Government of **Western Australia**
Fire & Emergency Services Authority

FESA
Fire & Emergency Services Authority of Western Australia

Part Two:

Participant's Resource

Respond to Wildfire

PUAFIR204

Hand Tools

Training Resource Kit

Version 2.0 January 2012

Introduction

The knowledge of the correct use, care and maintenance of a rakehoe, axe, shovel and drip torch are a must for all firefighters. Knowing and understanding what your equipment is all about will not only maximise your firefighting efforts but will increase your efficiency and confidence in maintaining a high level of safety.

The range of uses for these tools is extremely varied but the point to stress is the right tool for the job—it makes your work a whole lot easier.

Uses for hand tools:

- constructing a fire line
- controlling backburns
- containing a fire
- mopping up

Section 4.1 Tools

The Rakehoe

A rakehoe is especially designed for firefighting and is equipped with one serrated edge for raking and one sharpened edge for cutting, scraping and chipping.

Rakehoe

Before Use

Prior to using a rakehoe the following checks should be made:

Handle:

- check for splinters
- check for snugness in head
- check for defects

Head:

- check angle of sharpening
- check for sharpness
- check condition and angle of prongs

Carrying a Rakehoe

A rakehoe is a potentially dangerous piece of equipment and should always be carried in the following manner:

- horizontally to the ground
- close to the side
- hand just behind head
- handle facing backwards
- balanced with cutting edge outwards

Carrying a rakehoe

It should not be carried over the shoulder. Do not run, and if you do slip, push the rakehoe to one side as you are falling.

Axe

The axe is the most widely known tool as it is used for a variety of jobs other than firefighting. The wide range of tasks for which an axe is used means that, unfortunately it is abused and becomes unsuitable for the job for which it was designed—cutting tree trunks or limbs. Once an axe has been used for jobs such as grubbing smouldering stumps, it should be correctly sharpened to ensure it is ready for the more typical uses as listed below:

- Felling trees and small shrubs
- Removing branches and limbs that could act as hazards or obstacles
- Cleaning bark from trees

Regardless of the type of work performed, all axes must have secure handles as a head flying off the handle can cause serious injury.

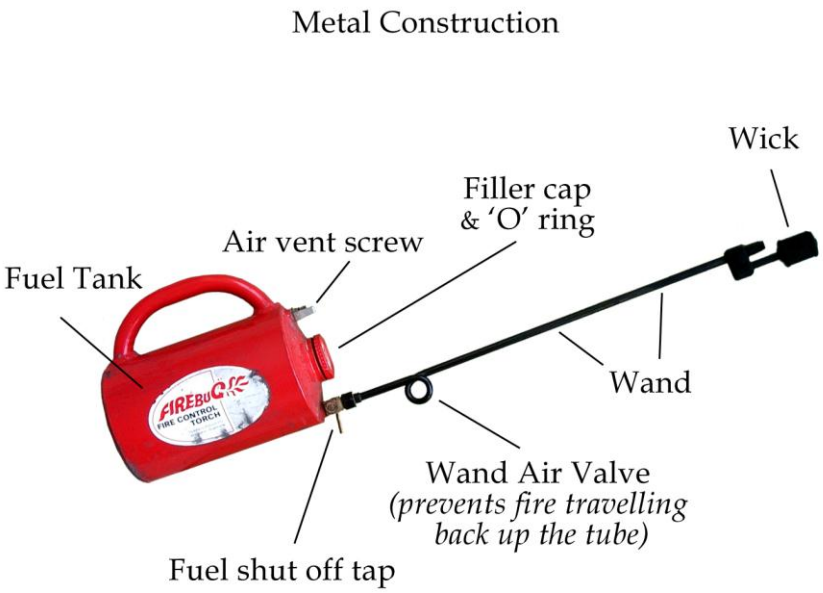
Shovel

A shovel can be used for suppressing a fire in country where raking is difficult, or where mineral soil is readily available to throw over burning material. Ensure that the handle is securely fitted.

Section 4.2 The Drip torch

The drip torch is a fire lighting device which can be used to ignite fuels. It is a container holding a fuel mixture which drips from a nozzle over a lighted wick, dripping burning liquid onto the fuel to be ignited. It is used as a management tool in: • fire prevention and prescribed burning (eg. to reduce fuel loading which reduces the impact of a bushfire) • fire suppression (eg. for lighting a backburn)	
	Using the drip torch

Parts of the Drip Torch



Parts of a drip torch

The drip torch is to be used for prescribed burning and authorised lighting activities only.

Safe Operation of a Drip Torch

Operators should always take the utmost care when working with fuels.

