Course Code	Course Title			Core / Elective
OE 801 CE	**Road Safety Engineering**			Elective
	Contact Hours per Week	CIE	SEE	Credits
	6	30	70	3

COURSE INSTRUCTOR

DR. G NARENDRA GOUD

NARENDRA_CIVIL@MVSREC.EDU.IN

Unit-2 Accident Analysis

Accident Investigations and Risk Management,
Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies,
Traffic Management Measures and Their Influence on Accident Prevention,
Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements
Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features
Accident Reconstruction. Application of computer analysis of accident data.

Different Collisions

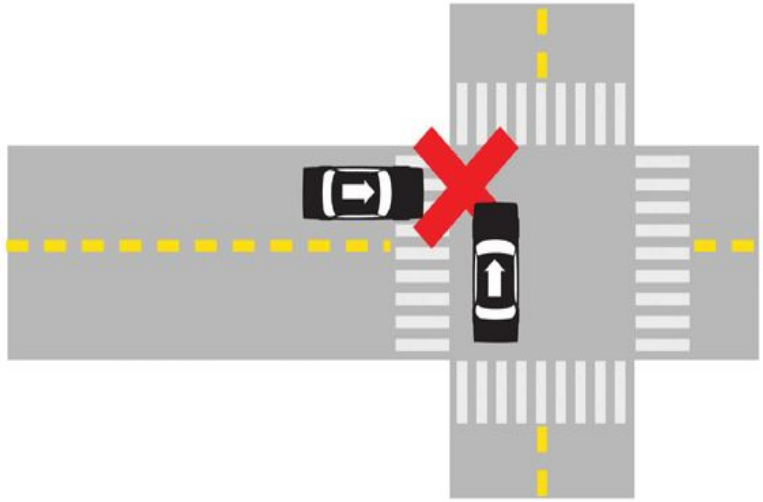
- Head-on collisions
- Left turn head-on collisions
- Right angled collisions
- Rear end collisions
- Pedestrian-Vehicle collisions

Head-on collisions

- A **head-on collision** is a traffic **collision** where the front ends of two vehicles such as cars, trains, ships or planes hit each other when travelling in opposite directions

Left turn head-on collision

- Unless the driver has the **right**-of-way, the vehicle making a **left**-hand **turn** must yield to other vehicles. This is why, in most cases, the driver making the **turn** will bear liability for the accident. ... Speeding out in front of an oncoming vehicle is a risk that could result in the driver's fault for a **collision**.



Rear end collisions

- A **rear-end collision** (often called simply **rear-end** or in the UK a shunt) occurs when a vehicle crashes into the one in front of it. Common factors contributing to **rear-end collisions** include driver inattention or distraction, tailgating, panic stops, and reduced traction due to wet weather or worn pavement.

Right angled collisions

- In the United States and Canada this **collision** type is also known as **right-angle collision** or T-bone **collision**; it is also sometimes referred to by the abbreviation "AABS" for "auto accident, broadside". ... After the **collision**, the involved vehicles may be stuck together by the folding of their parts around each other.

BLACK SPOT

- At certain sites, the level of risk of road accidents is higher than the general level of risk in surrounding areas
- Crashes tend to be concentrated at these relatively high-risk locations. These locations with an abnormally high number of crashes are generally described as **black spots**.

Considerable proportion of accidents occur on relatively short sections called **Black Spots** or **Black sites**

Why Black Spots?

Data/information pertaining to the locations of identified black spots provide us the causes for appearing of such black spots:

- Excessive traffic, no sub-way, no Fly Over Bridge
- Curved and narrow road and no bypasses
- Densely populated area on both sides of the road and heavy traffic
- Blind turns and damaged surface of roads
- Narrow Bridge , Steep Slope and Curve .

Accident Evaluation and Black Spot Investigation

- The accident data collection involves extensive investigation which involves the following procedure:

Reporting: It involves basic data collection in form of two methods:

- Motorist accident report - It is filed by the involved motorist involved in all accidents fatal or injurious.
- Police accident report - It is filed by the attendant police officer for all accidents at which an officer is present. This generally includes fatal accidents or mostly accidents involving serious injury required emergency or hospital treatment or which have incurred heavy property damage.

Accident Evaluation and Black Spot Investigation

At Scene-Investigation: It involves obtaining information at scene such as measurement of skid marks, examination of damage of vehicles, photograph of final position of vehicles, examination of condition and functioning of traffic control devices and other road equipment.

Technical Preparation: This data collection step is needed for organization and interpretation of the study made. In this step measurement of grades, sight distance, preparing drawing of after accident situation, determination of critical and design speed for curves is done.

