

## Protecting Workers from Heat Stress and Heat-Related Illnesses

Heat stress is a significant cause of occupational illnesses that may also lead to death. Based on Workplace Safety and Insurance Board (WSIB) statistics, there were 350 lost-time claims for heat exhaustion for construction workers alone between 2006 and 2015. Heat-related illnesses affect all workers, even the young and fit. A significant source of heat for outdoor workers is exposure to the sun. Prolonged occupational sun exposure is also a risk for developing cancer; for example, it more than doubles the risk of developing skin cancer.

Heat stress occurs when the heat load on a worker from the combined contribution of environmental factors, physical activity, and clothing overcome the body's natural cooling system. 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 body's inability to cope may result in a worker experiencing health effects ranging from fainting, to heat exhaustion and heat stroke resulting in death.

Hot and humid conditions can occur either indoors or outdoors. Environmental factors that affect heat stress include air temperature, humidity, air movement, and sources of radiant heat such as working in the sun or near hot objects. Work task factors that affect heat stress are the physical demands of the job, the frequency and length of breaks, and the type of clothing worn.

Examples of workplace conditions that could expose workers to increased risk of heat stress include:

- Indoor work in high air temperatures, radiant heat, high humidity, and poor air movement conditions such as those found in smelters and blast furnaces, foundries, manufacturing facilities, chemical plants, laundries and dry cleaners, boiler rooms, bakeries and commercial kitchens, and greenhouses.
- Outdoor work in building and road construction, roofing, landscaping and agricultural work, and at pools and amusement parks.
- Use of impermeable or semi-permeable personal protective equipment and clothing in asbestos removal/abatement operations, emergency services (e.g., firefighting) and hazardous waste remediation.

Due to changes in our climate, extreme heat events are a growing health risk to workers in Ontario. According to the [Canada in a Changing Climate: Regional Perspectives Report](#), the average temperatures in Ontario are increasing, and heat waves and heat-related illnesses are projected to become more frequent.

## Current Requirements

Under the *Occupational Health and Safety Act* (OHSA), employers have a general duty under clause 25(2)(h) to take every precaution reasonable in the circumstances for the protection of a worker. This general duty includes protecting workers from hazardous thermal conditions that may lead to heat-related illnesses.

As a general practice, the Ministry of Labour, Immigration, Training and Skills Development (MLITSD or the Ministry) looks to the American Conference of Governmental Industrial Hygienists' (ACGIH)<sup>1</sup> method (ACGIH method) of assessing a worker's risk of heat stress based on a wet bulb globe temperature (WBGT) threshold for the purposes of enforcing clause 25(2)(h) in this context. The ACGIH method is widely used and adopted by other Canadian jurisdictions. Ontario's occupational health and safety system partners provide resources to support Ontario workplaces in identifying and preventing heat stress.

## Proposed Requirements

The Ministry is proposing to introduce a stand-alone heat stress regulation under the OHSA with specific requirements that would apply to all workplaces to which the OHSA applies. The regulation would:

- Introduce heat stress exposure limits based on the ACGIH method.
- Provide for the use of other methods to assess a worker's risk of exposure to heat stress.
- Require employers to identify and implement measures and procedures to control heat exposures based on the "hierarchy of controls", and
- Require employers to provide worker information and instruction on recognizing the signs and symptoms of heat-related illnesses and the measures to protect themselves.

Details of the regulatory proposal are outlined below:

1. All employers would have a duty to take all measures reasonably necessary in the circumstances to protect workers from exposure to hazardous thermal conditions that may result in a heat-related illness or a worker's core body temperature exceeding 38°C (100°F).
2. Requiring compliance with heat stress exposure limits for light to very heavy work loads in accordance with methods used to determine heat exposures.

---

<sup>1</sup>The ACGIH is a private, not-for-profit, nongovernmental corporation whose members are industrial hygienists and other occupational health and safety professionals dedicated to promoting health and safety in the workplace. Along with other Canadian jurisdictions, MLITSD looks to the ACGIH recommendations as the basis for setting occupational exposure limits.

