

Preventing Heat Stress at Work



About WorkSafeBC

At WorkSafeBC, we're dedicated to promoting safe and healthy workplaces across B.C. We partner with workers and employers to save lives and prevent injury, disease, and disability. When work-related injuries or diseases occur, we provide compensation and support injured workers in their recovery, rehabilitation, and safe return to work. We also provide no-fault insurance and work diligently to sustain our workers' compensation system for today and future generations. We're honoured to serve the workers and employers in our province.

Prevention Information Line and contact information

We provide information and assistance with health and safety issues in the workplace.

Call the information line 24 hours a day, 7 days a week to report unsafe working conditions, a serious incident, or a major chemical release. Your call can be made anonymously. We can provide assistance in almost any language.

If you have questions about workplace health and safety or the Occupational Health and Safety Regulation, call during our office hours (Monday to Friday, 8:05 a.m. to 4:30 p.m.) to speak to a WorkSafeBC officer.

If you're in the Lower Mainland, call 604.276.3100, or toll-free at 1.888.621.7233 (621:SAFE) in Canada.

Health and safety resources

You can find our health and safety resources at [worksafebc.com/forms-resources](https://www.worksafebc.com/forms-resources). Printed copies are available for some resources and can be ordered from [worksafebcstore.com](https://www.worksafebcstore.com).

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Introduction

Many jobs require working in hot environments, both outdoors and indoors. Working in the heat can affect the body's cooling system. If the body is unable to cool itself, a worker can experience heat stress. If heat stress is not recognized and treated in the early stages, more serious conditions called heat-related illnesses may quickly develop.

If workers are required to work in conditions that put them at risk of heat stress, employers must take steps to prevent heat-related illnesses. The risk of heat stress may be present year-round in work settings such as industrial bakeries, industrial laundries, boiler rooms, smelters, foundries, and cement manufacturing plants. During the hot summer months, the risk increases in indoor work settings without air conditioning and in most outdoor work settings. Workers exposed to hot environments must be trained to recognize the early signs and symptoms of heat stress in themselves and co-workers. Training must also include how to respond.

Whether you are a worker or an employer, this booklet contains information essential to health and safety. It provides a basic overview of:

- Risk factors that increase the chance of experiencing heat stress
- How to prevent heat stress
- How to recognize and treat heat-related illnesses

Note

Early symptoms of heat stress — such as excessive fatigue, lethargy, irritability, lack of coordination, and altered judgment — can result in serious incidents.

What is heat stress?

Human bodies naturally maintain temperatures between 36°C and 38°C. When body temperature rises above this range, the body responds to get rid of the excess heat. However, if the body continues to gain heat faster than it can get rid of it, body temperature increases and the person experiences heat stress. Health problems that result from heat stress are known as heat-related illnesses. These illnesses can occur in hot, humid environments and when the body loses too much fluid and salt as sweat.

Many variables contribute to heat stress. To prevent it, employers must assess the risk of heat stress and put in place effective control measures. Workers at risk of heat-related illnesses must follow control measures and know what to do to prevent these illnesses in themselves or their co-workers.

Note

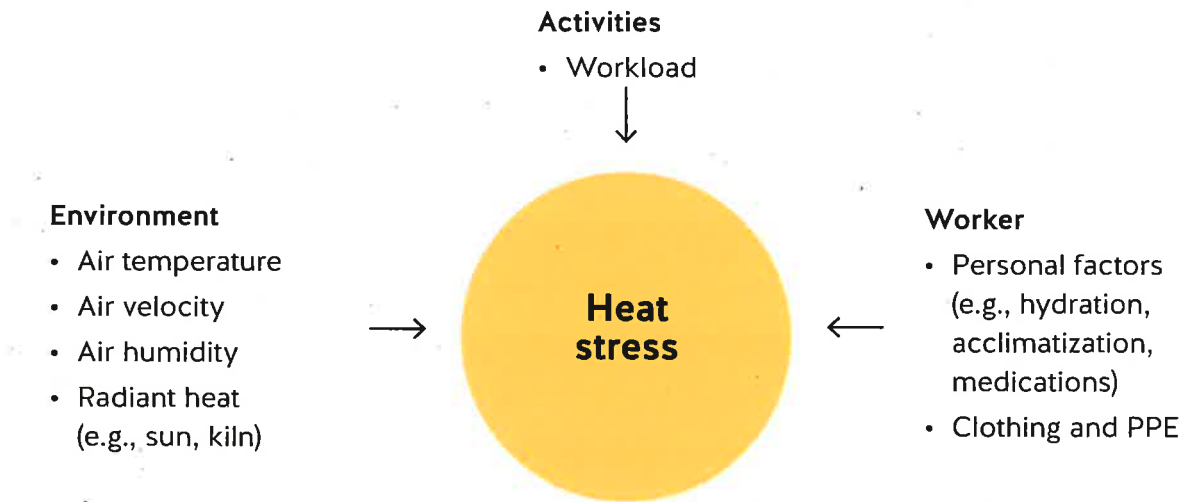
If the body is unable to cool itself, a worker can experience heat stress.

