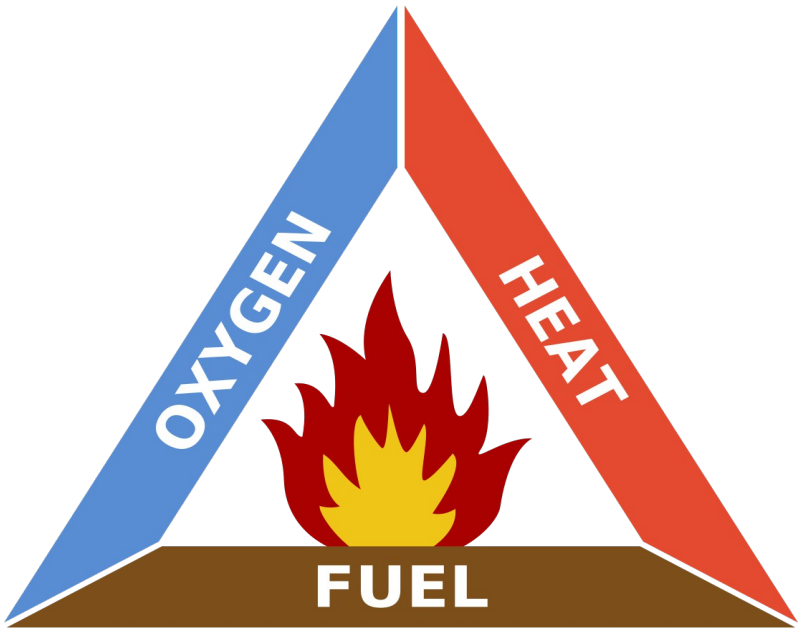
Fire Safety, Equipment and Fire Breaks.

How does fire work?



What is the Fire Triangle?

The fire triangle is a model that demonstrates the three elements required for a fire.
The three elements of the fire triangle are:

- Oxygen
- Heat
- Fuel

Every element of the fire triangle is required for a flame to start and continue burning.

Sometimes we call the fire triangle a 'fire tetrahedron.'

A tetrahedron is a 3D fire triangle. The extra point in the tetrahedron is the 'chemical reaction' (**combustion**) that occurs when the three elements of the fire triangle are present in enough quantity.
A chemical reaction (precisely an "exothermic" reaction) constantly occurs during a fire. The effects of this chemical reaction are the heat and light that we see as 'fire.' The stored energy in the fuel reacts with the oxygen and heat to let off excess heat and light.

Fire Safety

1) Never enter a fire zone alone! Always work in a team of two at least.
2) Never approach a fire from the front. This means the wind must not be in your face and the fire must not be in front of you.
3) Keep the wind from behind and the fire in front of you.
4) Don't park vehicles in areas that can still burn.
5) Always leave your keys in the vehicle or with someone that will stay with the vehicles.
6) Don't wear jewellery or have cell phone on your person.
7) Wear protective clothing. Clothing should be fire proof where possible. Try not to wear synthetic materials. Wear long, woollen or heavy cotton clothing, solid boots or shoes, a hat or woollen balaclava, and gloves.
8) Try not to inhale smoke if possible.

Fire fighting equipment

1) Fire beaters. A good smack with a fire beater will deprive the combustion of oxygen and will put the fire out.
2) Water backpack (same as used for administrating pest control substances). The water will cause the combustion to loose heat as well as oxygen and put the flames out. Although to a lesser extend, the water will deprive the combustion of burnable fuel.
3) Blowers. The blower will deprive the combustion of heat but primarily will cause imbalance to the combustion requirements by adding too much oxygen.
4) Water car with pressure pump. Similar to the water pack.
5) Good fire lighter. To assist in starting back burns.

Personal Protection

1) Face Visor or balaclava. A buff also works.
2) Gloves.
3) Good shoes or boots.
4) Hat.
5) Long woollen or cotton clothes.

Fire fighting methods

Each fire is unique due to several reasons and must be assessed before attempting to put it out.

1) The fuel / veld type.
2) Direction of the wind.
3) Strength of the wind.

4) How big is the burn front?
5) How many fire fighters are available?
6) What equipment is available?
7) What infrastructures are near or in danger?
8) Are there any animals or people in danger?

Blowers:

The most effective tools for fighting veld fires are **blowers** by far. Employ one person with a blower and one with a water pack or fire beater in each team. The blower will approach the fire from one end of the burn and work it's way towards the head of the fire The best side to start with is the end that burns with the wind from directly behind the burn. This will also be the side that moves the fastest forward. The member with the fire beater will follow and make sure that there are no flare-ups and that all fire is extinguished.

Fire Beaters:

If the are no blowers then fire beaters will be the second best tool. Two persons work together each armed with a beater. The same approach is used as with the blowers. One member will lead and beat the fire for 5 to 10 times while the second member follows and extinguish any remaining flames. After the 5 or 10 times the member in front steps back and let the second member take over. The first member moves to the second position. This method will allow the members to take a breather from inhaling smoke and to rest n short while.

