Occupational Health Clinics for Ontario Workers

Centre de Santé des Travailleurs(ses) de l'Ontario

Submission to the

Ontario Ministry of Labour, Immigration, Training, Skills, and Development

on

Protecting Workers from Heat Stress and Heat-Related Illnesses

Occupational Health Clinics for Ontario Workers

September 18, 2023

Executive Summary

We thank the Ontario Ministry of Labour, Immigration, Training, Skills, and Development (MLITSD or Ministry) for the opportunity to comment on the proposed heat stress regulation. As per our mandate, the Occupational Health Clinics for Ontario Workers (OHCOW) strives to prevent occupational disease by primary, secondary and tertiary measures (preventing hazards, screening for early signs of occupational disease and recognizing cases of work-related disease). We submit the following submission in response to the Ministry's invitation.

The following summarizes our observations and concerns regarding the MLITSD proposal:

1. The Ministry's proposal, which is a "simplified" version of the ACGIH's Heat Stress/Strain TLV, **does not include protections for workers who are unacclimatized** to heat stress (as per the ACGIH definition of acclimatization). Given that the Ministry recognizes that "(h)ot spells in Ontario seldom last long enough to allow acclimatization", this essentially means that the provisions of the proposed regulation would not apply to most Ontario workers (as confirmed by reviewing the weather data to date for 2023). Without the Action Limit (exposure limits for unacclimatized workers), just following the proposed regulation will not protect Ontario workers from heat-related illnesses and deaths.
2. The proposed regulation also is missing the **adjustment for body weight when assigning a metabolic rate (workload) classification**. The ACGIH TLV requires body weight be divided by the standard reference of 154 lbs and that ratio be multiplied by the metabolic rate (such a change can move a particular worker from the "light work" classification to the "heavy work" category). This correction factor is an integral part of the ACGIH criteria and needs to be included in the regulation if the ACGIH TLV is to be used.
3. A recent scientific report highlighted the **differences between how male and female workers' bodies manage heat stress** and that the TLV, based on the experiences of young male army recruits, is not applicable to many female workers. There also are many other individual and group heat stress/strain **risk factors,** including genetic conditions such as malignant hypothermia (ruled a contributing factor at the Coroner's Inquest into Brian Freeman's death due to heat stroke), all of which indicate the importance of training workers to recognize and counter heat stress symptoms, regardless of environmental measurements.
4. P**roduction incentives** also need to be addressed. During heat stress conditions, any financial, status or prizes based on productivity should be suspended to prevent workers from sacrificing their well-being for productivity recognition/status or financial incentives.
5. The importance of **self-monitoring of symptoms and the ability to self-regulate exposures** is emphasized by the TLV's inability to prevent heat stress illnesses and deaths among those with risk factors and thus do not fit into the category of "healthy hydrated" workers able "to sustain thermal equilibrium". This approach uses controls such as adjusting work pace/rest regimens and maintaining proper hydration through access to water. If the workplace/work process does not allow workers the flexibility to self-regulate, worker protection requires the more rigid requirements stipulated in the TLV.
6. The importance of self-monitoring and self-regulation imply the **essential priority of effective mandatory training** of workers and their supervisors to identify heat stress signs and symptoms, know how to control exposures (e.g., access to shade), adjust work pace/rest regimen, and

maintain adequate hydration. Training needs to be provided in verbal, visual and written formats in appropriate languages and literacy levels that ensure workers and supervisors understand and can discuss the topic. Supervisors, or whomever is training, need to evaluate if workers can demonstrate that they are able apply the training and revise it appropriately if they cannot.

7. The **technical and administrative challenges** of applying the ACGIH TLV is ironic in that all these complicated and challenging procedures are intended to determine the thermal status of **workers who already know** (more accurately than measuring equipment can determine) their thermal status. Given the technical complexity of the measurement and application of the criteria, there's a crying need for simplified tools (e.g., the Humidex Plan) for smaller workplaces without the resources or expertise to apply the recommended assessments.
8. E**xcluding outdoor workers from the engineering controls provision** (e.g., shade structures, breaks in air-conditioned vehicle cabs) seems discriminatory and dangerous, particularly for temporary foreign agricultural workers who do not live in air-conditioned residences and who often fear speaking up about their working or living conditions, lest they be sent home or not invited to return. They face after-work heat stress on top of their workload, a factor cited in many heat-related deaths in British Columbia's experience (Ontario does not track this information -- https://www.cbc.ca/news/canada/ottawa/heated-related-deaths-statistics-ontario-coroner-1.6901159).
9. Since the WSIB covers any incidents/illnesses/deaths that occur in employer-provided housing, it seems reasonable that the proposed regulation (and the *Occupational Health and Safety Act*) also **should apply to these work-associated accommodations**.
10. The Ministry and its Prevention Partners have already created, endorsed, and publicized a **simplified Humidex Plan** under the auspices of the former Occupational Health and Safety Council of Ontario (OHSCO). Based on the ACGIH TLV, it is offered as a workplace resource (included in written heat stress management materials) by many other Canadian jurisdictions. This plan is particularly **well suited to small businesses** without the resources and technical know-how to implement the WBGT techniques.

Recommendations:

1. Adopt the full 2022 version of the ACGIH TLV as the baseline requirement for heat stress/strain assessment, prevention, and control, including the provisions for unacclimatized workers.
2. Recognize simple heat stress tools demonstrated to be equivalent to the ACGIH TLV (e.g., OHSCO/OHCOW Humidex Plan).
3. Require information, training, and instruction about heat stress, with sufficient time and engagement, using effective formats, relevant literacy and language(s) and evaluation to assess workers' and supervisors' comprehension and ability to use what was taught, and changes if the evaluation indicates ineffective training.
4. In that training, emphasize sign and symptom recognition and self-regulation where practicable.