Professional Reconstruction: In this step effort is made to determine from whatever data is available how the accident occurs from the available data. This involves accident reconstruction which has been discussed under Section No.7 in details. It is professionally referred as determining “behavioral” or “mediate” causes of accident.

Cause Analysis: It is the effort made to determine why the accident occurred from the data available and the analysis of accident reconstruction studies

Investigative approaches used to develop accident reduction programmes

- There are four main investigative approaches used to develop accident reduction programmes. These are described as:

1. Single site schemes
2. Mass action programmes
3. Route action programmes; and
4. Area action programmes.

All involve four major planning steps:

(a) Data collection, storage and retrieval,

(b) Identification of hazardous locations for further study

(c) Diagnosis of the accident problem(s), and

(d) The final selection of sites to be included in the remedial implementation programme

Integrated safety improvement

Road safety engineering measures Typical examples:

1. **Single site treatment**

– improved signing

– carriageway markings

– road surface treatment

– lighting improvements

– alterations to alignment, kerbs and islands

– introduction of signal control or mini-roundabouts.

2. **Mass action plan**

– lighting improvements
– anti-skid surfacing
– speed enforcement cameras
– red-light running cameras
– pelicans, zebras and pedestrian phases at signals.

Road safety engineering measures Typical examples:

3. Route action plan

– carriageway widening at junctions

– speed limits

– speed control measures

– side road closures or left-in, left-out only

– cycle routes.

4. Area action plan

– vertical deflection – humps and tables
– horizontal deflection – chicanes and narrowings
– mini-roundabouts
– road entry treatment
– road closures and banned turns
– 20 mph zones

Traffic calming Schemes

- Traffic calming has two main objectives: the reduction in numbers of personal injury accidents and improvement in the local environment for people living, working or visiting the area.
- Traffic calming techniques can be broken down into eight broad categories:

1. legislation and enforcement
2. surface treatment and signing
3. vertical deflection
4. horizontal deflection
5. gateways and entry treatment
6. 20 mph zones
7. home zones
8. lorry control schemes.

Scientific investigations and data collection

- For each type of accident, three questions should be asked:

1. What driver actions lead to the occurrence of such accidents?
2. What existing conditions at the site could contribute to drivers taking such actions?
3. What changes can be made to reduce the chances of such actions taking place?

ACCIDENT STUDIES AND RECORDS

- **COLLECTION OF ACCIDENT DATA**
- **ACCIDENT REPORT**
- **ACCIDENT RECORDS**
  - LOCATION FILES
  - SPOT MAPS
  - CONDITION DIAGRAMS
  - COLLISION DIAGRAMS

COLLECTION OF ACCIDENT DATA

- The accidents occur infrequently and at unpredictable times and locations, they cannot be directly observed and studied in the field (if CC cameras not fixed)
- All accident data comes from secondary sources-primarily police and motorist accident reports
- The information is needed for a wide variety of purposes, including:

1. Identification of locations at which unusually high numbers of accidents occur.
2. Detailed functional evaluations of high-accident locations to determine contributing causes of accidents.
3. Development of general statistical measures of various accident-related factors to give insight into general trends, common causal factors, driver profiles, and other factors.
4. Development of procedures that allow the identification of hazards *before* large numbers of accidents occur.

DATA COLLECTION

- As in most countries, traffic police are the source of official government statistics related with road traffic injuries in India.
- The main sources of traffic crash data at the national level are the annual reports published by the National Crime Record Bureau (NCRB), Ministry of Home Affairs, and the annual publication of the Ministry of Road Transport & Highways (MoRTH) titled *Road Accidents in India.* The basic information for both these reports comes from all the police stations in the country based on the cases reported to them
- https://data.gov.insectors/Transport-9383
- The International Road Traffic and Accident Database (IRTAD) is a **data** collection maintained by the Organisation for Economic Co-operation and Development (OECD) and **the International Transport** Forum (ITF) in Paris, covering safety **data** in countries within and outside of Europe

