



LECTURE 14

HIGHWAY GEOMETRIC DESIGN, INTERSECTION ELEMENTS

INTERSECTION OF ROAD

- Intersection is an area shared by two or more roads.
- This area is designated for the vehicles to turn to different directions to reach their desired destinations.
- This is because vehicles moving in different direction want to occupy same space at the same time.

TYPES OF INTERSECTION

There are two main types of intersection of roads .

1. Grade-separated intersections or interchanges
2. At-grade intersections

GRADE SEPARATED INTERSECTION OR INTERCHANGES

- It is a bridge that eliminates crossing conflicts at intersections by vertical separation of roadways in space.
- Route transfer at grade separations is accommodated by interchange facilities consisting of ramps.
- The interchange configurations are designed in such a way to accommodate economically the traffic requirements of flow, operation on the crossing facilities, physical requirements of the topography, adjoining land use, type of controls, right-of-way and direction of movements.

GRADE SEPARATED INTERSECTION OR INTERCHANGES

Objective:

- The ultimate objective of grade separated intersections is to eliminate all grade crossing conflicts and to accommodate other intersecting maneuvers by merging, diverging and weaving at low relative speed.

CLASSIFICATION OF GRADE SEPARATED INTERSECTION

- One of the distinctions made in type of Interchange is between the directional and the non directional interchange.
- Directional interchanges are those having ramps that tend to follow the natural direction of movement.
- Non directional interchanges require a change in the natural path of traffic flow.

MAJOR INTERCHANGES

- Underpass
- Overpass
- Trumpet Interchange
- Diamond Interchange
- Cloverleaf Interchange
- Partial Cloverleaf Interchange
- Directional Interchange
- Bridged Rotary

UNDERPASS

- An underpass or a tunnel is an underground passageway, completely enclosed except for openings for ingress and egress, commonly at each end.
- A tunnel may be for foot or vehicular road traffic, for rail traffic .

UNDERPASS



OVERPASS

- An overpass also known as a flyover, is a bridge, road, railway or similar structure that crosses over another road or railway.
- A pedestrian overpass allows pedestrians safe crossing over busy roads without impacting traffic.

OVERPASS



TRUMPET INTERCHANGES

- Trumpet interchanges have been used where one highway terminates at another highway.
- These involve at least one loop ramp connecting traffic either entering or leaving the terminating expressway with the far lanes of the continuous highway.
- The principal advantages are low construction cost and are useful for highways as well as toll roads.

