Modern Roundabouts

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Disclaimer

This document contains extracts from the Gauteng Department of Roads and Transport draft BL104, **Guidelines for Roundabouts on Provincial Roads in Gauteng**, PWV Consortium, April 2005. The views expressed herein are however entirely the author's.

1. Roundabouts v. Circles

Internationally, the modern roundabout is making an increasing impact as a safe and efficient form of traffic control. They must not however be confused with traffic circles which were removed from most intersections in years gone by.

The main differences between "old traffic circles" and "modern roundabouts" are:

- Approach roads on old circles entered tangentially, allowing entry at 60 to 80 km/h. Modern roundabouts have a tight entry radius to reduce speed to between 30 and 40 km/h;
- Modern roundabouts work on gap acceptance principles. Vehicles on the approaches must give way to vehicles in the circulating roadway, even if those vehicles arrived after them. Older circles were designed on weaving principles;
- Modern roundabouts require a raised splitter island between entry and exit lanes.

The roundabout should also not be confused with the mini-circle. The "mini-circle", although it works on the same principle as a roundabout, is not big or raised enough to force speed reduction and generally does not have space for splitter islands.

All modern roundabouts have an outer diameter of 26 m or greater. Most references require a minimum outside diameter of 28 or 30m and a tracking width of 7,5 m or wider, as these are the minimum dimensions required to cater for large trucks. Roundabouts larger than the minimum are used to increase capacity.

Mini-circles have an outside (or outer) diameter of 25 m or less, and an inner diameter of around 2 to 4 m. Because heavy vehicles are unable to track around mini-circles, the central island is painted or slightly raised to allow vehicles to drive over it.

2. Safety

Properly designed roundabouts are regarded as the safest form of intersection control. Of all the benefits claimed for roundabouts, improved safety is the most consistently and most convincingly indicated. Typical collision numbers and severity of collisions at roundabouts are at around 30% to 50% of equivalent intersections with traffic signal control. Pedestrian and cyclist safety, often perceived as a potential problem at roundabouts, is also no worse and often better than at other intersection control types.

The major reason for the improved safety condition at roundabouts is the reduced speed at which vehicles enter. Vehicle speeds in the circulating roadway are typically 30 to 40 km/h. Other reasons include the provision of splitter islands on all approaches to roundabouts to protect pedestrians and cyclists, and setting the pedestrian crossing approximately one vehicle length back from the yield line to reduce vehicle/ pedestrian conflict.

3. Warrants for Roundabouts

The following is a summary of the guidelines for the location of roundabouts as extracted from local and international literature and as contained in the Gauteng BL 99/5 report.

While roundabouts are sufficiently flexible to be used at most intersections, they do give equal priority to all approaches, no matter how minor. They should be used with caution where traffic volumes on approaches are greatly different. Furthermore all vehicles must slow and take gaps on approaching the roundabout and priority cannot be given to any movement without violating the roundabout operational principles (e.g. once traffic signals or stop streets are installed at roundabouts, they cease to operate as roundabouts).

Table 1 is a guide to the general applicability of roundabouts at the intersection of roads with varying functional classifications.

Table 1: Roundabout Applicability at Cross Roads (Guideline)

	Class 2 Major Arterial	Class 3 Minor Arterial	Class 4 Collector	Class 5 Local Street
Major Arterial	B	B	C	C
Minor Arterial	-	B	B	C
Collector	-	-	A	B
Local Street	-	-	-	A

Notation: A: Likely to be an appropriate treatment

B: May be an appropriate treatment
C: Not likely to be an appropriate treatment

The best locations for roundabouts are:

i. Intersections where safety would otherwise be a problem;
ii. Intersections where environmental enhancement or landscaping is required;
iii. Intersections where traffic signal maintenance or the availability of power is a problem;
iv. Where signals are required but cannot be afforded;
v. Where permanent, maintenance free control without enforcement is necessary;
vi. Where there are four-way or multi-way stops;
vii. Where urban and rural roads meet (e.g. entrance to towns) or where commercial/industrial and residential areas meet;
viii. Where the road standard or speed limit changes;
ix. In suburban areas where traffic calming is required;
x. At intersections with high turning movements;
xi. At intersections with more than four legs;
xii. At Y-junctions or other junctions with awkward geometry (e.g. sharp change in direction);
xiii. With other roundabouts in a network where intersection spacing is too close for signal coordination to be achieved;
xiv. Where U-turns are prevalent or desirable;
xv. Where three or more phases are required at traffic signals, roundabouts should be considered.

