



# Effects of Heat



*Precautions for Firefighters*

# Introduction

## **Hard Work and Heat**

Firefighters regularly confront the problems of working in heat, the effects of which include:

- Dehydration
- Heat exhaustion
- Premature fatigue
- Poor decision making which can lead to accidents
- Heat stroke

The effects of heat stress can be brought on by:

- Steady hard physical work (hot or cold weather) - *the major source of heat stress*
- Hot weather - high air temperature, sun
- Radiant heat from the fire

The body's temperature rises normally during hard physical work but is controlled mainly by cooling through the evaporation of sweat from the skin. The harder the work the higher the body temperature and the greater the sweating. The body temperature is controlled by adjustments in sweating over a wide range of environmental conditions. As the environment gets hotter there are added loads on the blood circulation and there may be a further rise in body temperature. The sweat lost in cooling will result in dehydration unless replaced by drinking water.

The type of clothing worn will also impact significantly on heat stress. Protective clothing has both advantages and disadvantages. It blocks radiant heat, but also reduces the evaporation of sweat from the skin.

# Minimising heat stress

## *Behave Sensibly*

In bush firefighting situations it is essential to remain as effective as possible, often for many hours. A significant number of heat stress cases arise from the firefighter's own behaviour. Sensible behaviour is the first line of defence against premature fatigue and heat illness.

By far the greatest heat load arises from physical work. Avoid overheating by:-

- Drinking water frequently
- Sensible work pacing
- Walking not running
- Adopting a comfortable conservative pace on the fire line
- Sharing heavy work loads, such as dragging hose line or crew rotation
- Keeping environmental heat loads as low as possible
- Working at a comfortable distance from the fire
- Wearing appropriate clothing
- Reducing dehydration by regular drinking



## ***Drink Plenty***

Avoiding or minimising dehydration by frequent water intake is the single most important method of maintaining good function on the fireground.

Sweat losses on the fireground usually exceed **one litre per hour** and will rapidly lead to dehydration, resulting in premature fatigue and eventually heat exhaustion.

Sweat must be replaced by frequent **water** intake in small amounts. Avoid consuming large volumes of water at the one time.

## ***Water is the best choice***

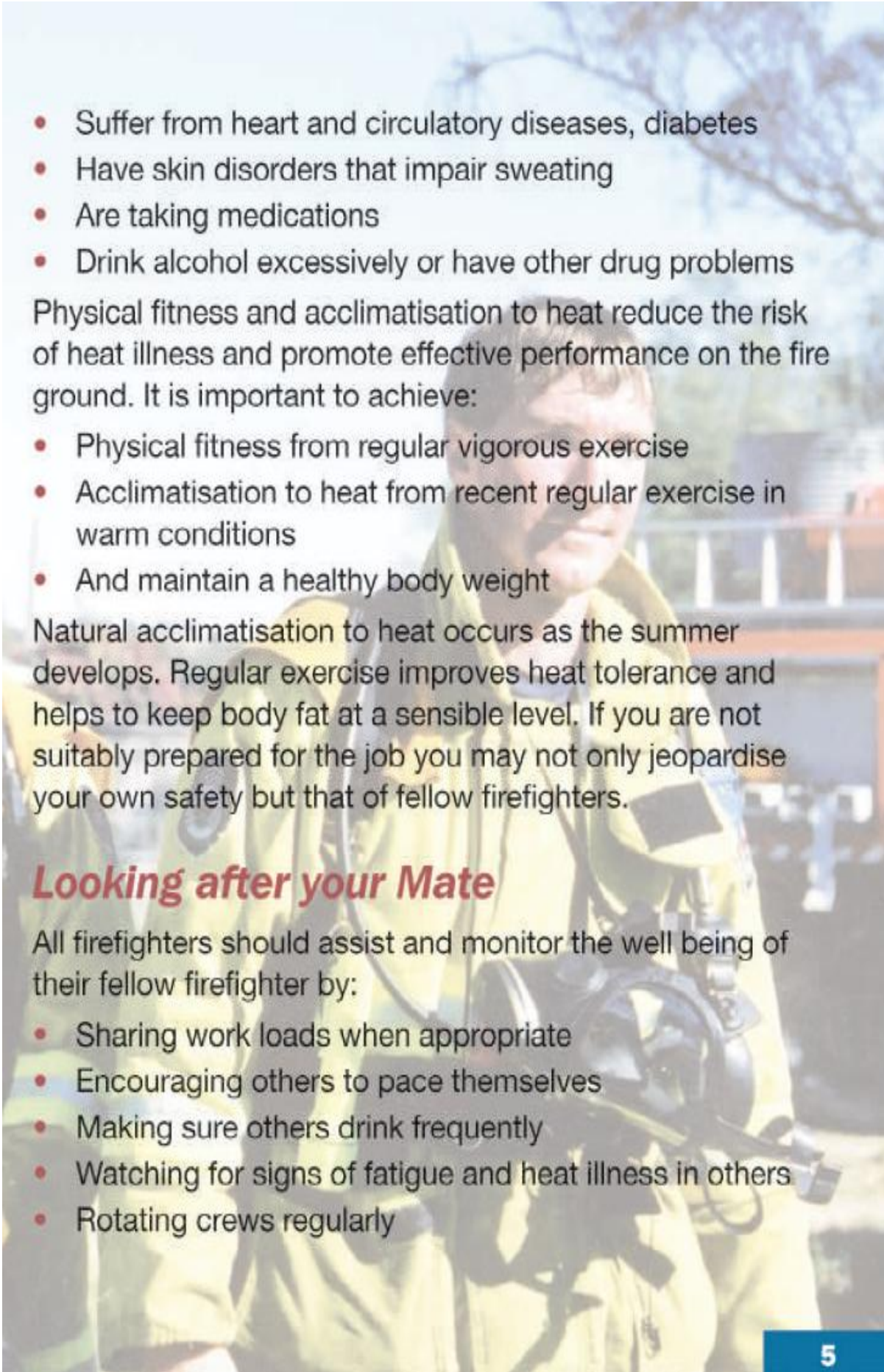
- Increase your body fluid levels before work commences, particularly in hot conditions
- Drink **water** frequently (at least 150-200ml every 10 - 15 minutes)
- Do not let thirst dictate when you drink
- Drink in excess of thirst
- Ensure clean supply of water is available
- Do not drink alcohol as it dehydrates the body
- Avoid excessive amounts of tea or coffee as both tend to increase dehydration

