

## Heat Stress

### **Legal requirements**

Employers have a duty under clause 25(2)(h) of the Occupational Health and Safety Act to take every precaution reasonable in the circumstances for the protection of a worker. This includes developing policies and procedures to protect workers in environments that are hot because of hot processes and/or weather.

For compliance purposes, the Ministry of Labour recommends the Threshold Limit Values (TLVs) for Heat Stress and Heat Strain published by the American Conference of Governmental Industrial Hygienists (ACGIH). These values are based on preventing workers' core body temperatures from rising above 38°C.

This guideline is intended to help employers, workers and other workplace parties understand heat stress, and develop and implement workplace policies to prevent heat-stress-related illness.

### **What is Heat Stress?**

Working or playing where it is hot puts stress on your body's cooling system. When heat is combined with other stresses such as hard physical work, loss of fluids, fatigue or some pre-existing medical conditions, it may lead to heat-related illness, disability and even death.

This can happen to anybody – even the young and fit. In Ontario, heat stress is usually a concern during the summer. This is especially true early in the summer, when people are not used to the heat.

Heat exposure may occur in many workplaces. Significant sources of heat can be found in workplaces such as foundries, smelters chemical plants, bakeries and commercial kitchens. For outdoor workers, direct sunlight is usually the main source of heat. In mines – especially deep mines – geothermal gradients and equipment contribute to heat exposure. Humidity in workplaces also contributes to heat stress.

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## How we cope with heat?

Your body is always generating heat and passing it into the environment. The harder your body works, the more heat it has to lose. When the environment is hot and/or humid or has a source of radiant heat (such as a furnace or the sun), your body must work harder to get rid of heat.

If the air is moving (for example, by fans) and it is cooler than your body, it is easier for your body to pass heat into the environment.

Workers on medication or with pre-existing medical conditions may be more susceptible to heat stress because some medication and/or medical conditions may impair the body's response to heat. Such workers should speak to their personal physicians to see if their medication(s) and/or health condition(s) affect their ability to work in hot environments.

## Heat-Stress-related disorders

A summary of heat-stress-related disorders, causes, symptoms, treatment and prevention is presented in the table below.

	<b>Cause</b>	<b>Symptoms</b>	<b>Treatment</b>	<b>Prevention</b>
<b>Heat rash</b>	Hot humid environment; plugged sweat glands.	Red bumpy rash with severe itching.	Change into clean dry clothes often and avoid hot environments. Rinse skin with cool water.	Wash regularly to keep skin clean and dry.

	<b>Cause</b>	<b>Symptoms</b>	<b>Treatment</b>	<b>Prevention</b>
<b>Heat cramps</b>	Heavy sweating from strenuous physical activity drains a person's body of fluid and salt, which cannot be replaced just by drinking water. Heat cramps occur from salt imbalance resulting from failure to replace salt lost from heavy sweating.	Painful cramps occur commonly in the most worked muscles (arms, legs or stomach); this can happen suddenly at work or later at home. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing, gently massage and stretch affected muscles and drink cool salted water (1½ to 2½ mL salt in 1 litre of water) or balanced commercial fluid electrolyte replacement beverage. If the cramps are severe or don't go away after salt and fluid replacement, seek medical aid. Salt tablets are not recommended.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
<b>Fainting</b>	Fluid loss, inadequate water intake and standing still, resulting in decreased blood flow to brain. Usually occurs in unacclimatized persons.	Sudden fainting after at least two hours of work; cool moist skin; weak pulse.	GET MEDICAL ATTENTION. Assess need for cardio-pulmonary resuscitation (CPR). Move to a cool area; loosen clothing; have the person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Move around and avoid standing in one place for too long. Workers should check on each other to help spot the symptoms that often precede heat stroke.

	<b>Cause</b>	<b>Symptoms</b>	<b>Treatment</b>	<b>Prevention</b>
<b>Heat exhaustion</b>	Fluid loss and inadequate salt and water intake causes a person's body's cooling system to start to break down.	Heavy sweating; cool moist skin; body temperature over 38° C; weak pulse; normal or low blood pressure; person is tired and weak, and has nausea and vomiting; is very thirsty; or is panting or breathing rapidly; vision may be blurred.	GET MEDICAL ATTENTION. This condition can lead to heat stroke, which can cause death quickly. Move the person to a cool shaded area; loosen or remove excess clothing; provide cool water to drink; fan and spray with cool water. Do not leave affected person alone.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
<b>Heat stroke</b>	If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise. Heat stroke may develop suddenly or may follow from heat exhaustion.	High body temperature (over 41°C) and any one of the following: the person is weak, confused, upset or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person may pass out and have convulsions.	CALL AMBULANCE. This condition can kill a person quickly. Remove excess clothing; fan and spray the person with cool water; offer sips of cool water if the person is conscious. Do not leave affected person alone.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.

## Controlling Heat Stress

### Acclimatization

The longer you work in a hot environment, the better your body acclimatizes to the heat. If you are ill or away from work for a week or so you can lose your acclimatization.

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To become acclimatized, consider the following progressive approaches:

- If you are experienced on the job, you should limit your shift time in hot working conditions to 50 per cent on the first day, 60 per cent on the second day, and 80 per cent on the third day. You should work a full shift on the fourth day.
- If you are *not* experienced on the job (for example, if you are a new employee), you should start off spending 20 per cent of shift time in hot working conditions on the first day and increase your time by 20 per cent on each subsequent day. You should be able to work a full shift in hot working conditions by the fifth day.
- Instead of progressively increasing the exposure times on the job in a hot environment, you can become acclimatized by gradually increasing the physical demands of the job over a week or two.

