Heat Stress Protection & Compliance Game Plan

The human body functions normally at a “core” temperature of 36°C/98.6°F. If core temperature rises too high, serious or even fatal injury can occur, including:

- **Heat rash** (aka, prickly heat or miliaria), a stinging skin irritation that turns skin red;
- **Heat cramps,** painful spasms in the muscles;
- **Heat exhaustion,** indicated by heavy sweating, a fast and weak pulse and rapid breathing; and
- **Heat stroke,** a life-threatening illness that occurs when body temperature rises above 41°C/106°F.

Heat stress is a hazard for outdoor work in the summer and for indoor work inside a heated environment at any time of the year. High-risk indoor operations include foundries, glass, brick, ceramics, rubber and chemical plants, mines, smelting, electrical utilities (especially in boiler rooms), steam tunnels, bakeries, confectioneries, food canneries and commercial kitchens and laundries.

OHS Heat Stress Requirements

Most jurisdictions have specific OHS regulations requiring employers to protect workers from heat stress. In Alberta and Ontario, protecting workers from heat stress is implied under the part of the OHS Act imposing a general duty on employers

to implement reasonable or reasonably practicable measures to protect workers' health and safety. Heat stress requirements may also apply only to specific industries, such as mining or oil and gas production.

6-Step Heat Stress Compliance Game Plan

Regardless of industry or part of Canada you're in, you must take 6 basic steps to prevent heat stress hazards.

Step 1: Do a Heat Stress Hazard Assessment

First, have a competent person do a heat stress hazard assessment at your workplace to determine whether workers are exposed to thermal conditions that could cause a worker's core body temperature to rise above 36°C/96.8°F. Consider not just temperature but all factors affecting how hot the air actually **feels** on a worker's body, including:

- **Temperature:** If temperatures rises above 29.44°C/85°F, you have a potential problem;
- **Humidity:** Humidity can come from not only humid outdoor air but also steam generated by indoor equipment. If relative humidity exceeds 85%, you have a problem;
- **Heat radiation:** Sources of heat radiation that increase risk of heat stress include direct sunlight, fire welding and hot surfaces;
- **Air movement:** Stagnant air tends to be hotter; but circulating air that's already hot, such as air near steam pipes, can also heighten heat stress risks;
- **Workload:** The more strenuous the work, the greater the danger of heat stress;
- **Workers' Physical Condition:** Consider the age, weight, fitness and acclimatization, i.e., whether workers are

used to working in hot conditions; and
- **Clothing:** Thick clothing and heavy equipment like respirators and face hoods aggravate heat stress risks; lighter clothing of natural fibers alleviate them.

Step 2: Maintain Safe Thermal Conditions

All jurisdictions require employers to take measures to maintain thermal comfort in the workplace. Five jurisdictions (BC, NB, NL, NS, PEI) specifically require employers to limit exposure to heat stress to Threshold Limit Values (TLVs) levels classified as posing "little danger" to workers under the American Conference of Governmental Industrial Hygienists (ACGIH), using the recommended methods of calculating heat stress. ACGIH TLV standards are expressly required in BC, NB, NS, PEI and QC. Ontario, MOL guidelines say that employers must maintain ACGIH TLV levels even though the duty isn't spelled out in the OHS Regulations.

First Choice: Elimination

As with other hazards, follow the "hierarchy of controls" in deciding how best to protect workers from the heat stress hazards you identify. If reasonably practicable, completely eliminate the hazard, such as by not performing outdoor operations in thermal conditions posing the risk of heat stress.

Engineering Controls

If elimination isn't reasonably practicable, use a combination of engineering and work/administrative controls and PPE to minimize heat stress hazards. Engineering controls for heat stress include systems and devices that control the thermal environment, including:

- General ventilation to dilute hot air with cooler air (generally from the outside) which may include

permanently installed ventilation systems for large areas and portable or local exhaust systems for smaller areas;
- Air treatment or cooling to reduce air temperature by removing heat and humidity;
- Air conditioning which cools the air but is expensive to install and operate;
- Local air cooling to reduce air temperature in specific areas. Two common methods: i. cool rooms that enclose a workplace or provide a recovery area near hot jobs; and, ii. portable blowers with built-in air chillers;
- Convection, or use of fans to increase air flow (where air temperature is less than the workers' skin temperature);
- Heat conduction methods like insulating the hot surface that generates the heat and changing the surface itself; and
- Controls to reduce radiant heat, that is, heat from hot surfaces within the worker's line of sight, such as shields located so as not to interfere with air flow.