5. Ensure that engineering controls, where practicable, are available to all Ontario workers, whether they work indoors or outdoors.
6. Include farmworker housing in any heat stress prevention activities and requirements.
7. Ensure that any physiological monitoring of workers is only performed when other types of monitoring are not practical or sufficiently protective. Ensure that this is considered medical information, subject to medical confidentiality restrictions during the collecting, interpretation, and storage of such information.
8. Ensure adequate enforcement of heat stress protective measures by requiring workplaces without extra process heat sources develop a hot weather plan based on the ACGIH TLV or demonstrated equivalent.
9. The Ministry should issue regional directives for workplaces based on forecasts of hot weather, using the hourly outdoor weather condition data available.
10. Ensure workplaces with programs for productivity monetary and non-monetary incentives either suspend or significantly modify such programs during heat stress episodes.
11. Be clear that workers have a right to refuse dangerous work in stressful heat conditions, without reprisals. This is particularly important for precarious workers, those without unions and temporary foreign workers.

OHCOW introduction and background context:

The Occupational Health Clinics for Ontario Workers Inc. (OHCOW) is a team of health professionals committed to promoting the highest degree of physical, mental, and social well-being for workers at work. At seven clinics in Ontario, a team of nurses, occupational hygienists, ergonomists, and physicians see Ontario workers to identify work-related illness and injuries, promote awareness of health and safety issues, and develop prevention strategies. First established in 1989, the clinics have seen thousands of individual patients and visited hundreds of workplaces, helping to identify unhealthy and unsafe conditions and providing advice to workplace parties on the prevention of occupational diseases.

With respect to heat stress/strain, OHCOW deals directly with Joint Health and Safety Committees (JHSCs), unions, employers, individual workers, and others, helping them to interpret measurements of heat stress, develop assessment strategies, providing advice concerning heat-related standard operating procedures (SOPs), directly assessing exposures, and recommending prevention and control measures. A number of OHCOW's hygienists and ergonomists had extensive experience in the foundry and steel industries measuring and controlling heat stress/strain prior to working for the organization.

Since 2006, OHCOW also has provided information and support to Ontario's temporary foreign agricultural workers and their employers on occupational health and safety issues, including heat stress and sun safety. From 2012-2014, we led a targeted project delivering heat stress and sun safety workshops to 500 Ontario temporary foreign outdoor agricultural workers from Mexico and the Caribbean. These workshops took place in Simcoe/Norfolk County, and Niagara, Bradford and Durham regions, on farms (at the invitation of employers), or at the community level at regional events and health and information fairs. At these workshops, we collected information from the workers about their experiences with heat and sun safety, which we reference in this submission.

Indoors, heat stress often is associated with work in or around boiler rooms, furnaces, ovens, kitchens, bakeries, and laundries. However, other jobs have heat stress hazards. OHCOW recently learned about heat strain incidents at public indoor recreational centres. In this case, the facility had a large, heated pool (which generates humid conditions) and large windows allowing sunlight into the building. On hot days, the ventilation system seemed unable to control the temperature and humidity. During a hot weather episode in July, temperatures of 32-33^{o}C and 95% humidity (31.7-32.7 ^{o}C WBGT) were recorded at the pool deck level. Lifeguards leading physical activities (e.g., Aquafit classes, swimming lessons) lost consciousness due to heat stress on two consecutive days. Although the temperature and relative humidity were being monitored, there was no heat stress response plan to prevent such occurrences.

This past spring and summer have illustrated the intersectionality of environmental stressors due to climate change when extremely hot days coincided with poor air quality due to wildfire smoke (particularly in June 2023). Through OHCOW's temporary foreign agricultural worker program, we recognized that workers who work and live under challenging social conditions are more vulnerable to the impacts of these climate changes. They work outdoors in direct sunlight subjected to the sun's ultra-violet (UV) radiation, lack air-conditioned living quarters, fear exercising their rights under the *Occupational Health and Safety Act*, are not provided respiratory protection during wildfire smoke episodes, have less access to health care, and more.

The effect of climate change on the current and future experience of heat stress by Ontario workers is well documented in the *Ontario Provincial Climate Change Impact Assessment Technical Report*. It

states that, between 1980 and 2010, “Regionally, Extreme Hot Days are already prevalent in Southwest, Central and Eastern Ontario (all averaging around 8.6 to 9.1).” *(p.42 Ontario Provincial Climate Change Impact Assessment Technical Report, January 2023)*. So far this year (2023), the Windsor airport weather station recorded 10 days with the maximum daily temperature greater than 30°C, the Toronto one recorded 12 days and the Ottawa one recorded 14 days. Last year (2022) the number of days with a maximum daily temperature greater than 30°C was 25 days for Windsor, 19 days for Toronto and 16 days for Ottawa. We assume that the Ministry’s interest in addressing heat stress was partly a response to this report.

Q1A. What method(s) are you using to monitor and assess worker exposure?

Over the years, OHCOW taken the lead in the Ontario Prevention System's efforts to provide simple-to-use tools to Ontario workplaces to protect workers from heat stress and strain. The following describes our efforts and collaborations with the various partners to produce and distribute these tools.

The history of the Ontario Prevention System's efforts regarding heat stress: During the mid 1990's, OHCOW explored the possibilities of translating the American Conference of Governmental Hygienists' (ACGIH) Heat Stress and Strain Threshold Limit Value (TLV®) into Humidex units. The MLITSD information on heat stress at the time noted that the Ministry used the ACGIH Heat Stress TLV to assess heat stress concerns under the auspices of 25(2)(h):

> *Employers have a duty under section 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 hot environment policies and procedures to protect workers in hot environments due to hot processes or hot 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 unacclimatized workers' core body temperatures from rising above 38°C*.

The ACGIH uses three types of measurements to assess heat stress: the wet-bulb (WB) temperature, the globe temperature (GT), and the ambient temperature. These measurements are combined in the equation provided by the MLITSD's proposal. While the ACGIH TLV has a sound evidence-based strategy for managing heat stress/strain, the units used to measure heat stress are counter-intuitive. OHCOW pursued "translating" the TLV because workers understood heat stress better in terms of Humidex than WBGT-based TLV.

Challenges with WBGT face validity: Face validity is whether or not, on the face of it, a measure appears to measure what it is supposed to measure. Since the WBGT measurement primarily relies on the wet bulb temperature (it is 70% of the WBGT), the WBGT measurement almost always is less than the ambient temperature (the one commonly referred to when talking about the heat at work). For example, workers may know from official weather information that the outdoor temperature is 30°C. They also may know that the corresponding Humidex value is 39°C (if the relative humidity is 60%). However, when they hear that the WBGT is 26.4°C, they naturally question its "accuracy" since the units (°C) appear to be the same. The Humidex attempts to adjust the ambient temperature by accounting for the effect of the relative humidity, so that it provides a measure of what the humidity-adjusted, ambient temperature actually "feels like" (in this example, 39°C). As such, the Humidex provides better face validity of the heat stress workers experience than does the WBGT.

