

Intersection Design

An intersection is an area, shared by two or more roads, whose main function is to provide for the change of route directions. Intersections vary in complexity from a simple intersection, which has only two roads crossing at a right angle to each other, to a more complex intersection, at which three or more roads cross within the same area.

Intersections at the same level, tend to have a high potential for crashes , therefore special design is needed.

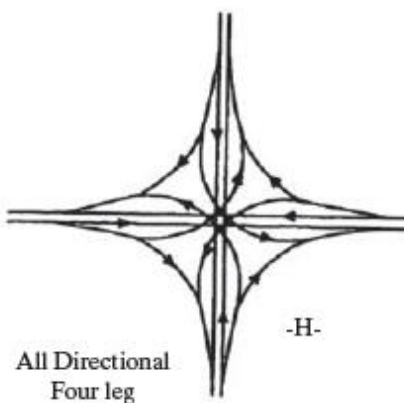
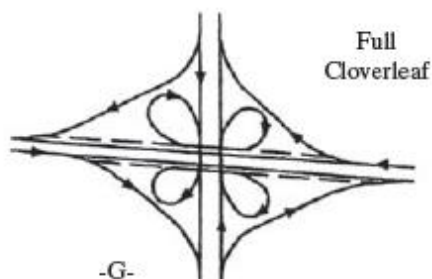
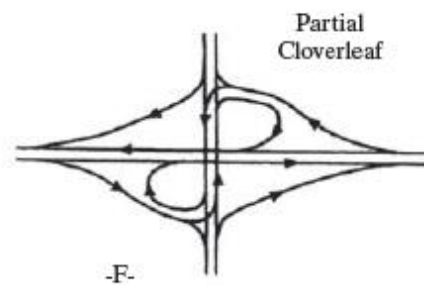
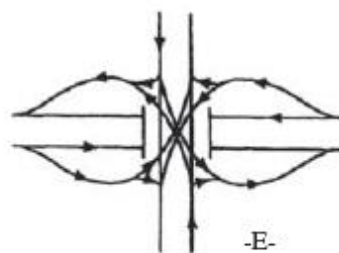
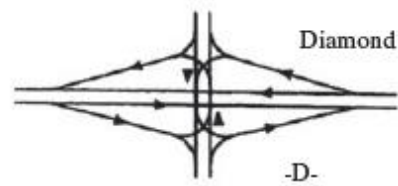
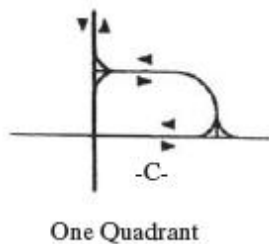
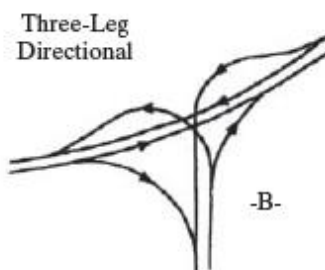
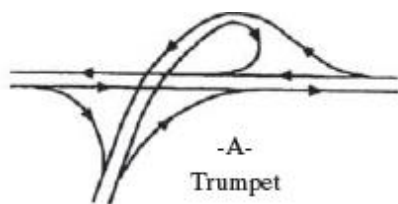
Intersections are classified into three general categories: grade-separated without ramps, grade-separated with ramps (commonly known as interchanges), and at-grade.

Grade-separated intersections usually consist of structures that provide for traffic to cross at different levels (vertical distances) without interruption. The potential for crashes at(grade-separated intersections) is reduced because many potential conflicts between intersecting streams of traffic are eliminated. At-grade intersections do not provide for the flow of traffic at different levels and therefore there exist conflicts between intersecting streams of traffic.

INTERCHANGES

An interchange is the intersection of two highways at different levels with separate connecting roads for the transfer of traffic from one highway to the other through a series of ramps.

The connecting ramps allow drivers to leave the road and enter another safely, without impeding the flow of traffic. While there is a large number of different interchange types, based on their configuration



Directional Interchange



A directional interchange is placed at an intersection of two highways where a high volume of traffic desires to transfer between only two legs of the interchange. Directional interchanges have increased ramp speed and capacity and require less space, when compared to a conventional cloverleaf interchange, but they are more costly to construct due to an increased number of ramps.