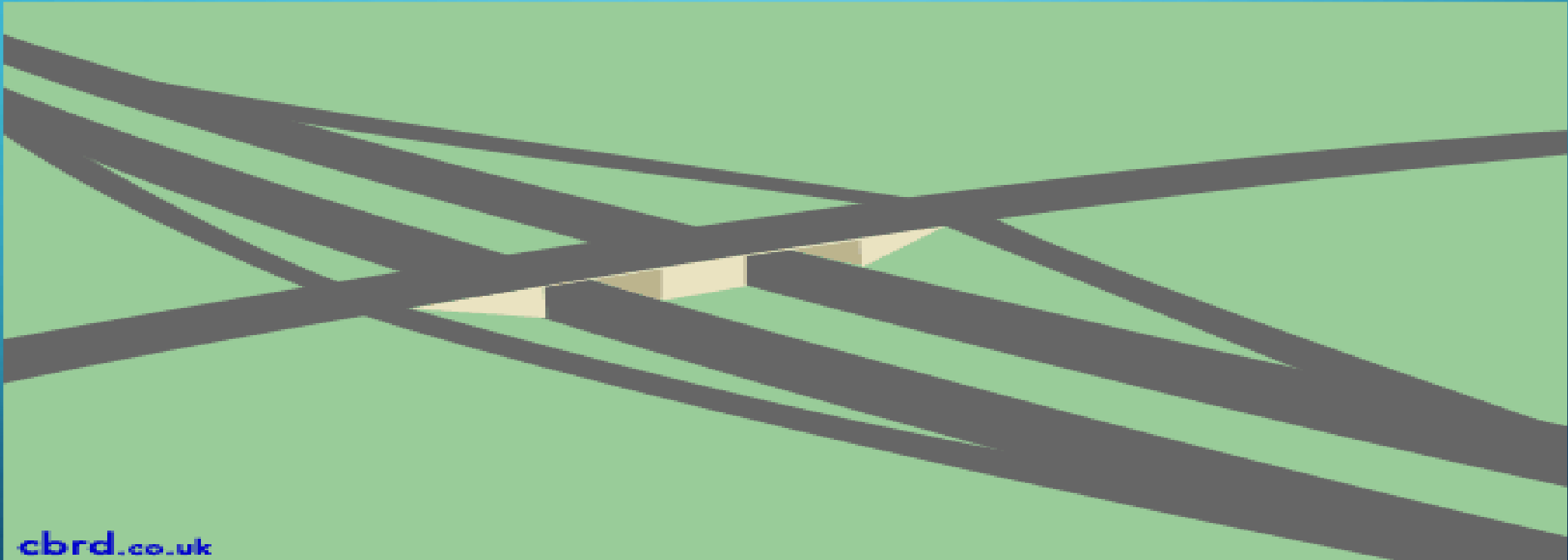
TRUMPET INTERCHANGES



DIAMOND INTERCHANGE

- A diamond interchange is a common type of road junction, used where a freeway crosses a minor road.
- The diamond interchange uses less space than most types of freeway interchange, and avoids the interweaving traffic flows that occur in interchanges such as the cloverleaf.
- Diamond interchanges are most effective in areas where traffic is light.

DIAMOND INTERCHANGE



CLOVERLEAF INTERCHANGE

- A cloverleaf interchange is a two-level interchange in which left turns are handled by ramp roads.
- To go left (in right-hand traffic), vehicles first continue as one road passes over or under the other, then exit right onto a one-way three-fourths loop ramp (270°) and merge onto the intersecting road.

CLOVERLEAF INTERCHANGE



PARTIAL CLOVERLEAF INTERCHANGE

- Partial clover leaf is a modification that combines some elements of a diamond interchange with one or more loops of a cloverleaf to eliminate only the more critical turning conflicts.
- It provides more acceleration and deceleration space on the freeway.