Unsuitable locations for roundabouts include the following:

i. Where minor crossroads enter major routes when a stop street would suffice;
ii. In signalised co-ordinated networks where they would break up the platoon flow;
iii. Where traffic signals will soon be required;
iv. Where main road and side road traffic flows differ greatly.

As with all intersections, roundabouts should be avoided on roads with steep slopes or where the intersection is not visible. Longer ‘flat’ areas are required for roundabouts compared with other intersection types, making them less suitable on steep grades.

4. Road Reserve

The minimum space required for a roundabout is 28 m for the outer diameter, to which a further 3 m verge should be added for pedestrian sidewalks and underground services on either side. The resulting 34 m dimension can therefore not be accommodated in road reserves of 24 m or less without the provision of splays on all four corners. The acquisition of these splays, where they do not already exist, adds to the cost and difficulty in providing roundabouts and is often a reason for not considering roundabouts as a solution.

The possibility of the road being widened to three lanes per direction should also be taken into consideration, as roundabouts on such routes are not recommended, at least until more experience has been gained with this method of control in South African conditions.

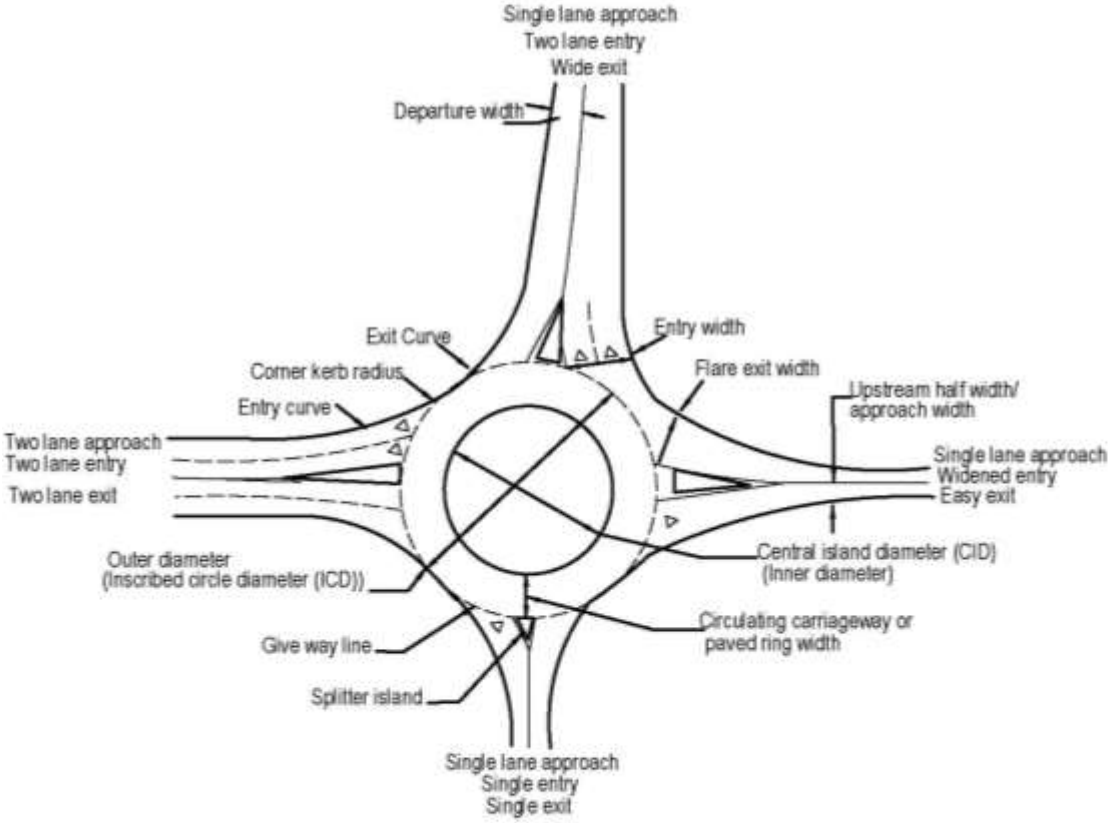
5. Capacity

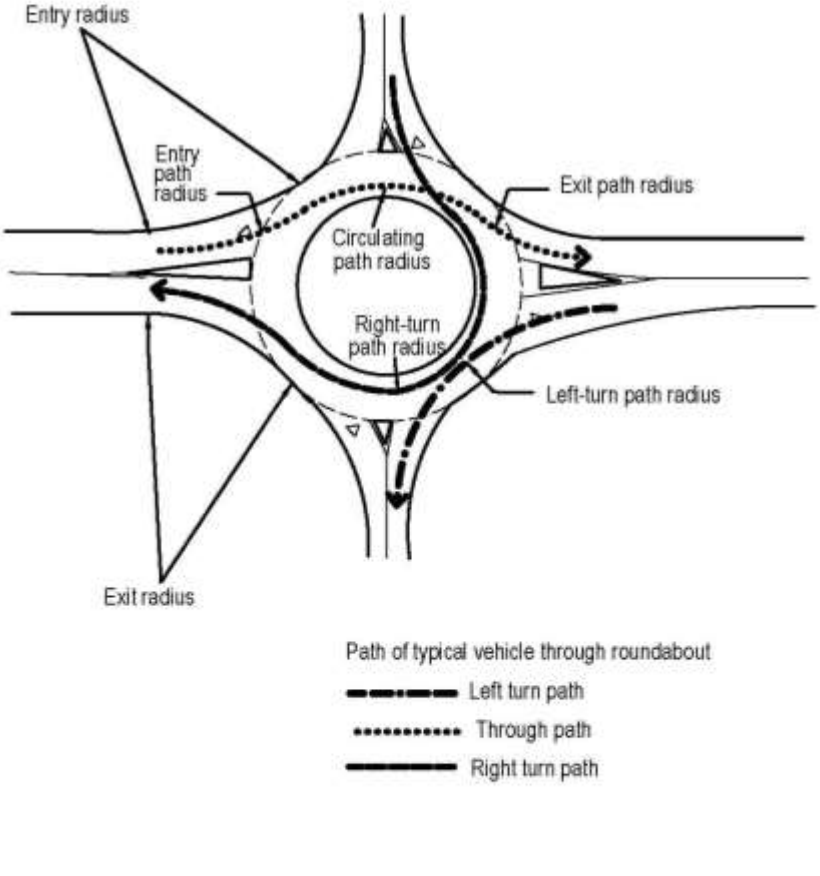
