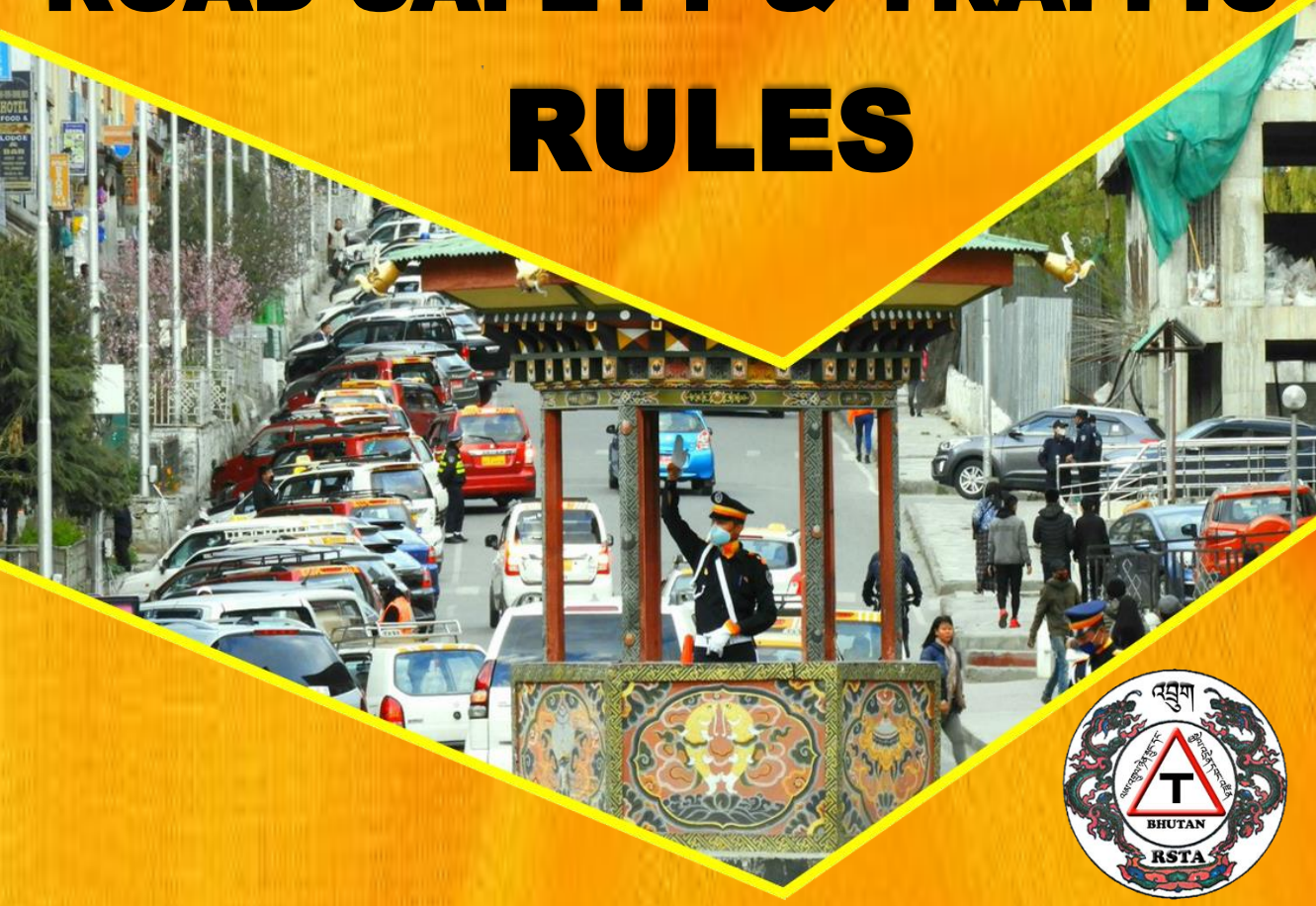
ROAD SAFETY & TRAFFIC RULES



Road Safety and Transport Authority

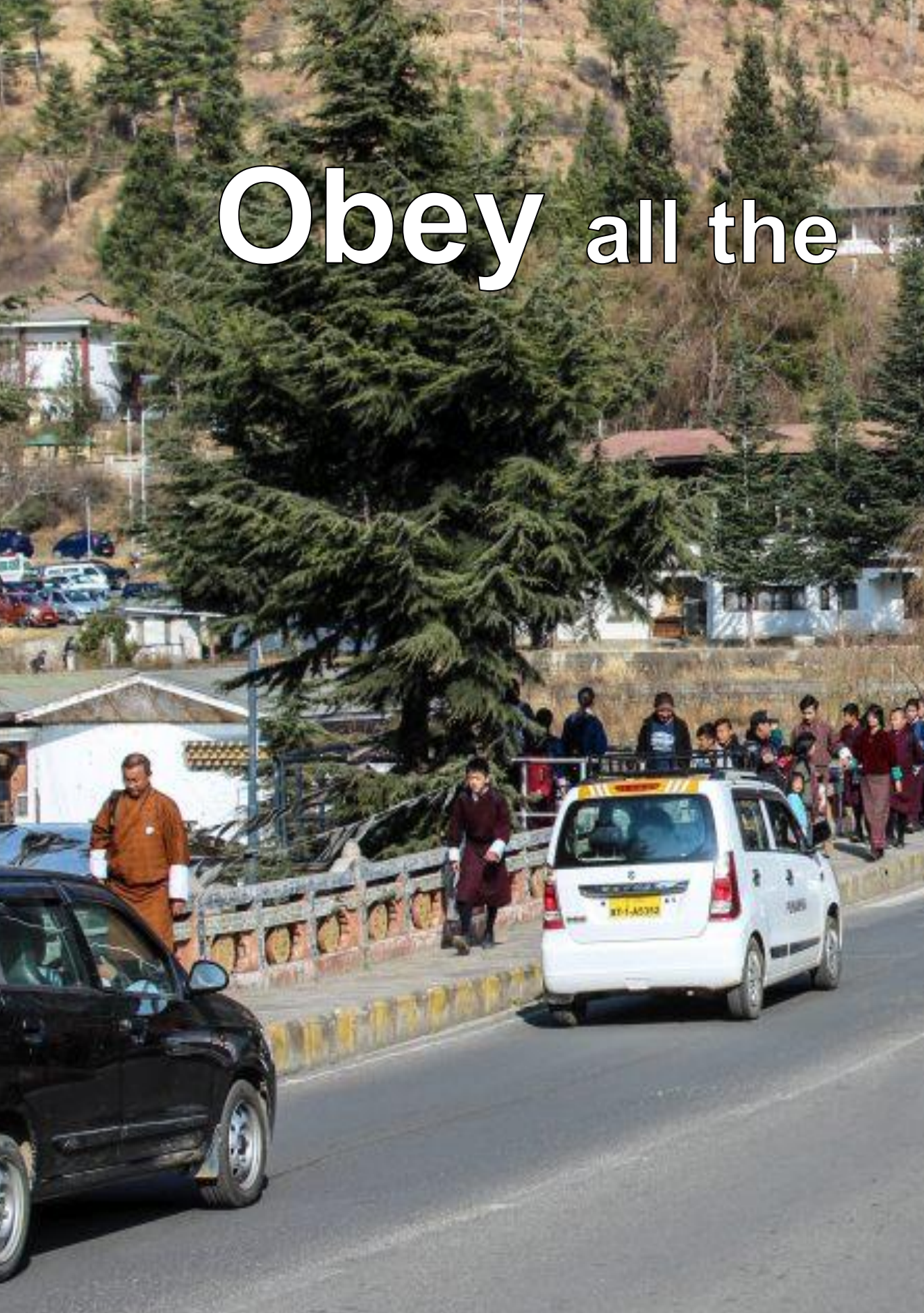
JUNE 2021

ROAD SAFETY & TRAFFIC RULES

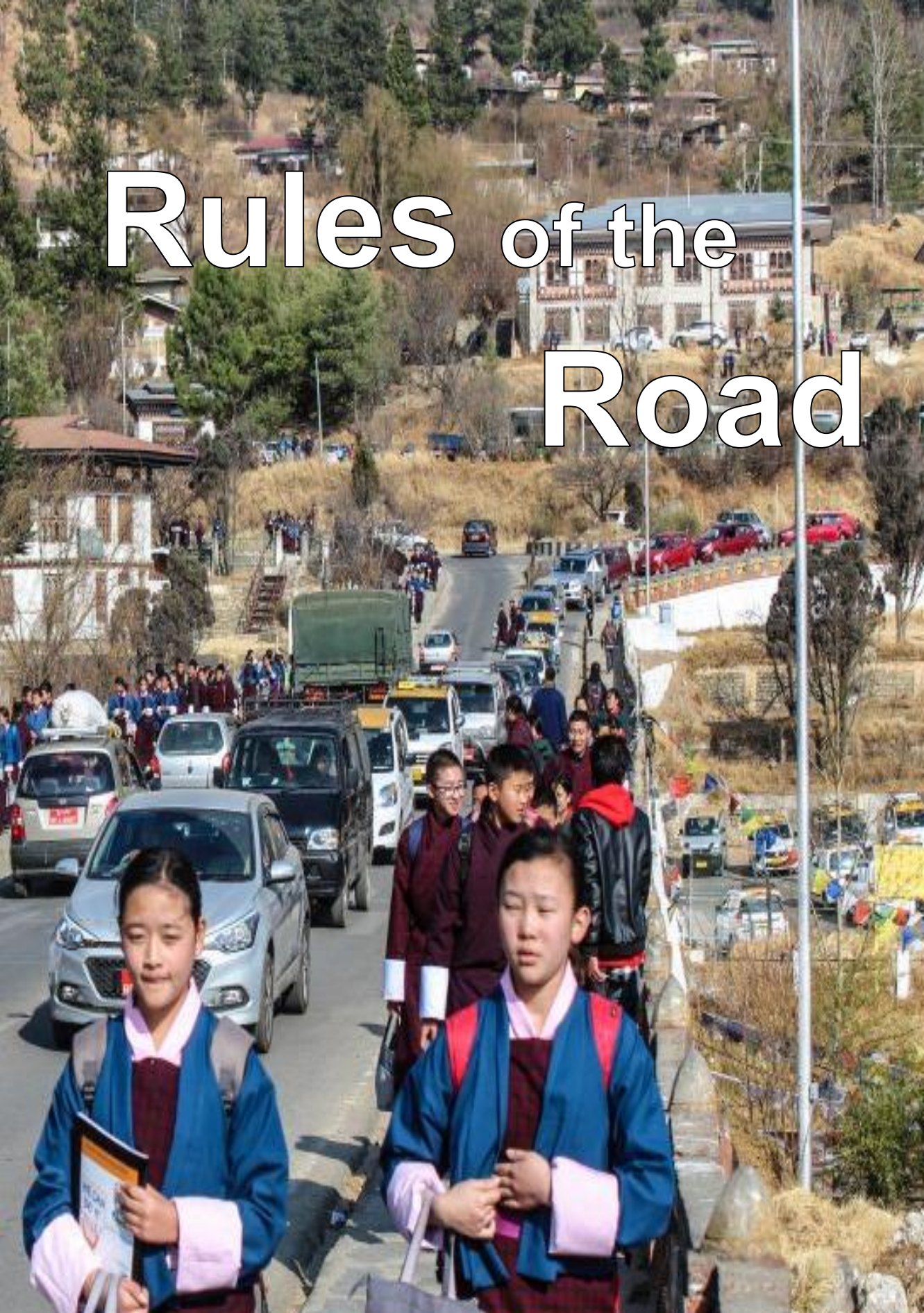
Road Safety & Transport Authority

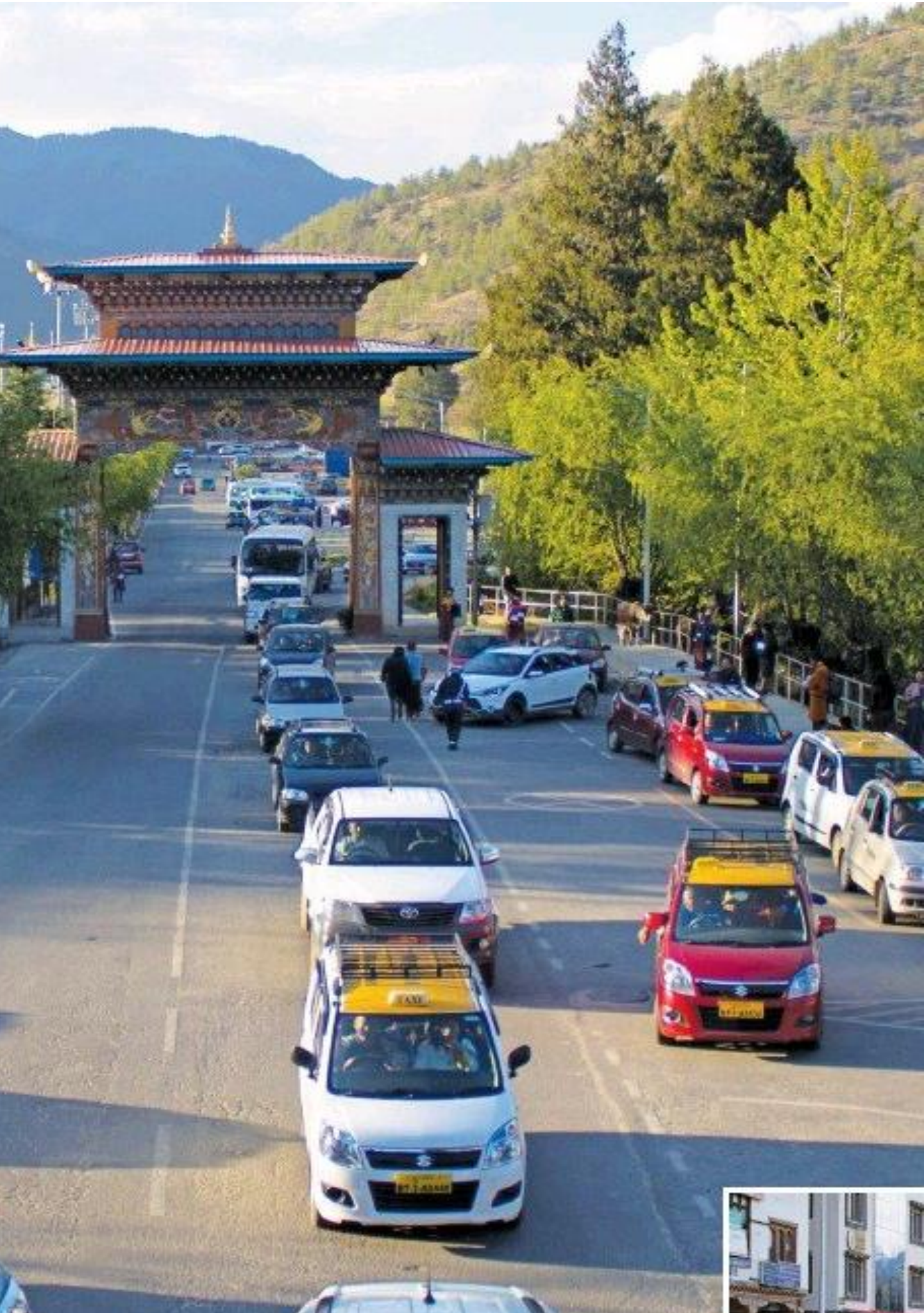
Ministry of Information and Communications

JUNE 2021


Obey all the

Rules of the Road





FOREWORD

The transport sector is the lifeline to any socioeconomic development and roads comprise an integral part of the system. In Bhutan, road transport is the single largest mode of transport and backbone to the economy. It is said that more the length of roads more the prosperity of a nation and that increasing demand for mobility is an unfortunate consequence of economic prosperity. While accepting that road network and transport systems provide immense potential for socioeconomic development, road transport if not used properly can have devastating impact on the culture, environment and lives of people. The World Health Organization (WHO) estimates that globally around 1.35 million people are killed and as many as 50 million people are injured in road crashes every year. Road traffic fatalities also cost many countries around 3% of their gross domestic product (GDP).

Under these circustances there is an urgent need to educate road-users about road safety measures to reduce fatalities and injuries, save precious lives and minimize financial burden on the health services provided by the government. While owning and driving a vehicle is a privilege, such privileges come with greater responsibilities not only for one's own life but for the lives of those immediately around. Road-users should be wary and obey the rules of the road, be extra cautious and always plan ahead before starting a road trip. Such small gestures will eventually add up to a lifetime of an **'accident-free'** Nation.

I take the privilege to encourage all road-users and those aspiring youths to read and understand traffic rules. Together, we can make our roads safer and driving more enjoyable.

Trashi Delek.

(Phuntsho Tobgay)
SECRETARY

PREFACE

When we learn to drive we all learn the rules of the road. We learn how to operate a vehicle, what each traffic sign means and how to maneuver a vehicle in a number of circumstances from heavy traffic to inclement weather. But as we drive, we sometimes forget the important responsibilities we shoulder on as we get caught in the routine of it. This is when many of us get involved in road crashes causing considerable emotional, social and economic loss to families, communities and to the nation as a whole. Road traffic injuries and fatalities are often sudden, violent and traumatic events the impact of which can be long-lasting and sometimes permanent. Each year, millions of injured from every corner of the world are added to the countless millions already suffering as a result of road crashes. The burden of grief and distress is far greater when many of the victims are young and many of the road crashes could and should have been prevented.

To address traffic-related issues, the Road Safety and Transport Authority (RSTA) has published this guidebook to educate road-users about road safety rules and traffic discipline so that the associated risks are minimized. All aspiring youths and those already licensed are encouraged to read, understand and obey the rules of the road while driving an automobile.

DISCLAIMER

This guidebook is an interpretation of the rules from the road safety point of view, not the law itself. All resource materials are meant for educational purposes only and is published in good faith. No copyright infringement is intended.

Practicing Road Safety is more important than Preaching it

TABLE OF CONTENTS

CHAPTER 1: LEGAL REQUIREMENTS AND ONLINE SERVICES 2

CHAPTER 2: A GOOD DRIVER 4

CHAPTER 3: ROAD SAFETY BEST PRACTICES 6

CHAPTER 4: GOOD DRIVING TECHNIQUES 18

CHAPTER 5: PRE-TRIP INSPECTIONS 24

CHAPTER 6: STARTING A VEHICLE 30

CHAPTER 7: TRAFFIC SIGNS 32

CHAPTER 8: ROAD MARKINGS 40

CHAPTER 9: RIGHT-OF-WAY RULES 44

CHAPTER 10: PEDESTRIAN CROSSINGS 52

CHAPTER 11: SPEED BREAKERS 56

CHAPTER 12: PARKING REGULATIONS 60

CHAPTER 13: LIGHT SIGNALING 68

CHAPTER 14: ANATOMY OF A VEHICLE 72

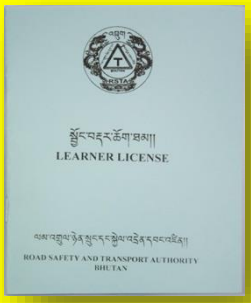
CHAPTER 15: VEHICLE SUSPENSION SYSTEMS 80

CHAPTER 16: VEHICLE ELECTRICAL SYSTEMS 84

CHAPTER 17: VEHICLE EMISSIONS 90

CHAPTER 18: MOTORCYCLE SAFETY 94

CHAPTER 19: MAIN CAUSES OF MOTOR VEHICLE CRASHES 100



RSTA ONLINE SERVICES

Book a Driving Test
Change your Contact Address/Mobile number
Pay Fine (Offence)
Renew your Vehicle Registration Certificate
Replace your Vehicle Registration Certificate
Vehicle Fitness Test (RWC)
Renew your Learner License
Replace your Learner License
Renew your Driving License
Replace your Driving License
Online Transaction Manual
Generate your Online Acknowledgement Receipt

For more information log on to www.rsta.gov.bt

CHAPTER 1: LEGAL REQUIREMENTS AND ONLINE SERVICES

The Road Safety and Transport Act 1999 is a statute passed by the National Assembly of Bhutan to facilitate the adoption of nationally consistent policy and legal environment on road safety and transport systems in the country.

It includes provisions to:

- provide safe, reliable, efficient, inclusive and environmentally-friendly surface transport systems; and
- enable the establishment of systems and procedures for licensing of drivers, registration of motor vehicles and other transport-related services thereof.

The Road Safety and Transport Regulations 2021 on the other hand contain the rules that address the practical application of the law as enforced by the Act. It provides guidelines and procedures for motor vehicles and drivers licensing and other transport-related rules and services within the country.

