

PURPOSE/APPLICATION

Canadian Plains Energy Services (CPES) shall attempt to minimize risks to personnel, equipment and property by conducting operations during safe and tolerable working weather conditions. Every effort will be made to ensure that workers will not be exposed to levels that exceed those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard. In extreme conditions workers will be provided with an adequate supply of cool potable water and clothing corrections will be applied in accordance with the heat stress and strain section of the ACGIH Standard. When temperature conditions are extreme, workers will be provided training on thermal stress through Safety and Tailgate Meetings, and the following safe work practice and exposure plan will be adhered to.

PPE

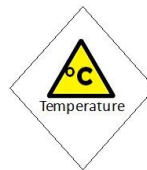
- CPES Minimum Requirements

TRAINING

- Strike New Worker Orientation

HAZARDS & CONCERNS

- Heat Stress
- Heat Illness

**PRECAUTIONS****The Body's Response to Temperature**

The body works best when it has an internal "core" temperature of approximately 37°C. During a regular day, your body temperature may vary by about 1°C depending on the time of day, your level of physical activity and how you are feeling. The body's metabolic processes produce the right amount of heat you need when you digest your food and when you perform physical activity.

Maintaining Balance

When you work in extreme temperatures, your body has to adapt. To maintain a constant inner body temperature, the body must continually keep or gain heat in cold environments and lose heat in hot environments.

To stay cool in hot environments, the body:

- Sweats – evaporating sweat cools the body, and
- Increases blood flow to the skin – to speed up the loss of heat from the skin (radiate away the excess heat) if the outside air is cooler.

By sweating, shivering, and changing the rate of blood flow, the body can adapt to a fairly wide range of temperatures. However, there are limits to what the body can adapt to and its ability to maintain its core temperature can fail.

Acclimatization

People can adapt to hotter temperatures through a process called "acclimatization." At the workplace, acclimatization is important because it allows you to work more safely and efficiently. However, becoming acclimatized takes time.

When working in hot conditions, people need at least 4 to 7 working days to become fully acclimatized, but the process may take up to three weeks. A scheduled exposure is recommended. For example, doing physical work for less than a full working day on the first hot day and slowly increasing the time spent working over the next week. Each person must be monitored to ensure that they are adapting to working in the heat.

Factors Affecting How You Feel

How “hot” or “cold” you feel depends on 6 main factors:

- **Air temperature** – Air temperature is what can be measured with a thermometer. However, in situations where there is a lot of radiant heat (see below for examples) it is not always an accurate indication of how hot or cold you feel.
- Other sources of heat (**radiant heat**). These sources can include direct sunlight, machinery that generates heat, hot water, heaters or open flames, asphalt, etc. Over time on a hot day, these sources can radiate heat into the air and add to the amount of heat you “feel”.
- **Relative humidity** is the amount of moisture (water) in the air. The warmer the air, the more moisture it can hold. High humidity makes people feel hotter because sweat does not evaporate off the skin (it is the evaporation of sweat that makes you feel cooler). Cold air with high relative humidity “feels” colder than dry air at the same temperature. Why? Because high humidity in cold weather increases the conduction (loss) of heat from the body to the surrounding air.
- **Moving air** (speed) usually cools a person. This cooling provides relief in a hot environment as long as the moving air is cooler than the person. In cold situations, air movement can create wind chill and make you feel much colder than the temperature may indicate.
- **Physical exertion** (how hard you are working) also influences how hot or cold you feel. Moving around or working generates heat. When working on a very hot day, this movement increases your heat stress.
- **Clothing** can help you stay warmer. However, when mist, rain or sweat is heavy enough to make your clothing wet, you feel colder as wet clothing loses its insulating properties.
- **Other Factors:**
 - A person’s **general health** also influences how well the person adapts to heat and cold. Those with extra weight often have trouble in both cold and hot situations due to the body having difficulty maintaining a good heat balance. Age (particularly for people about 45 years and older), poor general health, and a low level of fitness will make people more susceptible to feeling the extremes of heat and cold.
Medical conditions can also increase how susceptible the body is to heat and cold. People with heart disease, high blood pressure, respiratory disease and uncontrolled diabetes may need to take special precautions.
 - **Substances** – both prescription or otherwise – can also have an impact on how people react to heat and cold. Substances that can affect a person’s tolerance to heat include:
 - Alcohol
 - Amphetamines
 - Anaesthetics
 - Anticholinergics (e.g. atropine)
 - Antidepressants
 - Cannabis (marijuana)
 - Cocaine
 - Hypnotics (e.g. barbiturates)
 - Morphine
 - Psychotropic drugs

Heat Stress, Heat Related Illness and Warning Signs

Heat stress is the overall heat load on the body, including environmental heat and inner body heat production due to working hard. Mild or moderate heat stress may be uncomfortable and may affect performance and safety, but it is not usually harmful to your health. When heat stress is more extreme, the possible health effects include:

- **Heat edema** is swelling which generally occurs among people who are not acclimatized to working in hot conditions. Swelling is often most noticeable in the ankles.
- **Heat rashes** are tiny red spots on the skin, which cause a prickling sensation. The spots are the result of inflammation caused when sweat glands become plugged.

