A Brief Guidance For The Protection Of Employees Against The Effects Of Heat Stress For Outdoor Works

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FOREWORD

Occupational exposure to heat can result in injuries, disease, reduced productivity, and death. In addition, there is evidence that heat stress is an increasing problem for many workers, particularly those located in densely populated areas closer to the equator where temperatures are expected to rise in relation to the changing climate. This guidelines describes what you, as an employer, may need to do to protect your employees from heat stress in the workplace. It will also be useful to employees and their safety representatives. It tells you about the risks to the body from overheating when working in hot environments and gives practical guidance on how to avoid it; personal protective equipment and clothing that can be used to control heat stress.

In many jobs, heat stress is an issue all year round but this information also applies during the hot summer months where there may be an increased risk of heat stress for some workers who works outdoor. The employer and your employees must be aware of how to work safely in heat, the factors that can lead to heat stress, and how to reduce the risk of it occurring.

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Introduction

At times, workers may be required to work in hot environments for long periods. When the human body is unable to maintain a normal temperature, heat illnesses can occur and may result in death. It is also important to consider that hot working environments may exist indoors. Workers who are exposed to extreme heat or work in hot environments indoors or outdoors, or even those engaged in strenuous physical activities may be at risk for heat stress. Exposure to extreme heat can result in occupational illnesses caused by heat stress, including heat stroke, heat exhaustion, heat syncope, heat cramps, heat rashes, or death. Heat can also increase workers' risk of injuries, as it may result in sweaty palms, fogged-up safety glasses, dizziness, and may reduce brain function responsible for reasoning ability, creating additional hazards. Other heat injuries, such as burns, may occur as a result of contact with hot surfaces, steam, or fire.

The current hot weather is expected to continue and working in Malaysia's hot and humid weather can put workers at an increased risk of heat stress, especially so for workers who are not acclimatized to working in the hot weather. Heat stress, if not well controlled, puts workers at risk of developing heat stroke, an acute life-threatening condition that can be fatal if not promptly treated. Under the Occupational Safety & Health Act (OSHA) 1994, employers have a duty to protect their employees' safety and health at work. Hence, it is duty upon employers to carry out a proper risk assessment and to implement appropriate measures, including specifying when to stop work, so as to ensure that risks identified are minimised or mitigated.

What is Heat Stress?

Heat stress occurs when the body's means of controlling its internal temperature starts to fail. Air temperature, work rate, humidity and work clothing are all factors which can cause heat stress. It may not be obvious to someone passing through the workplace that there is a risk of heat stress.

How Does The Body React To Heat?

The human body functions best within a narrow range of internal temperature. This "core" temperature varies from 36°C to 38°C. A worker performing heavy work in a hot environment builds up body heat. To get rid of excess heat and keep internal temperature below 38°C, the body uses two cooling mechanisms:

1. The heart rate increases to move blood—and heat— from heart, lungs, and other vital organs to the skin;
2. Sweating increases to help cool blood and body. Evaporation of sweat is the most important way the body gets rid of excess heat.

When the body's cooling mechanisms work well, core temperature drops or stabilizes at a safe level (around 37°C). But when too much sweat is lost through heavy labour or working under hot, humid conditions, the body doesn't have enough water left to cool itself. The result is dehydration. Core temperature rises above 38°C. A series of heat-related illnesses, or heat stress disorders, can then develop.

How Can We Recognize Heat Stress Disorders?

Heat stress disorders range from minor discomforts to life-threatening conditions:

a. heat rash
b. heat cramps
c. heat exhaustion
d. heat stroke.

a. Heat Rash

Heat Rash is the most common problem in hot work environments. Heat rash is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash may appear on the neck, upper chest, groin, under the breasts and elbow creases.

Treatment: The best treatment for heat rash is to provide a cooler, less humid work environment. In most cases, heat rashes disappear a few days after heat exposure ceases. If the skin is not cleaned frequently enough the rash may become infected.

b. Heat Cramps

Heat Cramps are muscle pains usually caused by the loss of body salts and fluid during sweating. These are spasms in larger muscles—usually back, leg, and arm. Cramping creates hard painful lumps within the muscles.

Treatment:

- Stretch and massage muscles;
- Replace salt by drinking commercially available carbohydrate/ electrolyte (e.g. sports drinks) replacement fluids.

c. Heat Exhaustion

Heat Exhaustion is the next most serious heat related health problem. Heat exhaustion occurs when the body can no longer keep blood flowing to supply vital organs and send blood to the skin to reduce body temperature at the same time. Signs and symptoms of heat exhaustion includes:

- weakness
- difficulty continuing work
- headache
- breathlessness
- nausea or vomiting
- feeling faint or actually fainting.