Road Safety and Transport Authority (RSTA) has also put in place the payment aggregator to facilitate online payment for almost all its services. The payment aggregator is integrated with the RSTA's e-Registration and Licensing System (eRaLIS) to accept all financial transactions related to the services provided. To further augment the online services, RSTA has introdued **mRSTA** a mobile application that allows clients to gain instant access to various information and services anytime from anywhere. By using the online facilities, it increases the speed, flexibility and convenience that allow clients to have a single window access to all the RSTA services.

CHAPTER 2: A GOOD DRIVER

Good drivers are individuals who are**'self-disciplined'** and understand that they have a responsibility to obey the law and follow traffic rules. Self-disciplined drivers are themselves the authority in control of their behaviour and are self-governed to follow the accepted norms internally.

Qualities of Self-disciplined drivers:

Calmness: They possess the highest expression of self-control no matter how much they are perturbed by other road-users and always keep themselves free from being agitated.

Patience: They have the ability to endure difficult circumstances in the face of heavy traffic situations without being apprehensive.

Considerate: They are careful not to cause inconvenience or harm to others by exhibiting good driving etiquette and always think of other road-users first, before moving on.

Skilled and knowledgeable: They have the ability to apply safe driving techniques.

Defensive: They are well-attuned with the surroundings and drive with precautions to address road hazards in a fairly predictable manner. This constitutes a set of skills beyond the mastery of mechanics of driving and knowledge on traffic rules.

Defensive Driving constitutes:

- Controlling vehicle speed.
- Visually scanning their surroundings.
- Being alert always.
- Predicting behaviour of other road-users.
- Maintaining safe following distance.
- Watching out and respecting other drivers and road-users.

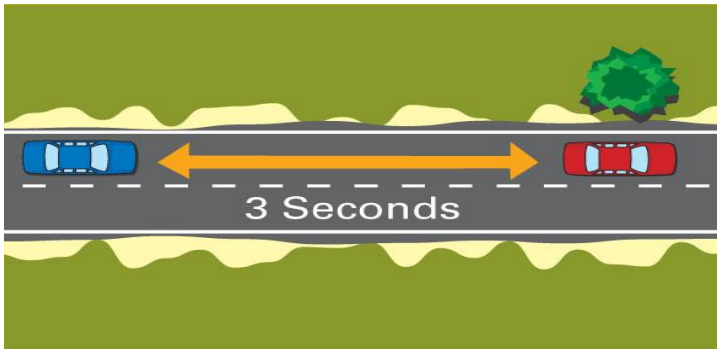

Ford

CHAPTER 3: ROAD SAFETY BEST PRACTICES

Best practices in road safety are measures expected to reduce road crashes and serious injuries through good public acceptance. It refers to good habits which together form the basis for implementing road safety best practices.

Avoid multitasking while driving: There are Apps that prevent texting or answering mobile phones while driving. For instance when the 'Airplane Mode'is turned on your mobile, callers will hear the phone ringing but it will not ring at your end because your phone is not active. While this prevents handling calls while driving there are many other forms of multitasking people get themselves engaged with while driving. Any form of multitasking while driving is dangerous as this takes away the focus from the road and handling a vehicle properly.When driving a vehicle the focus should be only on the road ahead and all other means of distraction should be avoided.

Keep a safe distance: Always keep a safe distance and follow the **'3-Seconds Rule'** when driving behind another vehicle. Keeping a safe distance gives you enough time to react and stop safely should the driver in front suddenly apply the brakes. This rule can be tested by identifying a stationary object on the side of the road, say a lamppost for example. When the vehicle ahead of yours passes the lamppost start counting. At least 3 seconds should pass before your vehicle passes the same lamppost. However the split second gap could increase or decrease depending on



driver's perception and reaction time, vehicle's reaction time, vehicle's braking capability and the travel speed of your vehicle.

Drive extra careful in bad weather: Driving through heavy rain, snow, ice or fog increases the chance of accidents manifold. Bad weather not only affects visibility but also condition of the road that you are driving in. You will often find yourself in a more slippery and dangerous situation which is not at all ideal especially if the vehicle tires are not in a good shape. When driving in bad weather be extra careful. Drive slower than the speed limits and stay further away from the vehicle in front of yours. If visibility becomes zero, stop and find a place to rest until the weather condition improves. It is important to remember that no matter what kind of weather you drive in, the simple rule of the thumb is ***'never drive faster than what is safe in the current condition of the road.'*** The best way to deal with driving in bad weather condition is to be well prepared and plan the journey ahead.

Fog: Dense fog is statistically the most dangerous condition to drive in because of how intensely it can impair a person's vision of the road. The safest way to handle fog is not to drive in it if possible. But if one must drive, keep the following safety tips in mind:

- Use fog lights when the visibility is seriously reduced.
- Make sure dipped headlights are put on. Avoid using high-beam headlights as it will reflect light off the fog ahead making it even harder to see.
- Slow down and increase safety space between yours and other vehicles. This will give you plenty of time to stop abruptly if necessary.
- Never tailgate the vehicle in front of yours.
- Slow down at turns and use the correct signals early. This will give cars behind yours plenty of time to slow down and notice that there are turns ahead while driving in fog.
- Use the edge line marked on the side of the road as a guide. This can help to prevent impaired driving vision by the headlights of on-coming traffic.

Snow and Ice: When driving in snow or ice it is probably going to take twice as long to get to your destination. Make sure to allow yourself plenty of time. The last thing to do is to be speeding on icy road to get to your destination on time.

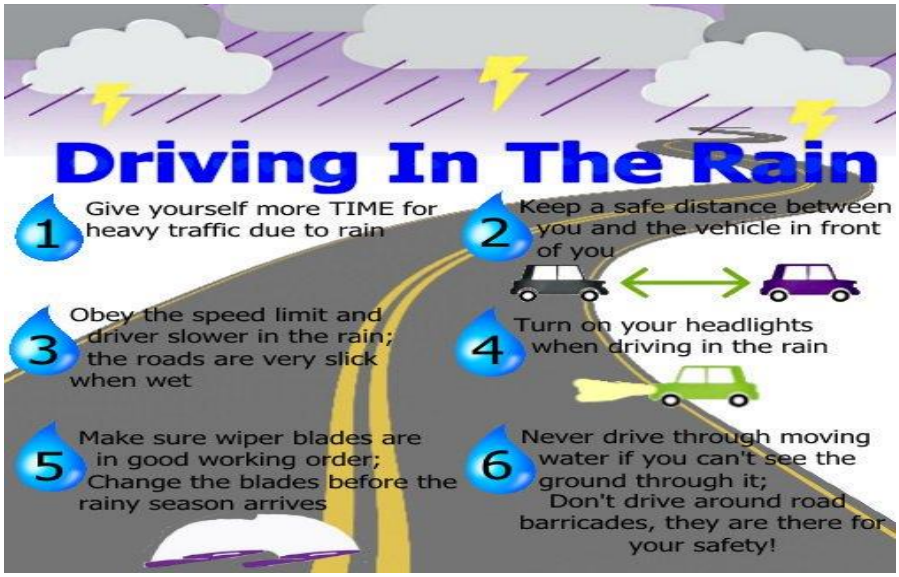
You should:

- Test out the brakes in an empty parking space to check how the vehicle reacts to the amount of pressure applied to the brake pedal before driving in snow or ice.
- Drive slowly and maintain extra safety space around your vehicle.
- Give yourself plenty of time to slow down before a turn because taking a corner with too much speed can cause the vehicle to lose control.
- If your vehicle skids, ease off the accelerator but do not brake suddenly. Accelerate gradually, maneuver gently and avoid harsh braking as the tires are likely to spin out of control.
- Beware of black ice and try to avoid driving over areas that look slick as this can cause a vehicle to spin out of control.
- Use the highest gear possible to avoid wheel spin.

Rain: When driving in rain good windshield wipers can be the best weapon. If the vehicle wipers are old and dull they can limit visibility and increase the risks of a collision.

Always:

- Maintain a good distance between your vehicle and the vehicle in front of you. It will give you plenty of time to stop because having to suddenly slam on the brakes can result in skidding.
- Turn on the low-beam headlights because that will not only help to see but will make your vehicle visible to other motorists.
- Try and avoid puddles as this can cause your vehicle to hydroplane out of control.

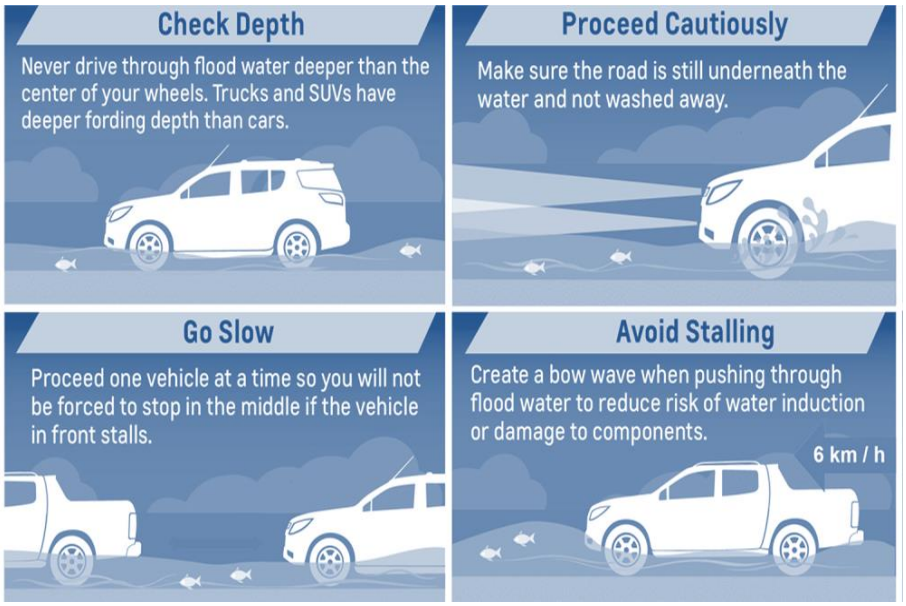


Flood: Never drive in flood water where the buoyancy force is greater than the weight of your vehicle. There will be less friction force and your vehicle can get lifted off the road. The safest way to handle flooded road is not to drive through flood water.

But if the flooding is minor and you need to move on:

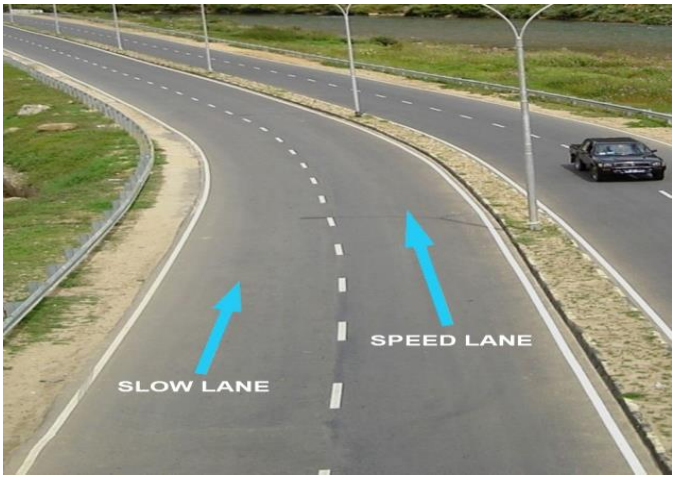
- Try to avoid deep water and drive through the shallowest point and watch out for other vehicles and allow them to pass.

- Drive slowly in first gear and keep the engine speed high by slipping the clutch to avoid stalling.
- Once you are out through floodwater, test the brakes a few times before continuing to drive.



Don't Drive when Drowsy (DDD): It is not just alcohol that can impair a person's driving abilities. Certain medications which contain ingredients that make a person drowsy will have a similar effect as consuming alcohol. It is also not advisable to drive when you had a sleepless night. In such situations the best option would be to stay home and get some rest. If you really have to be somewhere and you don't have anybody to drive, then arrange to go by a public transport say a bus or taxi.

Give way to vehicles moving faster than yours: The right-most lane of the road is the fast lane and it is used for overtaking. Do not block the fast traffic lane and keep to the left or slow lane if you need to drive easy.

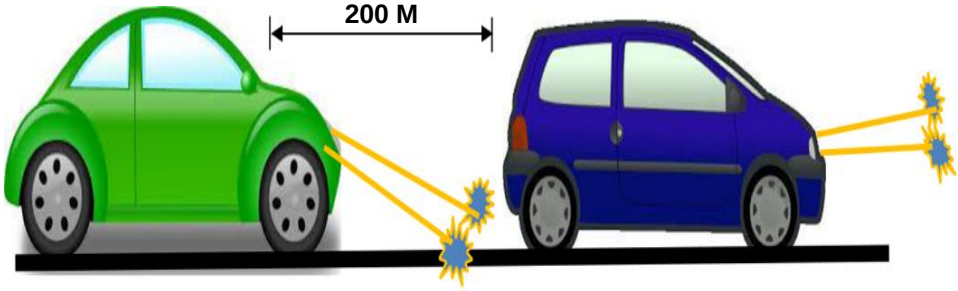


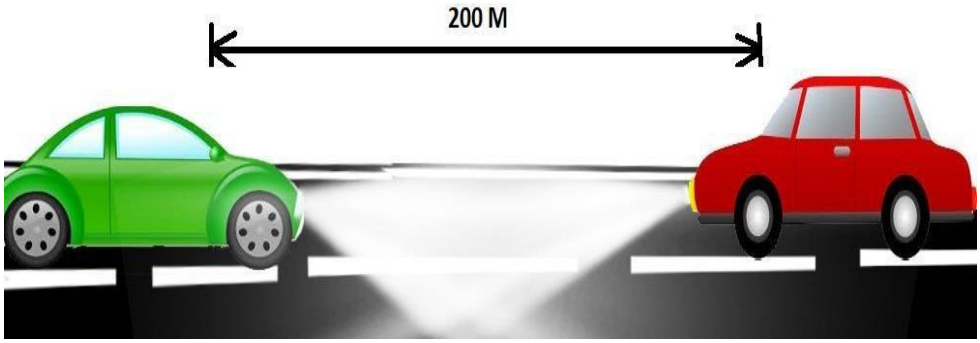
Be a good Human: Many people out of curiosity get apprehensive to know the reasons and situation of an accident when they come across one. While it is the duty of the Traffic Police to attend to road accidents, if there is such an incident on the road, the best thing to do is to get out of your vehicle and help the victims in every way possible.

Honk only when warning: Vehicle horn is meant to warn other road-users of your intention such as taking turns or changing lanes. Persistent and endless honking generates stress and can lead to road rage in fellow drivers. It is okay to give a short honk instead of a long blast because by blowing your horn loud, you are unnecessarily indicating your presence to other road-users.

Drive Carefully at Night: Driving at night is very tricky and entirely depends on how far you can see ahead. Although the headlamps have improved, most judgments are based on distant vision of a driver. Ensure to be safe by driving cautiously at night so that your vehicle can stop within the distance illuminated by the headlights.

Reduce high-beam glare when driving at Night: Driving at night becomes daunting as fellow drivers may be driving tired, stressed or under the influence of drugs or alcohol. The most prominent problem faced by almost every driver at night is the glare from the headlights of a vehicle coming from the opposite direction with high-beam. A bright light coming from the opposite direction falls directly on the eyes and can cause a driver to lose depth perception and peripheral vision leading to blurriness. This temporary blindness can result in accidents. It is important to drive with low-beam headlights and use high-beam headlights only when it becomes really necessary at night. Always dip your headlights to low-beam when a vehicle coming toward you is within 200 metres.

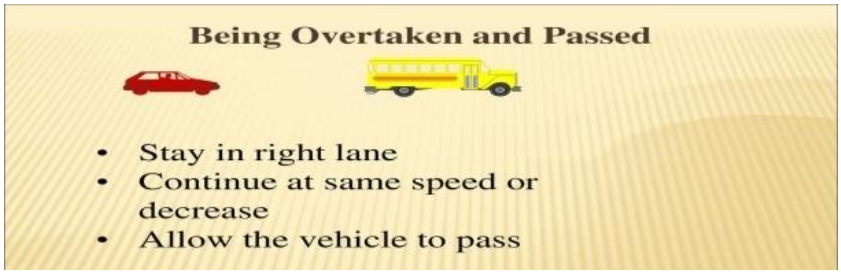




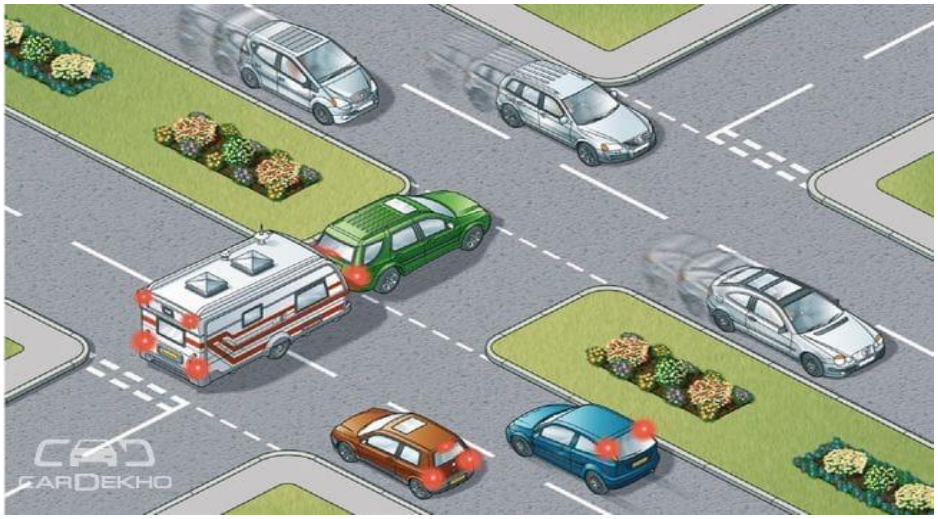
Avoid riding the Clutch: Do not drive your vehicle with the foot resting on the clutch pedal. Move it away as soon as you have shifted the gear. The clutch is exposed to constant friction and the partial engagement of clutch with the flywheel can result in premature wear-out of the disc, flywheel and the clutch itself.

Signal only when necessary: Signaling unnecessarily is not a good idea. Having the indicator or hazard lights switched on uselessly can mislead other drivers which in turn leads to error in their judgment. Although all vehicles have automatic cancellation system for indicator lights after taking a turn, it is good to check if they have been switched off after completing the turn.

Do not speed-up when being overtaken: Do not accelerate more if the vehicle behind you has pulled out and is trying to overtake. Accelerating simultaneously can create an error in the judgment of the other driver and this could be a situation for a potential collision. Instead it is better to get off a little to let the other vehicle overtake safely.



Never Block a Crossing: Always enter a junction only when you are sure about crossing it completely without stopping in the middle. If the other side of the intersection is clogged, keep patience and let the other end clear up.

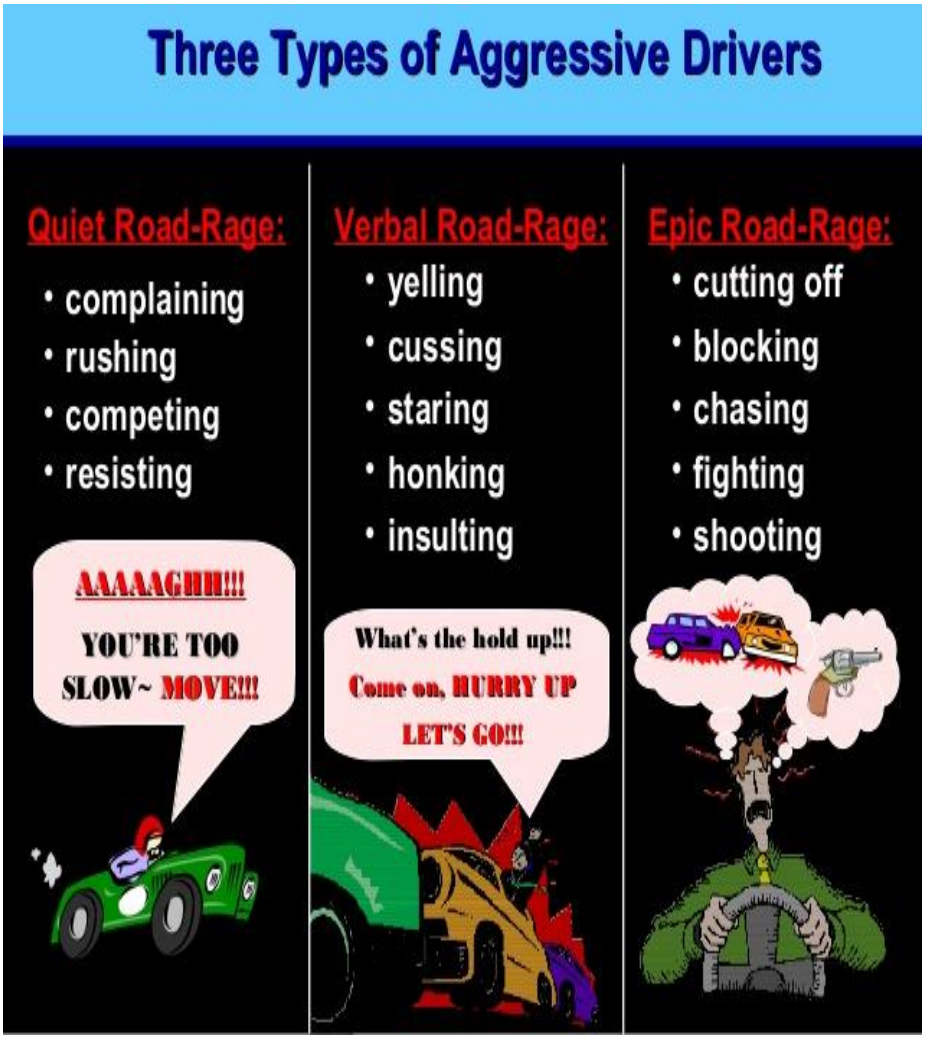


Avoid driving with high volume of Stereo: Loud music acts as a distraction and can insulate you from the activities happening on the road outside. Consequently you may not be able to hear a warning honk or notice the warning signs on the road. It is better to play the music at a level of volume that neither distracts nor isolates you from the world around.

