



Objective:

The objective of this workshop guide is for the Scout Leader and/or Scout youth to be able to describe and demonstrate safe use of building and igniting Campfires.

What Kind of Fire Do You Want to Build?

Before you rush to build a fire, decide what type and size of fire is needed. There are six common types of campfires that you need to think about:

COOKING CAMPFIRES	
<p>The hunter's fire is a cooking fire. The logs on top are spaced close enough together such that a pot, pan, or Dutch oven can be placed on them. Try to lay it as level as possible.</p>	
<p>The Reflector fire is best for cooking or building a fire to reflect heat; baked food is placed in front of the fire with the stacked reflecting wall behind the fire. Very useful for overnight survival fires to keep people warm as the fire can be build up against a vertical wall of rock or a wall of wooden tree trunks. If you sit (or sleep) between the reflector and the fire, the side of you facing the fire will be warmed directly, while the reflector throws heat to the opposite side.</p>	
ALL PURPOSE CAMPFIRES	
<p>The Star Fire. The advantage of this fire is that the logs can be of any length, avoiding the need to cut them up. As the ends of the logs burn, they are pushed into the fire. The fire is lit at the center of the star. If the logs are propped up on the fire ring, gravity will feed them in as they burn. The Star fire can be used for overnight survival with the logs spaced wide enough for people to sit/sleep between the spars.</p>	
<p>The teepee fire is probably the most recognized campfire. It is somewhat difficult to setup as it requires balancing logs against one another. A good trick is to stake wood into the ground to hold the Teepee fire logs. If staking is not done, the log pile may topple, upset the kindling and the tinder and the fire will have to be rebuilt. Lashing the top of the fire with twine is another option to consider. Once laid, the teepee fire is very easy to light, as convection will take the flames right to the fuel.</p> <p>This kind of fire lay is used to produce a quick fire for distress signal fires or for boiling as the fire is focused at the top of the Teepee.</p>	
<p>The log cabin Campfire is easy to set and it is stable. It is laid very much like a log cabin should not be a hollow square tower but a multi story building or pyramid with floors. When it burns, it falls in on itself, confining itself to the Campfire ring. It is also easy to add more fuel and maintain a neat orderly Campfire</p> <p>This kind of fire yields an excellent bed of coals for slow cooking, roasting, foil cooking or baking. A good tip is to lay a Teepee fire within the log cabin.</p>	
<p>The council fire is still used by <u>Native Americans</u> during their meetings (or councils). It is very much like the log cabin fire except that more than two logs are laid on each layer. Be careful not to lay the logs too close to one another. Leave gaps of at least one inch between each log to allow air to circulate. Like the log cabin fire, the council fire is very stable, and it falls into itself as it burns, remaining within the fire ring.</p> <p>The council fire is not usually used for cooking - but rather for ceremonies.</p>	



What's in a Campfire?

Fire needs 3 elements to survive: **Fuel**, **Air**, and **Heat**. This is known as the "Combustion Triangle". Deprive a fire of any one of the elements and it dies. Water does two things; it deprives a fire of oxygen and it cools the temperature to below the combustion point of the fuel being used. For a fire you need the following kinds of Fuel

Fuel

Tinder

Tinder may be made of many different types of material, including, dried grass, dry pine needles, wood shavings, birch bark, dryer lint, paper, etc. The key to tinder is that it should be dry, thin, and light. Tinder is laid first, and then it is surrounded with kindling.

Kindling

Kindling is small sized sticks around a quarter to half inch in diameter. You will need a fair amount of kindling when starting a fire. Kindling can be arranged in a tee-pee or log cabin style. As you build up the kindling pile, add larger and larger pieces, but do not add anything larger than 1.5 inches as this sized wood takes more heat to burn. Stacking the kindling is the most important aspect of building a successful fire. If it is stacked tightly, the tinder will not ignite as there will be insufficient air flow.