Treatment—heat exhaustion casualties respond quickly to prompt first aid. If not treated promptly, heat exhaustion can lead to heat stroke—a medical emergency.

- Call for medical help from nearest hospital or clinic
- Help the casualty to cool off by
    - resting in a cool place
    - drinking cool water
    - removing unnecessary clothing
    - loosening clothing
    - showering or sponging with cool water.

It takes 30 minutes at least to cool the body down once a worker becomes overheated and suffers heat exhaustion. Workers with signs or symptoms of heat exhaustion should be taken to a clinic or hospital for medical evaluation and treatment. Make sure that someone stays with the worker until help arrives.

d. Heat Stroke

Heat stroke occurs when the body can no longer cool itself and body temperature rises to critical levels.

WARNING: Heat stroke requires immediate medical attention.

The primary signs and symptoms of heat stroke are:

- confusion
- irrational behaviour
- loss of consciousness
- convulsions
- lack of sweating
- hot, dry skin
- abnormally high body temperature—for example, 41°C.

Treatment: For any worker showing signs or symptoms of heat stroke:

- Call for medical help from nearest hospital or clinic.
- Provide immediate, aggressive, general cooling:
  - Immerse casualty in tub of cool water or
  - place in cool shower or
  - spray with cool water from a hose.
  - Wrap casualty in cool, wet sheets and fan rapidly.
- Transport casualty to hospital.
- Do not give anything by mouth to an unconscious casualty.

WARNING

- Heat stroke can be fatal even after first aid is administered. Anyone suspected of suffering from heat stroke should not be sent home or left unattended unless that action has been approved by a physician.
- If in doubt as to what type of heat-related disorder the worker is suffering from, call for medical assistance.

Occupational Factors that May Contribute to Heat Stress?

- High temperature and humidity
- Low fluid consumption
- Direct sun exposure (with no shade) or extreme heat
- Limited air movement (no breeze or wind)
- Physical exertion
- Use of bulky protective clothing and equipment

Figure 1: Examples of heat-related illness risk factors

Typical Example of A Heat Stress Situation?

Someone wearing protective clothing and performing heavy work in hot and humid conditions could be at risk of heat stress because:

- Sweat evaporation is restricted by the type of clothing and the humidity of the environment;
- Heat will be produced within the body due to the work rate and if insufficient heat is lost deep body temperature will rise;
- As deep body temperature rises the body reacts by increasing the amount of sweat produced, which may lead to dehydration;
- Heart rate also increases which puts additional strain on the body;
- If the body is gaining more heat than it can lose then the deep body temperature will continue to rise. Eventually it reaches a point where the body's control mechanisms start to fail. The symptoms will get worse the longer someone remains working in the same conditions.

What Do I Need To Look At In The Risk Assessment?

When carrying out your risk assessment, the major factors you need to consider are:

- work rate – the harder someone works the more body heat they generate;
- working climate – this includes air temperature, humidity, air movement and effects of working near a heat source;
- worker's clothing and respiratory protective equipment – may mean that sweating and other means of the body regulating its temperature are less effective;
- worker's age, build and medical factors – may affect an individual's tolerance.

Firstly, talk to the workers involved and their safety representatives e.g. safety and health officer to see whether they are suffering early signs of heat stress. If there is a problem, you may need to get help from others who are more experienced in determining the risk from hot environments, e.g. occupational hygienists or occupational health professionals.

How Can Heat Stress Be Controlled?

Heat stress can be controlled through engineering, work procedures and training. Controls will:

a. **Protect Health:** Illness can be prevented or treated while symptoms are still mild.
b. **Improve Safety:** Workers are less liable to develop a heat-related illness and have an accident. Heat stress often creeps up without warning. Many heat-induced accidents are caused by sudden loss of consciousness.
c. **Increase Productivity:** Workers feel more comfortable and are likely to be more productive as a result.

Remove or reduce the sources of heat where possible by:

Engineering Controls

Engineering controls are the most effective means of preventing heat stress disorders and should be the first method of control. Engineering controls seek to provide a more comfortable workplace by using:

- reflective shields or physical barriers that reduce exposure to radiant heat;
- fans and other means to increase airflow in work areas;
- mechanical devices to reduce the amount of physical work.

Given the constantly changing nature of outdoor works, engineering controls are not usually feasible. Proper work procedures are therefore required to prevent heat stress disorders.

Work Procedures

The risks of working in hot environments can be diminished if employees and employers cooperate to help control heat stress.