Avoid road rage: Road rage is a societal condition where motorists lose their temper in reaction to a traffic disturbance.

You should:

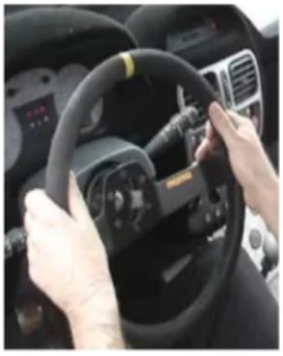
- Give other drivers a break and if someone is driving slowly keep in mind that they might be lost.
- Use hand gestures wisely and keep them positive.
- Do not tailgate no matter how slowly they might be driving.
- Lay off the horn as honking out of frustration will not solve the problem. Instead it will just increase the stress level for everyone on the road.
- Do not stop to confront another driver as this could lead to an undesirable situation



If another driver acts aggressively:

- Stay away and safely change lanes or even exit the highway to avoid a confrontation.
- Do not reciprocate. Ignore the temptation to respond to the other driver as this could cause the situation to escalate.
- Avoid eye contact as far as possible.
- If you are worried that the other driver is following you, drive to the nearest Police Station to lodge a complaint.

1. Before turn:
hands in quarter to three.



2. Turn-in: left hand relocated to pull 90 degrees left

3. Turning:
Hands in quarter to three

4. Tracking out: Right hand relocated to pull back 90 degrees.

5. After turn:
Hands in quarter to three.

CHAPTER 4: GOOD DRIVING TECHNIQUES

Properly holding the steering wheel of a vehicle is a key safety precaution to do every time you get behind the wheel. Good steering techniques is crucial for smooth driving as this can prevent any sudden lateral weight transfer and will allow the corners to be taken at a constant speed. Drivers who use the correct method of holding the steering wheel are less likely to get into a crash and will be in a position to use their vehicle more efficiently.

There are three steering techniques: the ***hand-to-hand, hand-over-hand and one-hand*** and three hand positioning: the ***10 and 2, 9 and 3, and 8 and 4.*** With technological advancement in steering wheel and associated mechanisms, the best steering and hand positioing technique may vary and will depend on the road designs and conditions. To maximize vehicle control, steering wheel balance and to avoid sudden jerks, the following hand positioning and steering techniques are being suggested.

Steering Wheel Handling

- Both your hands should be placed outside of the steering wheel on opposite sides.
- The grip of your hands on the steering wheel should be firm, yet gentle.
- Use your fingers instead of the palm of your hands and keep your thumbs up along the face of the steering wheel.
- Never turn the wheel while gripping it from inside of the rim.

When driving on a stretch of straight or gently curving tarmac

- The default hand position should be the ***'9 and 3' O'Clock technique*** where your left hand should be placed where the nine would be and your right hand where the three would be if the wheel was a clock. This technique retains a proper position to use the ***'push and pull'*** method of turning the steering wheel.
- Try to maintain this position unless it becomes impossible to take the turn in this way as this gives the advantage of instantly knowing exactly

where the straight-ahead position is and the ability to steer rapidly yet smoothly.

When steering round a corner

- The ideal steering movement is progressive, smooth and controlled.
- Applying and taking off the steering lock (maximum angular range of the steered wheel) should be done in a fluid movement without taking either hands off the wheel as far as possible.
- Pushing and pulling the wheel may be fine for general road driving but this does not allow the smooth motion needed when driving near the limits of the grip.
- In some cases when the situation requires taking the lock off very quickly, it may be easier to let the wheel slide through your fingers slightly but this should be avoided as far as possible.

Using the one-hand steering

The one-hand steering should be applied while ***reversing or operating the vehicle controls*** such as wipers, flashes and lights that require you to reach away from the steering wheel. In such situations, the placement of one hand on the steering wheel is critical for vehicle balance, steering reversals and preventing potential injury.

You should:

- Place your left hand and arm over the back of the front passenger seat with your right hand holding on top of the steering wheel.
- Turn the steering wheel in the direction desired to reverse the vehicle. The rear of the vehicle will swing in the same direction as the turn of the steering wheel.
- Do not depend on mirrors alone while reversing.

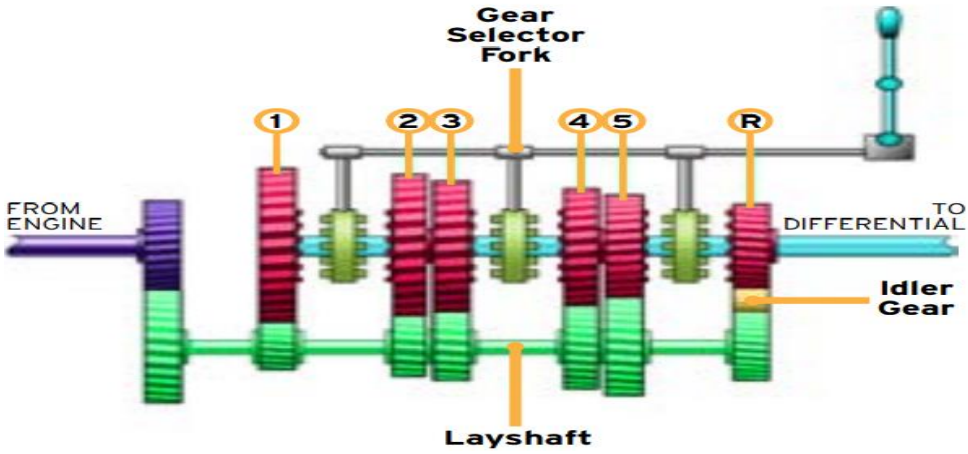
Gear Shifting Controls

The gears determine the amount of power available from the engine and it simply means that you change to a higher gear (4^{th} or 5^{th}) or to a lower gear (1^{st} or 2^{nd}).

The basic gear changing rule is ***'Brake to Slow – Gears to Go'.***

- Change up through the gears as the speed of the vehicle increases and down when more power from the engine is required.
- To reduce wrong gear changing and to prevent potentially damaging the clutch and gearbox, use the **'*palming method'*** to change gears. This technique involves applying pressure to a side of the gear stick and pushing it using the palm of your hands only.

There are also times when gears are changed selectively for example from 3rd to 5th gear for better acceleration when reaching the intended cruising speed. This is called ***'Selective' or 'Block'*** gear changing but should be avoided as this could result in losing control of the vehicle or stalling and it is very easy to slip gears if the changing techniques are not perfect.



Manual transmission change speeds (up-shift)

Gear change	Approx. speed (km/h)	Tachometer (rev/min)
1st - 2nd	25	2000-3000 rpm
2nd - 3rd	40	2500 – 3500 rpm
3rd - 4th	60	2500 – 3500 rpm
4th - 5th	80	2500 – 3500 rpm

Manual transmission change speeds (down-shift)

Gear change	Approx. speed (km/h)	Tachometer (rev/min)
5th - 4th	65	2000 rpm
4th - 3rd	45	2000 rpm
3rd - 2nd	35	2000 rpm
2nd - 1st	15	1500 rpm

Sobering!

A good reason to do a vehicle CIRCLE OF SAFETY check before driving off!

A crew working for a utility company found this young child in the wheel well of their truck while conducting a "CIRCLE OF SAFETY."

No one wants to imagine what could have happened if the employees had gotten into the truck and driven off before doing a walk around.

Please share this photo and experience with others.

The crew that took this picture also reported children climbing into the back of other company vehicles to play and explore!

CHAPTER 5: PRE-TRIP INSPECTIONS

Circle of Safety: Just as thousands of people from all walks of life circumambulate religious mounments to accumulate good merits, the ***'circle of safety'*** before setting off to drive is vital in making sure that the area around your vehicle path is clear from all type of obstacles like children, animals or physical structures to avoid unforeseen mishaps.

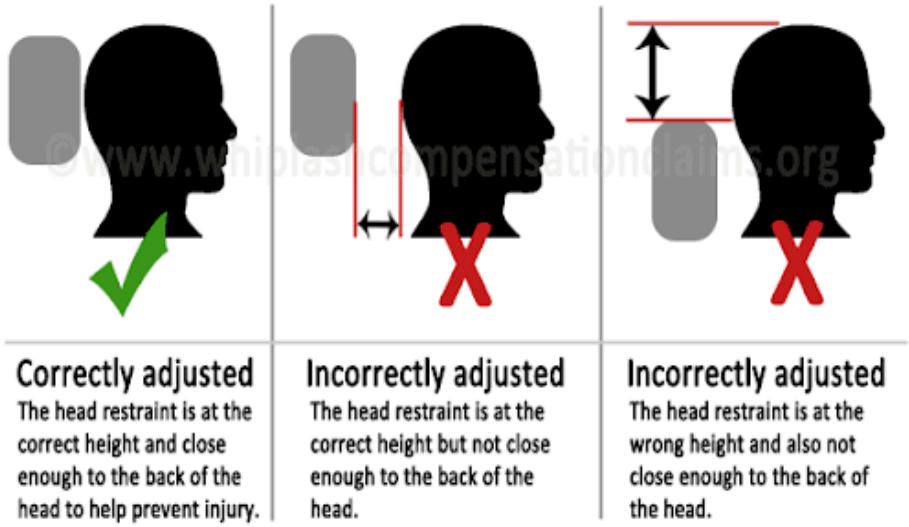
Tires: Having the correct tire pressure is extremely important to get good gas mileage and maximum life out of them. The required ***'pressure per square inch' (psi)*** level is printed on the vehicle door and if not, it is available in the Owner's Manual. Most passenger vehicles recommend psi level between 32 to 35 when the tires are cold to get an accurate psi level. A tire will not give correct psi level when it is hot because the friction between the tires and the road generates heat which increases the temperature and air pressure giving inaccurate psi reading.

Oil and fluid levels: Oil and fluids are important to vehicle engine and other components because they act as lubricants between several moving parts. Lubrication cuts down friction which in turn lowers engine over-heating and rust accumulation. It is not necessary to check the oil and fluid levels on a daily basis but do so after every 15 days or at least once a month and top up the oil and fluids when required. Oil and fluids include engine oil, radiator fluid, transmis sion fluid, power steering fluid, brake fluid, washer fluid and air conditioning coolant.

While the ***'periodical maintenance schedules'*** for oils, fluids, filters and others parts are provided in the 'Owner's Manual', the interval for changing motor oil depend on the motor oil type. If the oil is full synthetic, the changing interval is longer than the conventional type. Changing the motor oil will also depend on the environmental conditions under which a vehicle operates. If a vehicle operates in a hot, dry climate with sandy conditions the stressed engine oil must be changed sooner than in a more temperate location. The same is true if the vehicle is operating in extreme weather conditions.

Driver's seat: A driver's seat needs to be adjusted to be high enough to see clearly and close enough to use the accelerator and brakes. You should also be able to reach other controls of a vehicle when in a driver's seat but should maintain at least 10 inches away from the airbag to avoid the impact in case of an airbag explosion.

Headrest: The headrest has a purpose beyond comfort. If you get into a collision the headrest will support your head and avoid getting a whiplash. The headrest must be squarely positioned behind your head. The headrests are deliberately kept detachable and sharp so that they can be used to break open the glass of a vehicle in case of a fire or other emergencies.



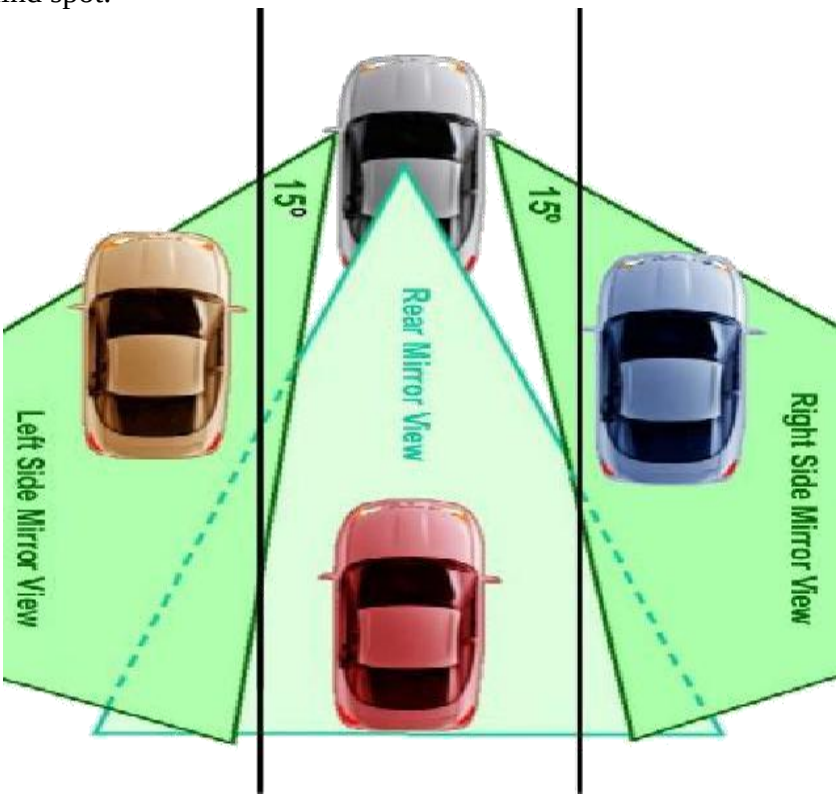
Lights and Windshield: Checking vehicle headlights, taillights, brake lights, windshield and windows are extremely important. They must be kept functional and reasonably clean. Dirt or grime on the windshield can be a serious problem as this will adversely affect visibility particularly in extreme weather conditions.

Rear and Side View Mirrors: Correct positioning of the rear and side view mirrors provide visual as well as safety to avoid blind spots. With the help of rearview mirror, a driver will know what is behind the vehicle. On the other hand, the side mirrors provide a parallel view of running traffic. If the mirrors are not properly adjusted, you will find yourself in a **'Blind Spot'**.

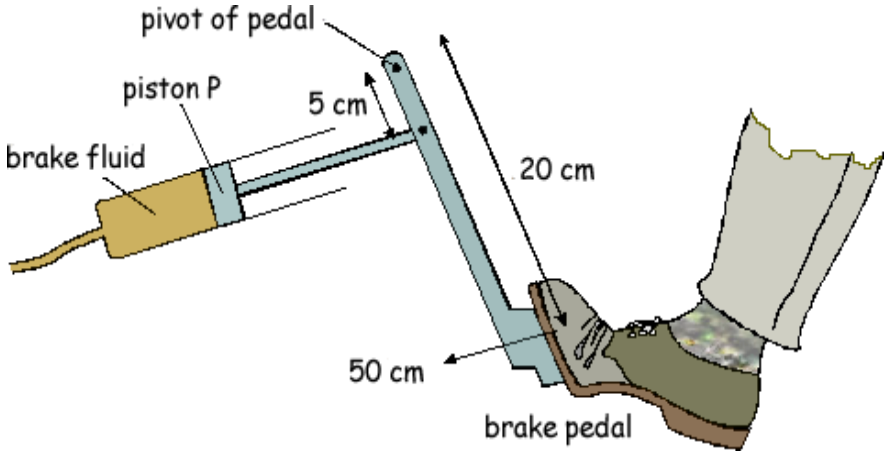
Adjusting the Vehicle for You
Rear and Side Mirrors
The Driver's View:

- The inside rearview mirror provides the widest field of view
- Adjust to see the entire rear window frame and the area 200' to the rear
- Adjust each side mirror 15° degrees outward until you can barely see the side of your vehicle, so you maximize the view of the lane next to your vehicle

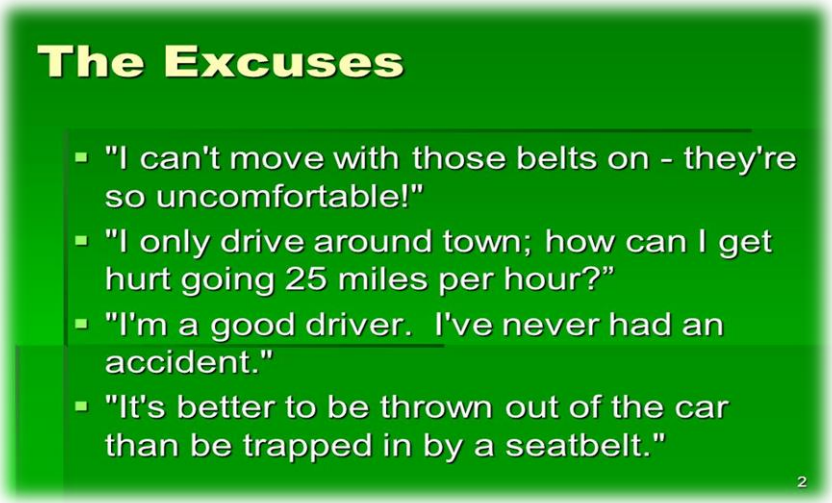
Blind Spot is the path around your vehicle that cannot be seen directly even with properly adjusted mirrors. You can experiment this by watching a vehicle approach in the rearview mirror of your car and then continue to watch as it prepares to pass your vehicle. There will be a point at which you can no longer see the vehicle in both the side and rearview mirrors. That is known as the blind spot and must be avoided at all times. You should never drive alongside the rear of another vehicle and if you get into that spot, either drop back or increase the vehicle speed and move out of the blind spot.