Challenges with applying the WBGT-based ACGIH Heat Stress/Strain TLV: Originally, the technology required to measure WBGT values was quite expensive (currently about $4,000 or more for the top-of-the-line monitors; less accurate models are available on-line for about $250-$1,500) and demanded some training to operate. Secondly, applying the TLV to the measurements was complicated since it combined metabolic rate categories in two sets of tables (one for acclimatized workers and one for

unacclimatized workers). Furthermore, there were common errors in reading the categories in the table.

The machinery used to measure heat stress also needs time to equilibrate with the thermal environment being measured. If not, enough time was allocated for the measurement -- 10-15 minutes in extreme cases -- the reading reflected the thermal environment where the machine had just been (e.g., an air-conditioned office), not the thermal conditions in the working environment being assessed.

Last, but definitely not least, this technical equipment is being used to determine a worker's internal thermal condition, while with proper training, that person is the most accurate source of information about the heat stress that they are experiencing. They know best when it's "too hot to work", better than any machine external to their body. This point was Recommendation #3 in the 1992 Coroner's Inquest into the heat stroke death of Brian Freeman; he died in 1990 at the age of 21.

Demand for a simpler heat stress assessment method: OHCOW's original efforts to develop a Humidex translation of the TLV's WGBT criteria did not gain much interest until the 2001 heat wave that lasted six days in the beginning of August, causing workers in the province to experience a lot of heat strain. A bakery worker died on the last day of the heat wave after working a number of 12-hour shifts around hot ovens. In response to this death, the Canadian Auto Workers union (now Unifor) approached OHCOW, looking for a simpler system to assess workplace heat stress than the WBGT, something like the well known and well understood like the Humidex. OHCOW researched how to translate measures of temperature and relative humidity into WBGT units. We used the equation from a (then) recently-published paper [DS Moran, and KB Pandolf, "Wet bulb globe temperature (WBGT) – to what extent is GT essential?", Aviat Space Environ Med 70:480-484 (1999) https://pubmed.ncbi.nlm.nih.gov/10332944/] to translate the WBGT criteria into Humidex and built a table based only on temperature and relative humidity measurements. The current version of this table is available at: https://www.ohcow.on.ca/wp-content/uploads/2022/06/humidex-based-heat-response-plan-01-14-21.pdf.

Initial endorsements of the Humidex plan: In May 2002, the CAW and OHCOW presented the table to the Ministry of Labour and received encouragement to promote the plan. However, the MOL indicated they would still rely on the formal WBGT measurements and the ACGIH TLV for enforcement purposes. That same month the Humidex plan also was presented to the Occupational Health and Safety Council of Ontario (OHSCO) which decided that its partners would use OHCOW's Humidex Heat Stress Response Plan to answer questions and provide information on heat stress. Led by the CAW, various unions in Ontario (and outside the province) also promoted the plan at health and safety conferences, on their websites and through their health and safety staff interacting with health and safety committees and reps in various sectors and workplaces.

2002 Validation of the Humidex plan: This Humidex plan was piloted in June 2002 in GM's Oshawa assembly plant. Based on their experiences, we increased the Humidex criteria in each category by a single Humidex unit. That same summer, OHCOW partnered with a mid-sized auto-parts manufacturing firm (350 workers), whose processes included some heated (400°F) presses, to measure heat stress continually for the whole summer. The firm hired three students whose only tasks were to continually take WBGT/Humidex measurements over the operation's three shifts. they collected just over 7000 measurements, including one outdoor measurement in the sun every hour. We then used this data to validate our translation of the WBGT into Humidex indoors and outdoors, along with local weather station data. We came up with the following correlation: Humidex = 1.94 x WBGT - 11.3. Using the

outdoor WBGT measurements, an adjustment factor was determined to account for the radiant heat experienced by workers working outdoors in direct sunlight (add 2 to 3 Humidex units to the outdoor measurement – pro-rated based on the amount of cloud cover). Adjustments were also added for different clothing configurations.

OHSCO Heat Stress Package: In July 2004, OHSCO established a sub-committee to jointly further development of the plan and produce promotional materials. The package -- finally completed in 2007 -- was updated in 2009 when the ACGIH TLV was revised (resulting in a slight change to the Humidex plan). The poster, guidebook, and a heat stress calculator "wheel" are still available on the websites of various HSAs. For several years, OHCOW co-ordinated bulk purchasing of these materials for distribution by the 12 HSAs, the MOL, the WSIB, and the WHSC. The WSIB supported these efforts with a three-minute video featuring Dr. Leon Genesove (then MOL's Chief Occupational Physician) discussing the importance of workplaces addressing heat stress using these tools. The WHSC also produced a 12-minute heat stress training video, freely available on the internet. OHCOW also produced an on-line calculator (https://www.ohcow.on.ca/edit/files/general_handouts/heat-stress-calculator.html) to allow users to enter the temperature and relative humidity, using measurements taken in the workplace, to calculate the Humidex value and provide the corresponding heat strain prevention advice.

These efforts resulted in the wide adoption of the Humidex plan in Ontario workplaces. While these materials look slightly dated, they are still accurate and relevant and widely in use today as illustrated in this list of provinces either reproducing or linking their guidance to the OHSCO/OHCOW tools:

- ❑ WorkSafeBC cites the OHSCO plan and the OHCOW tools in their Guidelines - Part 7 - Division 4 - Thermal Exposure: G7.29-4 Heat stress assessment using a dry bulb thermometer or Humidex index (https://www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-guidelines/guidelines-part-07#SectionNumber:G7.29-4).
- ❑ Alberta references the OHCOW Humidex plan in its "Best Practice – Working Safely in the Heat and Cold" publication (https://open.alberta.ca/dataset/dc0a7530-64d4-481a-a0c9-2f1c7107d8db/resource/b6c78e81-c91c-4cd2-a244-7b93c5862d6f/download/68946222014workingsafelyheatcold2014-07whs-pubgs006.pdf).
- ❑ Saskatchewan lists the plan in their "Hot Conditions Guideline" (https://www.worksafesask.ca/wp-content/uploads/2020/06/Hot-Conditions-Guidelines-FINAL.pdf)
- ❑ Manitoba specifically cites and reproduces the OHSCO Humidex guidelines: https://www.safemanitoba.com/Page%20Related%20Documents/resources/TC_OutdoorHeatStress_14SWMB.pdf
- ❑ Nova Scotia has a description of, and a link to, the OHCOW Humidex Plan (page 9): https://novascotia.ca/lae/healthandsafety/docs/Heat-Stress-Guidelines.pdf
- ❑ PEI has also reproduced OHCOW's Humidex Plan in their "Heat Stress Prevention Guide" (https://www.wcb.pe.ca/DocumentManagement/Document/pub_guidetopreventionofheatstressatwork.pdf)

Q1B. What engineering controls (e.g., shade structures) and other measures and procedures do you think are most effective at protecting workers?