Management

- Give workers frequent breaks in a cool area away from heat. The area should not be so cool that it causes cold shock—around 25°C is ideal.
- Increase air movement by using fans where possible. This encourages body cooling through the evaporation of sweat.
- Provide unlimited amounts of cool (not cold) drinking water conveniently located.

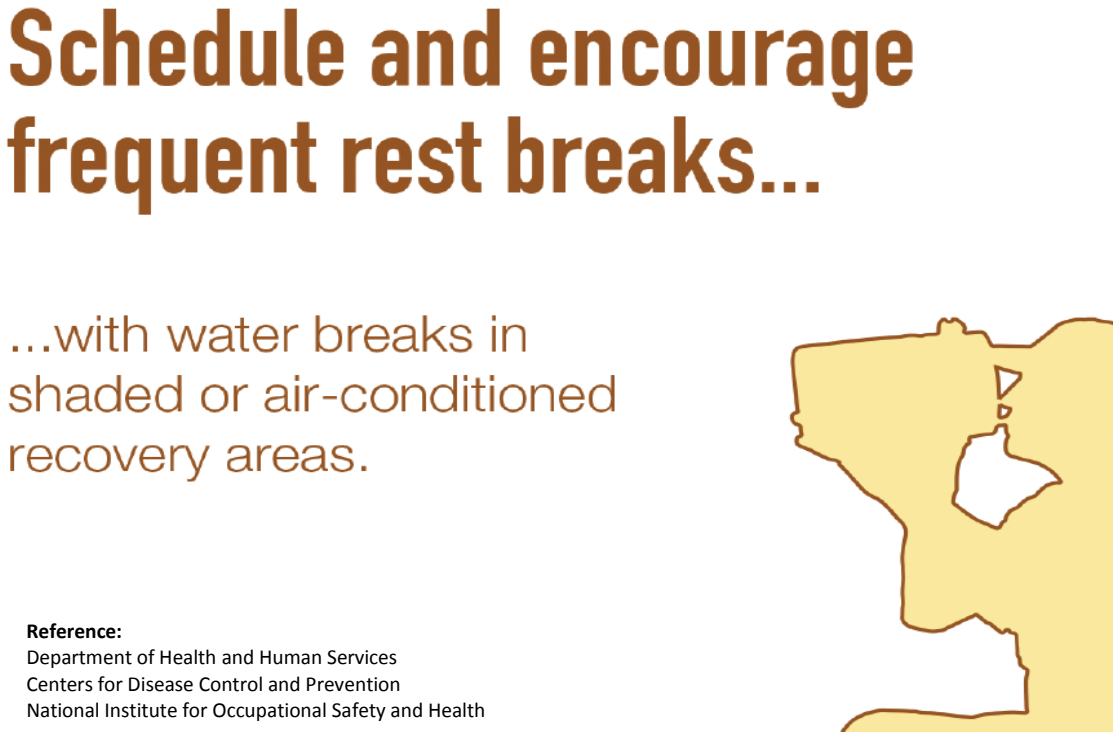


Figure 2: Schedule and Encourage Frequents Rest Breaks

- Allow sufficient time for workers to become acclimatized. Acclimatization is a physical change that allows the body to build tolerance to working in the heat. It occurs by gradually increasing workloads and exposure and taking frequent breaks for water and rest in the shade. A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such a program exposes employees to work in a hot environment for progressively longer periods.