ROAD ACCIDENT RECORDING FORM

A. Accident Details

B. Road Related Details

C. Vehicles Involved in the Accident

D. Driver Details

E. Persons Other Than Drivers Involved in the Accident

- https://iith.ac.in/~dspawar/Accident_form/accident2.php

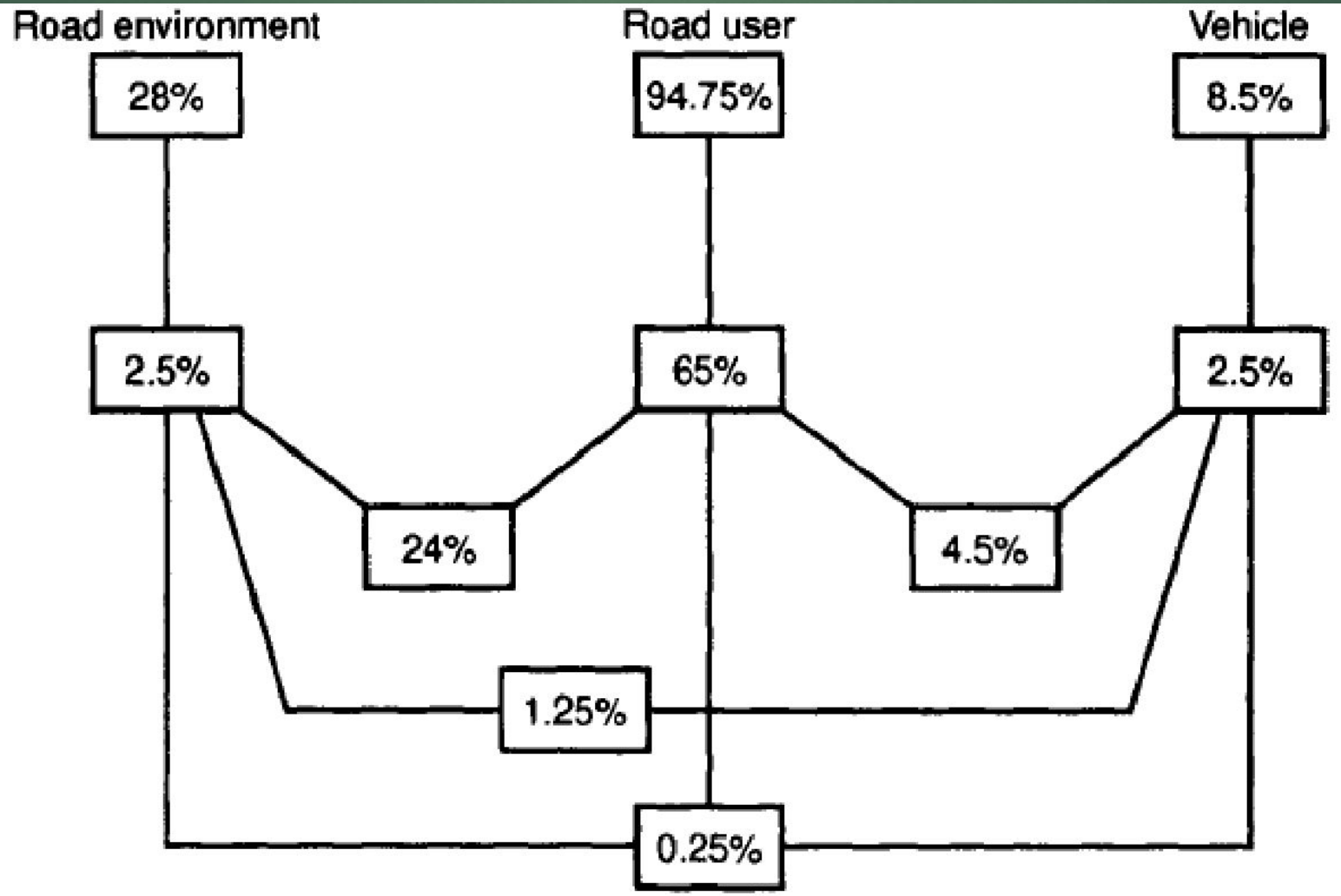
ACCIDENT RECORDS

- LOCATION FILES
  - To keep check on location, identify point of high accident incident
- SPOT MAPS
  - Spots, pins on map with scale and legends (fatal / non fatal etc…)
- CONDITION DIAGRAMS
  - Drawing to scale with imp. Physical features, road way limits, curves, bridges, trees, signals etc.
- COLLISION DIAGRAMS
  - Diagram to show approximate path of vehicle/pedestrian involved in accident. Used to see accident pattern before and after the remedial measures.