Work/Administrative Controls

If it isn't reasonably practicable to use engineering controls to control the thermal environment, use work controls that reduce heat stress hazards by changing how the work is carried out. **Strategy:** Implement a heat stress exposure control policy that includes:

- Developing safe work procedures for hot weather operations or work during heat waves;
- Scheduling outdoor jobs requiring heavy exertion for the early morning or late evening when the air is cooler;
- Letting workers take frequent water breaks;
- Providing access to shade and/or cool temperature recovery areas, such as air-conditioned enclosures and rooms;

- Making ample supplies of cool (10°C/50°F to 15.5°C/60°F) water, Gatorade or other cool liquid (except alcoholic beverages) available to workers in or near the work area and encouraging workers to drink small amounts frequently, like one cup every 20 minutes;
- Taking steps to cut the physical demands of work, e.g., use of lifting tools so workers don't have to manually carry heavy objects;
- Having workers operate in pairs so they can keep an eye on each other;
- Monitoring thermal conditions during the work;
- Monitoring the pulse and other vital signs of exposed workers;
- Ensuring that somebody is available at the scene who's trained to provide first aid in case workers exhibit signs or symptoms of heat stress;
- Implementing emergency response procedures for heat stress; and
- Providing workers safety information and training (See Step 3 below).

PPE & Protective Clothing

Require workers who work in extreme heat to dress in light weight, loose fitting clothing made of natural fibers like cotton. Workers exposed to sunlight should also wear light colors, sunglasses and protective skin lotions and creams. Reflective clothing keeps the skin from absorbing radiant heat but reduces the body's evaporative cooling by blocking air exchange through the garment and, accordingly, should be worn as loosely as possible. PPE for work in extreme heat can include:

- Ice vests that can keep the body cool for 2 to 4 hours;
- Wetted clothing like terry cloth coveralls that are especially effective in cooling the body when worn underneath reflective and other impermeable protective

clothing.
- Water cooled garments like hoods that cool the head and/or vests and long johns that cover more of the body.
- Clothing and equipment that circulate air from a supplied air system around the body.

Step 3: Provide Appropriate Heat Stress Training

According to NIOSH, a heat stress training program should cover:

- Knowledge of heat stress hazards;
- Recognition of risk factors, danger signs and symptoms;
- Awareness of first-aid procedures for, and the potential health effects of, heat stroke;
- Workers' responsibilities in avoiding heat stress;
- Dangers of using drugs, including therapeutic ones, and alcohol in hot work environments;
- Use of protective clothing and equipment; and
- Purpose and coverage of any environmental and medical surveillance programs and why workers should participate in them.

Step 4: Acclimatize Your Workers

The human body is capable of adapting to heat exposure via a process called acclimatization, which involves exposing workers to work in a hot environment for progressively longer periods so that the body learns to sweat more efficiently and maintain normal body temperatures. NIOSH recommendations for acclimatization:

Day	**Exposure***
1	50%
2	60%
3	80%

Day	Exposure*
4	100%

**For new workers similarly exposed, the recommended regimen is 20% on Day 1, with a 20% increase in exposure each additional day*

Step 5: Monitor Exposed Workers

Designate one or more competent persons to personally monitor workers working in extreme conditions posing high hazards of heat stress. Monitoring methods to consider:

- Checking heart rate by counting the radial pulse for 30 seconds at the start of the rest period and shortening the next work period by 1/3 (with the same rest period) of any worker whose heart rate exceeds 110 beats per minute;
- Checking recovery heart rate, that is, heart rate measured at a fixed, reference period over one minute after activity stops, by comparing pulse rate taken at 30 seconds (P1) with pulse rate taken at 2.5 minutes (P3) after the rest break starts;
- Checking body temperature orally with a clinical thermometer after work stops and before the worker drinks water and shortening the next work cycle by 1/3 if oral temperature taken under the tongue is over 37.6°C/99.68°F; and
- Measuring body water loss by weighing the worker on a scale at the beginning and end of each work day to ensure weight loss doesn’t exceed 1.5% of total body weight in the work day.

Step 6: Monitor Your Controls

You need to continually monitor the heat stress controls you implement to ensure they’re effective, identify problems and

make the necessary corrections. Review should be undertaken on a regular basis and in response to incidents and changes in work operations or conditions that may alter or weren’t addressed in the current assessment.

What To Do

An effective way to implement all these measures is to incorporate them into a Heat Stress Exposure Control Policy like the one on the OHSI website, which you can use as a template to adapt according to your industry, facility type, work process, etc.