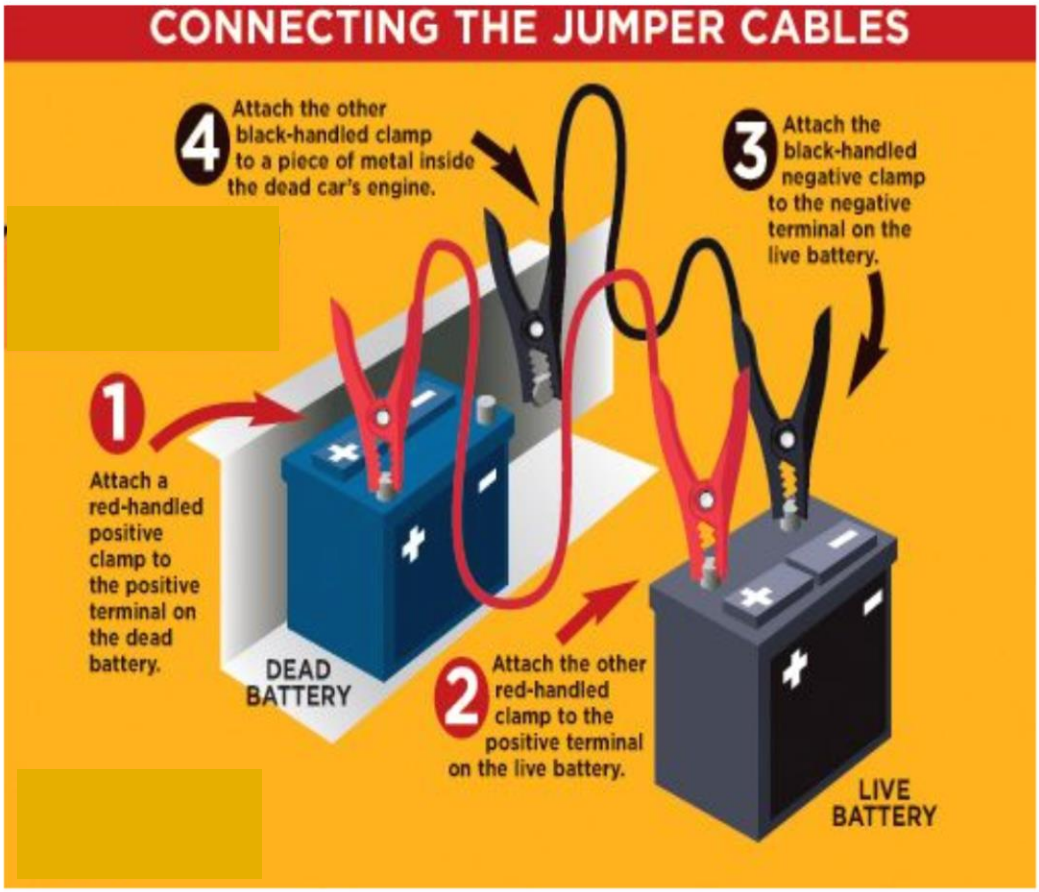


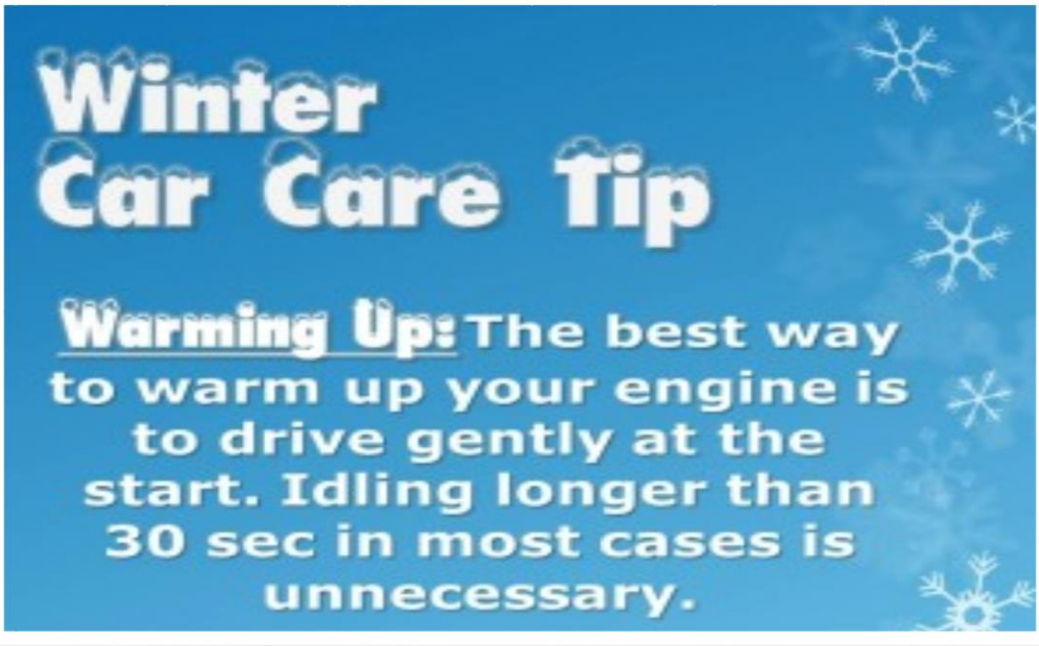
Brakes: Before driving off make sure to check the brakes. Press the pedal and make sure that the brakes don't feel spongy or slack. The vehicle should have the needed stopping power and pull up smartly without pulling to one side. When using anti-lock braking system (ABS) the rule of the thumb is to press the pedal all the way to the floor. There will be a strong vibration in the brake pedal which is a sign that the ABS is working properly. Ignoring brakes can result in life threatening situations.



Buckle-up: Seatbelts are the best defence against impaired, aggressive and distracted driving and will keep everyone inside a vehicle safe during a crash. Not wearing seatbelts could result in injuries during head-on collision because of the force at which the frontal air bags open. Never put the shoulder belt behind your back or under the arm.




CONNECTING THE JUMPER CABLES
4 Attach the other black-handled clamp to a piece of metal inside the dead car's engine.
3 Attach the black-handled negative clamp to the negative terminal on the live battery.
1 Attach a red-handled positive clamp to the positive terminal on the dead battery.
DEAD BATTERY
2 Attach the other red-handled clamp to the positive terminal on the live battery.
LIVE BATTERY


Winter
Car Care Tip
Warming Up: The best way to warm up your engine is to drive gently at the start. Idling longer than 30 sec in most cases is unnecessary.

Chapter 6: Starting a Vehicle

Normal Weather Conditions

- Make sure that the gear is in neutral. Verify that the manual transmission is in neutral by lightly jiggling the shifter. If it moves freely then the transmission is in neutral position. If a vehicle is started 'in gear' the vehicle will lurch and stall.
- Twist the ignition key to start and release the key after twisting to the ignition point. If the key is kept turned as far as it will go after the engine starts running, a grinding sound will come out from the gears which is bad for the vehicle.
- Once the engine is running never release the clutch suddenly with the engine in gear and no pressure on the accelerator as this will result in sudden vehicle movement and most likely stall the engine causing it to suddenly stop running.

Cold or Extreme Weather Conditions

- Minimize electrical drainage in the battery by turning off all accessories that use battery power.
- Turn the key to start and hold it for up to 10 seconds. Do not hold it for any longer than 10 seconds as overworking the starter will not make it any more likely to start.
- If the vehicle is coming close to starting but seems sluggish, give it a break and try again because the battery might have been slightly drained.
- If after trying many times and the starter is still sluggish, it means that the battery is fully discharged and will require a jump start.
- If the battery is totally drained out and cannot even jump start, then it will take up to 8 hours to recharge the battery sufficiently to reach the required amperage.

Here are our top tips on what to remember when you're on the road and how to keep safe:

Follow Traffic Sign

- Before you officially get your driver's license, you may have taken an exam to determine whether you recognize traffic signs and their meanings. If you don't pass, you may be asked to retake after reviewing the traffic signs again.

- Being able to recognize traffic signs is important for you to follow them. Traffic signs serve as warnings and regulations for drivers and pedestrians alike on what they should look out for on the road, such as speed limits, hazards, or rules.

CHAPTER 7: TRAFFIC SIGNS

Traffic signs provide valuable information to drivers and other road-users and they represent rules that keep motorists safe by communicating road safety messages through symbols, numerics or expressions to prevent accidents from happening. Neglecting them can be dangerous. Traffic signs mostly use graphic symbols so that they are easily understood and can be interpreted without causing distraction to drivers while driving.

They are broadly classified into three main groups:

I. Mandatory or Regulatory Signs are circular in shape and set obligations to all traffic. Mandatory signs tell traffic what it must do rather than must not do, and not abiding by these signs are punishable by law.

II. Cautionary or Warning Signs are upward triangular or diamond-shaped and are meant to caution and alert traffic about potential danger either on or adjacent to the roadway so that motorists can take the desired action. They warn drivers to give special attention for their own and the safety of other road-users.

III. Informatory or Guide Signs are rectangular in shape and are usually black or white legend with blue borders. They are meant to facilitate dissemenation of information on directions, destinations and other roadside information to motorists.

IV. Temporary Traffic Control Signs are diamond or square-shaped fluorescent orange colour with black legend. They alert motorists about road work zones, diversions, detours, lane closures, traffic control people and other road hazards.

Different Traffic Signs

Speed Limit Signs have numbers displayed indicating the maximum permissible speed beyond which it is dangerous and punishable by law.

No Horn Signs prohibits blowing vehicle horn in certain places.

One Way Signs permits traffic only in one direction that is marked without red diagonal line across it.

No Overtaking Signs prohibit overtaking other vehicles until the continuous solid lines ends and is replaced with broken lines on the road.

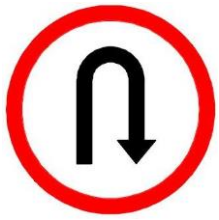
No Entry Signs conveys a clear message restricting unauthorized access or entry.

No Left Turn Signs restrcits left turn and vehicles can either move straight or turn right, if permissible.

No Right Turn Signs restricts right turn and vehicles can either move straight or turn left, if permissible.

Load limit Signs restricts vehicle load and warns that a vehicle weighing more than the specified weight limit is heavy and risky.

U-Turn Signs allows vehicles to take a complete U-turn in the opposite direction.



No U-Turn Signs depicted with red diagonal line prohibits a u-turn in the opposite direction.

Stop Signs inform traffic that they must come to a complete stop and make sure that the intersection is clear of vehicles and pedestrians before they can move on.

Give Way Signs indicate that merging vehicles must prepare to stop if necessary to let another approaching vehicle proceed. A driver who stops or slows down to let another vehicle through has yielded the right-of-way to that vehicle.

Left/Right Hand Curves Signs caution drivers about a left/right hand curve on the road ahead. It signals a driver to reduce speed to an approaching turn.

Narrow Road Ahead Signs informs that the width of the road will start decreasing and merge into a narrow road. It cautions traffic to slow down and be extra careful.

Narrow Bridge Ahead Signs warn traffic that the bridge ahead is not as wide as the road and that vehicles should reduce speed and drive cautiously.

Pedestrian Crossing Signs warn traffic to be alert for people who might walk or run in front of the vehicle. The sign provides an advance notice of high pedestrian activity so that drivers can prepare themselves to slow down or stop at short notices.

School Ahead Signs give advance warning of a nearby school so that traffic can slow down and watch out for children crossing the road.

Right/Left Hairpin Bend Signs warn traffic about potentially hazardous conditions on or adjacent to the road which may not be readily apparent. This sign requires traffic to slow down.

Right/Left Reverse Bend Signs cautions drivers that they are approaching a right or left zigzag turn ahead and must slow down.

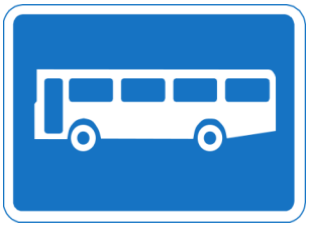
Steep Ascent Signs informs that a steep ascent is ahead and that traffic should prepare to make the climb in the appropriate gears.

Dangerous Dip Signs warn traffic about a sharp dip on the road ahead which could be potentially dangerous.

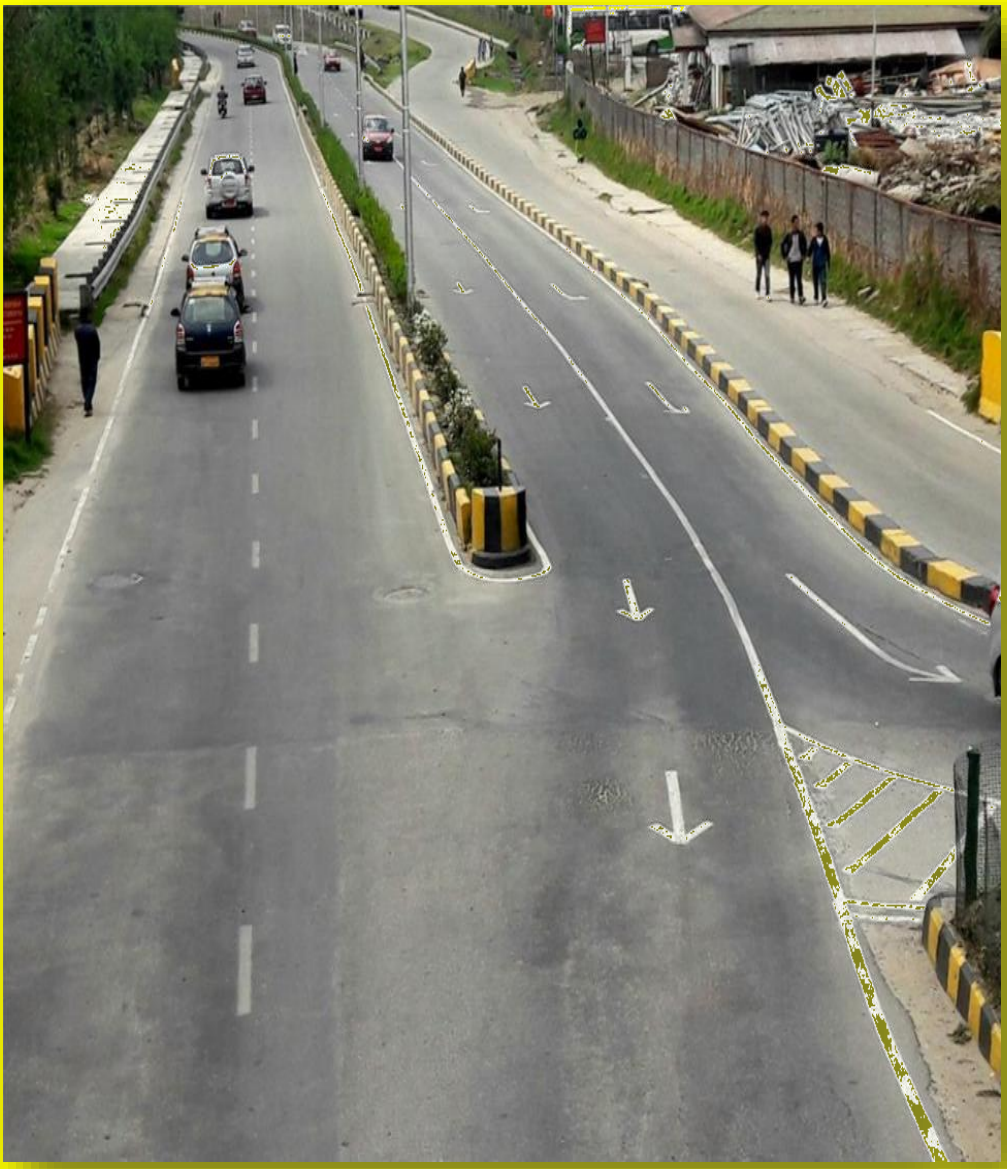
No Standing Signs inform traffic that they can stop only for a short while to drop or pick-up passengers but cannot load or unload goods. When there are signs that restrict stopping or standing altogether, a driver cannot stop to drop/alight passengers or load/unload goods at all times.

Gas Station Signs informs traffi about an approaching gas station a few distance away eg. 2 km ahead in case they need to re-fuel the vehicle.

Bus Stop Signs informs that there is a Bus Stop ahead. Next or below this sign there may be additional information available about bus timings and routes.



Temporary Road Signs restrict temporarily vehicle access on a road. Roads may be temporarily closed for a number of reasons such as accidents, flooding or other road works.

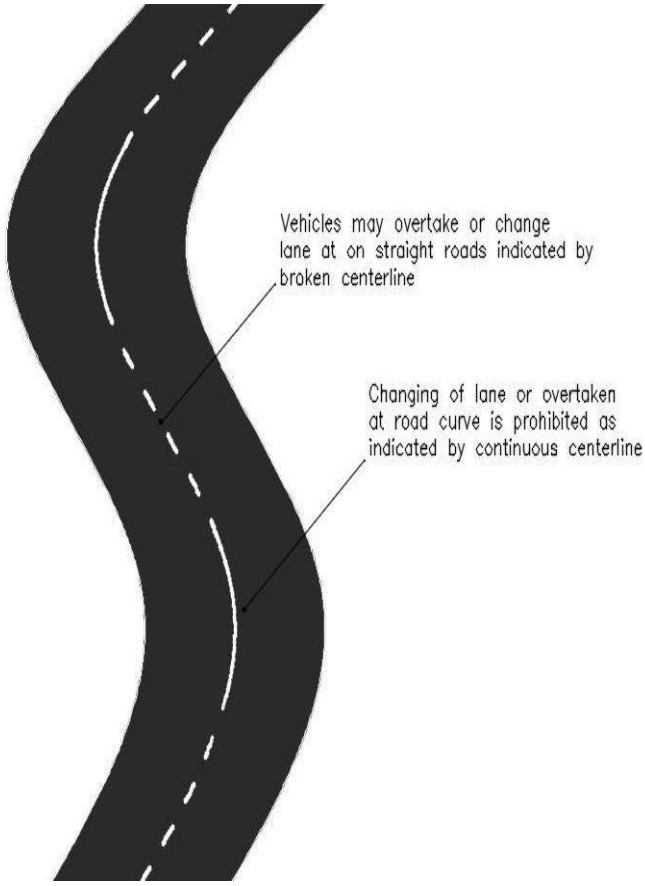


CHAPTER 8: ROAD MARKINGS

Road markings act as a guide and control traffic on a highway. They supplement the functions of traffic signs and serve as a psychological barrier. Road markings also signify the delineation of traffic path and its lateral clearance from traffic hazards for safe, smooth and harmonious flow of traffic.

1. Carriageway Markings

Centre Lines separate the opposing stream of traffic and facilitate smooth movement. The centre line may be marked with single broken line, single solid line, double broken line or double solid line depending on road and traffic requirements.

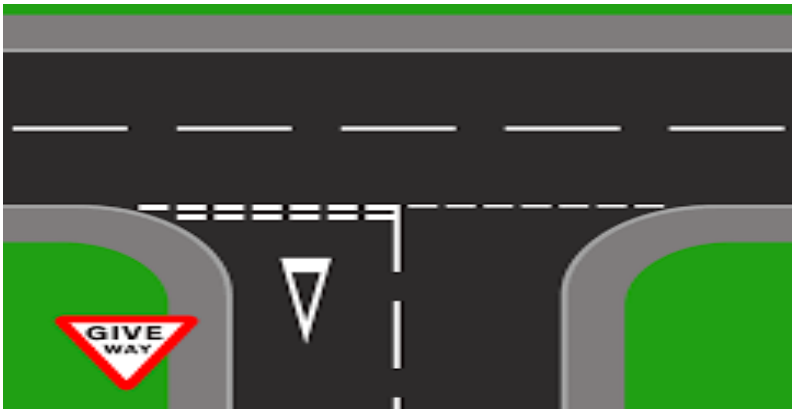


Edge Lines are road markings on the sides of carriageway without curbs. They serve as a visual guidance to traffic indicating the limits to which a vehicle can safely venture. Edge lines are single continuous line placed around 150 mm from the edge of the road.

Single Broken Lines are road markings that allow traffic to change lanes but with caution. A driver can also overtake but after having properly checked out for any approaching traffic.

Solid (continuous) Lines are road markings which restrict traffic from overtaking the vehicle ahead or simply put it, not allowed to change lanes.

Give Way lines are double dotted lines marked transversely at junctions. They are generally supplemented by reverse triangle give-way sign painted on the surface of the road or a road sign installed before the dotted lines. They indicate that a driver should give priority **(give-way)** to traffic on the main road.



2. Object Markings are physical obstructions within or near the roads and are meant for the safety of traffic. Typical obstructions on roadways include underpasses, narrow bridges, culvert, head walls and structures with restricted vertical clearances. They are marked with not less than five stripes in black and yellow colour at an angle of 45^{o} on the side of the obstruction on which traffic passes through.