An interesting anecdote arose during the GM Oshawa pilot project of the Humidex plan. During the presentation to the GM Joint Health and Safety Committee, we mentioned the hierarchy of controls. When we suggested air-conditioning assembly plant buildings as an engineering solution, there was a not-so-polite chuckle. Everyone at the table assumed the cost would be exorbitant. However, asked what was done in GM's Texas assembly plants, the company hygienist discovered they were all air conditioned. A year or two later, we learned that GM had installed chillers in their ventilation system to remove the humidity of incoming air. We were told that the Accounting Department independently did their own cost/benefit analysis of shutting down production according to the negotiated heat stress plan versus the cost of dehumidifying the plant air. They concluded the business case for installing the chillers was justified. In our experience with many workplaces over the years, this is one of the few cases where the "business case" for a health and safety intervention came from the accounting department as opposed to coming from the JHSC or health and safety staff. (Perhaps the Ministry's guidance for any heat stress regulation should include this example.)

Excluding heat stress engineering controls for outdoor workers seems discriminatory and dangerous, given the following exceptions for extreme weather conditions and engineering controls that are "not reasonably practicable". Since they work in direct sunlight, with generally higher exposures to heat stress than indoor workers, the exemption also seems counterintuitive. In fact, simple engineering or administrative measures, such as providing shade and/or taking a break in an air-conditioned vehicle, are both reasonably practicable and appropriate for extreme weather conditions. They're expected in the United States, where federal and state OSHA agencies' heat stress prevention materials use the mantra "Water, rest, shade" (https://www.dir.ca.gov/DOSH/HeatIllnessInfo.html). Also note that the Coroner's Inquest into Brian Freeman's death due to heat stroke (Brian worked outdoors) also recommended air conditioning in garbage trucks) and the recent US UPS agreement to provide air conditioning in its trucks (https://www.npr.org/2023/06/14/1182147381/ups-workers-facing-extreme-heat-win-a-deal-to-get-air-conditioning-in-new-trucks).

In a related topic, another engineering control is adequate and accessible sanitary facilities and potable water for outdoor workers, including agricultural workers. The Ontario government already has changed the rules about toilets for construction workers (https://news.ontario.ca/en/release/1002827/ontario-requiring-cleaner-washrooms-on-construction-sites). Other outdoor workers deserve the same rights. In conversations with agricultural workers, we know that some are not getting enough hydration on hot days because they have no accessible toilet. They fear drinking "too much" will mean they need to use a toilet when one is not available. If they must be available on construction sites, surely, they should be at other outdoor work sites. Furthermore, they also need easy access to potable water on a regular basis.

Q2. Are there any additional provisions to protect workers that you think should be included in this proposal?

When we compare the Ministry's current approach to managing heat stress concerns (referring to the ACGIH Heat Stress/Strain TLV using the OHS Act Section 21(2)(h)), the proposed regulation offers much less protection than the currently referenced ACGIH TLV. These missing items are crucial to protecting the health of Ontario workers exposed to heat stress/strain.

Absence of the TLV Action Limit for unacclimatized workers: Probably the most significant missing provision in the MLITSD proposal is the absence of the TLV Heat Stress/Strain Action Limit (AL). The ACGIH TLV has two tables of heat stress criteria, one for unacclimatized workers (Action Limit) and the other for acclimatized workers (TLV). The *Documentation of the Heat Stress/Strain TLV* clearly states:

> *The goal of the TLV is to limit heat stress exposures to those that may be sustained for hours; that is, where healthy acclimatized individuals can achieve and maintain thermal equilibrium. The Action Limit (AL) describes conditions where most healthy unacclimatized workers can achieve thermal equilibrium. If thermal equilibrium cannot be sustained, there is an increasing likelihood of heat exhaustion or heat stroke.*

The current proposal only uses the portion of the ACGIH TLV table that applies to acclimatized workers. According to the Ministry's own documents "(h)ot spells in Ontario seldom last long enough to allow acclimatization." Thus, according to the Ministry's own documents, this proposed regulation would only protect acclimatized workers whose exposure to additional workplace heat sources (e.g., furnaces, molten metal, ovens, hot water processes) would be considered acclimatized. The *Documentation for the Heat Stress/Strain TLV* provides an objective measure to determine heat stress acclimatization:

> *Acclimatization is a physiological adaptation that improves an individual's ability to tolerate heat stress. Acclimatization requires physical activity under heat stress conditions like those anticipated for the work. With a recent history of heat stress exposures of* ***at least 2 continuous hours for 5 of the last 7 days****, a worker may be considered acclimatized for the purposes of the TLV. Acclimatization declines when activity under heat stress conditions is discontinued. A noticeable loss occurs after 4 days and may be completely lost in 3 weeks. A person may not be fully acclimatized to a sudden or episodic higher level of heat stress.* (*emphasis added*)

To check the validity of the Ministry's statement that "(h)ot spells in Ontario seldom last long enough to allow acclimatization.", we collected weather data for June 1 – September 8, 2023 for Windsor, Toronto and Ottawa. Using the work of Thomas Bernard, chief architect of the ACGIH TLV for Heat Stress/Strain (https://health.usf.edu/publichealth/tbernard/~/media/92C0253689504F958E7D4F9A685B39D1.ashx), we converted temperature and relative humidity weather data into WBGT estimates. Then we applied the ACGIH acclimatization criteria ("at least 2 continuous hours of heat stress exposure for 5 of the last 7 days") to the weather data (see Appendix #1 for data used).