CAUSES OF ROAD ACCIDENTS

- Driver or Operator Action:
  - Major contributing cause of many crash situations is the performance of the driver of one or both
- Vehicle Condition:
  - Mechanical condition of a vehicle can be the cause of transportation crashes
- Roadway Condition:
  - The condition and quality of the roadway, which includes the pavement, shoulders, intersections, and the traffic control system, can be a factor in a crash
- Environment:
  - The physical and climatic environment surrounding a transportation vehicle can also be a factor in the occurrence of transportation crashes

CONTRIBUTIONS TO ROAD ACCIDENTS



A: Collisions due to actions of drivers/riders

1 Tired or asleep, 2 Illness, 3 Drunk or drugged

4 Speed too great for prevailing conditions

5 Failing to keep to nearside

6 Overtaking improperly on nearside

7 Overtaking improperly on offside

8 Failing to stop at pedestrian crossing placed

9 Turning round carelessly , 10 Reversing carelessly

11 Failing to comply with traffic sign

(other than double white line or traffic lights)

12 Failing to comply with double white lines

13 Starting from nearside carelessly

14 Starting from offside carelessly

15 Changing traffic lanes carelessly

16 Cyclist riding with head down ,

17 Cyclists more than two abreast

18 Turning left carelessly, 19 Turning right carelessly

20 Opening doors carelessly

21 Crossing road junction carelessly

22 Cyclist holding another vehicle, 23 Not in use

24 Misjudging clearance

63 Failing to comply with traffic lights

64 Incorrect use of vehicle lighting

B: Collisions due to actions of pedestrians

26 Crossing road masked by vehicle

27 Walking or standing in road

28 Playing in road

29 Stepping or running into road carelessly

30 Physical defects or illness

31 Drunk or drugged; 32 Holding onto vehicle

C: Vehicle lighting
33 Dazzle by other vehicle's lights
34 Inadequate rear lights
35 Inadequate front lights
36 Not in use

D: Collisions due to actions of passengers
37 Carelessly boarding or alighting from bus
38 Falling inside or from vehicle
39 Opening door carelessly
40 Negligence by conductor of bus

E: Collisions due to actions of animals
41 Dog in carriageway
42 Other animal in carriageway

F: Collisions due to obstructions
43 Stationary vehicles dangerously
44 Other obstructions
45 Defective brakes

G: Collisions due to defective vehicles
46 Defective tyres or wheels
47 Defective steering
48 Unattended vehicle running away
49 Insecure load

H: Collisions due to road conditions
50 Other defects; 51 Pot hole
52 Defective manhole cover
53 Other road surface conditions
54 Road works in progress
55 Slippery road surface (not weather)

I: Collisions due to weather conditions
56 Fog or mist; 57 Ice, frost or snow
58 Strong wind; 59 Heavy rain; 60 Glaring sun
61 Flood

5Es to ROAD SAFETY

Road safety is result of effective measures and their integration in the areas of

1. Engineering (Roads)
2. Engineering(Vehicles)
3. Enforcement
4. Education
5. Emergency

5Es to ROAD SAFETY

- Engineering (Roads)
  - Road Design and Maintenance
  - Segregation of traffic
  - Lighting system
  - Speed
  - Double white lines
  - Alignment
  - Road Surface
  - Margins
- Engineering (Vehicles)
  - Vehicle Design and maintenance

5Es to ROAD SAFETY

- Enforcement
  - Speed control
  - Traffic control
  - Training and supervision
  - Medical check
  - Compulsion to wear Helmet, seat belt
- Education
  - Road users (pedestrians, drivers) training, education
  - Traffic rules, traffic safety week programs etc.
- Emergency

Rs 14,000 cr to be spent to cut road accidents-11.07.2019
https://www.socialnews.xyz/2019/07/11/rs-14000-cr-to-be-spent-to-cut-road-accidents/

PEDESTRIAN SAFETY ISSUES

- More pedestrian deaths is the result of a collision with a vehicle at an intersection

Pedestrian safety problems can occur at intersections for a variety of reasons, including the following:

- **Complex signal phasing** or lack of traffic control at high-volume, high-speed and multi-lane intersections.
- Limited or somewhat **erratic compliance by motorists**, even at simple STOP- or YIELD-controlled intersections
- **Pedestrian violation of traffic control devices**, particularly in large urban centers.4 More than a quarter of fatal crashes involving pedestrians are the result of pedestrians disobeying intersection traffic control or making mis-judgments while attempting to cross a street
- Low levels of enforcement for pedestrian and driver traffic control violations.
- **Auto-oriented signal timing**. Traffic signal timings may be too short to permit safe intersection crossing. Assumptions of walking speeds for signal timing may be too fast for many pedestrians to cross to the other side of the curb. At the same, additional lanes to increase roadway capacity can also have a negative effect on signal timing and pedestrian safety if not properly applied
- **Poor understanding** of pedestrian signal displays by pedestrians.