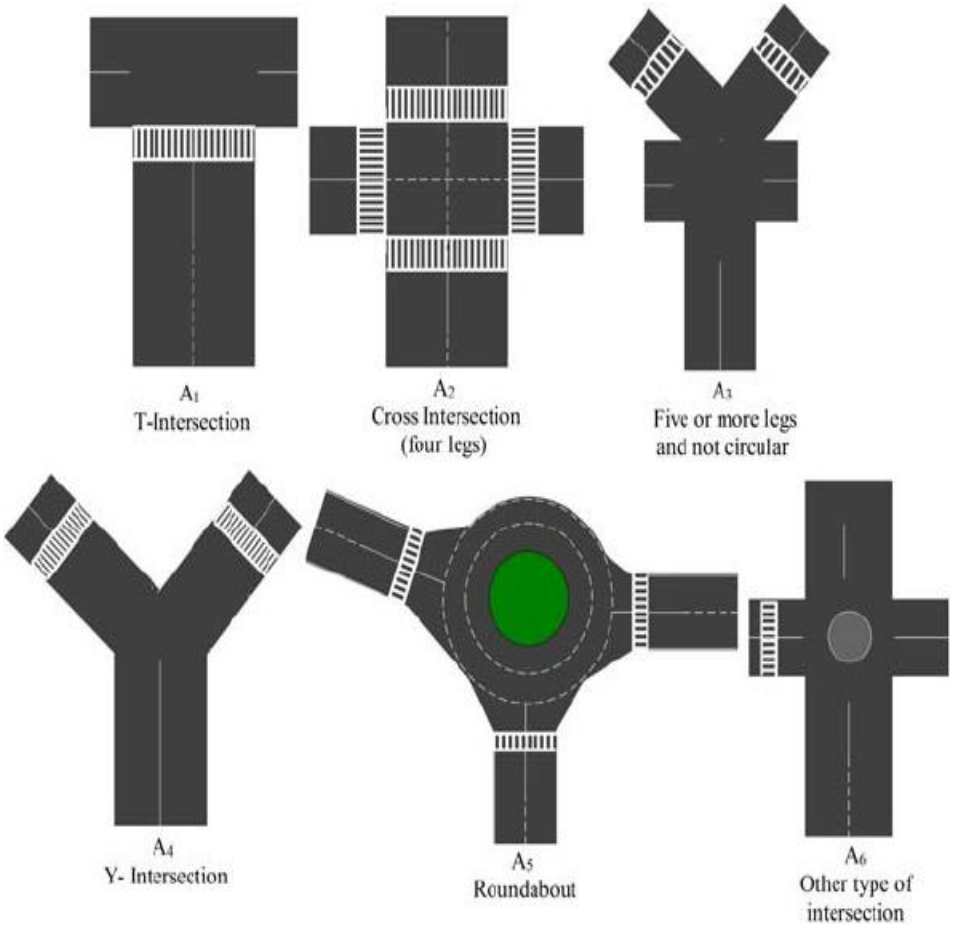
Right of Way Concepts

- Right-of-Way is not a right or privilege – it must be given!
- Right of Way is determined by a set of rules
- Drivers must understand right-of-way rules governing
  - Intersections
  - Merges
  - Special conditions

CHAPTER 9: RIGHT-OF-WAY RULES

Besides traffic signs and road markings, many road rules are based on common sense and the ability to read a situation and make the right decision. These are important rules every driver should know so that they can react with confidence and be safe on the road. These are called the **'Right-of-Way Rules'** using simple logic for road safety.

1. Intersections



T-Junction (three-leg) Rules

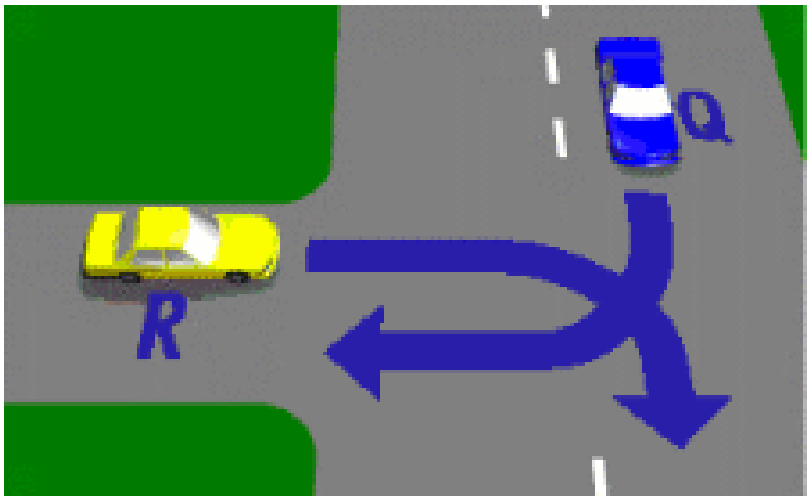
T-Junctions are road junctions that forms like the letter ’T’ and signifies that another road is about to enter the road that you are traveling on and you should watch out for traffic from the new road.

Always:

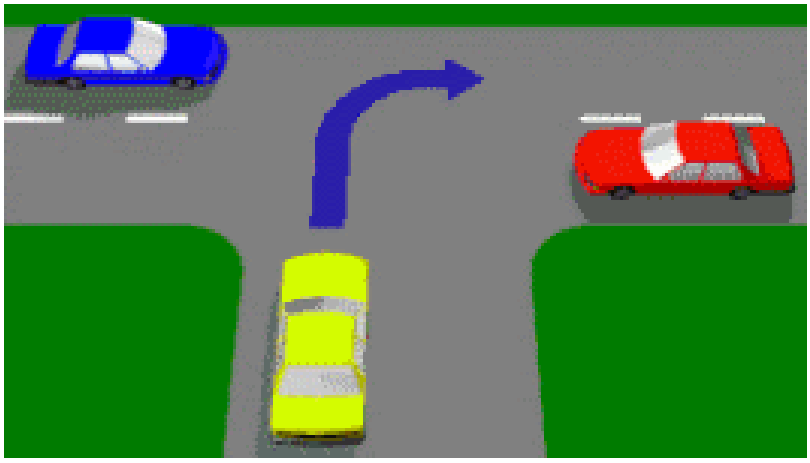
- Make good use of the mirrors and signals and adopt correct position for the turn by controlling the speed and making sure that the view of the junction is clear.

- The vehicle travelling on the road that ends must always give way to any pedestrian crossings or vehicles travelling on the road that continues unless otherwise signposted. In the diagram, vehicle A must give way to vehicle B.

- Even if someone else is turning in front of you, you must wait for them if you are on the bottom of the T. In the diagram, vehicle R must give way to vehicle Q.

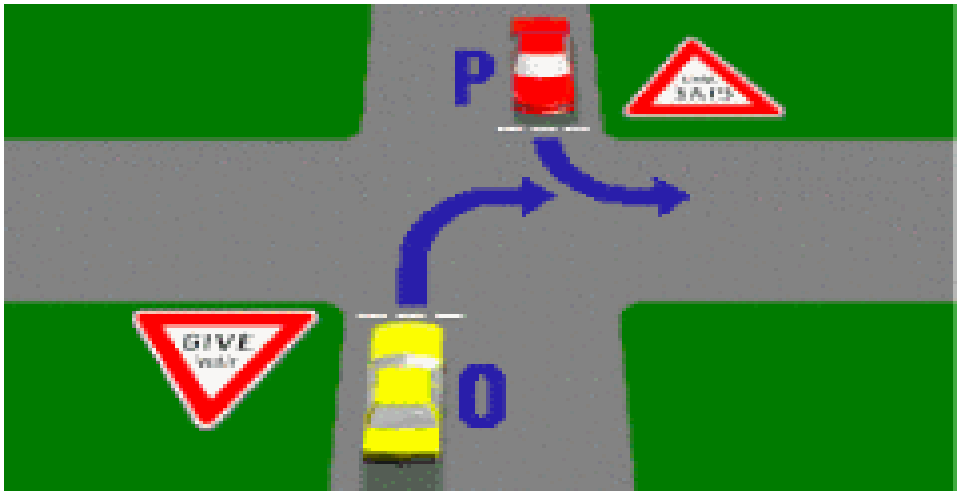


- If you are turning right at a T-intersection from the bottom of the T, you must give way to your left and right vehicles crossing at the top of the T. In the diagram, the yellow vehicle must give way to the red and blue vehicles.

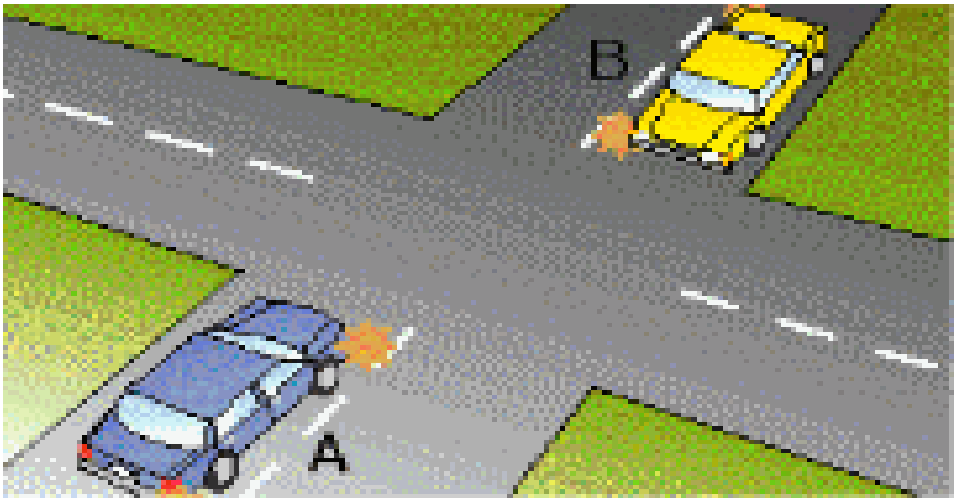


Crossroads (four-leg) Rules

- The traffic on the main carriageway always has priority on crossroads.
- If there are no traffic lights the first car to arrive at the intersection gets the right-of-way.
- When you are facing another vehicle at a crossroads and if you are turning right you must wait for any vehicles coming straight through or turning left. In the diagram, vehicle P has right-of-way over vehicle O.



- If both vehicles are turning right, then they do not need to cross each other's path.



Roundabout Rules

A roundabout also called a traffic circle, road circle, rotary, rotunda or island is a circular intersection or junction where three or more roads join and traffic must move around a circular area in the middle. In a roundabout, traffic is permitted to flow in one direction around a central island and priority is typically given to traffic already in the junction meaning that traffic already in the roundabout has the right-of-way.

Think of a Roundabout as a Clock

Approaching a roundabout

- Move into the correct lane in good time using the 12 o'clock golden rule.
- Maintain low, steady speed as you enter and drive through and exit a roundabout.
- Yield to traffic coming from the right or already in the roundabout but keep moving if the way is clear.
- Approach in the left-hand lane if you intend to exit between the 6 and 12 o'clock position.
- Approach in the right-hand lane if you intend to exit between 12 and 6 o'clock position.

In all cases watch out for and give plenty of room to:

- pedestrians who might be crossing the approaching and exit roads;
- traffic crossing in front of you especially vehicles intending to leave by the next exit;
- motorcyclists and cyclists who may stay in the left-hand lane but intend to continue round the roundabout; and/or
- long vehicles that might have to take a different course while approaching a roundabout because of their size and length.

Priority Vehicles

It is always important to bear in mind that in the right-of-way rules, pedestrians and priority vehicles always have right-of-way. You must always yield right-of-way to pedestrians and priority vehicles such as VIP vehicles, ambulance, fire brigade, vehicles moving in a convoy or vehicles driving uphill. They always have the right-of-way no matter which direction they take. If you see an emergency light of a vehicle flashing, pull over and let them pass no matter what.


TRAFFIC
POLICE

CHAPTER 10: PEDESTRIAN CROSSINGS

Pedestrian crossings are designated spots for foot traffic to increase pedestrian safety and to facilitate the flow of traffic. They are absolutely vital in maintaining decorum in the streets to protect both drivers and pedestrians alike on the road. There are five different types of pedestrian crossings: Zebra, Pelican, Puffin, Toucan and Pegasus but Zebra crossings are the most common pedestrian crossing used in the country.

Zebra Crossing on a road surface are marked in alternating dark and light stripes resembling coat of zebras. They give priority to pedestrians.

Pedestrians must always watch out for traffic and try to make sure that motorists have seen them. Pedestrians must always stick to the crossing and not go beyond the striped lines and be aware that in wet weather, vehicles will take a longer time to come to a halt.

Pedestrians should:

- stand at the edge of the crossing;
- watch carefully on both sides with their eyes and ears open for approaching vehicles;
- place one foot on the crossing and raise hands to indicate intention to cross the road; and
- cross only when the traffic has come to a complete **STOP**.

Pedestrians must never cross onto the zigzag lines because drivers attention will be on the crossing itself and they might not see pedestrians crossing on zigzag lines or elsewhere in the area.

Drivers must give way to pedestrians and keep their eyes peeled for people approaching the crossing. Do not under any circumstances try to cross once pedestrians step their foot on the stripes. A driver must stay alert and obey rules of pedestrian crossings.

Drivers should:

- Always give way to pedestrians approaching a crossing with the intention of crossing the road.
- Never park a vehicle on the zigzag lines. The zigzag lines painted on the road on either side of a zebra crossing are meant to prevent obstruction of the view of the crossing from where people might be crosssing.
- Zebra crossings must be kept clear at all times to allow the safe passage to pedestrians. Stopping in this area is not allowed and can pose danger to pedestrians.
- Never overtake another vehicle on or near a zebra crossing.
- Never gesture pedestrians at a crossing. A pedestrian may take this action as meaning it is safe to cross and could result in an accident.

CHAPTER 11: SPEED BREAKERS

Most roads are designed for a certain speed to meet the mobility requirements. However in some areas on the road, controlling vehicle speed becomes necessary although speed breakers may sometimes increase discomfort to drivers and passengers and cause damage on the vehicle underbelly.

Speed Bumps are vertical deflections on roads to slow down moving traffic. They reduce vehicle speed considerably preventing accidents and reducing severity of a crash.

Speed Humps are rounded and raised areas across roads. They are generally 10-14 feet in length in the direction of travel and 7-10 cm high making them different to a speed bump.

Rumble Strips have clusters of small bumps and are designed to alert inattentive drivers by creating tactile vibration and audible rumbling that is transmitted through the wheels into the vehicle cabin.


PUNAKHA
THIMPHU

CHAPTER 12: PARKING REGULATIONS

Parking is the act of stopping and leaving a vehicle unoccupied. It refers to a waiting vehicle regardless of whether it is attended or not for reasons other than as a result of traffic conditions. Parking rules are designed to inform drivers where they can and cannot park their vehicles, where to stop to allow passengers to board or alight and where they can and cannot load and unload goods. Parking rules are framed to prevent danger and inconvenience to road-users.

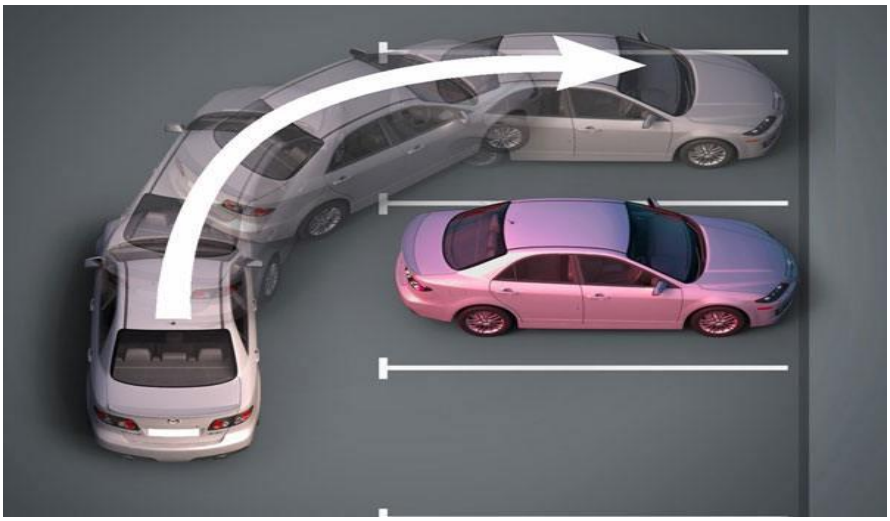
Parking regulations are based on the principle that traffic must not stop or park so as to endanger, obstruct or cause inconvenience to others. There are three types of parking alignment.

I. Parallel Parking involves parking the vehicle in line with other vehicles and parallel to the curb. In a parallel parking the standard rule is that all vehicles must face in one direction and should park parallel to the vehicle in front and side of your vehicle.

Parallel Parking Technique:

- Always look for a space that is roughly one-and-a-half times the length of your vehicle.
- Put in reverse gear and be sure to get into proper backing position by sitting up tall and turning your shoulders 90^{o} from the back of your seat.
- Reverse slowly until the middle of your vehicle lines up with the other vehicle's rear bumper. If another vehicle approaches from the rear, remain in a still position with your signals turned on so that the driver approaching knows your intention.
- When it is clear, cut the steering wheel sharply towards the curb to approach at a 45^{o} angle and continue until you see the headlights of the vehicle behind yours in the driver's side wing mirror. For most vehicles when the passenger's side wing mirror is in line with the rear bumper of the vehicle in front of yours, that's your cue to turn your wheels back the other way.
- Continue reversing until your vehicle is aligned with the vehicles at either end or parallel to the curb or road edge.
- Straighten and align. Always center your vehicle between the two other vehicles as this allows both vehicles room to exit the space. Though proper distance from the curb varies, typically your vehicle should be between 12 and 18 inches from the curb.
- If your left rear wheel taps the curb, turn the wheels all the way to the left and move forward until the vehicle is parallel.
- Do one last check on your distance from the curb.

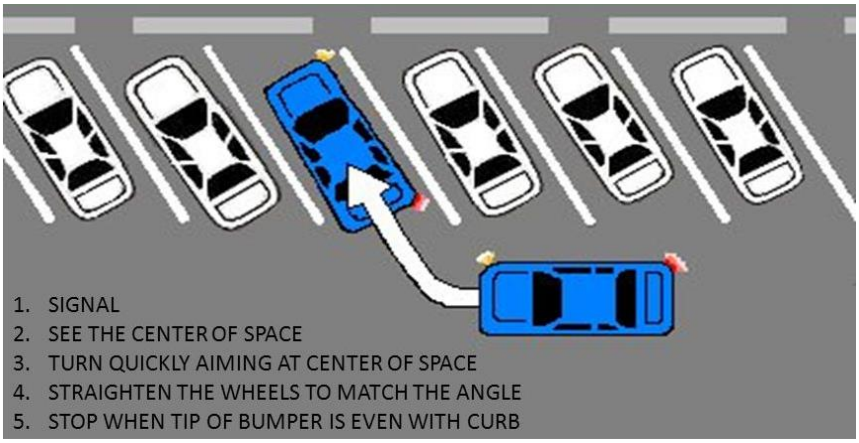
II. Perpendicular Parking takes less space than parallel parking and is commonly found at parking bays.

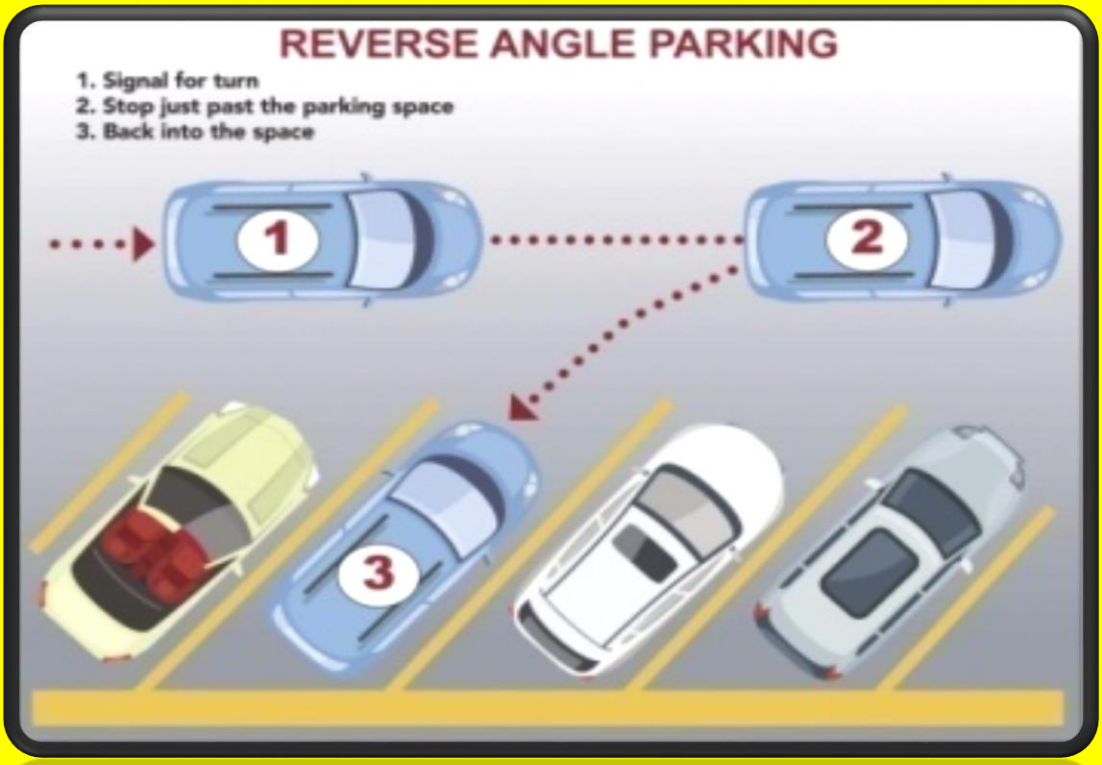


- Analyze your position and make sure that there is adequate distance from other vehicles.
- Turn on the light indicator signal to communicate with other road-users.
- Drive your vehicle into position and make sure the vehicle is inside the parking lot completely.
- Adjust the wheels to avoid unintentional difficulty when leaving.