Using the Ministry's proposed criteria (just the ACGIH acclimatized TLV values), Windsor and Ottawa only had a single hour between June 1 and September 8, 2023 when the WBGT exceeded TLV minimum value of 28°C WBGT (lowest level for moderate workload). Toronto's WBGT estimates never exceeded the 28°C WBGT threshold. The ACGIH acclimatization criteria requires two continuous hours, so none of the days from June 1st to September 8th would count for even a single day towards the five days out of

the last seven days exposed to 28°C WBGT. Thus, no worker exposed to heat stress at a level equivalent to this summer's outdoor weather conditions was acclimatized. This evidence clearly confirms the Ministry's statement that "Hot spells in Ontario seldom last long enough to allow acclimatization."

It also emphasizes the need for the inclusion of the ACGIH Action Limit (AL) in the regulation to ensure the health and safety of Ontario workers. Without this provision, there would be essentially no protection for most indoor workers (not exposed to excessive process heat). If Ontario workplaces had complied only with the proposed regulation, there probably would have been a significant number of workers suffering from heat-related illness and likely some heat-related deaths.

Looking at outdoor workers exposed to direct sunlight, even if we assume they were outdoors in constant direct sunlight for the whole summer (i.e., not a single cloudy day) and we add this value to the WBGT estimate regardless of the hour of the day (even after sunset), then (using Dr. Bernard's advice) we added 2.2°C WBGT to the estimated outdoor WBGT. The Windsor weather station data had a total of seven days in 2023 with at least a single hour's WBGT+2.2° value above the 28°C WBGT threshold, and none occurred within a time period of five days within the past seven days. Toronto had 27 hours over six days, and Ottawa had 30 hours over seven days, above 28°C WBGT (although one of Toronto's six days and three of Ottawa's seven days only had a single hour of WBGT+2.2° values above the 28°C WBGT threshold).

The following tables provide the **number of hours** for each weather station, between June 1 and September 13, 2023, when the outdoor temperature equivalent WBGT exceeded various ACGIH Moderate workload criteria:

	OTTAWA INTL A	
	WBGT count	**WBGT + 2.2 count**
WBGT>25.0	61	248
WBGT>26.0	23	152
WBGT>27.0	9	73
WBGT>28.0	**1**	**30**
WBGT>29.0	**0**	**12**
WBGT>30.0	**0**	**2**

	TORONTO INTL A	
	WBGT count	**WBGT + 2.2 count**
WBGT>25.0	61	235
WBGT>26.0	23	133
WBGT>27.0	8	71
WBGT>28.0	**0**	**27**
WBGT>29.0	**0**	**11**
WBGT>30.0	**0**	**0**

	WINDSOR A	
	WBGT count	**WBGT + 2.2° count**
WBGT>25.0	74	328
WBGT>26.0	38	176
WBGT>27.0	10	86
WBGT>28.0	**1**	**43**
WBGT>29.0	**0**	**15**
WBGT>30.0	**0**	**1**

Note that the Windsor weather station was not operating for 130 hours during this time and some of those hours were during heat stress conditions. That makes the Windsor table an under-estimate of the actual number of hours of WBGT estimates above the listed criteria.

Therefore, based on the weather data for this summer so far (where July was the world's hottest month on record), even assuming work in direct sunlight with no clouds every day for the whole summer, workers would not have achieved the ACGIH acclimatization criteria. This provides solid evidence supporting the Ministry's statement that "(h)ot spells in Ontario seldom last long enough to allow acclimatization." It is interesting to also note that NIOSH uses unacclimatized workers as the basis for their heat stress work/rest schedules (Table 6-2 p.76, in https://www.cdc.gov/niosh/docs/2016-106/pdfs/2016-106.pdf).

NIOSH Table 6-2. Work/rest schedules for workers wearing normal work clothing*

temperature (°F)†	temperature (°C)†	RH	sun	WBGT	Moderate work (minutes work/rest)
90	32.2	30%	0	21.7	Normal
91	32.8	30%	0	22.0	Normal
92	33.3	30%	0	22.4	Normal
93	33.9	30%	0	22.8	Normal
94	34.4	30%	0	23.1	Normal
95	35.0	30%	0	23.5	Normal
96	35.6	30%	0	23.9	Normal
97	36.1	30%	0	24.2	Normal
98	36.7	30%	0	24.6	Normal
99	37.2	30%	0	25.0	Normal
100	37.8	30%	0	25.3	45/15
101	38.3	30%	0	25.7	40/20
102	38.9	30%	0	26.1	35/25
103	39.4	30%	0	26.5	30/30
104	40.0	30%	0	26.8	30/30
105	40.6	30%	0	27.2	25/35
106	41.1	30%	0	27.6	20/40
107	41.7	30%	0	27.9	15/45
108	42.2	30%	0	28.3	Caution‡
109	42.8	30%	0	28.7	Caution‡
110	43.3	30%	0	29.0	Caution‡
111	43.9	30%	0	29.4	Caution‡
112	44.4	30%	0	29.8	Caution‡

***With the assumption that workers are physically fit, well-rested, fully hydrated, under age 40, and have adequate water intake and that there is 30% RH and natural ventilation with perceptible air movement.**

†Note: Adjust the temperature reading as follows before going to the temperature column in the table:

Full sun (no clouds): Add 13°F *Full sun (no clouds): Add 7.2°C*

Partly cloudy/overcast: Add 7°F *Partly cloudy/overcast: Add 3.9°C*

No shadows visible/work is in the shade or at night: no adjustment

Per relative humidity:

10%: Subtract 8°F *10%: Subtract 4.4°C*

20%: Subtract 4°F *20%: Subtract 2.2°C*

30%: No adjustment

40%: Add 3°F *40%: Add 1.7°C*

50%: Add 6°F *50%: Add 3.3°C*

60%: Add 9°F *60%: Add 5.0°C*

‡High levels of heat stress; consider rescheduling activities.

This implies that if the proposed regulation had been in force this summer, there would have been only a single hour (2:00 pm-3:00 pm) of relief provided in Windsor on July 28th, a single hour in Ottawa (3:00-4:00 pm) on September 5th and not a single hour in Toronto throughout the June 1- September 13, 2023 summer. Given our very hot weather conditions in July 2023, this proposed regulation would have provided a single hour of heat relief for some Ontario workers and none for most.