PEDESTRIAN SAFETY ISSUES

- **Conflicts with turning vehicles.** Data consistently show that crashes with pedestrians occur far more often with turning vehicles than with through traffic. Left-turning vehicles are more often involved in pedestrian collisions than right-turning vehicles, partly because drivers are not clearly able to see pedestrians on the left.
- **Wide crossings.** Research indicates that increasing the lanes on a roadway from four to six or more lanes increases the percentage of fatalities represented by pedestrian crashes by 64 percent
- **Right-turns-on-red (RTOR)** can potentially contribute to pedestrian crashes by creating conflicts between pedestrians and motorists. RTOR may also reduce pedestrian opportunities to cross intersections if motorists fail to yield the right-of-way to pedestrians.
- **Pedestrian visibility to drivers** is worse during hours of darkness, especially in areas with poor pedestrian-scale lighting. This is a common shortcoming of rural and suburban intersections. Pedestrians generally perceive that they are visible to drivers well before the drivers can actually see them.

PEDESTRIAN SAFETY COUNTERMEASURES

To address pedestrian safely problems at intersections, the possible pedestrian safety countermeasures within the following categories:

- Crosswalk improvements
- Intersection design/ physical improvements; and
- Intersection operations and signal hardware/technology.

DIAGNOSIS OF ROAD CRASH PROBLEMS

Six steps in the diagnosis phase

1. Study detailed crash reports
2. Data sorting to determine groups of accident types and the locations at which they occur
3. Data amplification by detailed on-site investigation (perhaps including conflict studies)
4. Detailed analysis of all data
5. Identification of dominant factors and/or road features
6. Determine nature of the crash problem,

OFFICE AND ON-SITE ANALYSIS

an in-office analysis

- Identifying predominant vehicle manoeuvres, and summarising the accident types which are occurring;
- This aims to reveal the type of countermeasure needed (e.g. a disproportionate incidence of night time crashes implies a need for delineation, lighting, etc).

an on-site analysis

- Involving observation of road and driver characteristics;
- This may be supplemented by extra studies, such as speed studies, traffic counts, turning manoeuvres, conflict analysis, etc.

Problem analysis- Relevant questions to be answered

- Are crashes associated with a physical condition of the road, and can this situation be eliminated or corrected?
- Is visibility adequate, and can this be corrected, or if not is there adequate warning?
- Are the existing signs, signals, and pavement markings doing the job for which they were intended? *Are* replacements needed?
- Is traffic properly channelled to minimise the occurrence of conflicts?
- Would crashes be prevented by prohibition of a specific movement (e.g. a right turn), or by giving it priority (e.g. exclusive phase)?
- Can some of the traffic be diverted to other streets where the crash potential is not as great?
- Are night time crashes out of proportion to daytime crashes - indicating the need for special night time protection (lighting, delineation, etc)?
- Do conditions show the need for additional traffic law enforcement?

TYPES OF CRASHES- PROBABLE CAUSES

Pattern	*Probable Cause*
Left-turn head-on collisions	• Large volume of left turns • Restricted sight distance • Too short amber phase • Absence of special left-turning phase • Excessive speed on approaches
Right-angle collisions at signalized intersections	• Restricted sight distance • Excessive speed on approaches • Poor visibility of signal • Inadequate signal timing • Inadequate roadway lighting • Inadequate advance intersection warning signs • Large total intersection volume

TYPES OF CRASHES- PROBABLE CAUSES

Pattern	*Probable Cause*
Right-angle collisions at unsignalized intersections	• Restricted sight distance • Large total intersection volume • Excessive speed on approaches • Inadequate roadway lighting • Inadequate advance intersection warning signals • Inadequate traffic control devices
Rear-end collisions at unsignalized intersections	• Driver not aware of intersection • Slippery surface • Large number of turning vehicles • Inadequate roadway lighting • Excessive speed on approach • Lack of adequate gaps • Crossing pedestrians

TYPES OF CRASHES- PROBABLE CAUSES

Pattern	*Probable Cause*
Rear-end collisions at signalized intersections	• Slippery surface • Large number of turning vehicles • Poor visibility of signals • Inadequate signal timing • Unwarranted signals • Inadequate roadway lighting
Pedestrian-vehicle collisions	• Restricted sight distance • Inadequate protection for pedestrians • School crossing area • Inadequate signals • Inadequate phasing signal

TRAFFIC MANAGEMENT

- **Regulatory measures for traffic management**
  - It has its basis in law, and uses mandatory and prohibitory traffic signs and markings
- Regulatory measures include
  - Speed limits
  - Restrictions on turning movements
  - Closure or one-way operation of streets
  - Tidal-flow operation of major roads
  - Priority for high occupancy vehicles (Exclusive bus lanes),
  - Reversible lanes, and
  - On-street waiting restrictions and parking control