Primary factors contributing to heat stress

The body can gain heat in two ways: It can absorb heat from the environment, and it can generate heat itself through work activity. The environment and work activity are both important sources of heat. Sometimes the work activity itself can be the main source of heat stress. Cases of heat stress have been reported when the air temperature was relatively low but the physical activity level of the work was very high.

In addition, the amount of heat stress a worker is exposed to may be affected by factors such as the following:

- Personal factors (e.g., hydration, acclimatization, medications, age, weight) may decrease the body's ability to respond to heat stress.
- Clothing and personal protective equipment (PPE) worn by the worker may inhibit cooling.



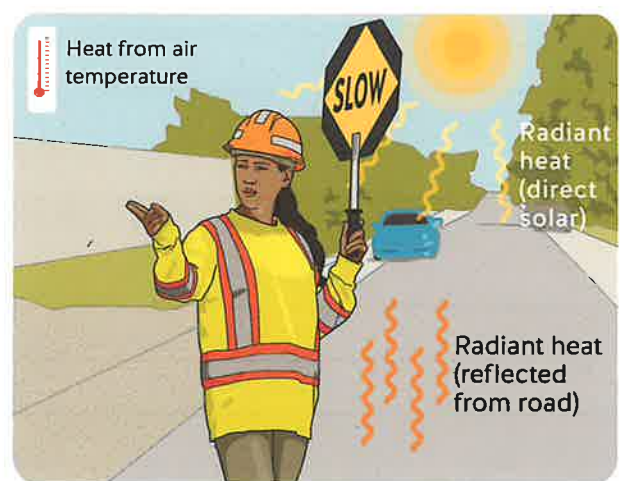
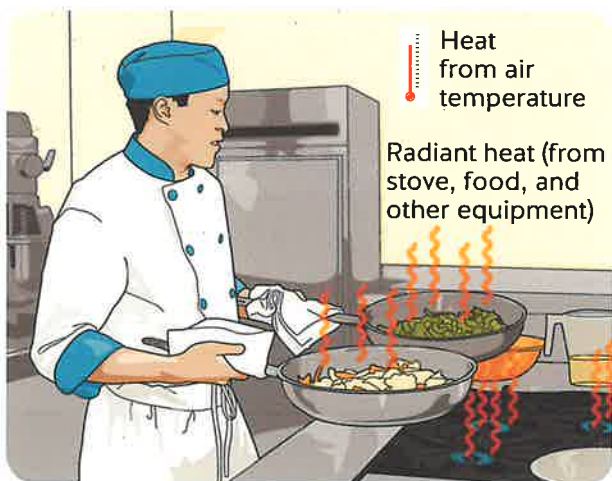
Factors that contribute to heat stress

Environment

The amount of heat gained from the environment (external heat) depends on the:

- Surrounding air temperature
- Humidity
- Air velocity
- Amount of radiant heat

Examples of radiant heat sources include kilns, smelters, boilers, ovens, fires, and sunlight. Added heat from radiant sources can cause overheating even when the air temperature is not high.



Examples of heat sources in the environment.

Activities

The amount of heat generated by a worker (internal heat) depends on the workload (the level of physical activity). The following table gives some examples of light, moderate, heavy, and very heavy workloads.

Workload	Activity	Examples
Light	• Sitting, with moderate arm and leg movement • Standing, doing light work, with mostly arm movement • Casual walking	• Desk work, typing, driving • Assembly-line work • Supervising a worksite
Moderate	• Brisk walking • Sitting, with vigorous arm and leg movement • Standing, doing light to moderate work, with some walking • Moderate lifting or pushing	• Delivering mail • Driving heavy machinery, industrial cleaning • Picking fruits and vegetables, cooking food in a commercial kitchen • Warehouse work, loading and unloading trucks
Heavy	• Some construction tasks • Intermittent heavy lifting, pushing, or pulling	• Sawing, planing, roofing • Climbing ladders • Restocking shelves, asbestos removal
Very heavy	• Some construction tasks • Very intense activity at fast to maximum pace • Climbing stairs with heavy gear	• Intense digging or shovelling, sledgehammer work • Stone or brick masonry • Firefighting

Note

Workload is only one factor to consider. Take into account heat from the environment when determining the risk of heat stress.

Worker

Personal factors

People respond differently to heat. As a worker, it is important to know the common personal factors that may increase your chance of developing heat stress. These factors include the following:

- **Dehydration.** Drinking enough fluids is necessary for the body to function properly, especially in a hot environment.
- **Poor physical fitness.** Physically fit people are generally better able to cope with heat stress and less likely to develop heat-related illnesses.
- **Obesity.** Excess fat provides increased insulation, which reduces heat loss. People with excess weight may also generate more heat during activity.
- **Increased age.** Older workers are generally less able to cope with heat. In older adults, heart function becomes less efficient. Sweating starts later and occurs at a slower rate.
- **Pregnancy.** Pregnant workers are at higher risk of heat stress because their bodies have to work harder to cool down. These workers are also at higher risk of dehydration.
- **Pre-existing medical conditions or treatments.** Some common medical conditions and treatments can decrease a person's ability to cope with heat stress. For example, heart problems and treatments such as low-salt (low-sodium) diets weaken the body's ability to efficiently remove excess heat. Heart disease can also be aggravated by heat. Other conditions that may increase the risk of heat-related illnesses include diabetes mellitus, cystic fibrosis, and hyperthyroidism. If you're not sure whether you are medically able to work in a hot environment or to do heavy work, seek medical advice from your doctor or an occupational health professional.
- **Short-term disorders and minor illnesses.** Feverish illnesses, diarrhea, and vomiting can all cause excess loss of fluids. This may decrease a person's ability to cope with heat. If you feel unwell, you should not work in hot conditions until you feel well again. Sleep deprivation can also increase the risk of heat stress.
- **Chronic skin disorders.** Rashes, dermatitis, healed burns, and other skin conditions that involve large skin surface areas may limit the body's ability to sweat properly. Skin problems can also worsen when exposed to heat.
- **Use of medications, street drugs, and alcohol.** Some substances, such as the following, may increase the risk of heat-related illnesses:
 - Medications (e.g., antidepressants, antihistamines, antipsychotics, diuretics). Some medications can affect the ability to feel heat or to sweat. If you work in a hot environment, discuss the potential side effects of your medications with your doctor.

- Unregulated substances (e.g., opioids, methamphetamine, cocaine). Some street drugs increase body temperature and decrease the ability to lose or feel heat.
- Alcohol. Alcohol intake increases water loss and can cause even acclimatized workers to become dehydrated.
- **Previous heat stroke.** Workers who have previously suffered from heat stroke are at increased risk for recurrence.
- **Lack of acclimatization.** Getting the body accustomed to a hot working environment is known as acclimatization. A person who regularly works in a hot environment has a lower risk of developing heat-related illnesses than a person who works in that environment only occasionally. Acclimatization is discussed further on pages 16–17.

Clothing and PPE

Worker clothing may contribute to heat stress by trapping heat and sweat. This can inhibit the body from cooling itself. Workers who wear the following types of clothing are at higher risk:

- Encapsulation suits
- Impermeable or thermally insulating clothing
- Multiple layers of clothing (e.g., coveralls over work clothes)

Clothing may also limit the methods available to measure heat stress.

How the body removes heat

The body has two main ways to get rid of excess heat: by increasing blood flow to the skin and by sweating. If these cooling mechanisms are disrupted, the risk of heat-related illnesses increases.

Increasing blood flow

The bloodstream takes excess body heat to the surface of the body — that is, to the skin. When the air is cooler than the skin, heat is transferred to the surrounding air. This process is known as simple heat exchange by convection. Heart rate and blood flow increase as excess body heat increases. Increased blood flow to the skin often causes redness in the face or a flushed appearance.

In hot weather, shaded areas can provide much cooler air than those in direct sun. Working or resting in shaded areas allows the body to get rid of excess heat by transferring it to the surrounding air. If a person is very hot, taking a cool shower can further speed cooling by transferring body heat to the cooler water.

At air temperatures over 35°C, when the air is hotter than the skin, heat will not be transferred to the surrounding air. In such cases, sweating becomes the most effective way for the body to cool itself.

Working in temperatures above 35°C

A thin layer of air is always trapped next to the skin. When the air temperature is higher than the skin temperature (skin temperature is generally about 35°C), this trapped layer of air protects the skin from direct contact with the hotter air in the environment. Airflow from fans or wind at these high temperatures can strip away this protective layer of air and cause the body to be heated by the warmer air. This is known as convective heating. (This is basically how convection ovens work to cook food faster.) Wearing a light layer of loose-fitting clothing helps maintain the protective layer of air. This is why people in hot desert climates cover themselves in clothing from head to toe.