When using a drip torch, the operator should:

- Ensure that there is no risk to other personnel in the vicinity
- Use the torch on the designated burn area only
- Wear level 1 Personal Protective Clothing (PPE), including gloves and goggles when filling, lighting, using and extinguishing a drip torch
- Ensure the drip torch has adequate fuel to complete the burn
- Ignite the torch, drip the fuel onto the vegetation and complete the burn under the direction of the officer in charge
- After use, stand the torch upright and extinguish the flame
- Always ensure that drip torches are stored upright and regular maintenance is undertaken

Other safety considerations:

- Do not use the torch near stored or escaped flammable liquids or gases or use it to light materials near another person when it may put them in danger
- Do not leave a drip torch unattended
- Do not use any technique for deepening the burn that involves personnel being in the potential path of the fire front
- Do not fully fill the drip torch. Leave at least 20mm to the top of the container for expansion of the fuel
- Store the pre-mixed fuel can in the designated carrying cradle on the appliance
- Ensure the nozzle and gauze are cool before storing

How to Use the Drip Torch

- Make sure you always follow the correct sequence of operations for a drip torch
- Remove or isolate the drip torch from any sources of ignition
- Unscrew the filler cap and fill the fuel reservoir with a pre-mixed fuel only: three parts (75%) diesel and one part (25%) petrol. Do not mix the individual fuels in the drip torch—these should be pre-mixed before use in the drip torch. Use a funnel and avoid spilling the mixture
- Replace the filler cap, checking the ‘O’ ring is in place and seals correctly.
- Wipe off any spilt fuel before lighting
- Loosen the air vent screw and tilt the drip torch so that the wand is pointing to the ground
- Let fuel drip from the nozzle to the wick (gauze)

- Ignite the wick with a match or lighter. The wick will serve as a pilot flame. As fresh fuel drips onto the wick, the fuel will catch alight and fall to the ground and onto the vegetation. The flow of the fuel is controlled by the air vent screw (see the diagram on previous page)
- When finished, hold the drip torch upright to stop the flow of fuel
- Extinguish the pilot flame

Storage of a Drip Torch

- Leave fuel tap turned on
- Close the air vent screw
- Ensure the ignition wick (gauze) is extinguished
- Place the drip torch in an upright position and secured (so it cannot fall over)

Conducting a Burn with a Drip Torch

Always ensure that minimal risks are taken when conducting a burning operation.

No burn will be carried out unless under the direction and supervision of the officer in charge.

The officer in charge will determine:

- The type of lighting pattern to be used (e.g. continuous line, spot ignition, etc).
- The rate of lighting (if too much is lit or it is lit in the wrong way the burn can escape).

When the burn has been completed, hold the drip torch in the upright position to avoid unwanted burns.

Hazards & Precautions

Drip torches are a fire hazard. Always follow correct procedures to reduce the risk to yourself and others.

Burns

To reduce the risk of burns while using a drip torch always use bush firefighter protective clothing and personal protective equipment (Level 1)—including wearing gloves and goggles—when filling, lighting, using and extinguishing a drip torch.

Ignition or Explosion

To reduce the risk of ignition or explosion of the fuel during filling:

- Use the recommended fuel mix only
- Do not fill or open the filler cap near sources of ignition
- Avoid spilling fuel during filling—use a funnel
- Wipe off excess fuel before use
- Ensure the washer is in place on the filler cap and it seals correctly before use

To reduce the risk of the drip torch exploding during operations:

- Do not place the drip torch where it is exposed to fire or in unburnt fuel in the path of a fire
- Warn others in the vicinity if a drip torch is involved with fire and keep everyone clear (at least 30 metres)

Uncontrolled Fire

To reduce the risk of uncontrolled fire:

- Only use the drip torch for authorised burns
- Follow the instructions from the officer in charge
- Be aware that lighting up a continuous line will produce a faster rate of spread, while spot ignition usually produces slower rate of spread

Every time you pick up a drip torch that has not been filled by you, remove the lid and check the contents to ensure these are not volatile.

Section 4.3 Fire Line Construction Using Hand Tools

Introduction

Fire trails and firebreaks are cleared paths which will prevent the spread of a fire by removing fuel from the fire path.

A trail is a narrow path built to enable access by foot or vehicles and is intended for low intensity fires, whereas a firebreak is a wider path built to halt fires of greater intensity. A firebreak is normally constructed as a pre-suppression measure, whereas 'fire lines' are constructed during the course of fire suppression.

When constructing trails and breaks you will hear the term mineral earth. This term refers to ground where all vegetation cover has been removed and only rocks and soil (minerals) are exposed. A fire can travel very slowly through grass roots or decayed vegetation and great care must be taken to ensure that mineral earth is exposed throughout the length and width of the trail. Consider the diagram which shows a cross-section through a typical forest floor.

Forest floor cross-section

Fire line construction is normally a crew exercise and it is necessary to work in a planned manner if the crew is to work safely. Remember that axes and rakehoes are very sharp. Failure to observe simple procedures can result in a severe injury.