Fuel

Fuel is the wooden logs that you will burn in the campfire. Logs should not be larger than six inches in diameter as these often will take too long to burn or not be dry in the centre. You may find yourself up all night tending to the campfire or dousing the Campfire before the wood has been consumed. It is far better to burn all your wood completely.

Air

A campfire needs lots of air, and the way the wood is stacked can affect the airflow greatly. Do not pack the wood tightly. Kindling should be stacked such that there are spaces between pieces. These gaps will allow the flames of the fire to get in between and burn *all* the kindling, thus igniting the larger logs. When you add logs to the fire, make sure there is adequate air flow otherwise, you will cut off the air supply and the camp fire will die down without burning all the wood.

Heat

Heat is initially added to the fuel and air with a match, lighter, or other fire lighting device. The tinder is lit first, and the heat from the flame is transferred to the kindling and then to the logs.

The secret to keeping a fire going after it is lit is to stack the logs from largest to smallest, bottom to top. Be sure you have enough kindling to ignite the main logs and ensure sufficient air flow. As soon as the tinder is alight and the main logs have caught fire, start adding more logs to the Campfire.

Campfire Safety

Before you build a fire, ask yourself the following

1. Do you have a fire permit?
2. Do you have a dedicated fire pit area?
3. A suitable first aid kit should be present
4. Do you want to do a "leave no trace" campfire?
5. What size of campfire is needed?
6. What kind of campfire is needed?



The above questions need to be answered prior any campfire construction as they all have an impact on the legality, location, size and type of campfire that is required.

**General Safety procedures for making campfires****Campfire Environment**

- Prepare the campfire area ahead of time. This will include the clearing the area of old campfire ashes, removing garbage, digging sand/soil and setting the appropriate perimeter for your audience.
- Determine the entry / exit points for the campfire and any hazards that your audience may incur as they enter/exit the campfire area
- Check for trees and any other overhead hazards and make sure that any sparks that fly from the campfire will not cause a secondary fire
- Check the weather for the campfire - pay attention to wind - and the openness of campfire as wind may blow ashes and sparks into your audience or into trees

Campfire Materials

- Ensure that you have adequate fuel for the fire. This means sufficient Tinder, Kindling and wood logs for the duration of the fire
- All fuel for the fire (wood) should be prepared ahead of time in daylight. This will mean that all chopping sawing of logs are done ahead of time.
- Build the campfire ahead of time

Safety Environment

- Ensure that there is sufficient extinguishing material for the fire that you intend to build.
 - Sand/Shovel and/or buckets of water
- Have a suitable 1st aid kit on hand in case of emergencies

Fire Starting Techniques

- Practice any fire starting techniques ahead of time to ensure safety for organizers and audience
- Exercise caution when using flammable fuels for campfire ignition
- Ensure that there is space for campfire ignition by match

Authorized Personnel

- Only personnel who are campfire setup and execution should be build campfires or supervise the building of campfires

Organization

- A campfire should have one campfire chief who organizes the campfire construction and looks after all the preparatory work
- A campfire should always be attended when it is alight
- Only personnel who are experienced in campfire setup and execution should build campfires or supervise others in building campfires

Extinguishing a Campfire

- A campfire should never be left unattended until the ashes have been completely extinguished
 - All glowing embers in the camp fire area have been doused with water or smothered with sand/dirt
 - Spread the wood and coals as widely apart as possible in the fire pit area and sprinkle with water and stir until the fire is out
 - Make sure you cover all sides of all pieces of wood and cover underneath rocks around the edge and cool the rocks. There should be no glowing coals, smoke or steam when you are done. If the coals are not sufficiently out and the fire is left, then wind can get the fire up again after you're gone
- A campfire is considered extinguished when it is cold enough for you to put your hand into the coals!



Ignition Methods

There are two common methods to starting a campfire.

Traditional Fire Starters

Traditional fire starters are matches and/or lighters. These items are essential tools for lighting a fire but have many disadvantages. Moisture will destroy the match heads, a match is easily blown out and often it takes more than one match to light a fire, which could be problematic on a long trip if you run out of matches. Lighters are more reliable than matches but suffer from moisture and the flame is small and is easily blown out.