REGULATORY MEASURES SPEED LIMITS

- Two types of speed limit are in use throughout the world

- *Absolute speed limit is that above which it is illegal to drive, irrespective of* the traffic, roadway, weather, or other conditions prevailing. This type of limit is preferred by enforcement police

- *Prima facie speed limit is* that above which motorists are assumed to break the law; however, they may argue in court that their speed was safe for the conditions prevailing at the time. This is a flexible limit in that police can adjust their enforcement according to their view as to whether the conditions prevailing are safe; however, it relies on the police to use judgement as to what is safe, and this is more easily challenged in the courts

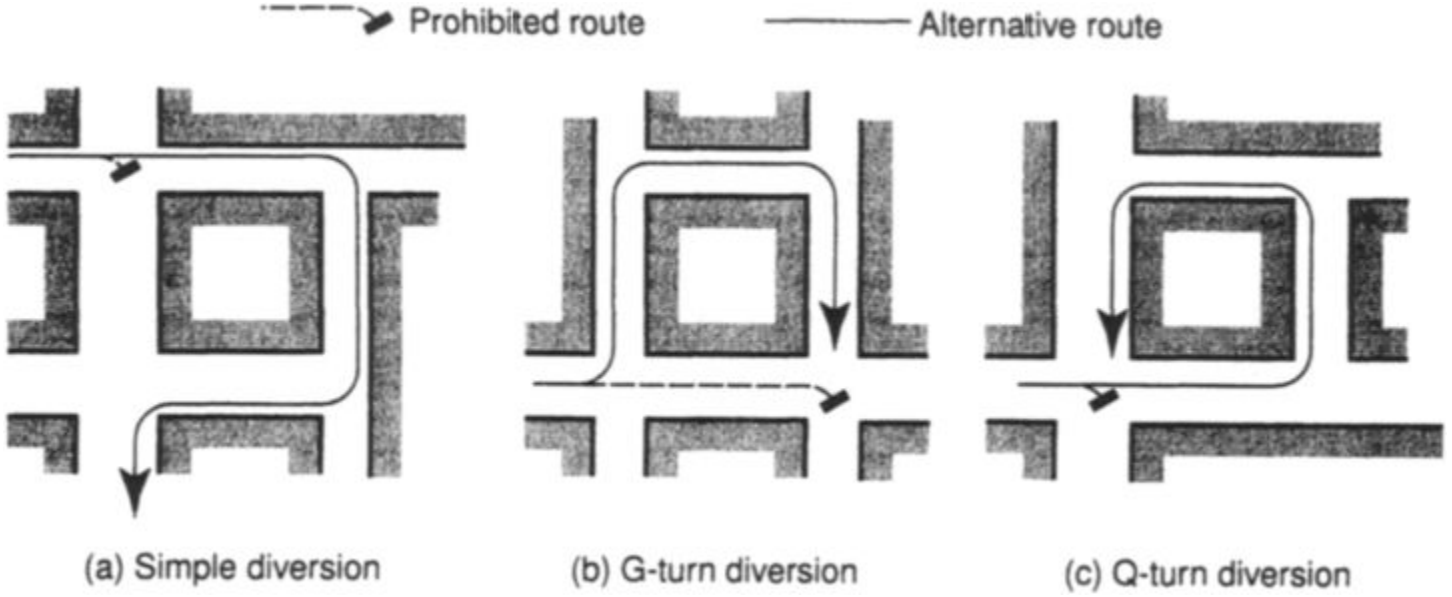
SPEED LIMIT FACTORS

Factors which should be taken into account when establishing a speed limit include

- Design speed of road,
- Prevailing vehicle speeds,
- Road cross-section,
- Curvature,
- Gradient and quality of surfacing,
- Frequency and spacing of intersections,
- Traffic volume and composition,
- Accident history,
- Presence of pedestrians/parking vehicles and
- Traffic control devices that affect vehicle speeds

RESTRICTIONS ON TURNING MOVEMENTS

- Congestion and accidents caused by right-turning vehicles at signal-controlled intersections are usually coped with by inserting an extra phase or early cut-off and late start arrangements in the signal cycle
- In some instances it may be preferable to ban right-turning vehicles at a critical intersection during all or part of the day, rather than attempt to provide directly for this movement.