Cloverleaf Interchange



Probably the most common highway interchange out there. The cloverleaf interchange is designed to allow drivers to make turns off and onto the highway from four directions using loop ramps. Loop ramps safely accommodate left turns and eliminate all cross traffic conflicts.

Two main disadvantages of the cloverleaf interchange design are the need for more space and longer travel distance for the left-turning traffic. However, cloverleaf interchanges are significantly cheaper than directional interchanges .

Diamond Interchange



Diamond interchange design is utilized when a busy freeway intersects with a lesser road. Traffic leaves and enters the highway through four ramps. Left turns are made after leaving the highway. Due to the limitations in design, an increase in the volume of traffic on the crossroad leads to congestion and increased waiting time for traffic leaving the highway.

Trumpet Interchange



A trumpet interchange may be used instead of a T-intersection when one highway terminates into another highway.

Single Point Urban Interchange (SPUI)

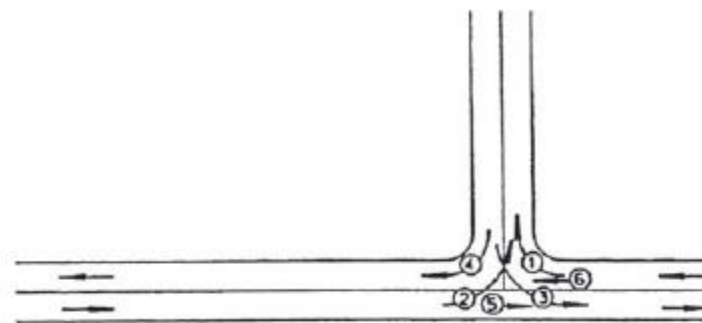


A single point urban interchange is a traffic signal-controlled diamond-shaped interchange, controlled by a single set of traffic signals that are located at the top of the interchange. The design is utilized at busy interchanges with limited space available, its main advantage is that it allows opposing left turns to proceed simultaneously.

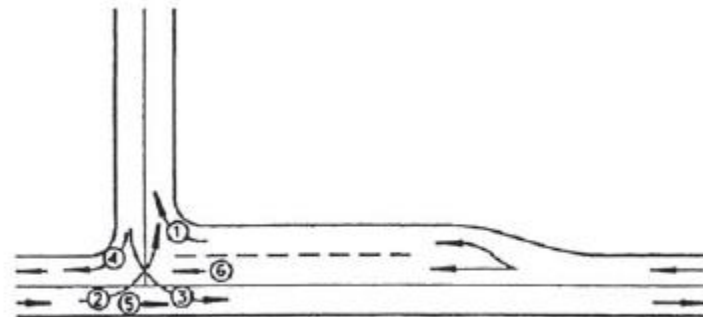
TYPES OF AT-GRADE INTERSECTIONS

The basic types of at-grade intersections are T or three-leg intersections which consist of three approaches; four-leg or cross intersections, which consist of four approaches; and multileg intersections, which consist of five or more approaches.

T Intersections



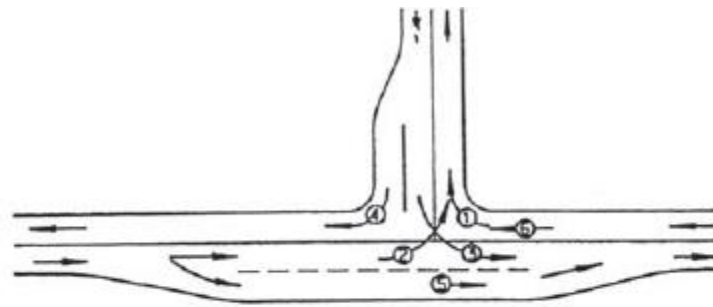
(a) Plain T Intersection



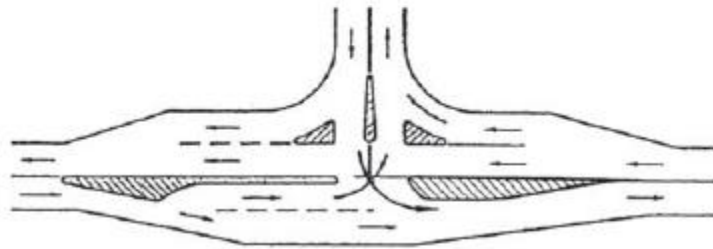
(b) T Intersection (With Right Turn Lane)

The intersection shown in (a) is suitable for minor or local roads. This type of intersection is also suitable for use in rural two-lane highways that carry light traffic.