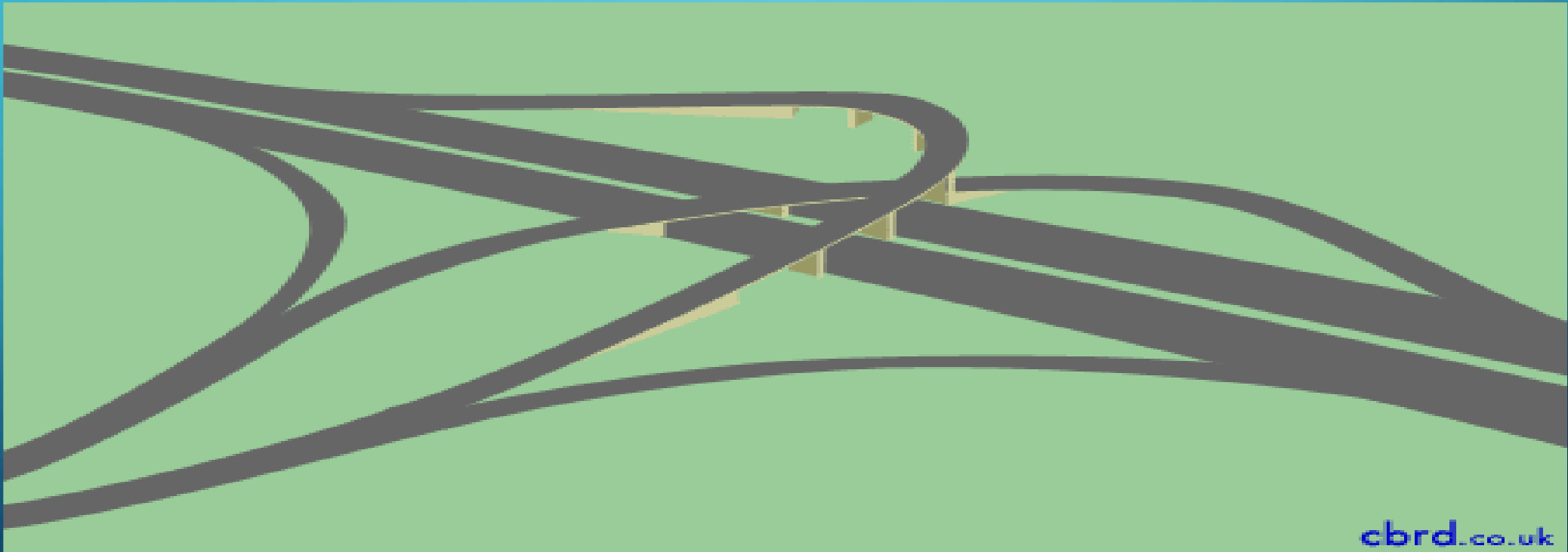
PARTIAL CLOVERLEAF INTERCHANGE



DIRECTIONAL INTERCHANGE

- A Directional interchange provides direct paths for left turns.
- These interchanges contain ramps for one or more direct or semi direct left turning movements.
- Interchanges of two freeways or interchanges with one or more very heavy turning movements usually warrant direct ramps, which have higher speeds of operation and higher capacities, compared to loop ramps.

DIRECTIONAL INTERCHANGE



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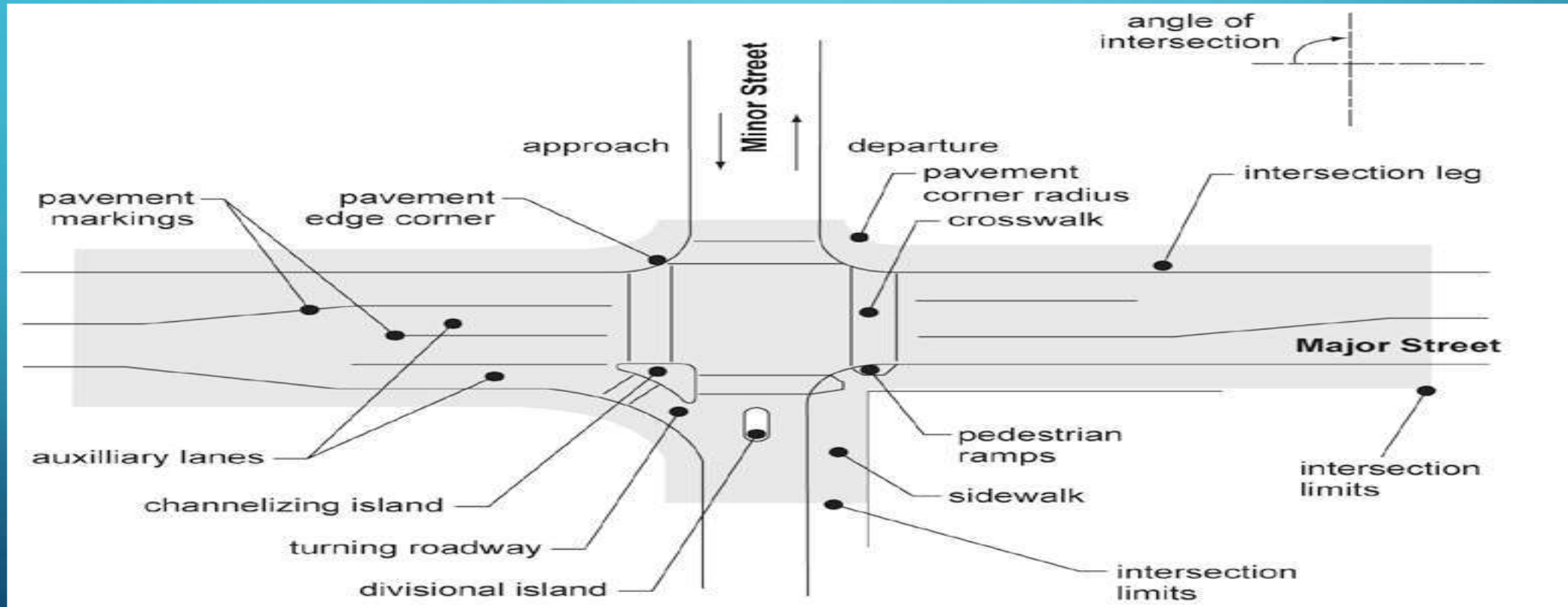
AT GRADE INTERSECTIONS

- At-grade intersections in which all the exchanges between the roads take place on the same plane.