- **Heat cramps** are sharp pains in the muscles that may occur alone or be combined with one of the other heat stress disorders. The cause is salt imbalance resulting from the failure to replace salt lost with sweat. Cramps most often occur when people drink large amounts of water without sufficient salt (electrolyte) replacement.
- **Heat exhaustion** is caused by excessive loss of water and salt. Symptoms include heavy sweating, weakness, dizziness, nausea, headache, diarrhea, muscle cramps, and more.
- **Heat fainting** is heat-induced giddiness and fainting induced by temporarily insufficient flow of blood to the brain while a person is standing. It occurs mostly among unacclimatized people. It is caused by the loss of body fluids through sweating, and by lowered blood pressure due to pooling of blood in the legs.
- **Heat stroke** is the most serious type of heat illness and represents a medical emergency (call 911). Signs of heat stroke include body temperature often greater than 41°C, it can also include complete or partial loss of consciousness.

Signs and Symptoms of Heat Stress (Hyperthermia)

Early Warning Signs

- Headache
- Dizziness / faintness
- Irritability / anger / mood change
- Fatigue
- Heavy sweating
- Prickly heat (heat rash)
- Muscle cramps (especially after several days of exposure)
- Changes to breathing and pulse rate
- Dehydration

As Heat Stress Worsens...

- Breathlessness (having trouble catching your breath)
- A strong rapid pulse changes to a weak rapid pulse
- Severe headache
- Severe muscle cramps
- Confusion
- Skin goes from feeling cold and clammy to hot and dry
- Severe dehydration
- Sweating may stop
- Exhaustion
- Coma and possible death

Treatment and Prevention of Heat Illness

Being aware of the signs of heat stress is the first step for prevention. Remember that lack of acclimatization, poor levels of physical fitness, and conditions such as diarrhea or fever increase susceptibility to heat stress because the body is already in a weakened state. Certain drugs such as tranquilizers and diuretics can also increase susceptibility. Heat stroke occurs more easily when the body has suffered a previous heat injury.

Heat stroke requires **immediate advanced medical attention**. Delayed treatment may result in damage to the brain, kidneys and heart, or death.

An individual suffering from heat illness may not recognize the heat stroke signs and symptoms, meaning their safety depends on their co-worker's ability to recognize the symptoms and seek immediate medical help.

If one person is showing signs of heat stress, it may be a sign that other workers may also be affected.

Workers should report to a cool area and be assessed individually before work continues.

First Aid for Heat Exposure

- Move the person to a cooler area where they can rest (such as an air-conditioned building or vehicle, or into the shade)
- Take off excess clothing (e.g., hard hat, boots, shirt, coveralls, etc.)
- Give the person water to drink (only if they are able to drink it on their own)
- Cool the person with cold compresses and rapid fanning
- If possible, help the person's body cool faster by wrapping wet sheets around the body and then fanning the body.
- If ice packs or cold packs are available, wrap the packs in a cloth and place them on each of the victim's wrists and ankles, in the armpits, and on the neck to cool the large blood vessels.
- Watch for signals of breathing problems and make sure the airway is clear.

If the worker does not recover quickly call 911, or, if the worker is awake and stable, transport the person to a medical facility.

While Getting Help, You Can

- Move the person to a cooler place. Keep the person lying down.
- If the person is conscious, have them drink cool water slowly but regularly.

NOTE: Immersing the victim in cold water more efficiently cools the body but it can result in harmful overcooling. This can interfere with vital brain functions so it must only be done under close medical supervision.

What and When to Drink

Dehydration is a serious issue, you cannot rely on "feeling thirsty", watch for signs of fatigue, irritability, headaches, nausea, and giddiness. The signs include not passing urine and changes to a person's personality or mental state. When dehydrated, urine will be dark yellow to orange in colour and there will be far less of it.

Unacclimatized workers can lose up to 5 or 6 litres of fluid in an 8-hour shift. While working, drink about 250 ml (1 cup) of water every 15-20 minutes. Workers should be well hydrated before work in the heat begins. A person working in a hot environment loses water and salt through sweat. On average, about one litre of water each hour must be drunk to replace lost fluid.

Workers in hot environments should be encouraged to drink water **even if they do not feel thirsty**. Make sure plenty of cool (10-15°C) or room temperature (20°C) drinking water is available at the worksite.

Electrolyte Drinks, Fruit Juice, etc.

Drinks specially designed to replace body fluids and electrolytes may be used. They may be of benefit for workers who have physically active occupations but keep in mind they add sugar or salt to your diet. Fruit juice or sport and electrolyte drinks can be diluted to half the strength with water. Drinks with caffeine can dehydrate the body. Most of the time water is the most efficient fluid for re-hydration. Keep in mind very cold fluids may absorb more slowly than cool fluids.