There are two recognised methods of crew work when constructing a narrow trail:

- the 'step-up' method
- the 'one-lick' method

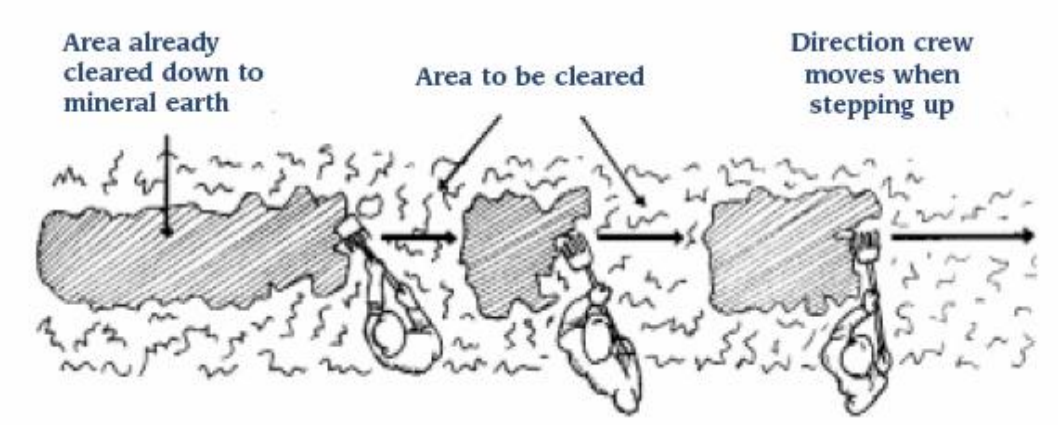
Step-up Method

A trail can be safely cleaned by the 'step-up' method which is based on the idea that a group of workers in a line will each complete individual sections of the trail. The workers are spaced out, at the start of the exercise, and each worker clears a short section of the trail to mineral earth. The first person to finish a

reasonable section calls out ‘step-up’ and all workers then move on to the next unprepared section. In this way, the group moves along at a steady rate and yet no single worker is ever required to pass another.

It is normal practice to have one worker at the end of the line checking to make sure that the trail is properly cleared. He does not join in the step-up routine but works as required to ‘polish’ the trail. The crew may be led by a person with an axe, and this person would not join in the ‘step-up’ routine but would clear a line for the group raking the trail.

In dense vegetation, the crew working to the step-up routine may follow some distance behind a crew, reducing the vegetation with chain saws and axes.



‘Step-up’ method

One-Lick Method

The ‘one-lick’ method is based on the idea that each individual worker merely removes a portion of the vegetation. The group should move forward at a slow walking pace with each worker removing vegetation as they go.

No one completes any section, however after several persons with rakehoes pass over a given section with each adding to the effort of the previous person, the section is progressively reduced to the stage of a completed trail.

This method is particularly useful where:

- A variety of tools is used such as chainsaws, axes and then rakehoes
- A large number of firefighters with little experience are used

The one-lick method can be used in thick scrub, open forest, in forest litter, or in open grass country.

Which Method to Use

Small Crew, Small Coverage

The ‘step-up’ method is useful with small crews of say 8–10 persons and where the distance to be cleared is not excessive. The crew must be trained and

experienced in the technique. This will produce a trail with a minimum of supervision and follow-up.

Large Crews, Large Coverage

The 'one-lick' method is more often used with large crews and where there is a considerable distance to cover. Under these conditions, the 'step-up' method becomes unwieldy. The crew can be spread out more than with the 'step-up' method and they will tend to cover the ground at greater speed. It is also more useful where people have not worked together before, and where close supervision is not always possible.

With either method the last firefighter, or polisher, should be experienced as they are responsible for determining whether or not the trail is to standard.

The 'step-up' and 'one-lick' methods of fire line construction have an inherent safety factor, which is; that no firefighter has to pass another while working.

Points to Consider

1. Always plan the trail carefully. Valuable time and effort will be lost if you find that you have to back-track because of unforeseen obstacles
2. Make the maximum use of natural firebreaks such as exposed rock shelves, open ground and creek beds
3. Keep the trail as straight as possible. This will allow a good view along the trail and will enable firefighters to move along the trail with greater ease
4. Avoid heavy concentrations of fuels as the fire may flash over
5. Whenever it is necessary to have corners in a trail, widen the trail at such points, as the fire will tend to increase in intensity where it is driven into a sharp corner
6. Remember that people may have to walk the trail at night. Remove all stumps or any objects protruding from the ground
7. Always look up when cutting a trail to make sure that the fire will not be able to cross the trail by burning through upper-storey vegetation. The trail must be clear, above the trail must also be clear
8. Keep trails clear of dead trees or trees with rough bark, as the bark may spread burning embers across the trail

For further information on hand and other tools used in firefighting see Part 2 of the *Prepare & Maintain Equipment TRK*.

Section 4.4 Summary & Activities

The best way to learn about hand tools is to use them. Don't just assume that you can construct a good mineral earth trail as it does take practice to develop the correct technique.

Remember that hazard reduction exercises are an excellent opportunity to develop skills with hand tools.

Using hand tools for fire suppression is hard work, under any conditions. By developing the correct skills you will soon appreciate their potential and value. Hand tools will always play a major role in combating fires, particularly in inaccessible areas.

Activity 4.1: Self Assessment

Answer the following questions.

1. Name two (2) uses for hand tools at a fire

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2. Name & describe the two (2) methods crews can use to construct a fireline with hand tools.

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3. List two (2) ways drip torches can be used for fire management

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Activity 0500: Demonstration & Practice

Using a Drip Torch.

Activity 0502: Demonstration & Practice

Fire line construction using hand tools