Water Packs:

Water when used correctly can be very effective in fighting fires. Even a small amount of water can put out fires. The member with water pack will again approach the fire in the same manner as described for the blower teams. The water pack team will also have a fire beater as the second member. The water jet is set to have a very small spread but not a solid beam of water. The water is sprayed towards the base of the flames and preferably just in front of the flames. The beater will follow and extinguish any flare-ups.

Back burning:

To reduce the element of fuel.

Fire fighters can often put it out when a wildfire is out of control. However, the fire has too much heat, oxygen, and fuel, so it will keep going. We don't have the tools to extinguish the fire.
Back burning is a strategy that involves moving ahead of the fire and removing the fuels that are in the fire's path. Usually, this will include running controlled burns ahead of the central fire to burn away any potential fuels for the primary fire. Fire fighters extinguish these smaller fires before the primary and out-of-control one arrives.
When the fire arrives, it finds no fuel to burn, so it stops in its tracks.

Back burns can only be done with the wind and the fire from the front. Care must be taken to only light a small section at a time in order to control the burn. The leading front of the back burn is extinguished and the rest is left to slowly burn towards the approaching runaway fire.

Fire Breaks

Landowners and farmers are often sceptical that fire breaks can stop a wildfire. Given reports of fires jumping national roads, and the number of fires started by random striking of lightning, they question how wide a fire break would need to be to stop a fire.

These are valid concerns. However, it is important to define the actual role of fire breaks. Most importantly, their function is to **create safe (or black) zones** from which to initiate back burns in order to stop a wildfire in its tracks. If a fire break is substantial enough, it may even become a safe zone for livestock during wildfires. However, there is no set or standard width for an effective fire break.

Environmental factors determine exactly how wide a fire break should be. These include the type and state of the vegetation, the quantity of grass fuel load present and the grass curing (the percentage of dry matter in the sward) at the time of construction.

When burning fire breaks, landowners should be cognisant of **high temperatures**, **low relative humidity** and even **moderate wind speeds**, all of which are cause for concern during prescribed burning. High grass fuel loads, especially dry grass with a high curing percentage, exacerbates fire behaviour.

When to burn fire breaks

Prescribed burning and the construction of burned fire breaks should be done only on days with a **low Fire Danger Index (FDI)** – that is, days coded green and/or lower yellow. It is also advisable wherever possible to burn during the cooler hours of the day – **before 10am and after 4pm**. Labour permitting, the safest time to burn a hazardous fire break is usually in the early evening after sunset.

How to make a fire break

A wet line fire break:

This is made using back pack sprayers to dampen the grass with water in parallel lines on the outer edges of the proposed fire break. The dry grass in between is then burned. The wet line fire break is constructed progressively over short distances of approximately 10m so that the sprayed grass does not have time to dry out before the area in between has burned out.

A dry line fire break:

This is created by igniting two parallel lines of fire, about one half metre from the edge of the pre-cut area, for a distance of approximately 10m. The flames are drawn towards each other, thereby lessening the heat for fire fighters beating out any flames spreading into the surrounding grassland. Once the first section has been successfully burned the next 10m can be lit. This is a slow but effective method of constructing fire breaks in areas of limited water supply. Two lines of burned fire break can be prepared in this manner 50m or 100m apart to create safe edges from which to ignite the main fire break. Once the outline borders have been completed, the area in between the lines can be burned.

If the wind blows across the fire break, then it is advised to burn the edge on the opposite side of

the wind first. Keep burning this edge further ahead of the closer side at all times. Follow with the edge that is closer to the wind. Always stay several meters behind the leading edge.

Method of burning a fire break:

A fire break team consist of six members making up two sections of three members each. Each section has one team leader that has a rake and a beater. The second member will operate the water pack and the third member will be manning the beater. One section will be the leading team and the other will be the lagging team.

Before starting any fires the team leader will determine the wind direction and strength in order to determine where the burn will be started. In contrast to fighting a fire with the wind always from behind, the wind must be from the front or side when burning a fire break.

Let's assume the fire break is running east / west and the wind is north westerly, we will start the fire break from the eastern side and the leading team will be burning on the southern side of the break.

The leading team will start the burn first and once the have proceeded a couple of meters then the lagging team will start their burn. This gap will be kept for as long as the wind hold direction. The leading team will burn a barrier between the edge of the fire break and the advancing wind.

The team leader will use the rake to drag the fire forwards at a steady pace while the water pack operator makes sure that the fire line on the outside of the burn is put out as soon as the fire line has seperated. The beater operator will make sure that there are no flames or smoldering fuel left behind.

General notes on fire breaks:

1) Always keep an eye on the wind strength and direction.
2) When the wind gets unpredictable or to strong, put the fire break out and take time to observe the situation.
3) Make a decision based on the observed conditions. If the wind direction has changed then move the start of the burn to the other side of the fire break.
4) Make sure the members that are on the fire team take a breather every so often. They need to take in lots of fluids.
5) Remember to notify neighbours of your intention to burn fire breaks.