## ***Be Prepared***

Work on the fire ground demands good health and fitness.

The risk of heat illness is greatly increased in firefighters who:

- Are overweight and do not undertake regular exercise

- 
- Suffer from heart and circulatory diseases, diabetes
  - Have skin disorders that impair sweating
  - Are taking medications
  - Drink alcohol excessively or have other drug problems

Physical fitness and acclimatisation to heat reduce the risk of heat illness and promote effective performance on the fire ground. It is important to achieve:

- Physical fitness from regular vigorous exercise
- Acclimatisation to heat from recent regular exercise in warm conditions
- And maintain a healthy body weight

Natural acclimatisation to heat occurs as the summer develops. Regular exercise improves heat tolerance and helps to keep body fat at a sensible level. If you are not suitably prepared for the job you may not only jeopardise your own safety but that of fellow firefighters.

### ***Looking after your Mate***

All firefighters should assist and monitor the well being of their fellow firefighter by:

- Sharing work loads when appropriate
- Encouraging others to pace themselves
- Making sure others drink frequently
- Watching for signs of fatigue and heat illness in others
- Rotating crews regularly

# Protective Clothing

## *Dress Properly for Wildfires*

To reduce radiant heat load on the body, loose fitting RFS wildland jacket and pants should be worn with sleeves rolled down.

When not working close to the fire, open up your jacket to encourage cooling. Trouser legs should be worn outside the boots so that the cinders do not get inside the boot and cause burns to the feet. Leaving the pants legs open at the bottom also assists in the ventilation process between the material and the wearer. This assists in the reduction of metabolic heat build up.

If you are affected by radiant heat, step back in to a cooler, more comfortable environment.

The RFS personal protective clothing provided for rural firefighting has been selected to provide an appropriate level of protection in wildfire conditions where firefighters are working vigorously and generating a great deal of heat. The design of the RFS wildfire jacket incorporates side pleat vents which allow this heat to escape.

# Heat Illness

## *If you feel ill*

The heat illnesses most likely to affect firefighters are:

- Heat Exhaustion
- Heat Stroke

Heat exhaustion can be reasonably common on the fire ground and if ignored may lead to heat stroke. Heat stroke is an extremely dangerous condition and can be fatal.

This condition occurs when the body temperature control mechanism fails, due to excessive heat load and fluid loss.



## **Symptoms**

The symptoms of these conditions are similar and may occur separately or in combination.

Initial symptoms are faintness, light headedness, dizziness, headache and nausea.

These symptoms should be treated immediately. In more serious cases other signs and symptoms may occur that indicate incipient heat stroke, i.e., staggering, loss of co-ordination, odd inappropriate or aggressive behaviour, denial of trouble, resistance to assistance, collapse and/or convulsions.



The heat illness victim usually has a rapid pulse, shallow sighing breathing, hot dry skin with no apparent sweating. It should also be noted that in some circumstances sweating may continue with the skins cold and clammy.

Any of these may occur quite suddenly and must be treated seriously and immediately.

### ***Heat Exhaustion***

- Consequence of being hot and dehydrated
- Recovery usually rapid with cooling down and drinking water

### ***Heat Stroke***

- Dangerously high body temperature
- Due to loss of body temperature control
- Dramatic symptoms and signs can occur quite suddenly
- Life threatening medical emergency
- Immediate and sustained vigorous first aid treatment (i.e. cooling) is essential

# First Aid Treatment

## *Cool for recovery*

Early recognition of the symptoms of heat illness and its treatment is vital, to reduce the potential for a more serious heat illness.

Any firefighter who feels excessively fatigued or unwell or any firefighter who is noticed by others to be affected by heat illness should:

- Stop work
- Move to a cooler place, in the shade with a breeze
- Remove as much clothing as reasonable
- Sit or lie down. If feeling faint, lie with legs elevated
- Drink plenty of fluids (preferably water)
- Sponge skin with water and fan to increase evaporative cooling

Where the victim is incapacitated they should be assisted with the above treatment.

Should they not recover quickly, continue to deteriorate or are unconscious they should be regarded as heat stroke victims. Emergency medical assistance should be sought immediately.

People who are unconscious should be placed in the “coma position”.

Active cooling, by sponging skin and fanning should continue while waiting for medical advice and be maintained while the victim is transported to hospital.

If available air conditioned vehicle cabins are ideal to assist the cooling process.

Early treatment is vital to reduce the effects of heat related illnesses.

Firefighter who suffer from heat illness or heat exhaustion should be removed from the fireground, even though they may appear to have recovered.