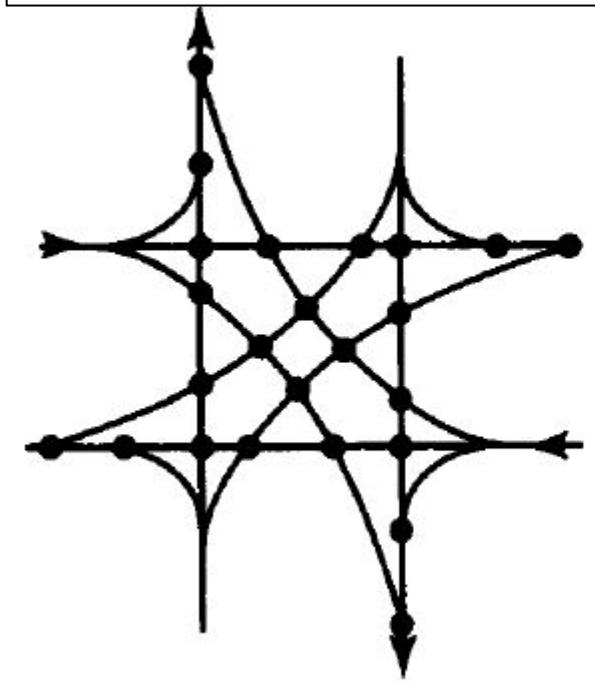


ONE WAY STREETS

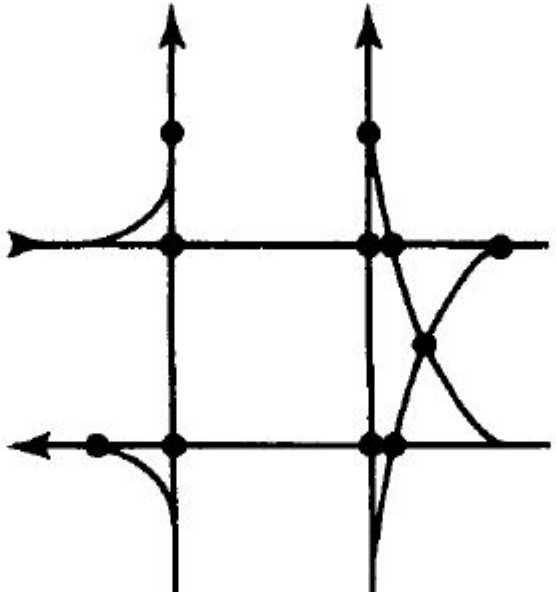
One-way traffic operation is a simple regulatory tool available for the relief of traffic congestion. Its most effective usage is on streets in and about the central areas of towns

Potential points of conflict at an intersection”

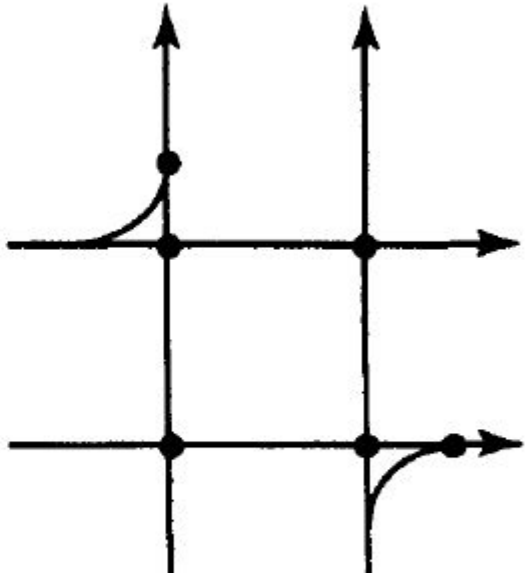
two 2-way streets, 24 conflicts



One 1-way & one 2-way street, 11 conflicts



two 1-way streets, 6 conflicts



ADVANTAGES OF ONE-WAY STREET SYSTEMS

- **General Benefits:**
- Improved ability to coordinate traffic signals
- Removal of opposed left turns
- Related quality of flow benefits such as increased average speed and decreased delays
- Better quality of flow for bus transit; lower transit operating costs
- Left-turn lanes not needed
- More opportunity to maneuver around double-parked or slow-moving vehicles
- Ability to maintain curb parlung longer than otherwise possible (due to capacity benefits)
- **Capacity Benefits:**
- Reduced left-turn pces
- Fewer signal phases (at signalized intersections)
- Reduced delay
- Better utilization of street width
- **Safety Benefits:**
- Intersection LT conflicts removed
- Midblock LT conflicts removed
- Improved driver field of vision

DISADVANTAGES OF ONE-WAY STREET SYSTEMS

- Increased trip lengths for some/most/all vehicles, pedestrians, and transit routes
- Some businesses negatively affected
- Signal coordinated in grid still poses closure problem
- Transit route directions now separated by at least one block
- For transit routes, a 50% reduction in right-hand lanes; may create bus stop capacity problem
- Concern of businesses about potential negative impacts
- Fewer turning opportunities
- Additional signing needed to designate “one-way” designations, **turn prohibitions, and restricted** entry