III. Angle Parking is similar to perpendicular parking except that the vehicles are parked at an acute angle and in the direction to the vehicles approaching the parking space. In an angle parking it is a lot easier to move into space since the turn into the parking lot is gentle. There is also the reverse-angle or reverse-diagonal parking. The concept is similar to 45^{o} parking but instead of pulling forward into the space, drivers reverse into the angled stall.

- Find your parking spot.
- Analyze your vehicle position.
- Turn on the correct light indicator signal.
- Turn the steering wheel half its' rotation and slowly drive your vehicle until reaching the final line in spot.
- Adjust the wheels which should be parallel with the vehicle body in order to drive out of the parking lot easily.




REVERSE ANGLE PARKING
1. Signal for turn
2. Stop just past the parking space
3. Back into the space
1
2
3

IV. Uphill and Downhill Parking

Parking up and down a hill takes special considerations compared to parking on a level surface. Because of the incline or decline, there are additional risks involved such as vehicle's brakes failing and rolling into oncoming traffic.

1. Pull forward into the spot intended for parking.
2. Keep your foot lightly on the brake pedal to control the vehicle while parking.
3. Apply the emergency brake.
4. Before turning off the vehicle turn the tires. It is important to turn the steering wheel before turning off a vehicle so that the wheels turn with power steering. Turning the wheels act as another backup if the vehicle brakes were to fail for some reasons.

    a. When parking ***uphill*** make sure to turn the wheels away from the curb or to the right. Roll backwards nice and slow until the back of the front tire gently rests against the curb using it as a block
    b. When parking ***downhill*** make sure to turn the wheel towards the curb or to the left. Roll forward nice and slowly until the front tire rests gently against the curb using it as a block.

5. After having positioned the vehicle into the parking space shift into first gear if facing uphill or in reverse gear if facing downhill. Leaving the vehicle in neutral or other drive gears will increase the risk of it rolling backward or forward.

When parking uphill

When parking downhill

V. Parking Restrictions

Parking is illegal or restricted in many areas. Unfortunately, you cannot always rely on coloured curb markings or a ***'NO PARKING'*** sign being present in places where parking is prohibited. As a driver it is your responsibility to learn about parking rules, restrictions and prohibitions and abide by the information at all times.

Unless a sign permits you must not stop or park a vehicle:

- On or across a footpath or a footpath ramp.
- Next to a vehicle that is parked in a parking area at the side of a road (double parking).
- Bridges, tunnels, causeway, ramps or culverts.
- Zoned area such as a a bus or taxi parking unless your vehicle is of the type allowed.
- Where a motorcycle or bicycle parking sign applies unless riding a motorcycle or bicycle respectively.
- Areas with 'No Parking' Signs.
- Inside of an edge/side line.
- Within 20 feet off a pedestrian crosswalk. Doing so may prevent other drivers from seeing pedestrians who are using the crossing.
- On an intersection where parking is illegal and dangerous. Never park within 20 feet of an unmarked intersection.

Understanding your Vehicle's SIGNALS

CHAPTER 13: LIGHT SIGNALING

Vehicle lights signaling are used to communicate and giving advance warning signals to other road-users about your intentions. Giving the right signals at the proper time and place and correctly interpreting the signals of other road-users is crucial to road safety. It is important to remember that light signaling indicates your intentions but they do not necessarily give you the right-of-way**.**

Indicator Lights are used when you want to:

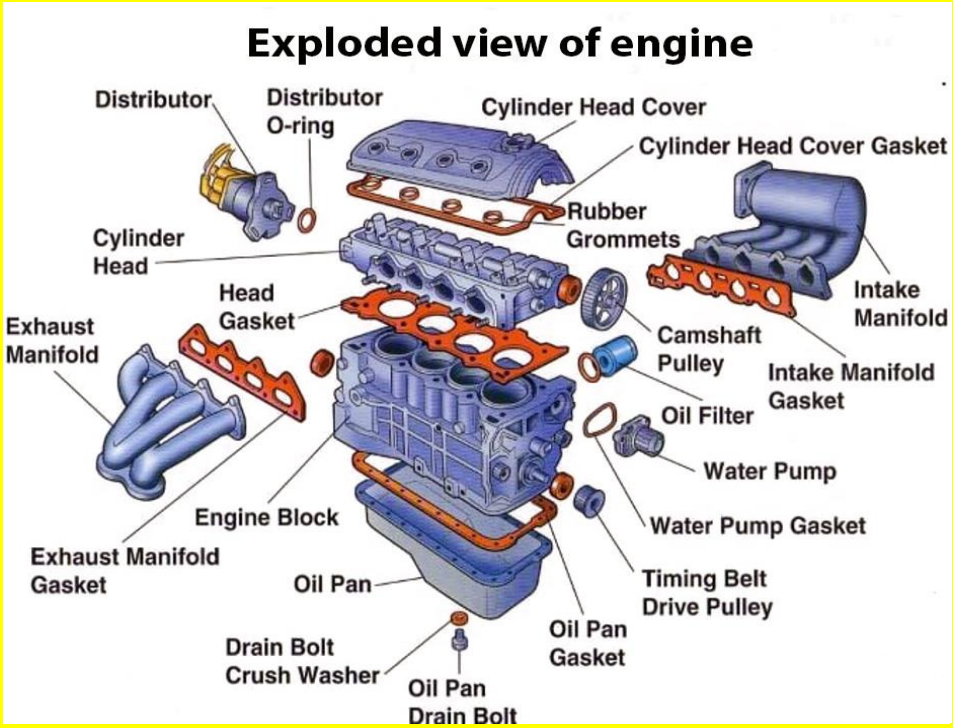
- Make a left or right hand turn at an intersection.
- Enter a driveway.
- Park on the side of the street.
- Pull over to the side of the road.
- Change lanes.
- Give pass or way to another vehicle on the road.
- Merge with traffic when entering a roadway.
- Enter and leave a roundabout.

Hazard (Emergency) Warning Lights denote turning on all the indicator lights of a vehicle. They are used when you want to warn other road-users of an emergency situation such as a mechanical failure with your vehicle, an obstruction to traffic or bad weather conditions on the road ahead.

Brake Lights are used when you want to signal to the traffic behind you that your vehicle is either slowing down or coming to a halt. Brake lights give useful warning about a situation on the road and cautions other drivers of your presence and intentions.

Fog Lights are mandatory when you drive in fog so that other motorists can see you. During foggy weather conditions, visual performance deteriorates under reduced lighting conditions on the road. Poor visibility can reduce a driver's detection rate which may lead to a road traffic collision or crash. Never use them when the visibility is clear especially at night when other drivers can easily be dazzled.

Flashing Headlights are useful in situations such as driving at speed on a busy motorway and is a handy alternative to honking. Never flash headlights to try and intimidate other road-users and never flash to give instructions. It is common for drivers to use the headlights flash as a signal to tell other road-users that the road ahead is clear. However this is not advisable.


Exploded view of engine
Distributor
Distributor O-ring
Cylinder Head Cover
Cylinder Head Cover Gasket
Rubber Grommets
Cylinder Head
Head Gasket
Intake Manifold
Exhaust Manifold
Camshaft Pulley
Intake Manifold Gasket
Oil Filter
Water Pump
Engine Block
Water Pump Gasket
Exhaust Manifold Gasket
Oil Pan
Timing Belt Drive Pulley
Oil Pan Gasket
Drain Bolt Crush Washer
Oil Pan Drain Bolt

CHAPTER 14: ANATOMY OF A VEHICLE

Your car is a powerful and complex beast. It houses countless components that all work in harmony to run and even one single malfunctioning part can affect a whole system and impede the performance. Every car owner must get acquainted with the main parts of vehicles and their functions to minimize maintenance costs and reduce the risks of road accidents.

I. Engine

The engine is the most important component by all accords and is the ***'heart'*** of every car. The combustion (process of burning fuel) chamber in an engine is where the magic happens. It is where fuel (diesel, gasoline, ethanol or electricity), air, pressure, and electricity all come together to create the small explosion that moves the car's pistons up and down thus creating the power to motion a vehicle. Engine requires timely oil change to stay lubricated and to prevent wear and tear.

Modern vehicle engine performs a **'four-stroke combustion cycle'** and this cycle is repeated over and over again. A four-stroke cycle is an internal combustion where the piston completes four separate strokes while turning the crankshaft.

The four separate stroke process are:

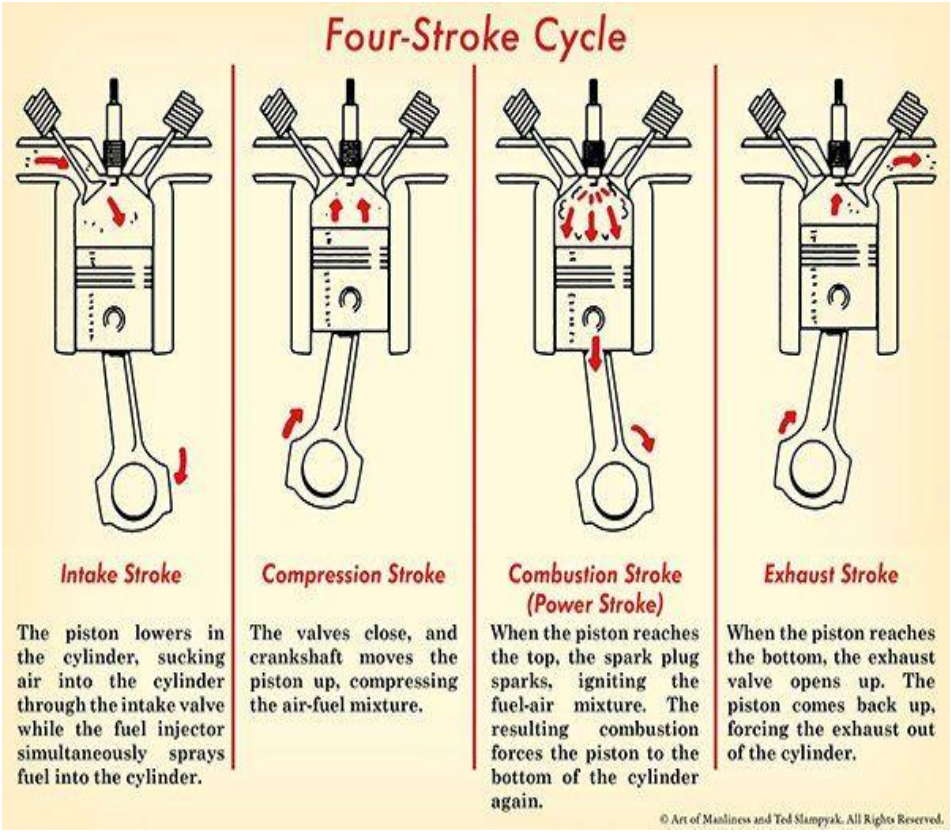
i. Intake: During this cycle the intake valve opens and the piston moves down from the Top Dead Centre (TDC) to the Bottom Dead Centre (BDC). The fuel injector sprays the fuel into the cylinder to achieve the perfect air-fuel mixture. This begins the cycle by bringing air-fuel mixture into the engine.

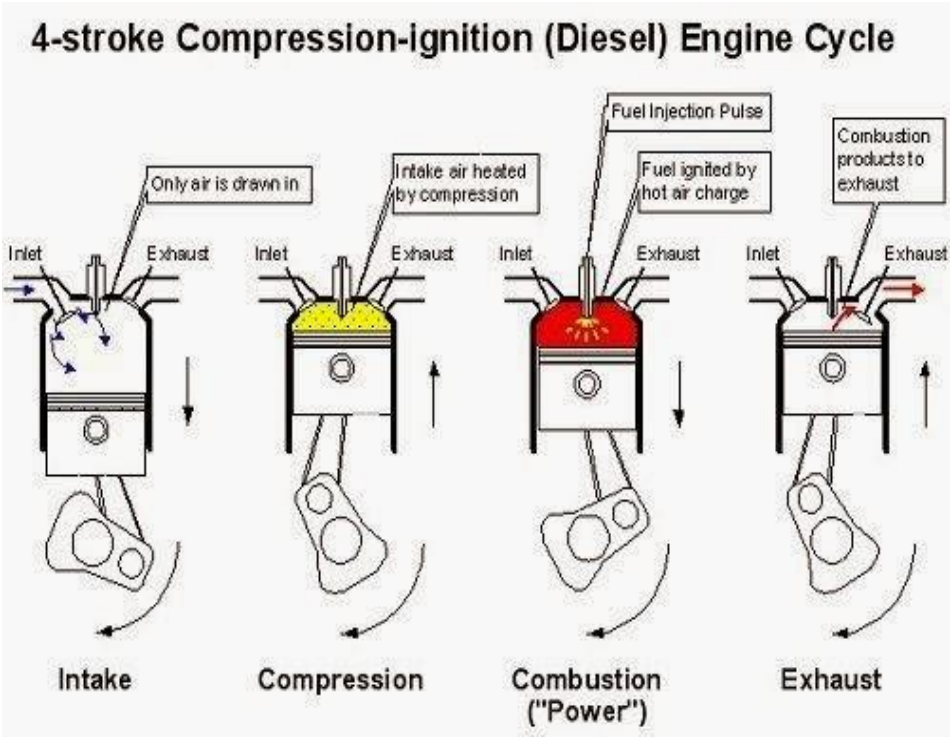
ii. Compression: As the compression cycle begins the piston moves up from BDC to TDC and causes the trapped air-fuel mixture to be compressed into a smaller space in preparation to ignite and create a powerful explosion during the combustion cycle.

iii. Combustion (Power): During this cycle the spark plugs in gasoline car engine creates sparks to ignite the compressed air-fuel mixture and explodes the gas. In the diesel combustion, the air-fuel mixture is ignited by the heat generated by high compression to create an explosion.

iv. Exhaust: In the final cycle the exhaust valve opens to release the waste gas created by the explosion. This gas is moved to the catalytic converter where it is cleaned and then expelled through the muffler before it exits the vehicle through the tailpipe.

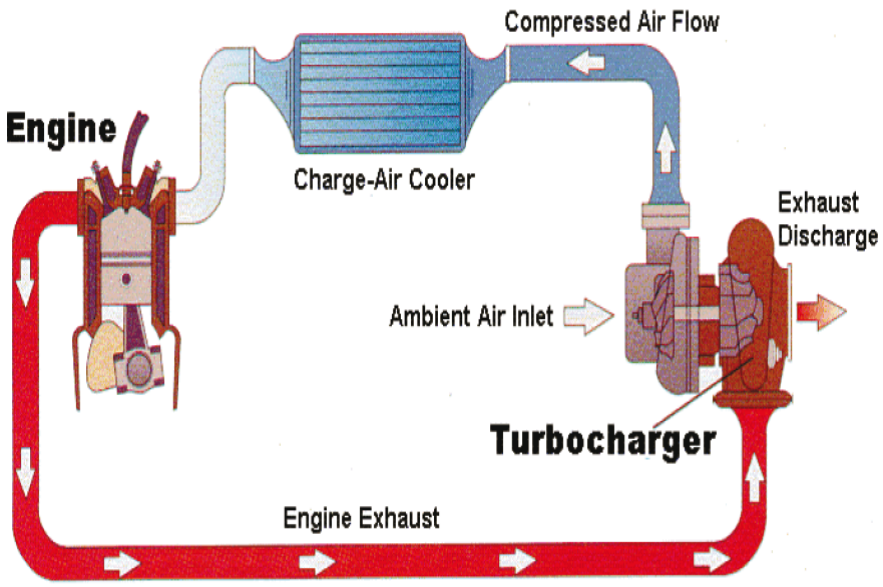
4-stroke Compression-ignition (Petrol) Engine Cycle





Turbo Engine

A normal engine simply sucks in the air through the air intake while a turbocharged engine is equipped not only with the regular air intake but also a turbine device that is driven by exhaust gases which spins and forces more compressed air into the engine. Simply speaking, a turbocharger gives significant amount of extra power to the engine but consumes more fuel than naturally aspirated engine of the same size. Turbo charging also heats up the air quickly making it less dense thereby reducing the efficiency of the combustion process. To reduce that heat, turbochargers are fitted with intercoolers to cool the compressed air after it leaves the turbo and enters into the engine.

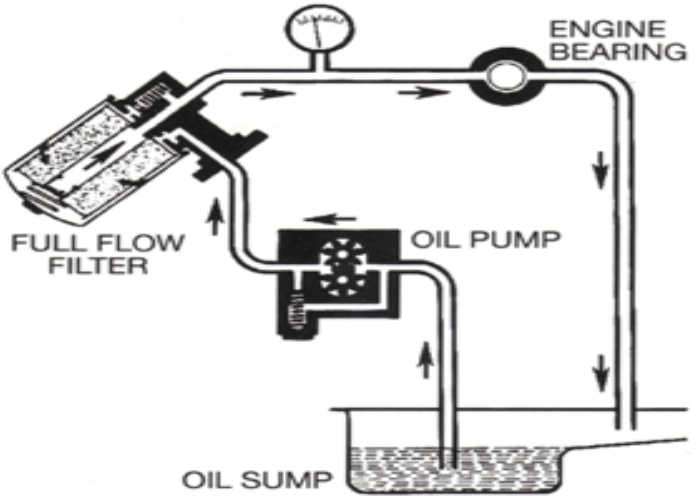


Lubrication

If the engine is the heart, then lubricants are the ***'blood'*** of a vehicle. The process of lubrication begins in the sump (oil pan) from where the oil is pulled through a strainer by the oil pump removing larger contaminants from the mass of the fluid. The oil goes through the filter and then through passageway to various components of the engine. Gravity then pulls the oil back down to the bottom of the motor to drain back into the sump and the cycle begins again.

The Primary functions of Lubricants are to:

- Prevent friction by creating a boundary layer between two surfaces.
- Dissipate heat from the surface.
- Tansport contaminants to filters.
- Protect from oxidization and corrosion.
- Power transmission.

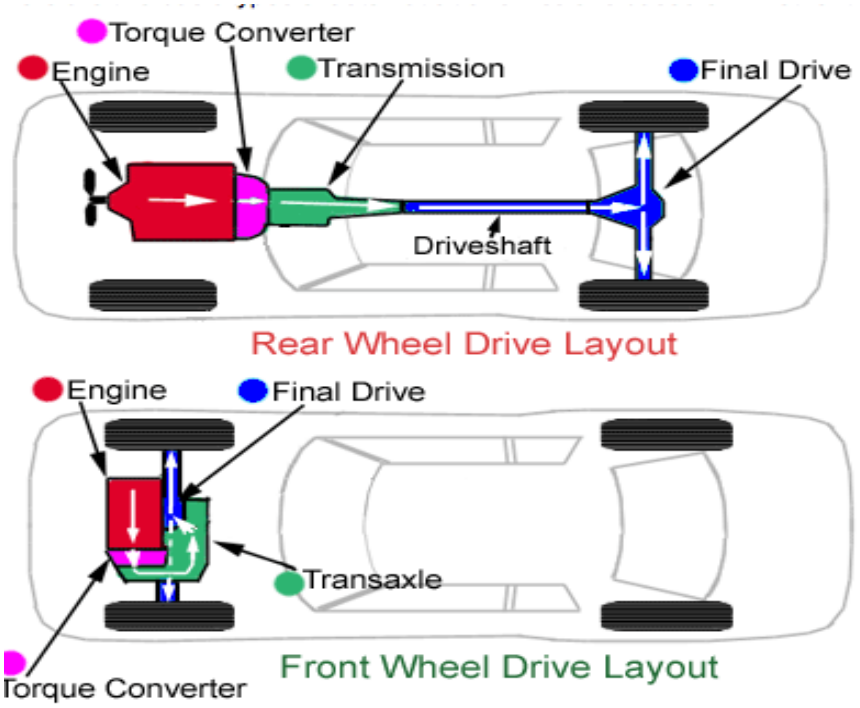


II. Gear Box

The gearbox is usually bolted to the rear of the engine with the clutch between them. While automatic transmission performs all the work of shifting gears through precise operating systems, the manual transmissions are run entirely by humans and are equipped with four or five speeds, one reverse as well as one neutral position.

