

# IRC STANDARD FOR TRAFFIC ROTARIES

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**Abstract:** The rotary intersection of road is also called as traffic rotary which is nothing but enlarged intersection of roads where vehicles roads or change their direction without stopping. All vehicles coming from different roads move in single direction around the central island and diverges into required exit. Rotary intersections or round about are special form of at-grade intersections laid out for the movement of traffic in one direction around a central traffic island. Essentially all the major conflicts at an intersection namely the collision between through and right-turn movements are converted into milder conflicts namely merging and diverging. The vehicles entering the rotary are gently forced to move in a clockwise direction in orderly fashion. They then weave out of the rotary to the desired direction. The benefits, design principles, capacity of rotary etc.

**Keyword:** Traffic Rotaries, rotary intersection, major conflicts, collision, milder conflicts

## Introduction

A rotary intersection is an enlarged road intersection where all converging vehicles are forced to move round a large central island in one direction before they we can weave out of traffic flow into their respective direction radiating from the central island. In other countries which follow to 'keep to the left' regulation, clock-wise direction of flow around the island is followed.

The main objects of providing a rotary are to eliminate the necessity of stopping for crossing vehicles and to reduce area on conflict. The crossing of vehicles is avoided by allowing all vehicles to merge into the streams around the rotary and then to diverge out to the desired radiating road. Thus the crossing conflict is eliminated and converted into 'weavingmanoeuvre' which consists of merging manoeuvre from the left and diverging out to the right or a merging from the right and a diverging out the left.

### 1.0 Guidelines for the selection of rotaries

Because of the above limitation, rotaries are not suitable for every location. There are few guidelines that help in deciding the suitability of a rotary. They are listed below.

1. Rotaries are suitable when the traffic entering from all the four approaches are relatively equal.
2. A total volume of about 3000 vehicles per hour can be considered as the upper limiting case and a volume of 500 vehicles per hour is the lower limit.
3. A rotary is very beneficial when the proportion of the right-turn traffic is very high; typically if it is more than 30 percent.
4. Rotaries are suitable when there are more than four approaches or if there is no separate lanes available for right-turn traffic. Rotaries are ideally suited if the intersection geometry is complex.

### 1.2 Traffic operations in a rotary

As noted earlier, the traffic operations at a rotary are three; diverging, merging and weaving. All the other conflicts are converted into these three less severe conflicts.

1. **Diverging:** It is a traffic operation when the vehicles moving in one direction is separated into different streams according to their destinations.
2. **Merging:** Merging is the opposite of diverging. Merging is referred to as the process of joining the traffic coming from different approaches and going to a common destination into a single stream.
3. **Weaving:** Weaving is the combined movement of both merging and diverging movements in the same direction.

These movements are shown in figure 40:1. It can be observed that movements from each direction split into three; left, straight, and right turn.

### 1.3 Design elements

The design elements include design speed, radius at entry, exit and the central island, weaving length and width, entry and exit widths. In addition the capacity of the rotary can also be determined by using some empirical formula. A typical rotary and the important design elements are shown in figure.

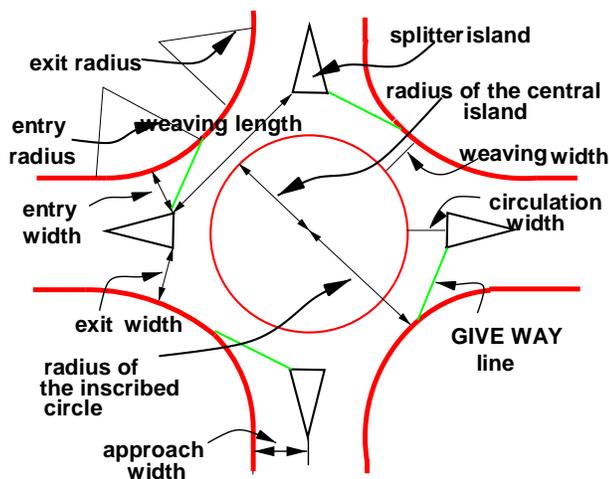


Fig.1 Design of a rotary

### 1.4 Design speed

All the vehicles are required to reduce their speed at a rotary. Therefore, the design speed of a rotary will be much lower than the roads leading to it. Although it is possible to design roundabout without much speed reduction, the geometry may lead to very large size incurring huge cost of construction. The normal practice is to keep the design speed as 30 and 40 kmph for urban and rural areas respectively.

### 1.5 Entry, exit and island radius

The radius at the entry depends on various factors like design speed, super-elevation, and coefficient of friction. The entry to the rotary is not straight, but a small curvature is introduced. This will force the driver to reduce the speed. The entry radius of about 20 and 25 meters is ideal for an urban and rural design respectively.