If we assume outdoor workers deal with constant sunlight (i.e., no clouds all summer), then the Windsor weather station data would have provided a total of 43 hours (spread over 10 days, two of these 10 days had only a single hour of the day that exceeded the 28°C WBGT TLV) during which heat stress relief were to be provided. The Toronto weather station data adjusted for outdoor work under constant sunlight would have provided two hours each on of two separate days, and the Ottawa data would have provided 12 hours with heat stress relief distributed over four days. For indoor workers without any radiant heat exposure, there essentially would have been no heat stress relief this summer.

We know that outdoor weather conditions do not accurately reflect indoor exposures. This is a point that we include in our Humidex plan, encouraging users not to rely on the weather station data but to take measurements of the temperature and relative humidity in representative locations inside the building. However, to evaluate the Ministry's proposal, and since we do not have access to any in-plant data, we used outdoor weather data as a surrogate.

To assess the bias this surrogate implies, we reviewed some data from a mid-sized auto parts plant in southwestern Ontario which has heated presses (400°F, i.e., inside work with some radiant heat contribution). It hired three students to take heat stress measurements continually on an hourly cycle from late June to early September 2002. Appendix #2 has a graph showing the indoor vs. outdoor hourly measurements (roughly 2000 measurements). From the graph, it is clear that for the majority of the time, outdoor WBGT measurements are higher than the indoor WBGT measurements (the sun's radiant heat contribution was greater than the radiant heat from the presses). We also received some in-plant measurements from another mid-sized auto parts plant in south central Ontario which also had some process-producing radiant heat, from the end of May to the end of August 2020. In this plant, measurements were only taken when heat stress concerns were raised (118 hourly measurements over this period of time). Comparing this data to the nearest weather station data, showed a similar pattern as the graph in Appendix #2. We calculated a lag time of peak temperatures in the plant occurring two to six hours inside the building after the weather station peak temperature (the optimum lagged correlation between in-plant and weather station measurements was four hours).

Thus, the evidence suggests that two-to-six hour lagged outdoor heat stress measurements are a safe (likely an over-estimate) surrogate estimate of the indoor heat stress assessments. Therefore, the evidence supports the surrogate use of outdoor measurements for the evaluation of indoor heat stress with a slight bias of the outdoor WBGT estimated data over-estimating the lagged indoor WBGT values (i.e., the true indoor values lagged by two-to-six hours are likely lower than the outdoor estimates).

Based on these considerations, the ACGIH TLV would not have been exceeded in any inside Ontario workplace (without a significant internal heat source such as ovens and furnaces) for more than an hour or two in the hottest spots in the province this past summer. Thus, if only the TLV is included in the regulation, leaving out the Action Limit, this regulation would not have provided any relief for most Ontario workers this summer. Given that currently the Ministry relies on the ACGIH TLV when using Section 25(2)(h) to assess workplace heat stress conditions (which includes the Action Limit for

unacclimatized workers), the proposed regulation would be a major step backwards in preventing heat-related illness for Ontario workers.

Adjustment for a worker's body weight: Table 1 in the ACGIH Heat Stress/Strain TLV, titled "Metabolic Rate Categories and the Representative Metabolic Rate with Example Activities", has a footnote saying: "Note: The effect of body weight on the estimated metabolic rate can be accounted for by multiplying the estimated rate by the ratio of actual body weight divided by 70 kg (154 lb)."

In the Ministry's proposal (last page), this footnote is not included under the listing of the four classifications of work loads. This means that a worker who weighs 154 pounds, with a metabolic rate of 228 Watts (W), would be assigned the "light work" category). However, if the worker weighed 200 lbs, the ACGIH footnote requires adjusting the metabolic rate by the ratio of the person's weight divided by 154 lbs (i.e., 200 lbs/154 lbs = 1.3), giving a weight-adjusted metabolic rate of (1.3 X 228 =) 296 W, which is in the middle of the "moderate work" classification. If the worker weighed 250 lbs, their weight-adjusted metabolic rate (250 lbs/154 lbs X 228 W = 370 W) would be just within the "heavy work" classification range of metabolic rates (360-468 W). This is one reason that the Humidex plan collapsed all the metabolic rate categories and simply assumed the single classification of unacclimatized, "moderate work" as the basis for the translation of the WBGT criteria into Humidex units.

Adjustments for additional factors: As mentioned above, the ACGIH Heat Stress/Strain TLV applies to "healthy acclimatized individuals" who "can achieve and maintain thermal equilibrium". It should be noted that the data for the establishment of the TLV was collected among young male army recruits (average weight of 154 lbs) and the extrapolation of this to other groups (such as women) is problematic. In a recent article Thomas Bernard and co-authors [S. Tony Wolf, Thomas E. Bernard & W. Larry Kenney (2022), "Heat exposure limits for young unacclimatized males and females at low and high humidity", Journal of Occupational and Environmental Hygiene, 19:7, 415-424] evaluated in a laboratory carefully selected volunteers assessing the differences of males and females to experimentally applied heat loads. Their conclusion was:

> *Occupational heat stress criteria, as a function of wet bulb globe temperature (WBGT) and metabolic heat production, are set by organizations such as the ACGIH (2021), NIOSH (2016), and ISO (2017). Those criteria are made with reference to the "standard man," considered to be a representative human with a body mass of 70 kg and body surface area of 1.8 m^2, assuming no significant differences between sexes. Although the overall probability of uncompensable exposure at the OEL was ≈5%, the data presented herein suggest that, when matching for metabolic heat production, females have a higher probability of uncompensable heat stress at the OELs defined by the ACGIH TLV and NIOSH REL. (page 422)*

It should be noted that the researchers choose not to control for menstrual cycle, pregnancy, nor menopause. As explained above, the fact that a person's metabolic rate is proportional to their weight also needs to be considered. The fact that the TLV documentation stipulates that it applies to "healthy" workers who can "maintain a thermal equilibrium" also calls into question the applicability to those with risk factors. The ACGIH TLV mentions the following exceptions (HSMP= heat stress management plan):

> *The HSMP should remind workers with personal risk factors that may lower tolerance to heat stress that they may be at greater risk for heat-related disorders. Lower tolerance is associated with: (1) a prior history of heat stroke or episodes of heat exhaustion; (2)*

health conditions or medications that affect the cardiovascular system, water and electrolyte balance, metabolism, or thermoregulation; (3) acclimatization state; and (4) lower aerobic capacity, obesity, pregnancy, or age.