If you have health problems or are not in good physical condition, you may need longer periods of acclimatization. Hot spells in Ontario seldom last long enough to allow acclimatization. However, exposure to workplace heat sources may permit acclimatization.

When there is a potential for exposure to heat stress, control measures must be taken to prevent heat exposure in the workplace. These include engineering controls, administrative controls and protective clothing. Selection of appropriate workplace controls will vary, depending on the type of workplace and other factors. Some measures may include:

### **Engineering controls**

- Reduce physical demands of work task through mechanical assistance (hoists, lift-tables, etc.)
- Control the heat at its source through the use of insulating and reflective barriers (e.g., insulate furnace walls)
- Exhaust hot air and steam produced by operations
- Reduce the temperature and humidity through air cooling
- Provide cool, shaded work areas
- Provide air-conditioned rest area
- Increase air movement if temperature is below 35°C (e.g., use fans).

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## **Administrative and work practice controls**

- The employer should:
  - Assess the demands of all jobs and have monitoring and control strategies in place for hot days and hot workplaces
  - Increase the frequency and length of rest breaks
  - Schedule strenuous jobs to cooler times of the day
  - Provide cool drinking water near workers and remind them to drink a cup about every 20 minutes, or more frequently, to stay hydrated
  - Caution workers to avoid direct sunlight
  - Assign additional workers or slow down the pace of work
  - Make sure everyone is properly acclimatized
  - Train workers to recognize the signs and symptoms of heat stress and start a “buddy system” since people are not likely to notice their own symptoms
  - Investigate any heat-related incidents.
- Trained First Aid providers should be available and an emergency response plan should be in place in the event of a heat-related illness.
- Pregnant workers and workers with a medical condition – or those taking certain medications – should discuss with their physicians about working in the heat.

## **Protective clothing**

- Light summer clothing should be worn to allow free air movement and sweat evaporation.
- If working outdoors, wear light-coloured clothing, preferably long sleeve shirt and pants, and cover the head to prevent exposure to direct sunlight.
- In a high radiant heat situation, wearing reflective clothing to shield radiant heat may help.
- For very hot environments, consider air, water or ice-cooled insulated clothing.
- Vapour-barrier clothing, such as chemical protective clothing, greatly increases the amount of heat stress on the body. Extra caution is necessary such as heat strain (physiological) monitoring, if vapour-barrier clothing is worn.

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## Managing Heat Stress from process heat

For an environment that is hot primarily due to process heat (furnaces, bakeries, smelters, etc.), the employer should follow the guidance of the American Conference of Governmental Industrial Hygienists (ACGIH) as outlined in its booklet and documentation for the recommended Threshold Limit Values (TLVs), and set up a heat stress control plan in consultation with the workplace's joint health and safety committee or worker health and safety representative.

Further information on the ACGIH TLVs, and on the development of heat stress control plans, can be found at the following websites:

### ACGIH

[www.acgih.org/home.htm](http://www.acgih.org/home.htm) (documents available for purchase)

### U.S. Occupational Safety and Health Administration (OSHA)

[www.osha.gov/dts/osta/otm/otm\\_iii/otm\\_iii\\_4.html](http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_4.html) (documents available for free)

## Managing Heat Stress caused by hot weather

Most workplaces do not have “hot processes”; however working in hot weather can pose health risks to workers. For work in hot weather, a hot weather plan is appropriate. A hot weather plan is a simplified heat stress control plan. A hot weather plan should establish the implementation criteria, or “triggers” to put the plan into effect. The criteria may include weather/environmental indicator triggers such as:

- Humidex (local or site specific) reaching or exceeding 35
- Environment Canada humidex advisory (air temperature exceeding 30°C and humidex exceeding 40)
- Environment Canada weather reports
- Heat waves (three or more days of temperatures of 32°C or more); and/or
- Ontario Ministry of the Environment smog alert.

Generally, plans related to hot weather should be in place between May 1 and September 30.

The following websites have information on humidex, weather reports and smog alerts:

### Environment Canada – weather and meteorology

[www.msc.ec.gc.ca/](http://www.msc.ec.gc.ca/)

### Environment Canada Weather Office

[www.weatheroffice.ec.gc.ca/canada\\_e.html](http://www.weatheroffice.ec.gc.ca/canada_e.html)

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## Air Quality Ontario smog advisories

[www.airqualityontario.com/](http://www.airqualityontario.com/)

## Occupational Health Clinics for Ontario Workers (OHCOW) – humidex-based heat response plan

<http://www.ohcow.on.ca>

## Other resources

Additional information on methods to monitor and manage workplace heat exposures:

### WSIB — Prevent Heat Stress

Information and tools on heat stress awareness, monitoring and control measures can be found on the [WSIB website](http://www.wsib.on.ca) (www.wsib.on.ca).

### Health and Safety Ontario (HSO)

- Health and safety information, training materials and consulting services are offered by the HSO Partners in Prevention. [www.healthandsafetyontario.ca/HSO/Home.aspx](http://www.healthandsafetyontario.ca/HSO/Home.aspx)

### Infrastructure Health and Safety Association (IHSA)

- Links to resources on heat stress prevention at construction sites include a Heat Stress kit, resources, e-learning and video. [www.ihsa.ca/topics\\_hazards/heat\\_stress.cfm](http://www.ihsa.ca/topics_hazards/heat_stress.cfm)

These links to external websites are offered for convenience only; they do not constitute an endorsement of the websites or their contents. The Ministry of Labour takes no responsibility for the views, contents or accuracy of the information presented by external websites.

**Remember: while complying with occupational health and safety laws, you must also obey applicable environmental laws.**

For further information or assistance, please contact the  
Ministry of Labour Health & Safety Contact Centre:  
1-877-202-0008