Magnesium Campfire Fire Starters: This is a flint-and-steel fire starter tool. This kind of fire starter tool has advantages over traditional fire starters in that they are small enough to fit in your pocket, unaffected by wet conditions or high temperatures and they last a very long time.

Strike the flint on the magnesium to create white-hot metal shavings that will quickly ignite your fire starting materials. Because these shavings are far hotter than a match, they can ignite tinder that is damp from rain or dew. This will allow you to get a fire going in any conditions

Starting a fire with a Magnesium fire starter requires greater effort in terms of making sure that you have plenty of tinder and kindling and that you need to be kneeling over the fire to ignite the tinder.

Fire Start in the Rain

Even after a rainstorm there is tinder and firewood that is dry. Knowing where to look and what to look for are the keys to success.

Tinder. Look around your site for fir trees. The smaller lower branches that have died are a good first choice. These smaller branches are usually dry and will break off in your fingers. Collect a good amount of these. Take a little extra time to fray and shred these with your knife or fingers as this will help ignition. Check for dry grass under trees as often the foliage on a tree will keep the ground dry. Look for birch trees as the bark is impregnated with oil and will not absorb moisture. Bird nests (unoccupied of course) are also good sources of tinder if you can find them.

Kindling. Look for trees known as "Dead Falls". These are trees that have fallen and are now in various stages of decay. Locate one that has been down for a while. Strip off the outer bark and cut chunks out of the rotting trunk. This material will burn fast so you will need lots of this material. The larger branches can also be stripped of bark and the wood below used.

Look for pine trees. Many of these trees have a sticky sap running down the bark. Collect this sap or pitch as it is a natural accelerant for your fire. Dry pine bark with sap is an excellent source of fuel.

Firewood is the main staple of any fire. The "Dead Falls" are the best source of firewood. Using an axe and a saw you can cut logs to suit your fire needs. If you don't want to cut the wood into logs, just strip the bark and off them and insert the end into the fire. As the log burns, just keep pushing it into the fire.

Before you start a fire make sure you have collected enough fuel to keep it burning for a length of time. Whatever wood you collect, protect it from getting wet by piling the wood on top of each other or cover the wood with pieces of bark, or store the wood under a tree and cover it with pine needles.



PERMIT DEMONSTRATION

In the presence of your instructor, perform the following:

Questions to be answered

1. State the different types of campfires
 - a. *Cooking Campfires: Hunter and Reflector Fire*
 - b. *All purpose campfires: Star, Log Cabin, Tee-Pee and Council*
2. State the three elements that are needed to ignite a campfire
 - a. *Fuel, Air, Heat*
3. What legal requirement do you need to run a campfire?
4. Discuss the environmental requirements for a campfire
5. Discuss the safety measures for campfire ignition
6. Discuss the requirements to safely walk away from a campfire

Demonstration

1. Demonstrate that you can establish a safe campfire environment
 - a. Collection of campfire material
 - b. Campfire perimeter for your audience
 - c. Safe ignition method
 - d. Materials for extinguishing a fire
2. Build a campfire
3. Safely ignite a campfire
4. Extinguish a campfire

TIPS:

Consider the following items for helping safely ignite a campfire:

1. Flint ignition
 - a. Used in conjunction with
2. Dryer Lint
 - a. *This will ignite very easily in all kinds of conditions and generates a larger flame*
3. Tea-Light candle
 - a. *The wick can be lit with the match - thus extending the length of time a flame can be lit*
4. Small taper candle
 - a. *Similar to the Tea-Light candle and it allows you to reach into a campfire*
5. Fire Paste or small fire logs
 - a. *Allows you to light a campfire or stove easily*
6. Spare paper which you can twist into a paper taper
 - a. *You can light this and use it as a large match thus extending the burning time for ignition*
7. Carry extended length matches
 - a. *These are thicker and longer and thus increase the ignition potential*
8. Burning Arrow fire start
 - a. *Wire enters the campfire where no audience is present*
 - b. *Small zip lock bag of naphtha buried in the centre of the campfire*
 - c. *Wood arrow has a nail at the front to piece the bag of naphtha*
9. Toilet Roll soaked in naphtha buried in start of campfire
 - a. *Fuel does not evaporate quickly allowing for longer*