Measuring Hot Conditions

There are two common methods for determining heat stress:

1 - Wet-bulb Globe Temperature (WBGT) Index

The WBGT Index is the "gold standard" because it is an indicator of workplace heat stress that factors in the effects of air temperature, humidity, air movement and radiant energy. It provides a single number measure of "perceived heat". The index can be calculated automatically using a portable instrument called a wet-bulb globe temperature meter often referred to as a heat stress monitor. This device is essentially a combination of three thermometers:

- A conventional thermometer (called a "dry bulb") that measures air temperature and is shielded from heat radiation

- A black bulb globe thermometer (a hollow 150 mm diameter copper ball painted black, with a conventional thermometer located at the centre) which measures the combined effects of radiant heat and wind
- A wet bulb thermometer (a conventional thermometer with the bulb wrapped in a wet cotton wick moistened with distilled water from a reservoir) which measures the cooling effects of movement and evaporation.

2 - Humidex

Humidex is an indication of physiological reactions, not an absolute measure. It does not account for personal factors, acclimatization, or clothing. Humidex is widely reported in weather forecasts and apps.

Outdoor humidex readings may not accurately reflect conditions at an indoor workplace. Humidex readings do not account for workplace-specific factors such as air movement and the presence of radiant heat sources.

Heat Stress Humidex Based Response Plan		
Humidex 1 – Moderate physical work, unacclimatized worker OR Heavy physical work, acclimatized worker	Response	Humidex 2 – Moderate physical work, acclimatized worker OR Light physical work, unacclimatized worker
25 - 29	• supply water to workers on an “as needed” basis	32 - 35
30 – 33	• post Heat Stress Alert notice • encourage workers to drink extra water • start recording hourly temperature and relative humidity	36 - 39
34 - 37	• post Heat Stress Warning notice • notify workers that they need to drink extra water • ensure workers are trained to recognize symptoms	40 – 42
38 - 39	• provide 15 minutes relief per hour • provide adequate cool (10-15°C) water • at least 1 cup (240 mL) of water every 20 minutes • workers with symptoms should seek medical attention	43 - 44
40 - 42	• provide 30 minutes relief per hour in addition to the provisions listed previously	45 - 46*
43 - 44	• if feasible provide 45 minutes relief per hour in addition to the provisions listed above	47 - 49
45 or over	• stop work until the temperature falls into a category listed above	50* and over

Control Measures to for Heat Stress and Illness

The DO's

- DO** Reduce the level of physical activity required in high heat (e.g., use carts, conveyors, or mechanical lifting devices).
- DO** Where possible, change the location of the work to a cooler work area – determine if some or all of the work can be done in the shade, or better, in a ventilated or air-conditioned space.
- DO** Establish a cooling station where workers can rest in a ventilated and air-conditioned space either a booth or vehicle.
- DO** Adjust the clothing used, use breathable fabrics where possible.
- DO** Use fans to increase air movement and help encourage sweat evaporation. **NOTE:** This control method is only effective when the air temperature is less than the skin temperature.

- DO** Discuss the hazard of heat at tailgate meetings, be included in daily planning, and factor into work scheduling.
- DO** Reduce the exposure to heat by, increasing the number and/or length of rest breaks.
- DO** Increasing the number of staff so that more workers share the workload.
- DO** Allow time for acclimatization. Acclimatization is an important control step.
- DO** Set a work-rest schedule. This schedule reduces the amount of time spent at physical activities and allows for a rest period for the body to recover and cool.
- DO** Ensure rest breaks allow the body time to cool, provide greater blood circulation to the skin.
- DO** Schedule physically demanding jobs for cooler periods of the day (usually early morning or evening).
- DO** Monitor infrequent or irregular tasks such as emergency repairs or working near hot process equipment as these tasks often result in heat stress.
- DO** Review this SWP when working in heat to increase workers' awareness of the potential hazards and what to do when they recognize warning signs in themselves or others.
- DO** Pay attention to workers with special needs, including those with medical conditions or pregnant workers. Workers should discuss limitations and precautions with their doctor.
- DO** Establish a "buddy system". Everyone should be able to recognize early warning signs of health effects in themselves and their co-workers, and be able to respond appropriately.
- DO** Provide enough drinking water for all workers. Each individual should drink about 250 ml (1 cup) every 15-20 minutes when working in hot conditions.

Reminder! Staying hydrated is essential. Level of acclimatization and personal factors also play a large role in how we adapt to heat and cold.

REFERENCES / ADDITIONAL INFORMATION

Alberta OHS Code

NA

British Columbia OHS Code

Part 7: Noise, Vibration, Radiation and Temperature

Manitoba OHS Act and Regulation

4.12 Thermal Stress

Saskatchewan OHS Regulations

6-7 Thermal Conditions

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