At locations with higher speeds and turning volumes. In this case, separate right-turning vehicles from through vehicles, as shown in (b)



(c) 'T' Intersection (With Right-Hand Passing Lane)

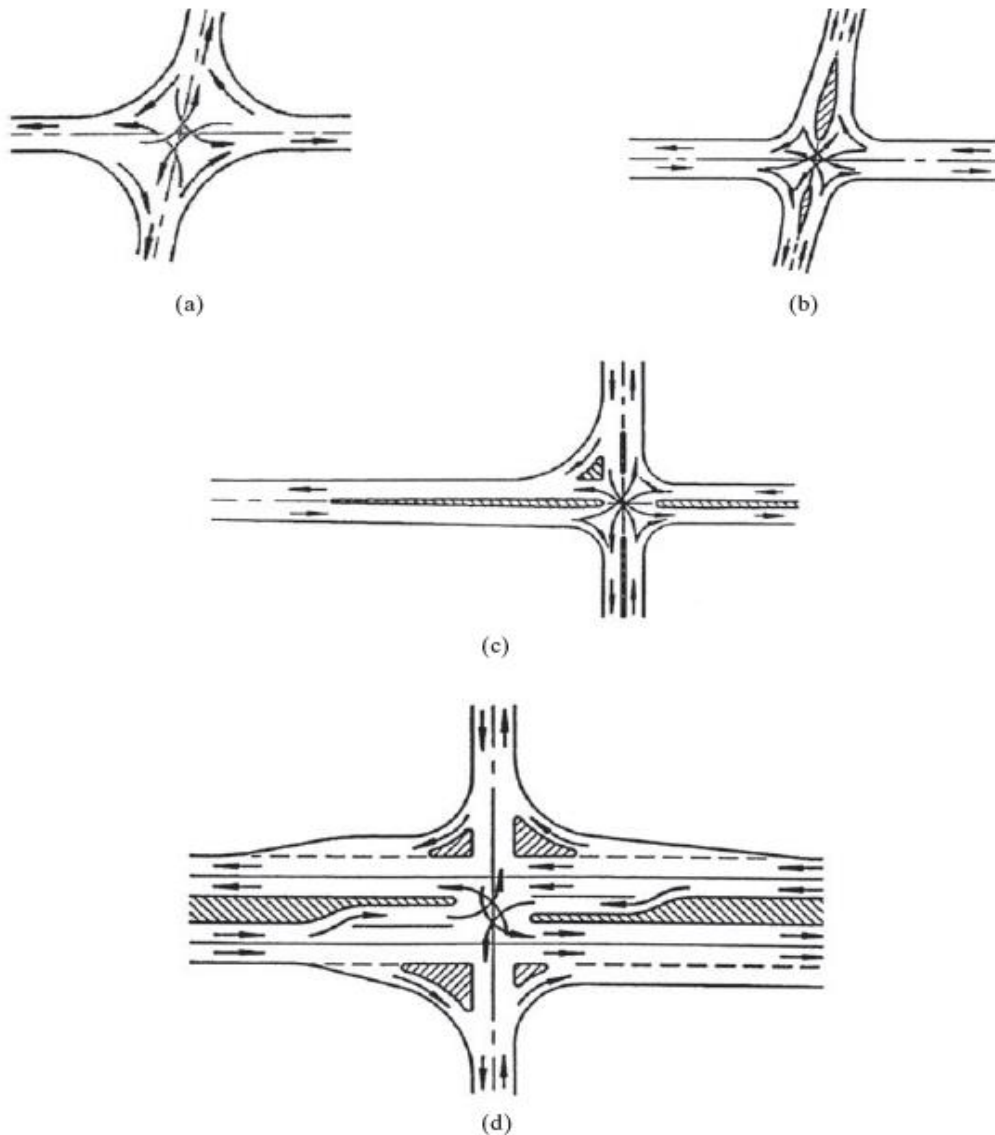


(d) 'T' Intersection (With Divisional Island and Turning Roadways)

In cases where left-turn volume from a through road onto a minor road is sufficiently high, an auxiliary lane may be provided, as shown in (c).