Note that while many workers fall into these categories, those who commonly succumb to serious heat stress related illnesses are often young males with none of these factors, but who ignore the heat stress signals from their body.

It should also be pointed out that the Coroner's Inquest into Brian Freeman's death took particular note that he had a genetic medical condition called malignant hypothermia, which the report said occurs at a rate of 1 in 200 persons [a more recent review cites the frequency as 1 in 400 (Rosenberg H, Pollock N, Schiemann A, Bulger T, Stowell K. "Malignant hyperthermia: a review", Orphanet Journal of Rare Diseases. 2015 Dec;10(1):1-9.)]. Persons with malignant hypothermia do not manage to dissipate heat from their body as well as those without this condition. For this reason, the Coroner's Inquest Jury recommended training and self-regulation of heat stress symptoms about the use of heat stress measurements. It is also the reason why OHCOW includes the caveat to "NEVER IGNORE ANYONE'S SYMPTOMS DESPITE YOUR MEASUREMENTS".

Self-regulation: As mentioned above, the Coroner's Inquest into Brian Freeman's death made a recommendation (#3):

To the Ontario Ministries of Labour and Health: that the WBGT-based heat stress limits be used henceforth only as guidelines and that the Ministry work towards establishing in their stead a system of self-regulation in which employers must:

a) inform workers if their work involves exposure to possible heat stress.

b) provide workers with information about factors which could predispose them to heat stress and advise them to seek medical examinations to determine their own capacity to work in hot environments.

c) Expose new and otherwise unacclimatized workers to heat stress on a gradual basis in accordance with progressive schedules of 5 – 10 days, employees must acknowledge they are acclimatized.

d) train their workers on the warning signs and symptoms of heat stress in themselves and their co-workers. Fluids best to drink in heat should be explained, such as caffeine free pop and fruit juice.

e) encourage self-monitoring by workers of their exposure to heat stress.

f) require workers to take breaks and fluids in accordance with their own assessments of their exposures to heat stress regardless of WBGT-based heat stress levels.

g) clothing should allow free movement of perspiration and air flow. Hats should be worn on hot days. Hats should be mentioned as an option during the interview for hot days. Tank tops and shorts should be made part of the regular dress code. Personnel should follow up on "references" by checking if person is used to heavy work and working in high heat.

h) training should be confirmed for competency.

i) include heat stroke training in first aid course.

In OHCOW's experience with workplace adopting the Humidex Plan, there seem to be three-stage evolution of the implementation of the plan:

a. First, using the measurements to settle disputes about whether conditions require work pace adjustments or not.
b. During the continual collecting of Humidex measurements, workers and supervisors "self-calibrate" themselves by sub-consciously correlating their symptoms with the measurement such that they can anticipate reasonably well how the rest-work regimen will be based on what their body is telling them.
c. Lastly, they realize that if they allow for self-regulation (allowing workers to take breaks/adjust work pace when needed and supplying sufficient fluids to maintain hydration) there is less work time lost than if the ACGIH criteria are strictly followed. At this point, measurements are only occasionally needed to confirm that self-regulation is working.

Thus, given time and leeway, workplace evolve their own heat stress responses in line with the Brian Freeman's Coroner's Inquest recommendation #3. Professor Jim Smith of the University of Toronto Chemical Engineering department, who chaired the Master's program in Industrial Hygiene, provided the testimony that convinced the Coroner's Inquest Jury to include this recommendation.

Training: The #1 step in the five-step Humidex plan is training. The Coroner's Inquest recommendation #3 also stresses the importance of effective training and that this training be "confirmed for competency" [recommendation #3(h)]. Since the training is rather straightforward, there might be a temptation to use a short web-based system. However, while such programs might be a support, they cannot be used alone because heat stress requires workers to look out for each other (a worker experiencing heat stroke will not be able to take the necessary steps to alert others to their condition). The training should be done in groups. It should include the basics listed in the MLITSD's proposal but the mechanisms to address heat stress emergencies must be organized at the departmental level with assigned responsibilities. This kind of training need not take a lot of time, but its effectiveness must be proven. Some sort of demonstration of training should be incorporated in the training program so that a worker can demonstrate they can apply the training to their work situation. Examples include being able to diagnose your own state of hydration by the colour of your urine, knowing how to improve your hydration, and being aware of the workplace supports if required. The timing of such training and periodic refreshers also is important (e.g., just before a forecasted heat wave, and/or workers starting new heat-exposed work tasks).

Worker housing: In July and August, during a pilot OHCOW project, we provided some interested temporary foreign agricultural workers in the Niagara region with Aranet4 wireless indoor air quality monitors. They recorded the temperature and humidity inside **employer-provided housing**. The following are measurements we received from the workers:

Date	Temperature	Relative Humidity	Humidex	WBGT
July 26, 2023	33.9°C	62%	46	30.1°C
July 27, 2023	32.6°C	54%	42	28.1°C
August 3, 2023	35.3°C	46%	44	28.8°C

The outdoor temperature at the St. Catherines/Niagara District A weather station reached a high of 30.0°C on July 26, 28.8°C on July 27, and 28.2°C on August 3, 2023, illustrating how the workers' living quarters heated up more than the outdoors.

Although, we recognize that the MLITSD currently does not recognize worker housing as part of their regulatory space, we believe there is precedent and opportunity for the Ministry to contribute to healthy and safe worker housing for temporary foreign workers, to which their employer assigns them.

For example, in 2022 Oregon OSHA adopted a temporary amendment to requirements for "Agricultural Labor Housing and Related Facilities", to address high ambient temperatures "to ensure that workers who live in employer-provided labor housing can recover after working long hours outdoors." (key requirements of this amendment can be found at https://osha.oregon.gov/OSHAPubs/factsheets/fs87.pdf and the full amendment is at https://osha.oregon.gov/OSHARules/adopted/2022/ao3-2022-letter-alh-heat.pdf). Oregon OSHA also created a "Heat Risks in Housing" poster for workers and requires employers to post the document and include emergency contact information on it.