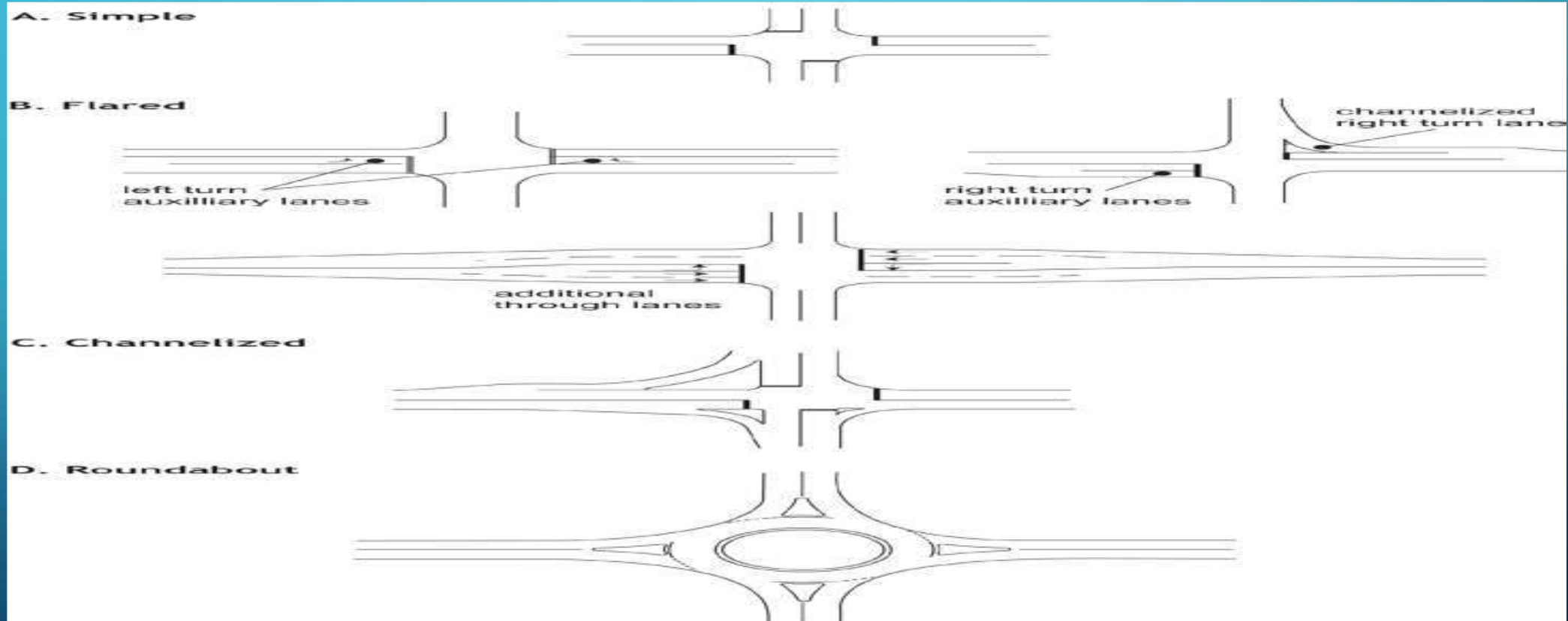
These are of two main types:

- Standard at- grade intersections
- Round about at-grade intersections.