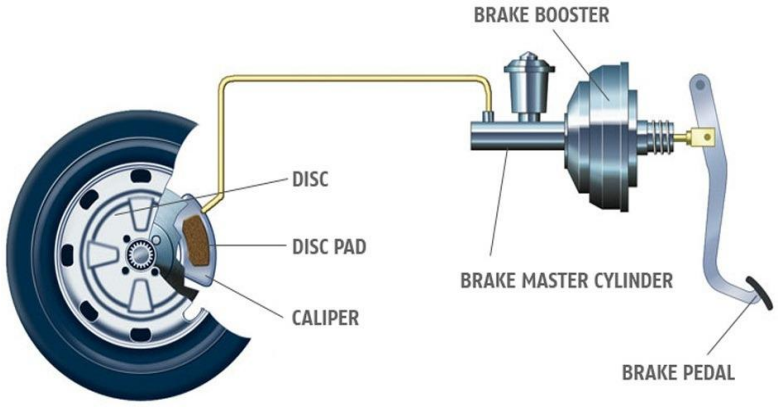
Their functions are to:

- transfer the power of the engine to the wheels to move at various speeds;
- provide different gear ratios so that the engine power can be delivered to the transmission system in various combinations of speed and torque. For example, to move the vehicle from standstill requires low speed and high torque and to keep a vehicle moving at 60 Kmph requires high speed and low torque;
- provide a means to take power away from the gearbox to the power auxiliary components;
- provide a permanent position of neutral power for units such as the hydraulic pumps; and
- provide a means of reversing the vehicle.



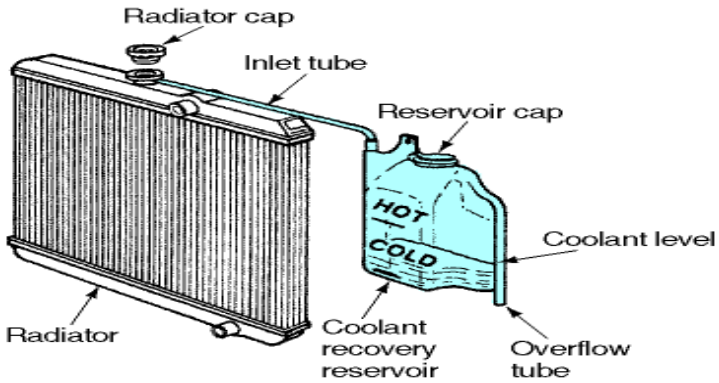
III. Brakes

The main function of the brake system is to decelerate vehicle speed. By stepping on the brake pedal, the brake pads compress against the rotor attached to the wheel which then forces the vehicle to slow down or stop due to friction.



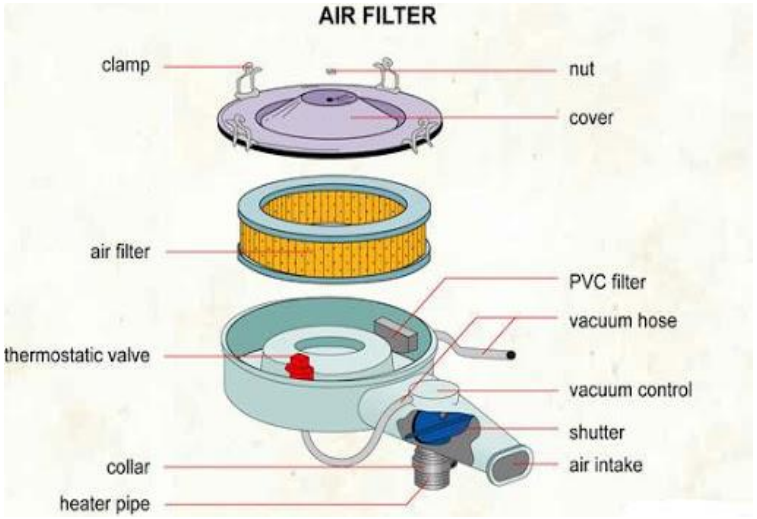
IV. Radiator

The radiator acts as a heat exchanger by transferring the heat from the fluid inside to the air outside thereby cooling the fluid which in turn cools the engine. The radiator cools the automatic transmission fluids, air conditioner refrigerant, intake air and sometimes the motor oil or power steering fluid.



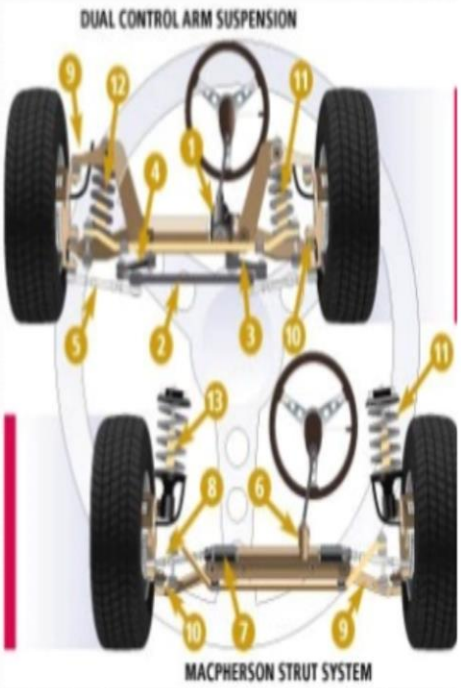
V. Filters

Air and oil filters facilitate the smooth flow of oil and fluids, traps dust and contamination in the air, impurities in fuel and abrasive particles in motor oil. If filters are not cleaned or replaced on time they will not work properly and in the end might harm the engine and prevent proper mechanical functioning.



PURPOSE OF SUSPENSION SYSTEM

- Supports the weight.
- Provides a smooth ride.
- Allows rapid cornering without extreme body roll.
- Keeps tires in firm contact with the road.
- Allows front wheels to turn side-to-side for steering.



- Works with the steering system to keep the wheels in correct alignment.
- Isolate passenger and cargo from vibration and shock

CHAPTER 15: VEHICLE SUSPENSION SYSTEMS

The primary function of suspension systems are to maximize the contact between the tires and the road surface providing steering stability and good handling, evenly supporting the weight of the vehicle and ensuring comfort of passengers by absorbing and dampening shocks. The suspension systems consists of springs, tires, shock absorbers, struts, arms, bars, linkages, bushings and joints and are located between the frame (chassis) of the vehicle and the road below.

I. Springs

Automotive springs and torsion bars provide recoil necessary to bounce back after suspension components move up and down over uneven road surface. There are three main suspension spring types: ***coil springs, leaf springs and torsion bar.***

Coil

Leaf

Torsion Bar

II. Tires

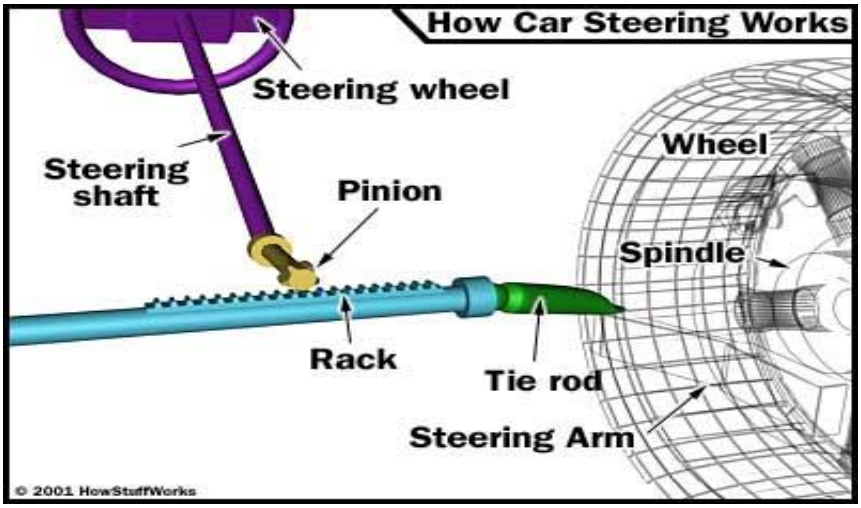
The tires and the amount of air in the tires is a fundamental part of the suspension system and the only part of the vehicle that comes in direct contact with the road. The suspension system requires the wheels and tires to travel up and down to absorb the shocks from bumps and potholes.

III. Shocks

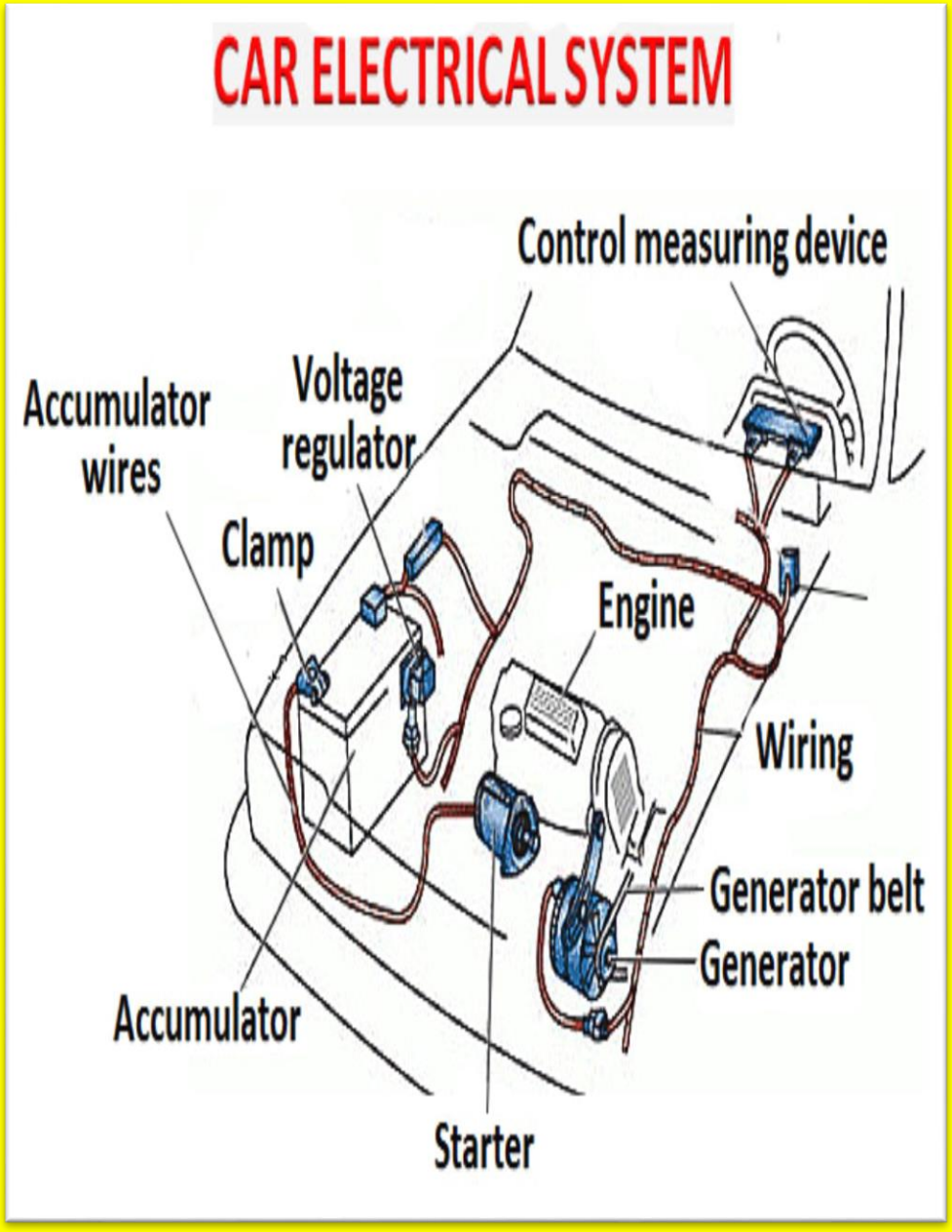
Shocks are hydraulic oil-filled cylinders that force the suspension to compress and decompress at a consistent rate to prevent the springs and vehicle from bouncing up and down. The primary function is to control spring and suspension movement and to make sure the tires maintain contact with the road. Many vehicles use ***'struts'*** instead of shocks that sit in the center of a coil spring. Struts perform damping function like shocks and makes sure that the tires maintain contact with the road.

IV. Steering Wheel

When we turn the steering wheel the front wheels are not pointing in the exact same direction as the turn of the steering wheel. The inside wheel has to follow a circle with a smaller radius in other words a tighter turn than the outside wheel. The steering system makes sure that the inside wheel turns more than the outside wheel.



CAR ELECTRICAL SYSTEM

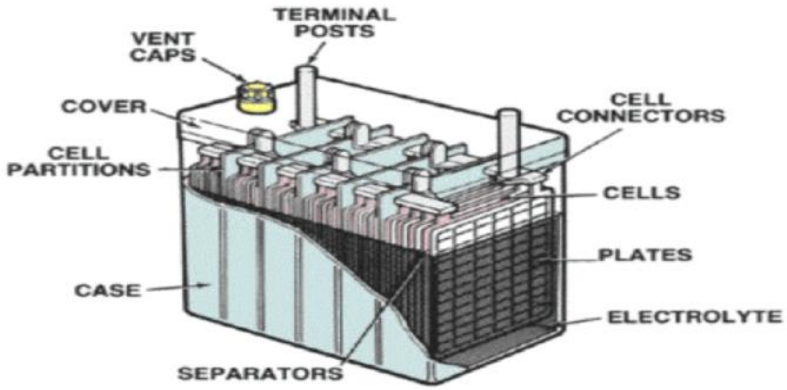


CHAPTER 16: VEHICLE ELECTRICAL SYSTEMS

The electrical systems main functions are to generate, store and supply the electric current to various parts of a vehicle to operates the electrical components. They include several electrical gauges, digital gadgets, power windows, central locking mechanisms and many more.

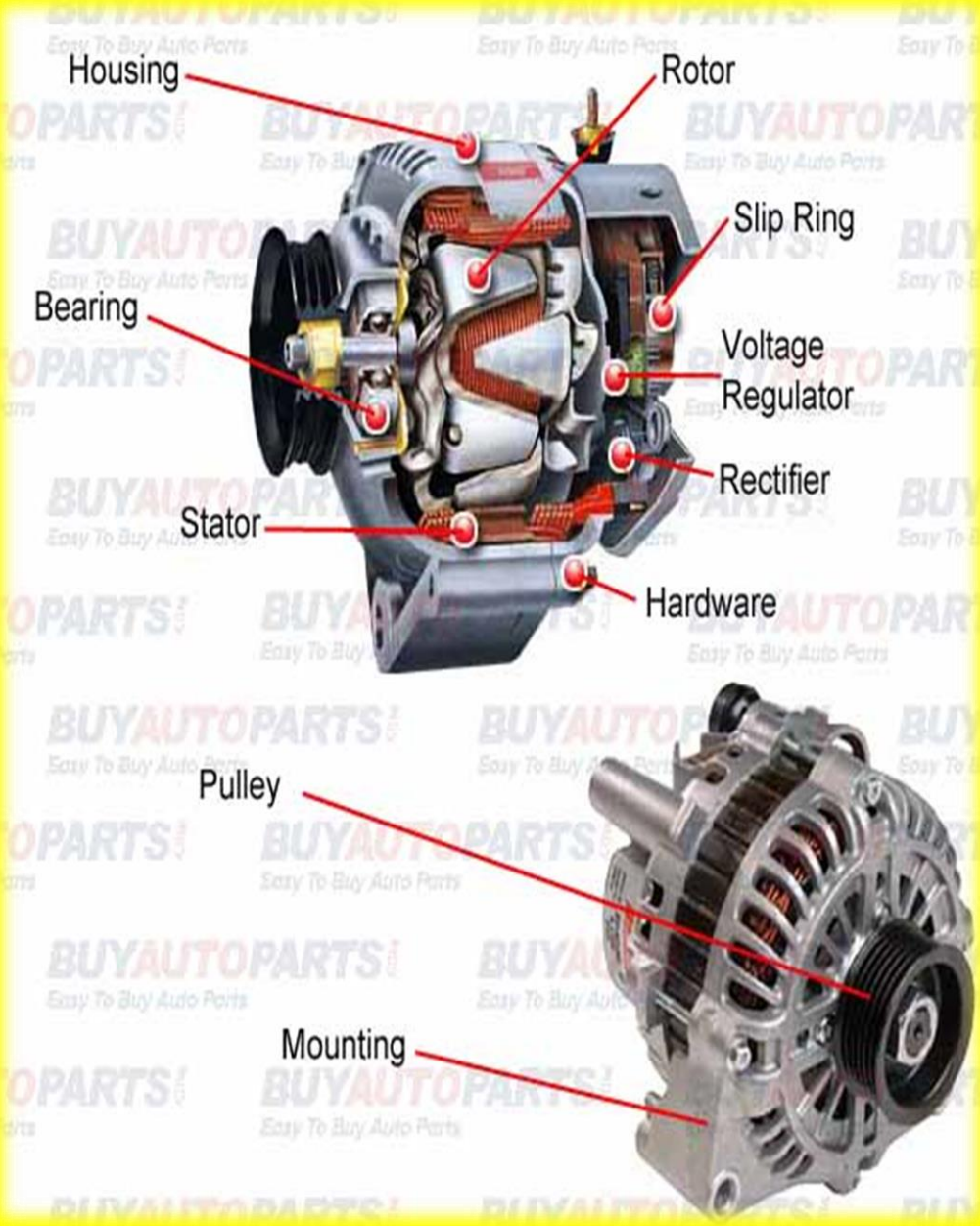
I. Battery

Battery is the most important and essential electric part of a vehicle. Besides starting the engine of a vehicle, the battery can also be used in place of a generator.



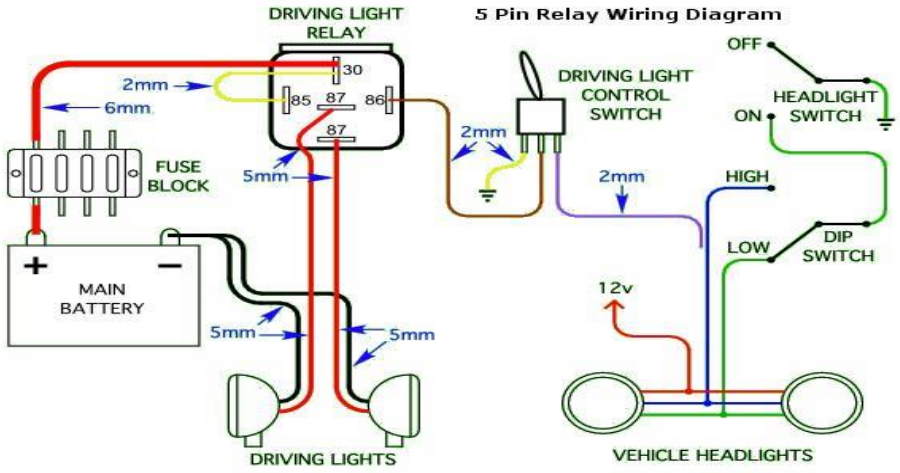
II. Alternator (Dynamo)

Alternators are small generators capable of converting mechanical into electrical energy. Driven by the engine belt, alternators use a small signal from the battery to energize a field current that turns a rotor inside a set of stators. Since the energy is driven by the polarity of magnetic fields, the current produced as a result changes direction as the rotor turns producing current in the opposite or alternating direction (AC). Alternators produce significantly higher currents than initially supplied by the battery, so they are used to recharge a battery itself and power other electrical components.


Housing
Rotor
Slip Ring
Bearing
Voltage
Regulator
Rectifier
Stator
Hardware
Pulley
Mounting

III. Lighting System

The entire lighting system inside a vehicle is electrified by the battery so that they can be kept active even when the vehicle is not running or switched off.



Diagnosing common electrical problems:

Battery: If the terminals have any white gunk or other debris, clean them thoroughly with a wire brush. Corrosion can bring a vehicle's electrical system to its knees. If that is not the cause then wiggle the battery cables to see if they are loose.

Alternator Belt: If it is loose or if there are signs of cracking or fraying, have it replaced immediately. A bad belt can make even the best of alternators run poorly.

Wires: Make sure the wires are seated firmly at both ends and ensure the spark plugs are tight.