The exit radius should be higher than the entry radius and the radius of the rotary island so that the vehicles will discharge from the rotary at a higher rate. A general practice is to keep the exit radius as 1.5 to 2 times the entry radius. However, if pedestrian movement is higher at the exit approach, then the exit radius could be set as same as that of the entry radius.

The radius of the central island is governed by the design speed, and the radius of the entry curve. The radius of the central island, in practice, is given a slightly higher radius so that the movement of the traffic already

in the rotary will have priority. The radius of the central island which is about 1.3 times that of the entry curve is adequate for all practical purposes.

## 2.0 Advantages of rotary intersection

1. Traffic flow is regulated to only one direction of movement, thus eliminating severe conflicts between crossing movements.
2. All the vehicles entering the rotary are gently forced to reduce the speed and continue to move at slower speed. Thus, none of the vehicles need to be stopped, unlike in a signalized intersection.
3. Because of lower speed of negotiation and elimination of severe conflicts, accidents and their severity are much less in rotaries.
4. Rotaries are self-governing and do not need practically any control by police or traffic signals.
5. They are ideally suited for moderate traffic, especially with irregular geometry, or intersections with more than three or four approaches.

## 2.1 Disadvantages of rotary intersection

1. All the vehicles are forced to slow down and negotiate the intersection. Therefore, the accumulative delay will be much higher than channelized intersection.
2. Even when there is relatively low traffic, the vehicles are forced to reduce their speed.
3. Rotaries require large area of relatively flat land making them costly at urban areas.
4. The vehicles do not usually stop at a rotary. They accelerate and exit the rotary at relatively high speed. Therefore, they are not suitable when there is high pedestrian movements.

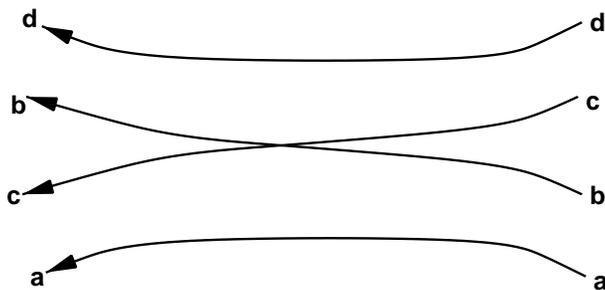


Fig.2 Weaving operation in a rotary

## 2.2 Width of the rotary

The entry width and exit width of the rotary is governed by the traffic entering and leaving the intersection and the width of the approaching road. The width of the carriageway at entry and exit will be lower than the width of the carriageway at the approaches to enable reduction of speed. IRC suggests that a two lane road of 7 m width should be kept as 7 m for urban roads and 6.5 m for rural roads. Further, a three lane road of 10.5 m is to be reduced to 7 m and 7.5 m respectively for urban and rural roads.

The width of the weaving section should be higher than the width at entry and exit. Normally this will be one lane more than the average entry and exit width. Thus weaving width is given as,

$$W_{\text{weaving}} = \left( \frac{e_1 + e_2}{2} \right) + 3.5\text{m}$$

Where  $e_1$  is the width of the carriageway at the entry and  $e_2$  is the carriageway width at exit. Weaving length determines how smoothly the traffic can merge and diverge. It is decided based on many factors such as weaving width, proportion of weaving traffic to the non-weaving traffic etc. This can be best achieved by making the ratio of weaving length to the weaving width very high. A ratio of 4 is the minimum value suggested by IRC. Very large weaving length is also dangerous, as it may encourage over-speeding.

### Figure in two lane intersection & four lane intersection

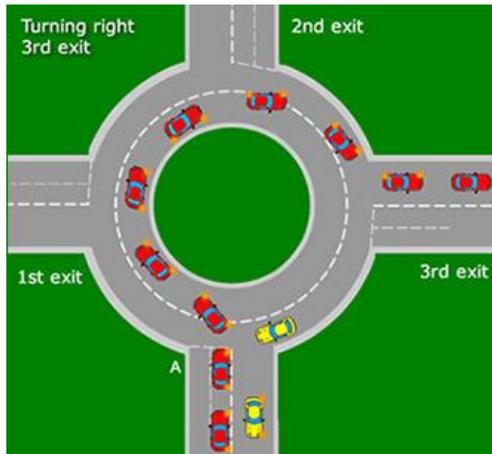


Fig.2 Two-lane intersections

Fig.3 Four-lane intersections

### 3.0 Result and Conclusions

From the analysis of collected data we concluded that the traffic approaching at the intersection is very high exceeding 3000PCU/hour and we know that a rotary can handle a maximum traffic volume of 3000 PCU/hour. So from analysis we can conclude that the existing rotary is not able to handle this much amount of traffic. And if can divide the traffic by introducing traffic signal with the rotary, this will divide the traffic to approximately half of the traffic which is currently approaching to the intersection. So the two phase traffic signal with the total cycle time of 60 sec will be installed with the rotary so the rotary can handle this much of traffic volume.

### 4.0 References

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