See Appendix A for more information on proposed heat stress exposure limits and the assessment of heat exposures.

3. Allow for the use of methods other than the ACGIH method to assess a worker's exposure to heat stress if the method is in accordance with recognized industrial hygiene practices and equally protects the health and safety of workers.
4. If physiological monitoring is used as part of an alternative method of assessing exposure to heat stress, it must be conducted under the supervision of a person who is qualified, because of knowledge, training and experience, to recognize and assess heat strain and heat-related illness resulting from hot work conditions.
5. Engineering controls must be used to maintain a worker's heat exposure within the heat stress exposure limits, except if:
  1. The workplace is outdoors,
  2. The workplace is indoors and engineering controls are sufficient to protect workers in usual thermal conditions, but there is a temporarily high level of heat unrelated to the workplace or work process being performed, such as a hot spell or heat wave, such that it is not reasonably practicable to protect workers through the use of engineering controls alone, or
  3. The workplace is indoors and the usual thermal conditions related to the workplace or work processes are such that it is not reasonably practicable to control some or all of the sources of heat through the use of engineering controls alone.
6. Any additional measures and procedures implemented, beyond engineering controls to control heat exposures must:
  - Be developed in consultation with the joint health and safety committee or health and safety representative, if any;
  - Include administrative controls, such as reducing the amount of time a worker spends in exposure to heat through implementation of a work-rest cycle, adjusting the start of the work day, or provision of more frequent breaks;
  - Include the use of personal protective equipment, such as anti-radiant heat or reflective clothing and, in the case of outdoor work in exposure to solar radiation, the use of adequate head protection, clothing and sunscreen, and;
  - Be in writing.

7. A requirement that cool, portable drinking water or another adequate hydrating fluid be provided by the employer, close to the work areas, for the use of workers in hot conditions.
8. A requirement that workers be provided the following information and instruction where the thermal conditions in a workplace or related to a specific work process will pose or are likely to pose a hazard to the worker's health or safety:
  - The measures and procedures to be implemented to protect the worker, including the engineering controls to be implemented.
  - The importance of staying hydrated and of taking breaks and all rest periods identified in the work-rest cycle set out in the measures and procedures.
  - The early signs and symptoms of heat strain and heat-related illnesses and the precautions to be taken to avoid illness or injury.
  - Steps the worker should immediately take if they suspect they are experiencing heat strain or heat-related illness.
9. In areas where a heat warning has been issued by Environment and Climate Change Canada, a requirement for employers of workers working outdoors or workers who face an increased risk of developing a heat-related illness as a result of a change in their usual thermal workplace conditions to advise them of the heat warning, the importance of staying hydrated and taking breaks and all rest periods identified in the work-rest cycle set out in the employer's measures and procedures.

Please see Appendix B below for more information on the terminology that may be included in a proposed new regulation.

### **Notice to Consultation Participants**

Submissions and comments provided to the Ministry of Labour, Immigration, Training and Skills Development (the Ministry) are part of a public consultation process to solicit views on and to facilitate the Ministry's development of proposed new regulatory requirements related to enhancing workplace protections from heat stress and heat-related illnesses. This process may involve the Ministry publishing or posting to the internet your submissions, comments, or summaries of them. In addition, the Ministry may also disclose your submissions, comments, or summaries of them to other parties during and after the consultation period.

Therefore, you should not include the names of other parties (such as the names of employers or other employees) or any other information by which other parties could be identified in your submission.

If you, as an individual, do not want your identity to be made public, you should not include your name or any other information by which you could be identified in the main body of the submission. If you do provide any information which could disclose your identity in the body of the submission, this information may be released with published material or made available to the public.

However, your name and contact information provided outside of the body of the submission (such as that which may be found in a cover letter, on the outside of an envelope, or in the header or signature of an email) will not be disclosed by the Ministry unless required by law. An individual who provides a submission or comments and indicates a professional affiliation with an organization will be considered a representative of that organization and his or her identity in their professional capacity as the organization's representative may be disclosed.