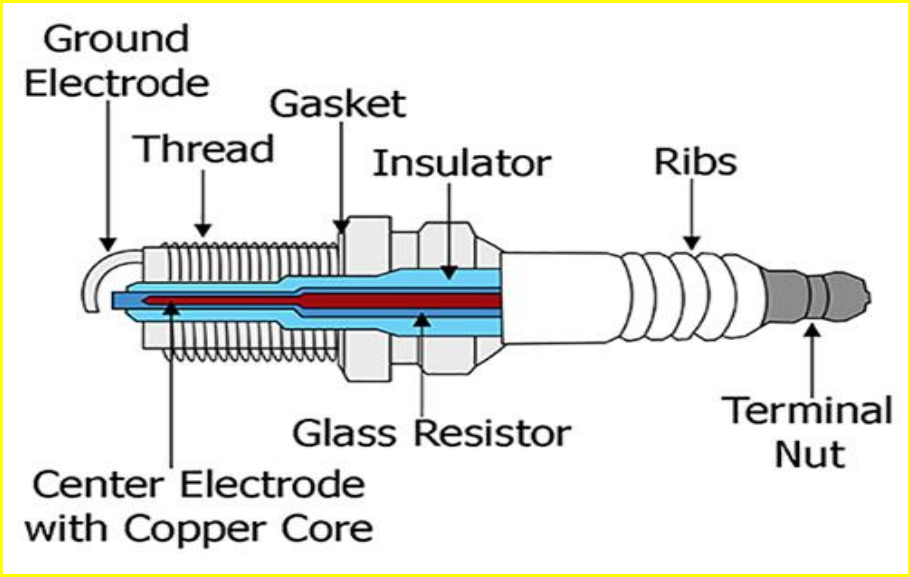
Fuses: If any of the vehicle lights get dim or the horn and radio don't work, that could be due to a simple thing as a blown fuse which is easy to fix. When constantly replacing blown fuses this indicates something in the electrical system is sending too much current through those fuses.

Engine Crank: Make sure that the engine cranks easily. To start, the engine needs electricity flowing to the spark plugs. Without a strong flow the engine will struggle to get going or it might not start at all.

Burning Smell: Never ignore signs of smelling plastics because it can indicate there is a wiring that is heating up so much and melting the insulation around it. If not taken care, this could result in a vehicle fire.

Spark Plugs: If the spark plugs are not getting enough electrical charge the fuel won't combust fully in the cylinders. Sometimes the issue might be with only one or two spark plugs causing the engine to run rough or sputter.

If there are multiple electrical systems failing it might indicate that the alternator or another component needs to be replaced.


Ground
Electrode
Thread
Gasket
Insulator
Ribs
Terminal
Nut
Glass Resistor
Center Electrode
with Copper Core


Spark Plugs
scotty

CHAPTER 17: VEHICLE EMISSIONS

Emissions from vehicle exhausts is one of the major causes of global warming. Vehicles emit carbonmonoxide (CO), nitrogen oxide (NOx) and other greenhouse gases (GHG) which contributes heavily to global warming. GHG traps heat in the atmosphere which cause worldwide temperatures to rise. Reducing vehicle emissions can have a strong and positive impact on the environment and may even benefit motorist's bottom line.

Change Engine Oil: The fluid that lubricates keep a vehicle engine clean, cool and prevents wear. Oil must be changed at regular intervals to keep them running at optimum efficiency and every vehicle owner should check their vehicle handbook for the recommended service intervals.

Change Oil Filter: When air filter is clogged up, the airflow to the engine is reduced which can lead to a multitude of issues. If an engine cannot breathe, deposits will build up causing premature wear and tear. Again, check the recommended service intervals for the optimum time to change the filter but be prepared to change it more regularly if the vehicle operates or is parked in a dusty environment.

Check Tire Pressure: Low tire pressure increases CO_2 emissions when they remain under-inflated by 20%. The tire pressures must be kept in line with the manufacturer's specification.

Avoid Excessive use of Air Conditioning (AC): Using AC makes the engine work harder increasing vehicle emissions. Avoid using when traveling on short distances as the system will allow cool air to circulate via the fans.

Avoid Long Idling: Idling for more than 30 seconds can increase air pollution unnecessarily, waste fuel and cause excessive wear and damage to engine parts. Auto manufacturers recommend that vehicles idle for no more than 30 seconds before they begin driving as modern engines take less time to warm up.

Drive Less: Perhaps the simplest way to reduce vehicle emissions is to drive less. While walking or cycling can be a great and healthy alternative to driving, driving less does not necessarily mean motorists should abandon their vehicles entirely.


85
85

Motorcycle safety tips

1. Wear a helmet
2. Get comfortable with your motorcycle.
3. Check your bike before every ride.
4. Ride defensively.
5. Obey the rules of the road.
6. Be aware of the weather.
7. Don't drink and drive.

CHAPTER 18: MOTORCYCLE SAFETY

Motorcycles share the same rights and privileges and must obey the same traffic rules as any vehicles on roadways. It is important for motorbike riders to understand the safety challenges faced and how best to respond. Motorcyclist must have high level of attention, good anticipation and excellent observation skills. Motorcyclists also need to make the most of the advantages of height, positioning, flexibility and maneuverability that a motorcycle provides.

Wearing proper Gears: Motorbike gears protect from the elements, debris and road rash. Appropriate gears include:

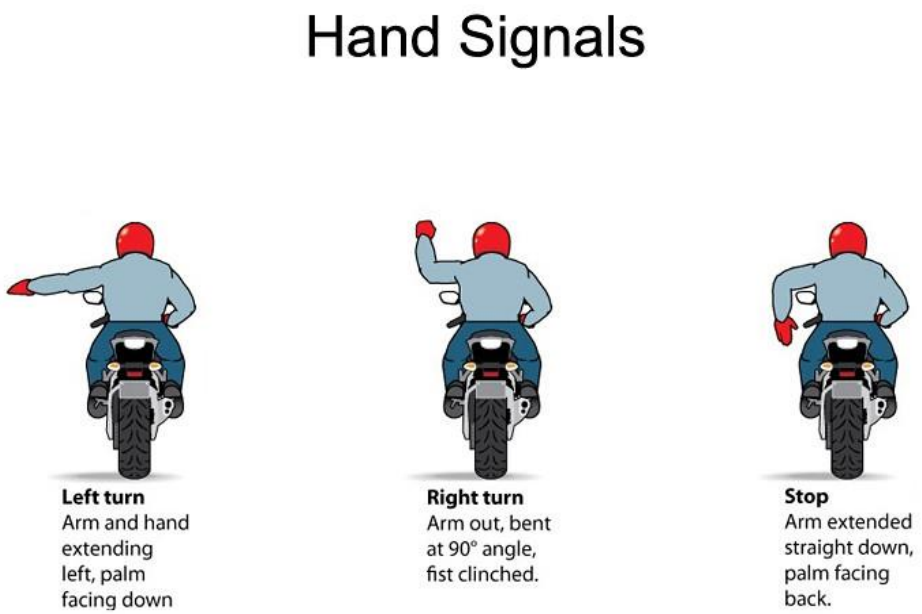
- **Helmet:** Helmet is very important and can save lives, prevent or reduce the severity of brain and facial injuries and protect a rider's eyes from wind, dust, insects or flying gravel. Riders who do not wear helmets face a 40% higher risk of fatal injury and a 15% higher chance of other injuries including life-changing brain damage.

- **Clothing:** The clothing should be of good quality and highly reflective. Bikers should dress in layers of clothing to adjust to any changing weather conditions throughout the day. Wearing goggles, protective footwear and non-slip gloves can also be helpful.

Inspect your motorcycle before each ride: It is good to inspect your motorbike before riding to ensure that it is as safe as possible. Check the headlights, taillights, turn signals, brakes, fuel, oil, tire pressure, mirrors, handlebars and horn.A motorcycle tire must have a tread depth of at least 1 mm to be roadworthy.

Be observant and watch out for road hazards: Driving defensively enables a biker to anticipate traffic problems and road hazards. Sand, oil, gravel, pools of water and rough surfaces can make a bike lose traction and cause it to skid. Bumps and potholes are equally dangerous and should be avoided.

Obey traffic rules, use signals and drive the speed limit: It is important to follow traffic rules, use signals and drive the posted speed limit to avoid accidents. However if other road-users cannot see these signals or if you think they might not be working, you should give clear hand signals as well.

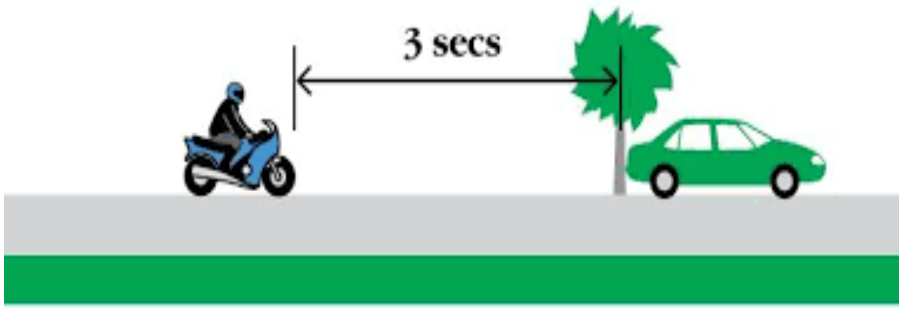


Check weather conditions before heading out: Rain, ice and snow can compromise riding a motorbike. Driving in these conditions can be very dangerous because motorbikes have less traction than a vehicle and their visibility is even lower.

Be visible: Avoid other driver's blind spots and always drive with your headlights on even during the day. Remember that drivers might not always see you in their blind spot. Avoid riding between traffic lanes and keep well clear of other vehicles when passing them. Use rearview mirrors if your motorcycle is fitted with them. Remember though not to rely on your mirrors only when moving off, changing lane, turning right and overtaking. You should also look over your shoulders and check for any blind spots.

Never ride a motor bike after consuming alcohol or drugs: Riding a motorbike is a demanding and complex task. When a rider consumes alcohol, the alcohol enters the bloodstream and reaches the brain within minutes and begins to affect the rider's ability to think clearly and make critical decisions. The major effect alcohol has is it slows down and impairs bodily functions both mental and physical. As little as one drink can have a significant effect on a rider's ability to exercise good judgment and riding performance, the greater the risk that may get you and someone else killed. '***If you ride don't drink or if you drink don't ride.'***

Keep a safe distance: Tailgating is not safe and it is recommended to stay at least 3-4 seconds away from the vehicle in front of you. This will give you enough time to stop in an emergency situation. In wet or icy conditions, the gap should be even wider.



Treat intersections with special care: Always follow safety protocol at intersections every single time you approach one to avoid accidents. You should come to a complete halt, view and obey posted traffic signs and signals, look both ways for approaching traffic and then proceed slowly.

Carry first-aid kit: Keeping a basic first-aid kit with your motorcycle is good in case of injury. They may include disinfecting wipes, bandages, hand sanitizer, gauze, adhesive tape and band-aids.

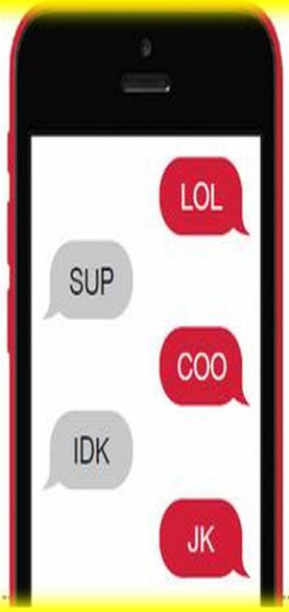
Carrying a Pillion Passenger:

You must adjust your riding style when carrying a pillion and leave aside the knee-down cornering and hard acceleration for your solo ride. Aim to make your entire bike handling action as smooth as possible, planning and anticipating the need for braking and gear changing. Remember that carrying a passenger will lengthen your braking distance, slow acceleration, make steering lighter and affect cornering and balance.

- Only carry a passenger if your motorbike is designed to carry two people. It needs to have suitable seat and foot supports for the pillion passenger.
- Make sure the total weight on the bike does not exceed the manufacturer's recommended maximum carrying capacity. The extra weight makes the bike handle differently and reduces the performance.
- Make sure your passenger is wearing a helmet and properly-fitting protective clothings.
- Your passenger will not have a great view of the road ahead and won't be able to anticipate your actions. Tell your passenger what they should do while on the bike like sitting still, leaning with the bike angle and keeping feet firm on the foot rests.

Carrying Children as Pillion Passenger:

The child needs to be able to reach the footrests and should wear the harness. Ensure that they wear the highest standard of protective clothings including boots, gloves, trousers, jacket and helmet all of which must fit them exactly. However, carrying children on motorbikes is not a ood idea.



A text is not worth your life

While driving, refrain from using phone

Chapter 19: Main Causes of Motor Vehicle Crashes

There are countless reasons for motor vehicle accidents. The most common causes are linked to human error. Although most accidents maybe minor, thousands of lives are lost each year due to vehicle crashes.

The leading elements and factors contributing to road crashes are:

Drivers: over speeding, rash driving, violation of traffic rules, failure to understand traffic signs, signals and road markings, fatigue and alcohol.

Pedestrians: Carelessness, illiteracy, crossing at wrong places, moving on carriageway and jaywalking.

Passengers: Projecting their body outside the vehicle, alighting and boarding vehicles from the wrong side, catching a running bus and jumping out of a moving vehicle.

Vehicles: Failure of brakes or steering, tire burst, insufficient headlights, overloading and projecting loads.

Road Conditions: Potholes, damaged roads, diversions and unmarked speed breakers.

Weather Conditions: Fog, snow, heavy rainfall, wind and hail storms.

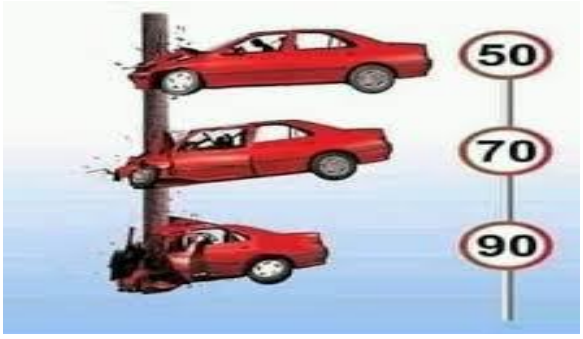
Major Causes of road accidents

I. Distracted Driving

Distracted driving is a leading cause of road traffic crashes all over the world. One of the most common reason is due to use of mobile phones while driving whether talking, texting or simply browsing. Doing something else while driving places extra demand on drivers and it can cause the driver to be less attentive on what to anticipate on the road ahead. Studies conducted in both simulators and in the real world have shown that using mobile phones while driving reduces visual scanning of the road ahead and are more likely to weave within their lane on bends and are slower to respond to hazards. Besides multitasking, not keeping your eyes on the road and having one hand only on the steering wheel while driving makes it obvious that it gets harder to navigate bends and respond to hazards.

II. Over-Speeding

Speed has been identified as a key risk factor causing road traffic accidents as well as the severity of injuries that result from road crashes. Exceeding speed limits or driving at a speed unsuitable for the prevailing road and traffic conditions increases the chances of being severely injured or killed in a road accident. The faster you are moving, the longer it takes for your vehicle to do the bidding when you apply the brakes. Controlling vehicle speed can prevent road crashes from happening and reduce the impact and severity of injuries when they do occur.



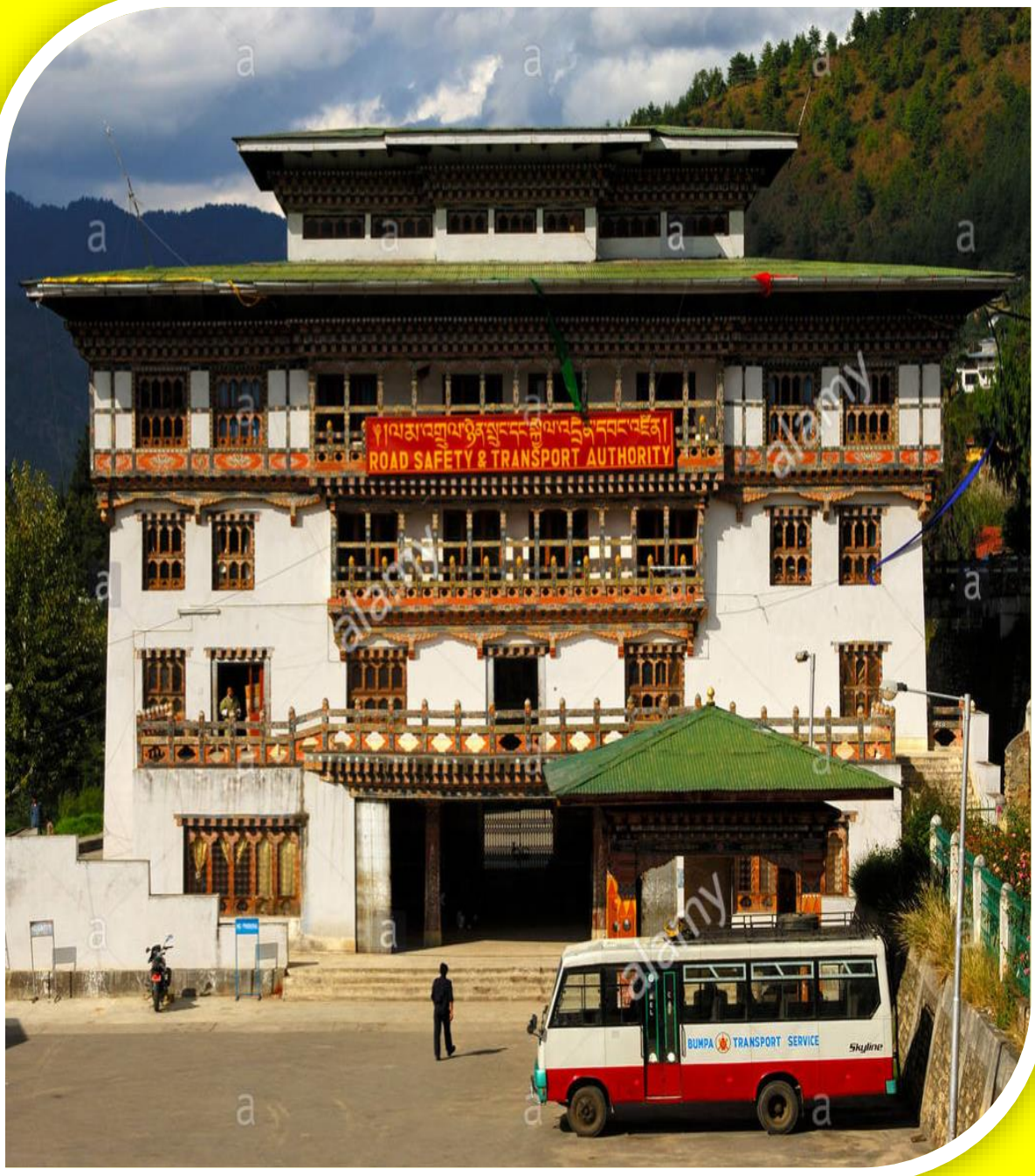
III. Unlicensed Driving

Unlicensed driving refers to a person who drives a motor vehicle without a valid driver license and include those who are unauthorized, disqualified, suspended, revoked, cancelled or never licensed. There are many people perhaps more than anyone realizes who are driving a vehicle at this very moment without a valid driving license. Various studies show that unlicensed motorists are some of the most dangerous drivers on the roads. Although unlicensed driving do not play a direct causative role in road crashes, it represents a major problem for road safety because of the evidence linking unlicensed driving to a cluster of high-risk behaviours including drink-driving and speeding. No matter what the reason is for a driver not having a valid driving license, there are no excuses for being on the road without it and this is among the most serious offences according to many national laws. Any person who drives a vehicle without a valid license can endanger their own life and the lives of other road-users because they are not qualified to be behind the wheels. Be sure when lending a vehicle to others that in case of an accident, the owner of the vehicle can be held responsible for the damages and the loss of lives. Staying legal on the road is the best way to go and never drive without a license or lend your vehicle to another person if they are unlicensed.

IV. Driving under influence (DUI)

Driving a vehicle after consuming alcohol or drugs is very dangerous. It is one of the main causes of road accidents worldwide. Driving under the influence (DUI) or driving while intoxicated (DWI) involves operating a vehicle with blood alcohol content (BAC) level of at least 0.08 %. Sometimes even a small amount of alcohol can lead to harmful situations. Some drivers may not even show warning signs of being under the influence but that does not mean it is any less dangerous. It takes roughly 30 minutes to 2 hours for alcohol to be absorbed into the bloodstream which then slows down breathing and delays a person’s cognitive skills. Because of this, it is always dangerous to drink and dri ve.

V. Vehicle Overloading: Vehicles have a specific limit known as gross vehicle weight rated (GVWR) to carry passengers or cargo. In most cases, drivers overlook this and end up overloading their vehicle with passengers and cargo beyond the GVWR. When a vehicle exceeds the maximum loading capacity it becomes less stable and the amount of time taken to react in an emergency is compromised resulting in accidents. Unsecured load and overloading will not only put the driver at risk but also pose danger to other passengers and road-users.


ROAD SAFETY & TRANSPORT AUTHORITY
BUMPA TRANSPORT SERVICE
Skyline

Issued in the interest of the General Public by:

The Road Safety and Transport Authority,
Ministry of Information and Communications,
Thimphu: BHUTAN.
Phone: 00975-2-321283/321284.
Website: www.rsta.gov.bt