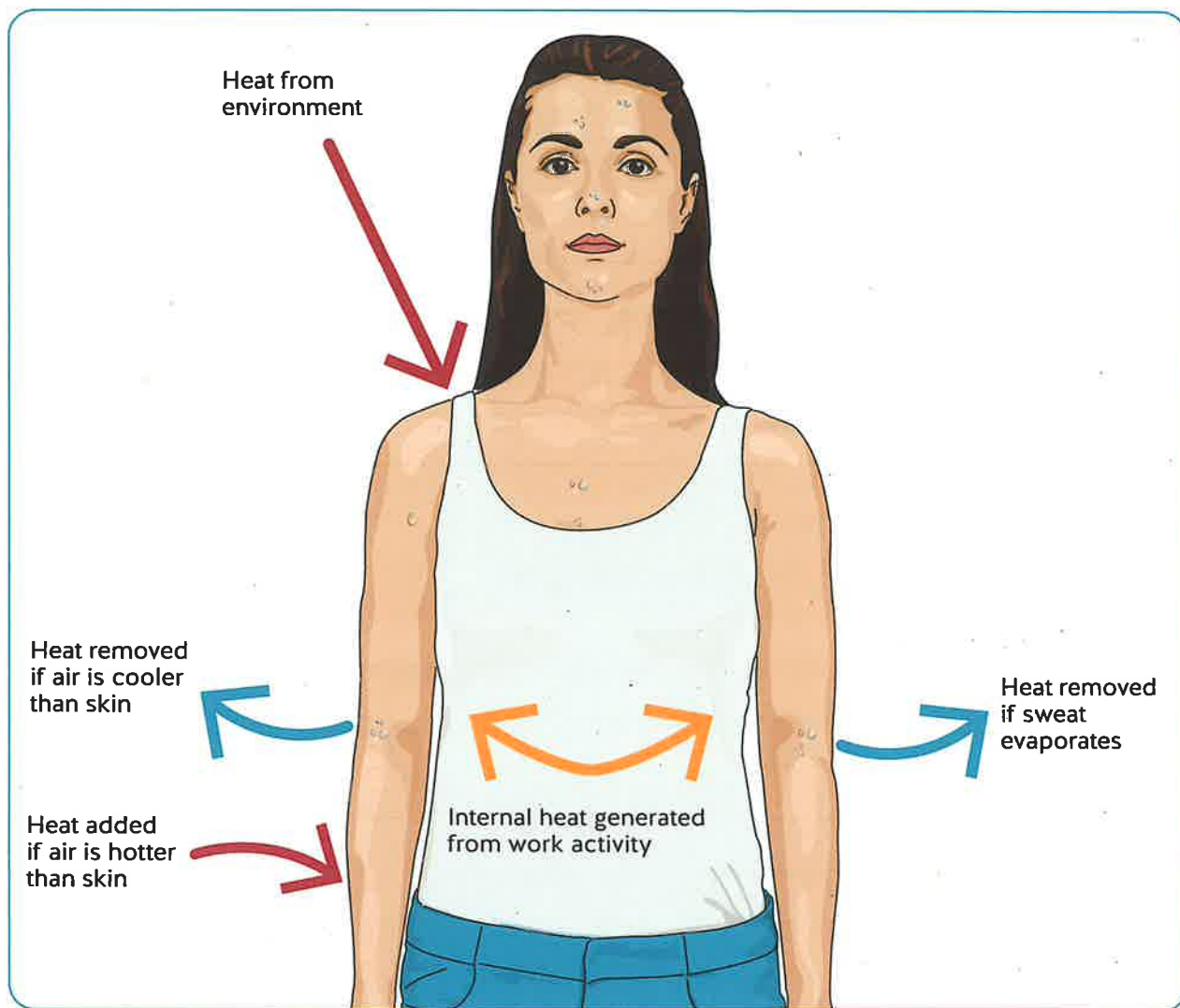
Sweating

When the body gets hot, the brain tells the body to sweat. Sweating itself does not cool the body. The cooling effect occurs when sweat evaporates from the skin.

The amount of sweat that evaporates determines the amount of cooling that occurs. Any factor that affects sweating or the evaporation of sweat will also affect the body's ability to cool itself by sweating. A worker's ability to sweat can be reduced by factors such as the following:

- Not drinking enough fluids
- Wearing non-breathable clothing or equipment that limits sweating
- Not being acclimatized to a hot environment
- Having a skin condition that limits sweating
- Using a medication that limits sweating

Evaporation of sweat is affected by air humidity, air velocity, and the type of clothing worn. Low humidity and high air velocity increase evaporation, whereas high humidity and protective clothing are likely to reduce evaporation. Although protective clothing protects workers from other hazards, it can contribute to heat stress.



The three main sources of heat and the two main ways heat is removed from the body.

Preventing heat stress

Employer responsibilities

Employers must identify work activities and work areas where a worker is, or may be, exposed to environmental conditions that could cause heat-related illnesses. If a worker is exposed to such conditions, employers must conduct a heat stress assessment and develop and implement a heat stress exposure control plan (ECP). As part of this plan, employers, supervisors, and workers must have a basic understanding of how heat affects the body if they are to prevent heat stress.

In the Regulation

For more information on employer responsibilities when it comes to heat exposure, see:

- **Sections 7.26 to 7.32** of the OHS Regulation
- **Guidelines G7.27 to G7.31** of the OHS Guidelines

Here are some examples of steps that employers can take as part of a heat stress ECP:

- Determine whether it's necessary to work in hot conditions.
- Monitor environmental conditions.
- Modify facilities, equipment, and processes to reduce heat exposure.
- Assign workers to work in pairs or groups where feasible.
- Change work practices and policies to limit the risk. For example, consider whether work can be done during cooler parts of the day.
- Determine appropriate work-rest cycles. When a worker feels ill, it may be too late.
- Rotate work activities or use additional workers to reduce exposure.
- Establish cooling areas with shade and water.
- Educate and train workers at risk of heat stress. Workers need to know how to recognize signs and symptoms of the early stages of heat stress and how to respond.
- Ensure that adequate first aid coverage and emergency procedures are in place.

If a heat warning has been declared in your region, take steps to protect workers. Employers may need to consider stopping work if they cannot protect workers from the risk of heat-related illnesses.

Note

Heat warnings are issued for vulnerable populations and may not reflect occupational exposure limits. Heat stress assessments must be performed to ensure worker safety.