Figure (d) shows a channelized T intersection in which the two-lane divided highway through the intersection. The channelized T intersection also provides both a left-turn storage lane for left-turning vehicles from the through road to the minor road and a right turn lane on the east approach. This type of intersection is suitable for locations where volumes are high such as high left-turn volumes from the through road and high right-turn volumes onto the minor road. An intersection of this type probably will be signalized.

Four-Leg Intersections



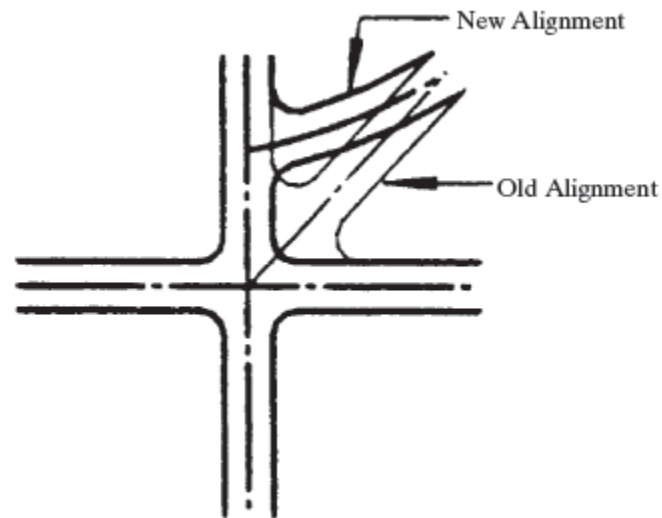
The unchannelized intersection shown in (a) is used mainly at locations where minor or local roads cross. In these cases, the turning volumes are usually low and the roads intersect at an angle that is not greater than 30 degrees from the normal.

When right-turning movements are frequent, right-turning roadways, such as those in Figure (b), can be provided. This type of design is also common where pedestrians are present.

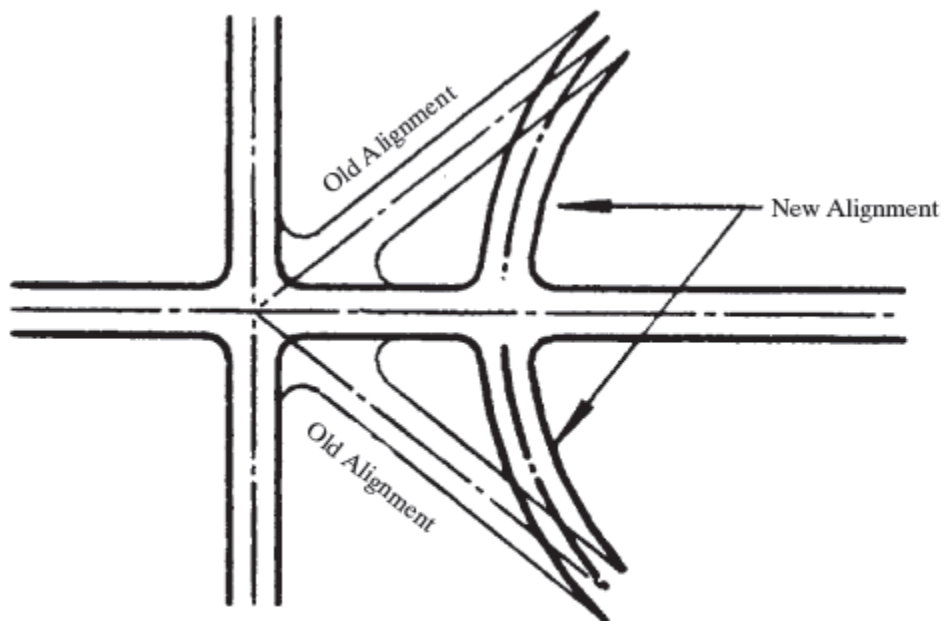
(c) is suitable for a two lane that carries moderate volumes at high speeds or operates near capacity.