Recent research has shown that while roundabouts may not have the ultimate capacity of a traffic signal, they do have a much greater capacity than two-way or all-way stop controls and can operate well at intersections which otherwise require the installation of traffic signals.

The capacity of roundabouts depends to a degree on the country where they operate, with the United Kingdom, where roundabouts are commonly provided, indicating the highest capacity. Fairly typical capacity ranges are around 2 500 veh/hr total for single lane roundabouts and 3 600 to 4 000 veh/hr for two lane roundabouts, with 1 500 veh/hr being the capacity of a single approach.

6. Conclusion

In the right circumstances, roundabouts are a suitable form of control on most urban and even on some rural roads. They are safe, have a high capacity and are environmentally more acceptable than other forms of control. At this stage however they should be limited to two or four lane roads.


Single lane approach
Two lane entry
Wide exit
Departure width
Exit Curve
Entry width
Corner kerb radius
Flare exit width
Entry curve
Upstream half width/
approach width
Two lane approach
Two lane entry
Two lane exit
Single lane approach
Widened entry
Easy exit
Outer diameter
(Inscribed circle diameter (ICD))
Central island diameter (CID)
(Inner diameter)
Give way line
Circulating carriageway or
paved ring width
Splitter island
Single lane approach
Single entry
Single exit


Entry radius
Entry
path
radius
Exit path radius
Circulating
path radius
Right-turn
path radius
Left-turn path radius
Exit radius
Path of typical vehicle through roundabout
Left turn path
Through path
Right turn path