Identify areas, tasks, or occupations that may be at risk

The first step to reduce the risk of heat stress is to determine the areas, tasks, or occupations that put workers at risk of heat-related illnesses. Such conditions can develop in areas with temperatures over 23°C (summer or winter) and where any of the following factors are also present:

- Areas with high humidity.
- Jobs or tasks that require moderate to high exertion.
- Jobs that require workers to wear protective clothing over most of their bodies and heads. Some types of protective clothing (e.g., impermeable or encapsulating suits) can inhibit the body's ability to cool itself through sweating.
- Areas, tasks, or occupations that have been identified as high risk for heat-related illnesses. Identification can include review of incident investigation reports, first aid treatment record books, and records of injury and illness.
- Areas, tasks, or occupations where workers have expressed concern about heat stress.

Here are some examples of workplaces where heat stress is likely to pose a risk to workers:

- Locations where there is extremely hot material or equipment. Examples include work in foundries, sawmills, pulp mills, or smelters, and near cement kilns or furnaces.
- Outdoor occupations where summer sunshine, radiant heat, and physical demands may contribute to heat stress. Examples include construction, road repair, agriculture, and motion picture location shooting.
- Locations where high humidity and radiant heat may contribute to heat stress. Examples include laundries, restaurant kitchens, bakeries, and canneries.
- Occupations such as asbestos abatement, where a combination of heavy physical demands and impermeable PPE may increase heat stress to intolerable levels.

During extreme heat emergencies, heat stress poses a risk in indoor workplaces without air conditioning.

Conduct a heat stress assessment

Once you have identified the occupations, tasks, or areas that put workers at risk of heat-related illnesses, conduct a heat stress assessment. This involves evaluating risk factors that contribute

to heat stress (i.e., environment, activities, and worker). The specific risk factors at the worksite play a key role in determining the appropriate method of measuring heat stress.

Methods for measuring heat stress include the following:

- Directly measuring body temperature
- Measuring other physiological responses, such as heart rate
- Measuring environmental factors (air temperature, air humidity, air velocity, and radiant heat)

Heat stress screening tool

Our **Heat stress screening tool** can help employers determine an appropriate method for measuring heat stress. For many employers, it can help with evaluating the risk of heat stress once environmental measurements have been taken at the workplace. However, the screening tool won't necessarily apply to all work situations.

If you can't use the screening tool, you'll need to evaluate the risk of heat stress in your workplace using one of the four methods described in our publication **Methods for Measuring Heat Strain or Stress**.

Note

Personal factors may affect a worker's response to heat. Symptoms of heat stress should never be ignored, even if heat stress screening criteria are not met.

Using environmental factors to measure heat stress

Most employers can use environmental factors to evaluate the risk of heat stress in the workplace. WorkSafeBC accepts several environmental methods for measuring heat stress. The most common methods include the following:

- The wet bulb globe temperature (WBGT) method. It uses a WBGT meter to measure air temperature, air velocity, air humidity, and radiant heat. This is the screening method used in the ACGIH Standard.
- The Humidex method. It uses a dry bulb thermometer and a hygrometer to measure temperature and relative humidity. You can also use a digital thermo-hygrometer, a device that is readily available at many hardware stores.

For more information on heat stress assessment methods and their limitations, see our publication **Methods for Measuring Heat Strain or Stress** and **G7.29-1** of the OHS Guidelines.

Limitations of household thermometers

Household thermometers that do not also measure air humidity can't be used to assess the risk of heat stress unless they are combined with physiological monitoring. However, don't ignore the readings on household thermometers. A high temperature reading may point toward the need for a heat stress ECP.

Develop and implement a heat stress exposure control plan

If a heat stress assessment determines that workers are exposed to conditions that put them at risk of heat-related illnesses, or if workers are exhibiting symptoms of heat stress, the employer must develop and implement a heat stress ECP.

An effective heat stress ECP includes the following elements:

- Statement of purpose and responsibilities
- Risk identification, assessment, and control
- Education and training
- Written work procedures, when required
- Hygiene facilities and decontamination procedures, when required
- Health monitoring, when required
- Documentation, when required

For more information on developing a heat stress ECP, see [G7.29-5](#) of the OHS Guidelines.

Note

Depending on the method used for assessing heat stress, additional elements (e.g., health monitoring and other documentation) may also be required as part of the ECP.

Educate and train workers

Employers must provide adequate training and education to all workers at risk of heat stress, their immediate co-workers, and their supervisors. Training should include the following:

- Types of heat-related disorders (heat cramps, heat exhaustion, heat stroke)
- Signs and symptoms of heat-related disorders
- Personal factors that increase the risk

- Potential health effects of excessive heat stress
- First aid procedures
- The process for investigating reports of heat stress
- When heat-related illnesses must be reported to WorkSafeBC
- Safe work procedures and precautions, including the importance of hydration and early reporting of signs or symptoms
- The purpose and a description of the heat stress exposure control plan and ongoing heat-stress monitoring
- Proper use of protective clothing and equipment, if required

Workers have the right to refuse unsafe work

As a worker, you have the right and responsibility to refuse unsafe work. If heat stress is not being adequately controlled, and you believe your health is at risk, report it to your employer. Follow the steps outlined in [sections 3.12 to 3.13](#) of the Regulation and the [related guidelines](#). Employers must not reassign work that has been refused, except in accordance with [section 3.12.1](#) of the Regulation.