KEY ELEMENTS OF INTERSECTION OF ROAD

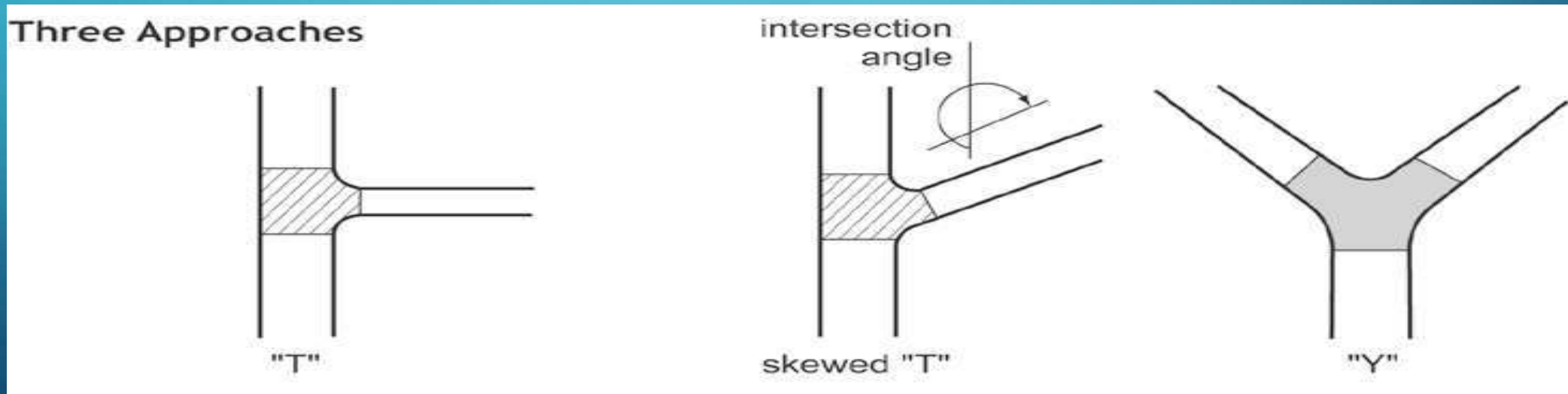


DIFFERENT TYPES OF AT GRADE INTERSECTIONS



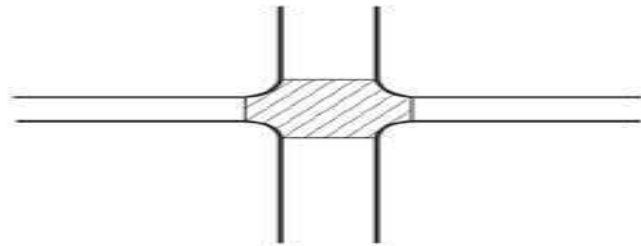
DIFFERENT TYPES OF AT GRADE INTERSECTIONS

- Most intersections have three or four legs, but multi-leg intersections (five and even six-leg intersections) are not unusual.

