

## Drivers and Pedestrians

# ROAD SAFETY AND FLOOD RISKS

**T**he last months have seen an increased focus on flooding and the risks of heavy rains, fast flowing rivers and floods have been discussed on several forums. We would like to discuss in this section a few more facts about flood risks and advise how all our road users can protect themselves from harm on the roads.

By Allen Versteeg (Transnet)

### Danger of flowing water over roads and low water bridges

We need to be aware of the following facts:

- Flowing water applies pressure to contact areas. The higher the speed the higher is the pressure.
- With water that is one meter high it will flow out at a speed of 4.47 meters per second or 16 km/h. The pressure is one metric tone per square meter.
- With a wheel half under water is the area 0.4 sq m and the force 0.4 tonne per wheel. For the four wheels it becomes one and a half tons and for 2m of water it becomes 2 ton per sq m.
- Be careful, water that has fallen only 0.4m reached a speed at 3.2 km/h and can sweep your car off a road bridge.
- When the side of the body of a vehicle makes contact with the water the force increases rapidly but the water now also acts on the underside of the vehicle as well and starts to lift it. It is now able to float like a ship. The weight of the vehicle will not be able to hold it on the road. Every cubic meter of space in a vehicle can lift one tonne.
- Be careful, 0.6 meters of water can float a car. Only vehicles that are open and let the water through will behave differently. Establish the body area of the vehicle and its mass. From this calculate the how deep will the vehicle sink in the water before it floats. For a truck that is 8.5 meters long and 2.5 meters wide and with a mass of 12 tonne it will float at a level of .532 meters above the body base and be able to float down the river.

### Danger of standing water

Standing water does not exert side pressure but will also lift the vehicle and float it. Then it will be impossible to move it forward.

### Speeding vehicles and aquaplaning

When vehicles are moving fast over a layer of water the vehicle can start to aquaplane. If the tyres are worn, it is easier to happen. Under these conditions an untrained driver may easily lose control over the vehicle.

### Pans and marshes

This is treacherous as it may appear solid but may only have a thin dry crust. The vehicle may disappear before your eyes in a marsh. The more you struggle the faster it will sink. Stay on the road.

### Floods and Debris

- When rivers are overflowing their banks the flow of water will cause light objects like trees to float. This could block the flow of water at obstructions and channels the water and cause rapids to form. Avoid these rapids.
- Every river has a catchment area. When it starts to rain at the top of the catchment area and the storm is moving along with the flow of the river the water in the river it is going to build up. It will start to avalanche on its way to the sea. This front wave will be full of debris (like trees plants and other floating material).
- This will also happen when a dam wall breaks. The higher the water drop the faster it will run. It will run 16 km/h times the square root of the height of the water in meters, max. It will appear like a broken wave on the sea shore.

### Destruction of surfaces and structures

The might of the water is very destructive, walls may fall over and road surfaces may be carved away. It may appear solid. It



also forms the places where vortexes may form that will suck objects to the bottom. Stay away from eddy currents.

#### Low water bridges

Low water bridges are designed without rails, as it will collect some excessive amount of debris. The small pillars sticking out are designed to give the driver of the vehicle an indication of the height of the water over the bridge surface. If you can't see the small pillars do not attempt to cross the bridge. If there is a causeway underneath the bridge do not attempt to cross the bridge if there is water flowing over it. The extent of the damage to the bridge can not be seen due to the muddy water and the water is flowing at a higher speed over the bridge.

#### Lack of visibility through muddy water

Due to the mud and debris in the flooding water it becomes impossible to see the condition of the bottom of the surface. Divers may not venture into this water to come and search for you.

#### Rescue methods and assisting rescue teams

Rescue is often performed via helicopter. This is extremely expensive - To search for you by helicopter costs about R32 000 per hour.

Boats, foot patrols, divers, ropes can be used to try and rescue you. Families normally gather and create search teams and comb the area. They normally won't stop until your body has been found.

Wear your safety vest with bright colours and reflective strips. Move into the open and put your wet clothes in an arm upraised position. Pack white stones in a SOS format. Or three short, three long and three short signs. Make smoke if you can, use a mirror to flash to rescuers.

To describe your position: Try to establish north as best as you can, work out the direction of the river flow and say it is flowing so many degrees from north in a wind direction.. Indicate how far you are from large objects and its direction from you. Give the direction to three very large prominent mountains. It makes it very easy to plot your position on a map. The direction of roads you can see from where you are and how far are they. Describe the easiest route to get to you. To save the life of your the cell phone batteries, send these messages by sms. If they phone don't talk long. Give facts only. To find North with your watch is to keep a thin stick at 12 and let the shade fall on 6, halfway between the hour pointer and 12 is North.

If you are injured inform the rescuers of the nature of the injury

*Don't drown on your way...  
arrive alive...!*

so that the rescuers can come prepared. If you have lost a lot of blood, advise your blood type as well.

#### Protecting from dangers and saving your phone

- Avoid flooded areas at night. To try your luck at night time makes your chance for survival very slim. No one can see you as it normally raining as well, you can't see in these conditions and you normally become very disorientated.
- When your body is exposed to some cold temperatures, which is a shock to your system, it goes into survival mode and cut the blood flow to the limbs. It goes into shaking mode to generate heat and you feel horrible due to the adrenaline overdose. Treat yourself for shock, meaning, calm down, relax and start to warm up the body gradually. Normally another person's body heat helps in emergencies. A fire will also help.
- The cause of death is normally drowning. At all costs keep the airways open. That means keep your face downstream. Your cellular phone can be the biggest help to save you if you are still alive. If you have the chance, wrap it in a plastic bag and save it in your underpants or in your bra. Try to ensure that it do not get wet.

#### What to do if you can't swim

It remains best to avoid water if you can't swim. If you cannot avoid getting in the water - there are a few things to keep in mind:

- Do not try to stand in fast flowing water. Should a foot become trapped in the rocks the river will force you over usually in a face down position, try to always face upstream if you are forced to stand in fast flowing water.
- Make yourself as light as possible, remove your heavy boots, the dark muddy water will make you float higher. Stay away from white foaming aerated water, it is soft and you will sink deeper into the water. Keep your lungs inflated.
- Try to get into a back-float on your back with your feet in front of you and your head up facing down river. Make use of the water rushing past you to push you up. Keep your back at 45 degrees with the water. With your elbows out, and hands down 45 degree you take up a 'Lazy boy' position. This will give you the maximum lift and keep your head above water.
- The river usually flows fastest in the middle and by maintaining a slight angle to the flow the river will steer you to the side. By opening and closing your hands you can steer yourself to the inside bend of the river where you will be washed out on the sand. The closed hand will feel more water force. With this you have used the least amount of energy and are able to use the force of the water that is around you. This will calm you and you will stay in control.
- Stay away from rocks and vegetation. Rocks normally injure you easily and the river may raise more and the vegetation may keep entrap you as the water flow through it. The flow will be slower on the inside of a bend in the river. Go for the white sand. There is also wood for fire. In the wild be careful for crocodiles, as these banks are also their resting area. If you find that the water is slowing down and your head is getting lower into the water try to move your closed hands in and out, all on your back, lifting and pushing you to the shore.