It is important for workers to recognize the signs and symptoms of the early stages of heat stress. If workers are removed from a hot environment in the early stages of heat stress, more serious illness can be avoided. Workers should also be able to recognize the range of signs and symptoms for different stages of heat stress. However, a decrease in alertness is one of the early symptoms. Workers may not be able to recognize the development of heat stress in themselves.

Provide drinking water

The body naturally sweats to cool itself. Sweating can use up a significant amount of fluid. This fluid must be replaced continuously throughout the workday. If fluid is not regularly replaced, workers will become dehydrated, increasing their risk for heat stress.

Employers are required to provide an adequate supply of cool drinking water close to the work area for workers exposed to heat. Suitable drinks include tap water, mineral water, and fruit juices. Fluids do not need to be iced. Cooled drinks between 10°C and 15°C are adequate. Fluids that contain caffeine or alcohol are not suitable because they increase dehydration. Eating fresh fruits will also help replace lost fluids and electrolytes.

It is important to drink water (without added salt) before, during, and after work in a hot environment. Workers should drink at least 500 mL (2 cups) of water before starting work in a hot environment and 250 mL every 20 minutes throughout the workday. In very hot environments or where sweating is profuse, workers may need even more water. Workers should not wait until

they are thirsty to replace fluids. Supervisors should ensure cool potable water is available and encourage workers to drink it.

The average North American diet usually contains enough salt for most work conditions, but working in hot environments can cause salt deficiencies. To replace the salt lost by sweating, workers can eat foods that contain moderate levels of salt. Salt tablets are not recommended.

Controlling heat exposure

Where possible, work should be altered to prevent workers from being exposed to environmental conditions that could cause heat-related illnesses. If that is not practicable, the employer must implement engineering controls to reduce exposure. If engineering controls are not practicable, the employer must provide administrative controls, such as an appropriate work-rest cycle. Personal protective equipment can be used if the equipment is as effective as administrative controls. Combining various control methods often provides the most effective protection from heat stress.

Note

In the Regulation, *practicable* means “that which is reasonably capable of being done.”

Elimination

Elimination involves identifying if there is a need to work in a hot environment. Look for ways to avoid exposing workers to conditions that could cause heat-related illnesses. Elimination is the most effective control measure, but it may not be practicable for some types of work.

Substitution

Substitution involves rescheduling to cooler periods any strenuous tasks or tasks that require workers to wear additional PPE. Work activities that don't increase the risk of heat stress are scheduled for hotter periods.

Engineering controls

If elimination is not practicable, engineering controls are the most effective and preferred way to reduce risk. Here are some examples of engineering controls:

- Where feasible, automate tasks to reduce worker exposure to heat.
- Cover or insulate hot surfaces to reduce radiant heat.
- Shield workers from radiant heat.
- Provide air conditioning or increased ventilation to remove hot air.

- Provide misting stations where humidity is low and where it is safe to do so.
- Provide fans for spot cooling. Caution: Fans may interfere with local exhaust ventilation, and they may not be effective at high temperatures. See “Working in temperatures above 35°C” on page 7 for more information.
- Where humidity is high, use dehumidifiers or reduce the sources of moisture (e.g., open-water baths, drains, leaky steam valves).

In the Regulation

Section 4.80 of the Regulation states, “The employer must ensure that temperature and humidity levels within the indoor work environment are maintained within acceptable comfort ranges, as far as is practicable.”

Administrative controls

If engineering controls are not practicable — which is often the case when work is done outdoors during the summer months — administrative controls must be considered. The following are some common administrative controls used to reduce the risk of heat stress.

Determine appropriate work-rest cycles

Determine and schedule appropriate work-rest cycles to allow enough time for workers to cool off. Workers can't rely on their bodies to indicate when a rest period is needed. By the time a worker feels ill, it may be too late.

As heat and humidity increase in the work environment, work periods should be shortened, allowing workers more time to cool off.

It is important to have cool areas, such as shaded or well-ventilated areas, for breaks and rests. Showering or soaking in cool water, when possible, can cool the body quickly.

Schedule work to minimize heat exposure

When organizing and scheduling work, consider the following to minimize heat exposure:

- Schedule the hardest physical tasks for the coolest part of the day.
- Rotate work activities between hotter and cooler environments.
- Increase the number of workers per shift to cover for workers taking breaks to cool off.
- Allow for slower-paced work during the hottest periods of the day.
- Move or relocate work away from direct sunlight and other radiant heat sources.

- For outdoor work, schedule routine maintenance and repairs during cooler seasons.
- For indoor work, schedule routine maintenance and repairs for times when hot operations are shut down.

Assign workers to work in pairs or groups

Workers should not work alone where there is a risk of heat stress. They should be closely supervised or work in pairs or groups to ensure that heat-related illnesses are identified and treated as soon as possible. Supervisors need to ensure that there is adequate first aid coverage and must establish emergency procedures to deal with serious conditions such as heat exhaustion and heat stroke.

Acclimatize workers

The body will adapt to working in hot environments if it is given a chance to gradually get used to the new conditions. This process, known as acclimatization, allows the body to modify its own functions to better cope with heat stress and to remove excess heat more efficiently.