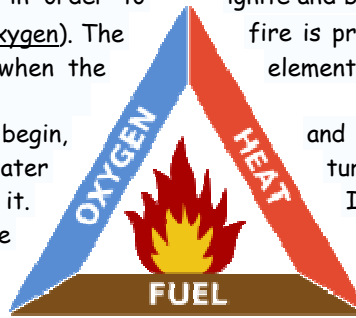


THE TRIANGLE OF FIRE

The triangle illustrates the rule that in order to **fuel**, and an **oxidizing agent** (usually **oxygen**). The one of them. A fire naturally occurs when the

ignite and burn, a fire requires three elements: **heat**, fire is prevented or extinguished by removing any elements are combined in the right mixture.

Without sufficient **heat**, a fire cannot begin, removed by dousing with water; the water heated, taking the heat with it. in the flame removes heat in the same each other also reduces the heat.



and it cannot be sustained. Heat can be turns to steam and the steam is further Introducing particles of powder or any gas manner. Separating burning fuels from

Without **fuel**, a fire will stop. Fuel can be removed naturally as where the fire has consumed all the burnable fuel, or manually, by mechanically or chemically removing the fuel from the fire. In scout terms, this could be through removal or dispersion of wood from the campfire. Fuel separation is an important factor as heat is for generating fire.

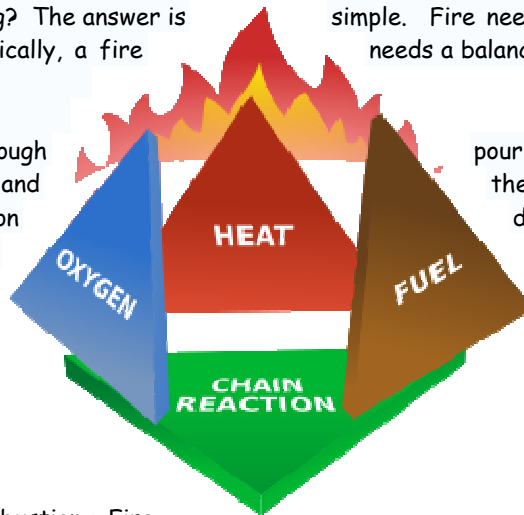
From a technical point of reference, when fuel is removed from fire, it ceases because fuel removal lowers the concentration of fuel vapor in the flame. This in turn leads to a decrease in energy release and subsequent reduction in heat. This points back to the first triangle of the fire triangle in which, sufficient heat is required.

This links both heat and fuel. Without fuel, heat cannot be generated.

Without sufficient **Oxygen**, a fire cannot start and it cannot be sustained. A reduction in oxygen supply or oxygen results in lower combustion velocity. You can see this through the simple example of blowing on a campfire. When you blow air directly on the fire the intensity and fierceness of the flame initially increases and then reduces when velocity is reduced.

So what happens when water or sand is poured on a fire? There is plenty of air in the atmosphere left when the fire goes out so what is happening? The answer is simple. Fire needs a balance of several gases, of which Oxygen is just one. Typically, a fire and Nitrogen, needs a balanced mix of Oxygen, Carbon Dioxide

Therefore, starving a fire through results in an imbalance in oxygen and takes more energy to burn carbon more energy is required to heat So, once again, it is all about the flame below the level



pouring water or sand on the fire the other two gases and as a result it dioxide and nitrogen. As a result, the lower concentration of gases. reducing the temperature in where radicals can exist.

The circle of Fire

Heat, fuel and Oxygen = combustion = Fire

Reduction in fuel = reduction in heat = Fire will die out

Reduction Oxygen = reduction in heat = Fire will die out

Reduction in heat = Fire will die out