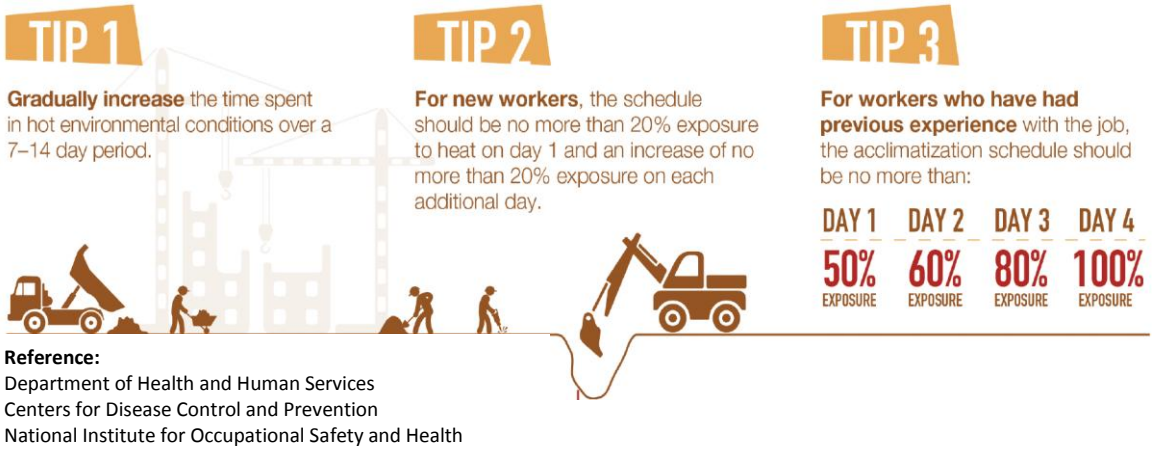


Figure 3: Develop an Acclimatization Plan

- Monitor the health of workers at risk. For example workers who must wear personal protective clothing and equipment that retains heat and restricts the evaporation of sweat.

Figure 4: Identify Suitable Personal Protective Equipment During Hot Environment

- Schedule hot jobs for the cooler part of the day e.g. schedule the more physically demanding work during the cooler times of day.
- Identify employees who are more susceptible to heat stress because of an illness, condition or medication that may contribute to the early onset of heat stress, e.g. pregnant women or those with heart conditions. You may need advice from an occupational health professional.

Figure 5: Identify Workers With Heat-Related Symptoms

- Consider the use of cooling vests containing ice packs or ice water to help rid bodies of excess heat.
- Emergency Planning and Response - have an emergency plan in place and communicate it to supervisors and workers.

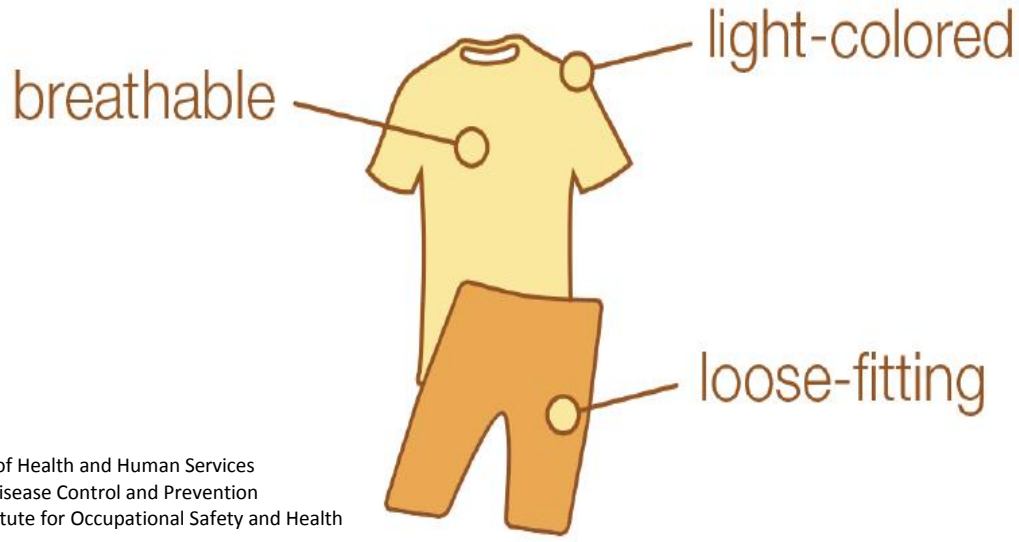
Training

Provide training for your workers, especially new and young employees. Heat stress training should cover the following components:

- knowledge of heat stress hazards
- recognition of risk factors, signs and symptoms
- awareness of first-aid procedures and potential health effects of heat stroke
- employee responsibilities in avoiding heat stress
- dangers of using alcohol and/or drugs (including prescription drugs) in hot work environments

Workers

- Wear light, loose clothing that permits the evaporation of sweat.



Reference:
Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Figure 6: Emphasize the Need of Appropriate Clothing

- Drink small amounts of water—8 ounces (250 ml)— every half hour or so. Don't wait until you're thirsty.

Figure 7: Encourage Workers to Drink Plenty of Fluids

- Avoid beverages such as tea, coffee, or beer that make you pass urine more frequently.
- Where personal PPE must be worn:
  - use the lightest weight clothing and respirators available;
  - wear light-colour garments that absorb less heat from the sun;
  - use PPE that allows sweat to evaporate.
- Avoid eating hot, heavy meals. They tend to increase internal body temperature by redirecting blood flow away from the skin to the digestive system.
- Don't take salt tablets unless a physician prescribes them. Natural body salts lost through sweating are easily replaced by a normal diet.

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