Acclimatization has three main benefits:

- **Enhanced cardiovascular fitness.** Both heart rate and core body temperature stay lower when working in a hot environment.
- **Enhanced sweating.** The person sweats sooner and sweats more, which has a cooling effect on the body.
- **Lower salt content in sweat.** Losing less salt in sweat helps prevent salt depletion. Note that there can still be significant salt loss because the total volume of sweat increases.

In general, acclimatized workers will be able to work in hotter work conditions and for longer periods than unacclimatized workers.

Note

Acclimatization only works in a very narrow range of circumstances. During sudden, short-term heat waves, for example, workers cannot acclimatize to the high temperatures. In such conditions, employers should not rely on acclimatization as a control measure for heat stress.

Healthy workers can normally acclimatize to working in hot environments if all of the following factors are considered:

- **Time.** The body needs time to adjust to working in the heat. Exposure should happen gradually over 7 to 14 days to prevent heat-related illnesses. The same personal factors that put individuals at risk of heat stress can increase the amount of time required for acclimatization.

- **Workload.** The body will only acclimatize to the level of workload experienced during the acclimatization period.
- **Environmental conditions.** The body will only acclimatize to the level of heat and humidity experienced during the acclimatization period. If it gets hotter, workers will be at risk again.

The benefits of acclimatization are lost more quickly than they are gained. After seven consecutive days away from work in a hot environment, a worker is considered to be unacclimatized. That worker should start the acclimatization process from the beginning.

Wear cool clothing

Clothing suitable for hot conditions and heavy work helps the body to cool itself. Loose-fitting clothes made from fabrics such as cotton and silk allow air to pass through. Air passing over the skin will help cool the body by evaporating the sweat from the skin.

For work outside in the sun, light-coloured clothing reflects heat better than dark-coloured clothing. This helps keep the body cool. Large-brimmed hats provide shade for the head, face, and neck. For safety headgear such as hard hats, attach a piece of light-coloured fabric to the back and side rims of the hat to provide shade for the neck. Items attached to a hard hat must not affect its integrity — for example, don't use glue or drill holes.

Wool clothing can help minimize heat stress near radiant heat sources (e.g., boilers, kilns) and where the air temperature is higher than 35°C. Wool clothing deflects radiant heat away from the skin and allows sweat to evaporate. In very hot climates with a lot of direct sun exposure, outdoor workers often wear wool hats to keep cool.

Note

Wear clean, light-coloured, loose-fitting clothing made of breathable fabric.

Post warning signs

Employers should consider posting warning signs (e.g., "heat stress hazard") in indoor areas where heat exposure limits could be exceeded.

Personal protective clothing and equipment

Sometimes, the control methods described above won't be enough to control the risk of heat stress. In extremely hot environments (e.g., near kilns), specialized heat-protective clothing may be required. This type of clothing can also be used in moderately hot environments to allow longer work periods between breaks. A proper assessment of all heat sources is required to determine which, if any, specialized clothing would be effective in reducing heat stress.

Workers should be trained on how to use specialized heat-protective clothing. Follow the manufacturer's instructions. The clothing's effectiveness must be monitored through physiological measurements (e.g., heart rate or body temperature). Heat-protective clothing may not be a complete solution. Precautions such as close supervision should be maintained until the clothing's effectiveness is known.

There are two main types of specialized heat-protective clothing: temperature-controlled clothing and anti-radiant heat or reflective clothing.

Temperature-controlled clothing

Temperature-controlled clothing includes air-cooled suits, water-cooled suits, and ice-cooled waistcoats. There are some practical limitations on its use, especially when access to the work area is restricted.

Anti-radiant heat or reflective clothing

There may be excessive radiant heat from a hot surface (e.g., from a boiler) that can't be otherwise covered or shielded. Anti-radiant heat or reflective clothing may be necessary. This clothing comes in different forms. There are aprons and jackets, and also suits that will completely cover the worker from the neck to the feet. These types of protective clothing protect only against radiant heat. They provide little or no protection against high air temperatures unless the clothing is also temperature controlled.

Recognizing and treating heat-related illnesses

Where there is a risk of a heat-related illness, employers must inform their workers about the early signs and symptoms. If heat stress is not recognized and treated in the early stages, it can have serious effects on the body. These can include heat cramps, heat exhaustion, or heat stroke. Heat stroke can be life threatening.

A decrease in alertness is one of the early symptoms, so workers may not be able to recognize the development of heat stress in themselves. People should not work alone or unsupervised in conditions where there is a risk of heat-related illnesses.

This section describes heat-related illnesses and how to recognize and treat them. The illnesses are presented in order of increasing severity. If workers show signs or report symptoms of a heat-related illness, they should be removed from the hot environment. If necessary, they should be treated by an occupational first aid attendant or a physician.

Heat rash

Heat exposure can cause a rash or make existing skin problems worse. People working in hot, humid conditions may develop a rash. It is often accompanied by intense itching spasms and prickly sensations. This is also known as prickly heat. Heat rashes are most likely to occur in areas where clothing traps hot, humid air next to the skin.