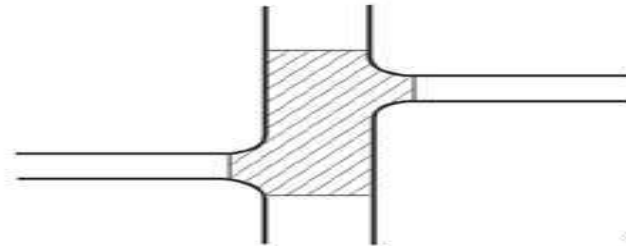


DIFFERENT TYPES OF AT GRADE INTERSECTIONS

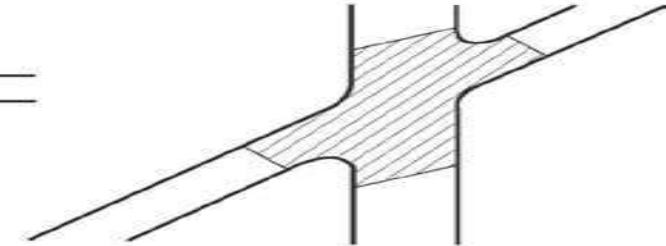
Four Approaches



right angles

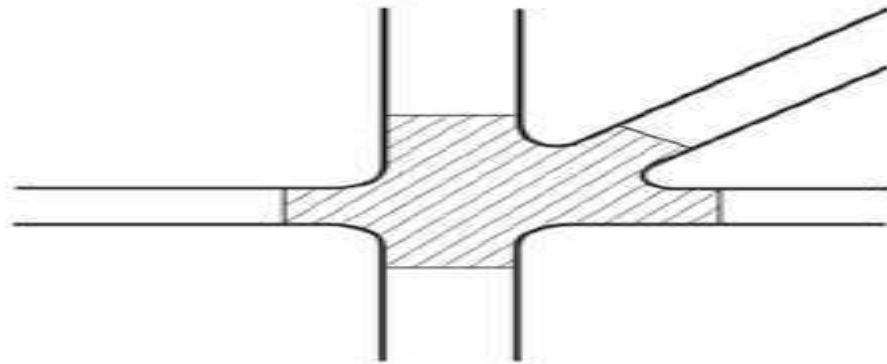


offset

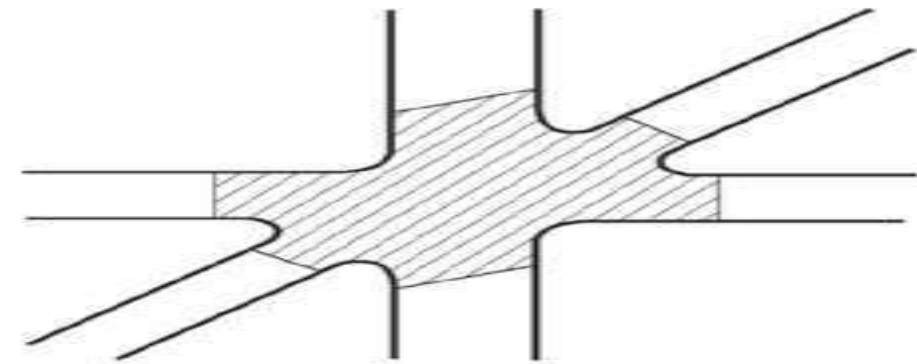


oblique

Five or More Approaches



5-leg

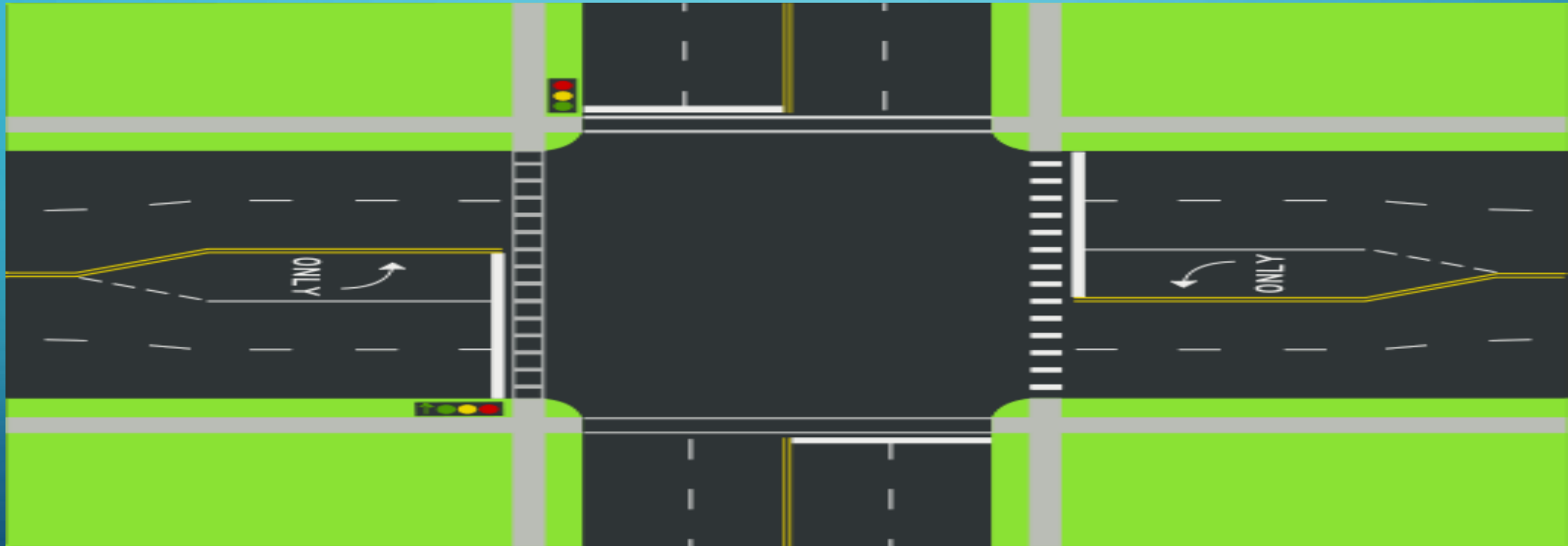


6-leg

FLARED INTERSECTIONS

- Flared intersections expand the cross-section of the street.
- The flaring is often done to accommodate a left-turn lane, so that left-turning bicycles and motor vehicles are removed from the through-traffic stream to increase capacity at high-volume locations, and safety on higher speed streets.