Personal information collected during this consultation is under the authority of s. 4.1 of the *Occupational Health and Safety Act* and is in compliance with subsection 38(2) of the *Freedom of Information and Protection of Privacy Act*.

**If you have any questions regarding the collection of personal information as a result of this consultation, you may contact the Ministry's Freedom of Information Office, 400 University Avenue, 10th Floor, Toronto, Ontario, M7A 1T7, or by calling 416-326-7786.**

**Comments:**

**Due Date:** September 1, 2023

**Email:** [WebHSpolicy@ontario.ca](mailto:WebHSpolicy@ontario.ca)

**Address:** Heat Stress Consultation  
Health, Safety and Insurance Policy Branch  
Ministry of Labour, Immigration, Training and Skills Development  
400 University Avenue, 14th Floor Toronto ON M7A 1T7

## **Consultation Questions**

Q. Does your workplace potentially expose your workers to thermal conditions that may lead to a heat-related illness or otherwise impact their health and safety? If so,

A. what method(s) are you using to monitor and assess worker exposure?

B. what engineering controls (for example, shade structures) and other measures and procedures do you think are most effective at protecting workers?

Q. Are there any additional provisions to protect workers that you think should be included in this proposal?

Q. MLITSD is committed to ensuring resources to support the implementation of the proposed new regulation are available. How can MLITSD best help employers, especially small businesses, to implement the proposed new requirements?

## Appendix A

### I. Proposed Heat Stress Exposure Limits

<b>Table 1</b> <b>Heat Stress Exposure Limits (TWA Limit – WBGT ° C) for Light, Moderate, Heavy and Very Heavy Work Loads</b>		
<b>Work Load</b>	<b>Hourly Percentage Work</b>	<b>*TWA – WBGT ° C</b>
<b>Light Work</b>	75-100% (continuous)	31.0
	50-75%	31.0
	25%-50%	32.0
	0-25%	32.5
<b>Moderate Work</b>	75-100% (continuous)	28.0
	50-75%	29.0
	25%-50%	30.0
	0-25%	31.5
<b>Heavy Work</b>	75-100% (continuous)	*
	50-75%	27.5
	25%-50%	29.0
	0-25%	30.5
<b>Very Heavy Work</b>	75-100% (continuous)	*
	50-75%	*
	25%-50%	28.0
	0-25%	30.0

Note: It is proposed that heavy work or very heavy work loads, undertaken in conditions leading to extreme physical strain, for which there is no heat stress exposure limit as noted in Table 1 above, be carried out only under the supervision of a person who is qualified, because of knowledge, training and experience, to recognize, assess and prevent heat strain and heat-related illness.

## II. Determination of Heat Exposures

1. WBGT °C heat exposure values are calculated using one of the following equations:

i. For outdoor work with direct sun exposure:

$$\text{WBGT} = 0.7 \text{ nWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$

ii. For indoor work or outdoor work without direct sun exposure:

$$\text{WBGT} = 0.7 \text{ nWB} + 0.3 \text{ GT}$$

Where:

WBGT = Wet Bulb Globe Temperature °C.

nWB = natural wet-bulb temperature °C

GT = globe temperature °C

DB = dry-bulb (air) temperature °C

2. The Time-Weighted Average - WBGT °C or TWA-WBGT °C exposure value is calculated using the following formula:

$$\text{TWA - WBGT} = \frac{\text{WBGT}_1(t_1) + \text{WBGT}_2(t_2) + \dots + \text{WBGT}_n(t_n)}{(t_1) + (t_2) + \dots + (t_n)}$$

Where:

TWA = time-weighted average

WBGT = is WBGT heat exposure value in °C

WBGT<sub>1,2,...n</sub> = WBGT heat exposure values in °C for tasks 1,2,...n

t<sub>1,2,...n</sub> = Duration of tasks 1,2, ...n in minutes

Rules:

1. To calculate the WBGT °C for continuous all day or several hour exposures, use the average WBGT °C heat exposure value over a 60-minute period.
2. For intermittent exposures or exposures at different heat levels throughout a work day, average the temperature over a 60-120 minute period, depending on the exposure duration.