Prevention includes the following:

- Avoid repeated exposure to heat.
- Change clothing often when sweating.
- Wear clean, light-coloured, loose-fitting clothing made of breathable fabric.

Signs and symptoms

- Rash or worsening of existing skin problems
- Intense itching
- Prickly sensations

Treatment

- Leave the hot environment, preferably until the rash has healed.
- Keep the affected areas clean, cool, and dry as much as possible.





Heat cramps

Heat cramps are painful muscle cramps caused by losing too much salt through sweating. They are usually the result of heavy exercise or physical work in a hot environment. Heat cramps usually occur in the muscles that have been used the most strenuously, such as those in the legs and abdomen. The cramps typically occur late in a workday or after the muscles have cooled (e.g., during a shower after work).

It is important to distinguish heat cramps from the more common cramps that occur during strenuous work. Common cramps will be cured with rest and massage. Heat cramps are cured only after the lost salt is replaced.

Signs and symptoms

- Muscular pain or spasms
- Excessive sweating

Treatment

- Move the worker to a cooler environment. If possible, lay the worker down and remove or loosen tight-fitting clothing.
- Cool the worker by sponging with cool water and fanning. Don't cool the worker too much. If the worker begins to shiver, stop cooling.
- If the worker is fully alert and not nauseated, provide oral fluids. The best fluids are juice, non-caffeinated soft drinks, commercially available oral rehydrating solutions (sport drinks), or a solution of salt water (1 teaspoon of salt in 0.5 litres of water). Alcoholic and caffeinated beverages are not recommended.

Continuing to work under conditions of heat stress can lead to heat exhaustion, a more serious illness. If a worker has cramps and other symptoms (e.g., fatigue, weakness, headache, gastrointestinal illness, or changes in mental state), then they may already be suffering from heat exhaustion or heat stroke. These conditions are medical emergencies that need to be treated as such.

Heat exhaustion

Heat exhaustion is caused by losing both water and salt through sweating. It can happen during prolonged periods of exertion, when fluid replacement has not matched losses. It is more serious than heat cramps. The worker will have a number of other signs and symptoms.

Signs and symptoms

- Shallow respiration
- Increased respiratory rate
- Weak, rapid pulse
- Cool, pale, clammy skin

- Sweating
- Weakness, fatigue, dizziness
- Headache and nausea
- Fainting
- Muscle cramps

Signs and symptoms are the same as for mild shock. The presence of sweating is an important finding. It is often the only way to differentiate heat exhaustion from life-threatening heat stroke. If untreated, heat exhaustion may progress to heat stroke. Workers suffering from heat exhaustion should be transported to medical aid.

Treatment

- Move the worker to a cooler environment. If possible, lay them down and remove or loosen tight-fitting clothing.
- Cool the worker by sponging with cool water and fanning. Don't cool the worker too much. If the worker begins to shiver, stop cooling.
- If the worker is fully alert and not nauseated, provide oral fluids. The best fluids are juice, non-caffeinated soft drinks, commercially available oral rehydrating solutions (sport drinks), or a solution of salt water (1 teaspoon of salt in 0.5 litres of water). Alcoholic and caffeinated beverages are not recommended.

In most cases, the worker's symptoms will improve dramatically within 30 minutes. They should still be transported to medical aid.

Heat stroke

Heat stroke occurs when the body's mechanisms for heat dissipation are overwhelmed and fail. Heat stroke is a life-threatening condition in which the body's core temperature rises above 41°C. At core body temperatures over 41°C, sweating stops and the body is unable to get rid of heat, causing body temperature to continue to rise. The person's mental functions may become disturbed. Without immediate first aid, heat stroke can result in loss of consciousness, permanent brain damage, and death. Notify a first aid attendant, and arrange for transportation to medical aid immediately.

Note

Heat stroke is a medical emergency. Notify a first aid attendant, call 911, and arrange for immediate transportation to medical aid.

Heat stroke can occur quickly and without warning. It may be preceded by heat exhaustion (see page 20).

Signs and symptoms

- Hot, dry, flushed skin (or profuse sweating in some cases)*
- Agitation, confusion
- Decreased level of consciousness
- Headache
- Nausea and vomiting
- Seizures
- Increased respiratory rate
- Irregular pulse rate
- Shock
- Cardiac arrest

* Heat stroke is generally identified by the presence of hot, dry, flushed skin, without evidence of sweating. However, profuse sweating may be present during heat stroke that occurs because of strenuous physical activity.

Treatment

- Maintain airway, breathing, and circulation as required.
- Move the worker to the coolest place available.
- Lay the worker down on their back unless the worker is actively vomiting or having a seizure. If they are, place them in the three-quarter prone or on-the-side position.
- Remove all outer clothing and apply cold water to the worker by either dousing or applying wet cool sheets. Spraying or sponging the entire body with cold water is also effective. Fanning will help.
- If the worker is fully alert and not nauseated, provide oral fluids. The best fluids are juice, non-caffeinated soft drinks, commercially available oral rehydrating solutions (sport drinks), or a solution of salt water (1 teaspoon of salt in 500 mL of water). Alcoholic and caffeinated beverages are not recommended.
- Transport the worker to medical aid and continue to cool during transport.

