the circulating traffic. This prevents traffic from locking-up and allows free flow movement.
- *Deflection.* The entry lane is designed with a small deflector island to reinforce the yielding process and slow traffic.
- *Limited size.* Modern roundabouts usually have just one, and never more than two, rotating lanes.

Mini roundabouts

- Exist at smaller intersections to avoid the use of signals, stop signs or the necessity to yield in favour of one road of traffic
- Can be a painted circle, a low dome, or often are small garden beds.
- Work in the same way as larger roundabouts in term of right of way.



Mini Roundabout

- Large diameter central island replaced by a small diameter island
- Increases intersection capacity
- Provides continuous traffic flow through the intersection

A pair of Mini roundabouts



Design principles

- Wider entries by narrowing median strips or islands and advanced give – way lines
- Smaller central island
- Deflection of traffic passing through the roundabout – safe speed for vehicles
- Simple, clear and conspicuous layout

Priority to the right

- This rule establishes that the right of way belongs to the driver who is coming from the right, and the driver coming from the left should yield to him.
- Absence of weaving – reduction in size of central island

Design Procedure

- Central island – $\frac{1}{3}$ of diameter of circle inscribed within outer carriageway boundaries or 8m, whichever is larger.
- Increase number of traffic lanes at give-way line by advancing give-way line into existing junction space or by flaring approaches.

- Minimum Stopping Distance of 25 m between give-way line and point of conflict with a vehicle from left should be available
- Deflection island to ensure that through movements do not occur

CAPACITY OF A MINIROUNDBABOUT

- $q = k(\sum w + a^{1/2})$

Where

q – Total entry volume in PCUs per hour

$\sum w$ - Sum of basic roads width used by traffic in both directions in metres

a - Area of junction widening i.e. area within intersection outline including islands which lie outside the area of cross roads in sq.m.

k – Efficiency coefficient depends on site conditions

k values in PCUs per hour

3 way junction	80
4 way junction	70
≥ 5 way junction	65

- Practical Capacity = 80 % of that given by the equation

Advantages

- Increase in capacity of intersection
- Reduced accident rates

Disadvantages

- Strict observance of ' priority from right' rule
- Reduced speed at junctions – pavement markings, road signing, guide islands, alignment of kerbs and central island
- Adequate visibility to approaching drivers