- Where applicable, the following clothing adjustment factors are to be applied to the TWA-WBGT °C heat exposure value to account for the effect on heat dissipation by the body.

<b>Clothing Type</b>	<b>Clothing Adjustment Factor °C</b>
Work Clothes (long sleeve shirt & pants)	0
Cloth (woven material) coveralls	0
Double layer woven clothing	+3
Spunbond melt-blown spunbond (SMS) Polypropylene Coveralls	+0.5
Polyolefin Coveralls	+1
Limited-Use Vapour-Barrier Coveralls	+11

**Rules:**

- Effective WBGT or  $WBGT_{eff} \text{ } ^\circ\text{C} = WBGT \text{ } ^\circ\text{C} + \text{clothing adjustment value } ^\circ\text{C}$
- The clothing adjustment values cannot be added for multiple layers.
- The resulting value, known as the effective WBGT or  $WBGT_{eff} \text{ } ^\circ\text{C}$  is used in the assessment of a worker's exposure to heat stress in Table 1 above.

## Appendix B

### Proposed Terminology and Interpretations:

“adequate” means,

sufficient for both its intended and its actual use, and  
sufficient to protect a worker from occupational illness or occupational injury;

“clothing adjustment factor” is the value in WBGT (°C), according to the clothing type, added to the TWA-WBGT (°C).

“Dry-bulb temperature or DB” is the air temperature measured in °C using a thermometer freely exposed to air but shielded from radiation and moisture.

“GT or globe temperature” is the radiant temperature measured in °C using a hollow spherical black globe with a temperature sensor in its core.

“heat-related illness” means a medical condition resulting from the body’s inability to cope with heat.

“heat strain” means the overall physiological response of the body dedicated to dissipating excess heat resulting from heat stress.

“heat stress” means the net heat load to which a worker is exposed from the combined contributions of metabolic heat, environmental factors (i.e. air temperature, humidity, air movement, and radiant heat), and clothing worn by the worker.

“metabolic rate” is the rate of energy production of the body in Watts (W) which varies with the level of activity or work performed.

“natural wet-bulb temperature” or “nWB” is the temperature measured in °C using a thermometer in which the sensor is covered by a wetted cotton wick and is cooled by the natural movement of air;

“physiological monitoring” means the monitoring of heat strain on a worker and includes, but is not limited to, monitoring the worker’s heart rate and measuring his or her body temperature.

“TWA limit - WBGT” is the time-weighted average wet bulb globe temperature in °C to which a worker may be exposed in a work day.

“WBGT or wet bulb globe temperature” means a composite temperature that considers and incorporates the effects of humidity and air velocity (natural wet bulb temperature), radiant energy (globe temperature), and ambient air temperature (dry bulb temperature) into a single value that represents the environmental heat load on a worker.

“work” means physical efforts performed using energy from the metabolic rate of the body;

### Classification of Work Loads

Work load means one of the following four classifications:

“light work” means work with a metabolic rate in the range of  $\geq 115$  W to  $< 234$  W such as sitting or standing while performing light hand work.

“moderate work” means work with a metabolic rate in the range of  $\geq 234$  W to  $< 360$  W such as sustained moderate hand/arm work, moderate arm/leg work, arm/trunk work or pushing/pulling light loads.

“heavy work” means work with a metabolic rate in the range of  $\geq 360$  W to  $< 468$  W such as intense arm and trunk work or carrying, shoveling, pushing or pulling heavy loads.

“very heavy work” means work with a metabolic rate in the range of  $\geq$  than 468 W such as very intense activities at fast to maximum pace.

Note: Proposed regulatory language is subject to prior review by the Minister of Labour, Immigration, Training and Skills Development and the approval of the Lieutenant Governor in Council.