TIDAL-FLOW OPERATION OF MAJOR ROADS

- It is a traffic management tool whereby the total carriageway width is shared between two directions of travel in near proportion to the flow in each direction
- The number of lanes assigned to each direction of travel varies with the time of day so that extra capacity is provided to the heavier traffic flow during, typically, peak commuter periods
- The great advantage of tidal-flow operation is that extra capacity is provided on the same road at the time required and, unlike one-way streets, traffic in the minor direction does not have to move to a complementary street
- Its usage is particularly applicable to heavily trafficked bridges, tunnels and radial roads in urban areas

DISADVANTAGES OF TIDAL-FLOW SCHEMES

- Implementation can be expensive
- Poor implementation can result in increasing numbers of head-on accidents
- Central pedestrian refuges have to be removed
- **No-parking restrictions are normally imposed**
- Right turns from minor roads may have to be banned
- Bus stops and laybys may have to be removed if single lanes are used to carry the minor flow
- This type of operation normally cannot be applied to roads divided by central reservations.

PRIORITY FOR HIGH OCCUPANCY VEHICLES (HOV)

- The use of HOV facilities, which focus on increasing the *person-movement efficiency of a road or travel corridor is aimed at addressing traffic* congestion and environmental concerns as well as reducing the delays to buses and increasing their reliability.
- A variety of HOV treatments are currently in operation worldwide; they include
  - Busways on separate rights of way,
  - Exclusive lanes, and
  - Priority for HOVs at intersections.
- HOV facilities that are open to private car pools as well as public buses are prevalent in North America, whereas elsewhere in the world (including Britain) the emphasis is on bus usage. However, in Britain access to HOV operation is often given to taxis (and emergency vehicles) and sometimes to cyclists and disabled drivers

Crash Reduction Capabilities and Countermeasures

- Used to estimate the expected reduction in crashes that will occur during a given period as a result of implementing a proposed countermeasure.
- CR = crash reduction (CR) factors are used to indicate potential crash reduction capabilities.
- Crashes prevented= N*CR*ADT after period/ADT before period
- N = expected number of crashes if countermeasure is not implemented and if the traffic volume remains the same.
- Example: CR = 0.3, ADT before = 7850, ADT after = 9000, No. of specific types of crash occurring per year = 12, 14, 13 for the same 3 years where ADT average values were computed.
- Avg no. of crashes/year = (12+14+13)/3=13
- Crashes prevented = 13 x 0.3 x (9000/7850) = say, 4 accidents

Procedure to determine Crash reduction factor (CR)

- When multiple countermeasures are selected…
- CR = overall crash reduction factor for multiple mutually exclusive improvements at a single site
- CR=CR1+(1-CR1)CR2+CR3(1-CR1)(1-CR2)….
- CRi = crash reduction factor for a specific countermeasure
- im = number of countermeasures at the site
- Example: CR1 = 0.40, CR2 = 0.28, and CR3 = 0.2. Determine the overall CR factor. Note that countermeasures are ordered in the descending order of their accident reduction factor values.
- CR = (1 – 0.4)* (1 – 0.4)(1 – 0.28)*0.2= 0.66

Effectiveness of Safety Design Features

- Effectiveness of safety design features (eventually we want to estimate the number of crashes that can be prevented (CP).
- (1) access control, (2) alignment, (3) cross sections, (4) intersections, and (5) pedestrian and bicyclist facilities might affect the overall safety of roadways.
- Among these cross section related factors are used as an example to compute CP values.
- Access Control: Defined as “some combination of at-grade intersections, business and private driveways, and median crossovers”
- More access control =Less accidents eg. Interstates Streets

Accident Reconstruction

- The purpose of reconstruction is to identify factors that are critical in a road accident like pre-impact direction and velocities of colliding vehicles
- To answer the questions “how” and “why” an accident happened. There are numerous factors to be considered, all of which add up to an understanding of the events that took place

Crash Reconstruction Exercise

A crash reconstruction exercise involves the following steps: -

- Preliminary investigation and measurement at the crash site
- Collection of forensic data
- Preparation of scaled drawings detailing accident site and relative locations of damaged vehicles
- Modeling of vehicles, pedestrians and vehicle – occupants
- Computer simulation

Application of computer analysis of accident data

- TEAAS-Traffic Engineering Accident Analysis System: a Software used to analyze the accident data (North Carolina)
- FARS (*Fatality Analysis Reporting System)* and GES (*General Estimates System) UK*
- **Road Accident Data Management System** (RADMS) India