- Right-turn lanes, less frequently used than left-turn lanes, are usually a response to large volumes of right turns.

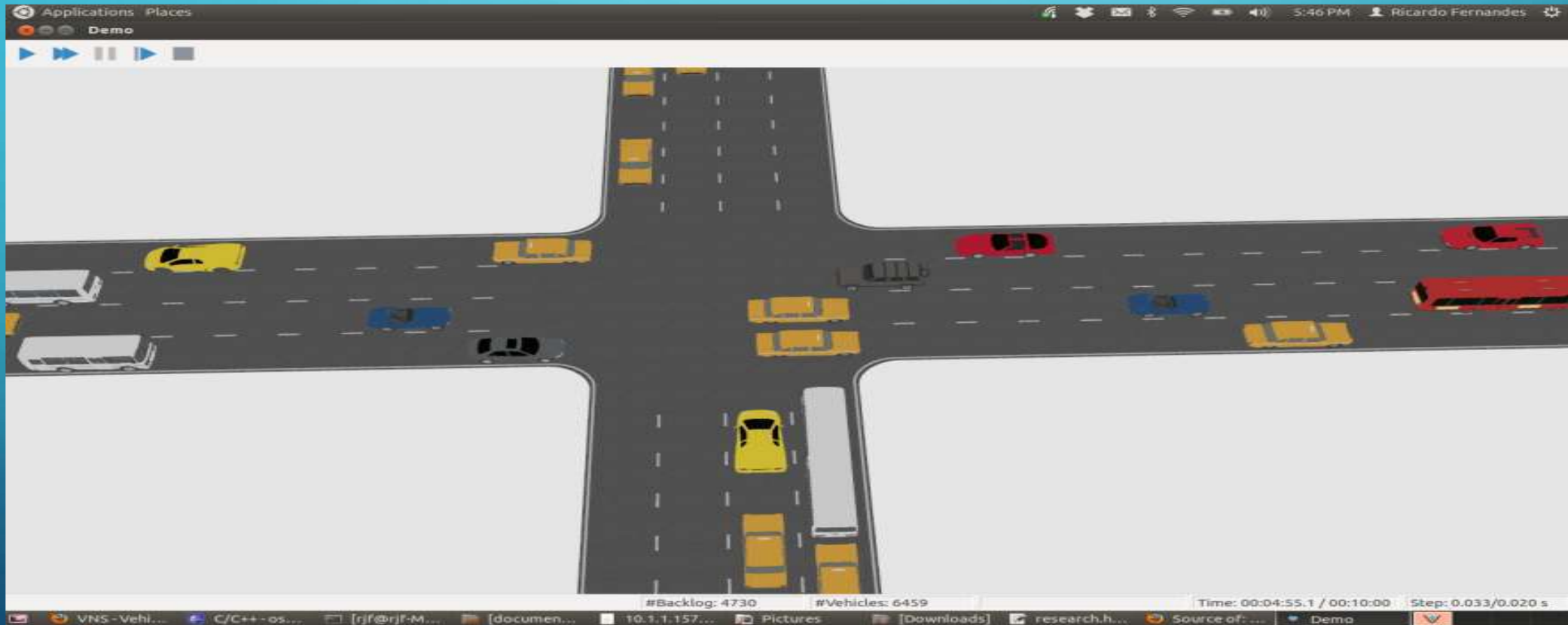
FLARED INTERSECTIONS



SIMPLE INTERSECTIONS

- Simple intersections maintain the street's typical crosssection and number of lanes throughout the intersection, on both the major and minor streets.
- Simple intersections are best-suited to locations where auxiliary (turning) lanes are not needed to achieve the desired level-of-service.