(d) is suitable design for four-lane approaches carrying high through and turning volumes. This type of intersection is usually signaled.

Multileg Intersections



(a)



(b)

Multileg intersections have five or more approaches. Whenever possible, this type of intersection should be avoided. In order to remove some of the conflicting movements from the major intersection and thereby increase safety and operation, one or more of the legs are realigned.

There are two important factors to consider when realigning roads in this way, the diagonal road should be realigned to the minor road and the distance between the intersections should be such that they can operate independently.

Traffic Circles

There are three types of traffic circles:

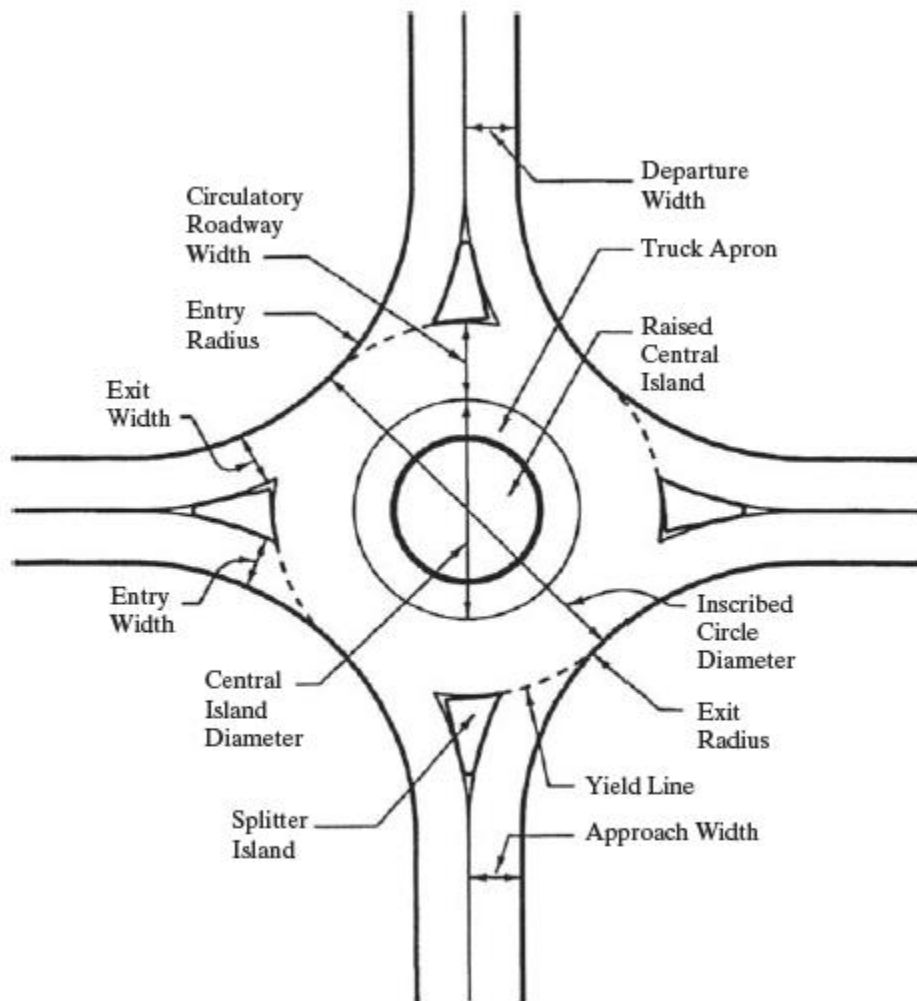
rotaries, neighborhood traffic circles, and roundabouts.

Rotaries have large diameters that are usually greater than 300 ft, thereby allowing speeds exceeding 30 mi/h, with a minimum horizontal deflection of the path of the through traffic.

Neighborhood traffic circles have diameters that are much smaller than rotaries and therefore allow much lower speeds, used mainly at the intersections of local streets..

Roundabouts have specific defining characteristics that separate them from other circular intersections. These include:

- Yield control at each approach
- Separation of conflicting traffic movements by pavement markings or raised islands
- Geometric characteristics of the central island that typically allow travel speeds of less than 30 mi/h
- Parking not usually allowed within the circulating roadway.



(a) Geometric Elements of a Single-Lane Modern Roundabout