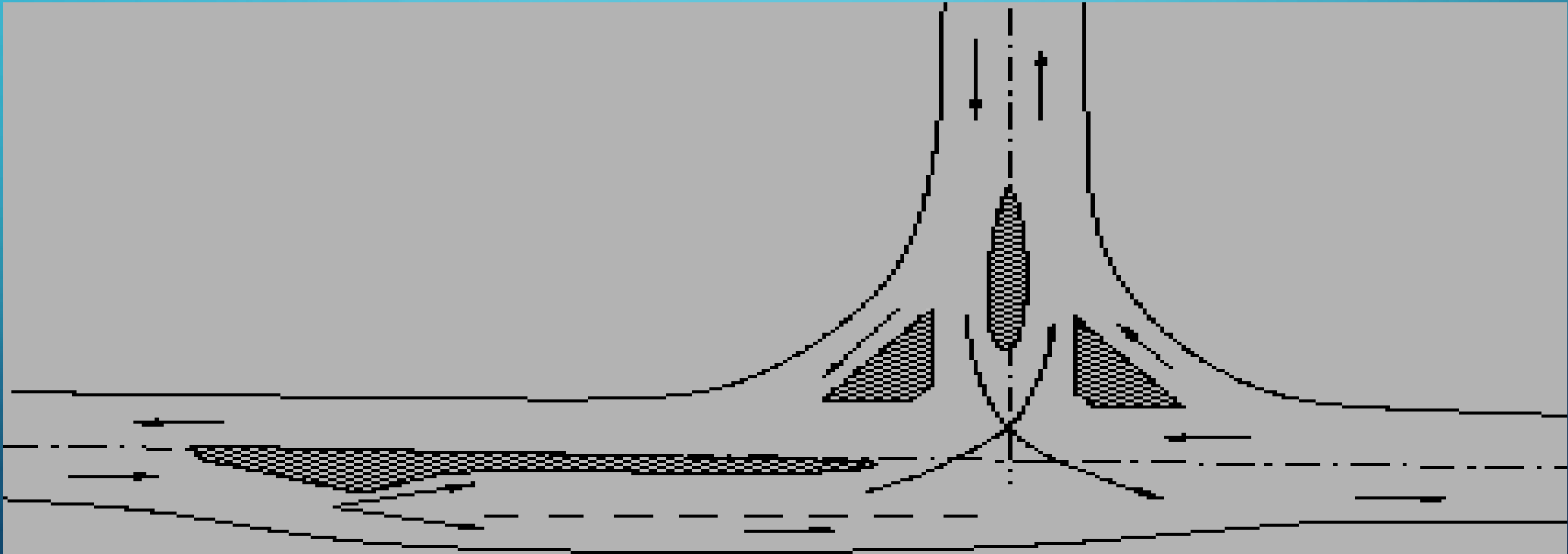
SIMPLE INTERSECTIONS



CHANNELIZED INTERSECTIONS

- Vehicles approaching an intersection are directed to definite paths by islands, marking etc. and this method of control is called channelization.
- Channelized intersection provides more safety and efficiency.
- It reduces the number of possible conflicts by reducing the area of conflicts available in the carriageway.
- If no channelizing is provided the driver will have less tendency to reduce the speed while entering the intersection from the carriageway.

CHANNELIZED INTERSECTIONS



ROUNDABOUT INTERSECTIONS

- A roundabout is a type of circular intersection or junction in which road traffic flows almost continuously in one direction around a central island.
- It provides maximum safety in all types of intersections.

ROUNDBABOUT INTERSECTIONS