The Ontario government should adopt Oregon OSHA's clear requirements for worker housing to demonstrate that it also is leading the way by responding to increasing temperatures from climate change and keeping agricultural workers healthy and safe. It also would be consistent with the WSIB's Foreign Agricultural Workers policy that "In addition to coverage while in the course of employment, workers are also covered during periods of leisure, meals, and while sleeping in employer-provided quarters" (https://www.wsib.ca/en/operational-policy-manual/foreign-agricultural-workers).

Other additional provisions: It seems that the Ministry has tried to simplify the fairly complicated ACGIH procedure for assessing and controlling heat stress. However, in doing so, it has removed protections Ontario workers already have under the current scheme of addressing heat stress (i.e., using the general duty requirement and the full ACGIH TLV). Unless the current proposal is uses the full equivalent of the ACGIH TLV, it appears that Ontario workers are better off with the current enforcement practices. OLRB Decision # 1207-06-HS Cancoil Thermal Corp., Applicant v. Brad Moon, https://www.canlii.org/en/on/onlrb/doc/2007/2007canlii15121/2007canlii15121.pdf, confirms the Ministry's ability to enforce the ACGIH TLV using Section 25(2)(h). Leaving things as they currently are seems better than implementing this proposed regulation. An alternative would be to simply refer directly to the ACGIH current TLV for Heat Stress/Strain rather than try to spell it out, similar to what is done for many biological and chemical agents under O.Reg. 833.

Comparison of recommended controls to the ACGIH Heat Stress Management Program: The table below compares the General and Job-Specific Controls outlined in the Documentation of the ACGIH Heat Stress/Strain TLV with the controls listed in the Ministry's proposal (bolded sections of the ACGIH control seem to be missing from the Ministry's proposal).

ACGIH Heat Stress/Strain Controls	MLITSD Proposed Controls
General Controls	
Training: Provide verbal and written instructions for pre-job and annual training programs with information about: heat stress and strain, heat disorders, mitigation plan, and emergency response plan **in a language and format that is understood by workers and supervisors**.	Workers be provided the following information and instruction • 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.
Heat Stress Hygiene Practices: Fluid replacement, self-monitoring of symptoms, maintain good health status, appropriate breaks with shade, and **modify expectations based on acclimatization**.	Any additional measures and procedures implemented, beyond engineering controls to control heat exposures must: • 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, A requirement that cool, potable 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.
Policies: Acclimatization plan, early recognition of heat-related signs and symptoms in other workers and actions to take, and on self-determination. Heat Stress Management Program. The elements of a written heat stress management program	Be developed in consultation with the joint health and safety committee or health and safety representative, if any • Be in writing.

ACGIH Heat Stress/Strain Controls	MLITSD Proposed Controls
include at least General Controls and include Job Specific Controls when there is a possibility of exposures greater than the TLV or AL or indicated by an alternative method of evaluation.	
Environmental surveillance	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.
Medical clearance and counseling by a healthcare provider.	
Emergency Response Plan: The worker who appears to be confused, disoriented, irritable, or has malaise, chills or seizures, should be managed as a medical emergency and needs aggressive cooling, and emergency transport and continuous observation.	
Job-Specific Controls	
Engineering controls that reduce the metabolic rate, provide general air movement, reduce process heat and water vapor release, provide shade, shield radiant heat sources, and adjust clothing requirements, among others.	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.
Administrative controls that set acceptable exposure times, allow sufficient recovery, and limit physiological strain.	
Personal cooling (air, liquid, ice) that is effective for the specific work practices and conditions.	
Physiological monitoring.	If physiological monitoring is used as part of an alternative method of assessing exposure to heat

ACGIH Heat Stress/Strain Controls	MLITSD Proposed Controls
	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.

The Ministry's use of the word "advise" in section 9, about the work-rest cycle, rather than using the words "shall implement" seems problematic from an enforcement perspective.

In their **2022 revision of the ACGIH *Heat Stress and Strain TLV Documentation***, the role of general controls and job-specific controls has changed from previous versions (and accordingly the Humidex Plan has been changed). Originally, it was assumed that general controls applied to exposures in the Action Limit range and specific controls applied to the TLV range (and physiological controls were needed to monitor exposures that exceeded the TLV range). The 2022 version clarified the applicability of different levels of control to recommend that all levels of control can be applied to all ranges of exposure.

Also, **the 2022 ACGIH TLV documentation revision no longer suggests a two-hour time weighted average** time frame for exposure assessment, which the Ministry's proposal uses.

Physiological monitoring entails collecting personal health information. While there is a vague reference to "the supervision of a person who is qualified", in our experience, it is beneficial to spell out more specifically who these qualified persons are. The regulation needs to specifically recognise that collection and storage of confidential medical information (body temperature, heart rate, etc.) falls under the *Personal Health Information Protection Act* (*PHIPA*). A regulation also should explicitly state that appropriate medical supervision and interpretation of the collected personal health information needs to be ensured.

OHCOW has regularly encountered attitudes amongst workplaces that collected personal measurements of core temperature and/or heart rate and other physiological monitoring of workers should be exempt from medical supervision, with no respect the confidentiality of such data. Therefore, in our experience, we recommend that this kind of data collection needs to be explicitly deemed confidential to prevent violations of medical privacy. This extends to employers asking about health conditions identified as factors for heat stress. Given the experience that young healthy male workers without those factors are the most likely to experience serious heat-related illnesses, it is evident that workers, guided by their personal health care providers, can manage these factors better than those who don't have them.

While the ACGIH includes medical screening for fitness when workers are to be exposed to heat stress, the proposed regulation does not. Physiological monitoring is at the bottom of the hierarchy of controls; as such, it should be discouraged. However, if it is necessary, the monitoring needs to be done extremely competently, as ACGIH expects, and it should not be used when other measures are practicable.

Production incentives/competition/etc. is another issue which comes up regularly about work pace controls during heat stress exposures. They can be financial, related to prizes, or simply meant to

establish a competitive productive environment (e.g., posting individual worker production rates with the effect of shaming workers with lower production rates). To prevent motivating workers from exceeding their heat stress control capacities, there should be a legal requirement to suspend such incentives/competitions/publication of production rates during heat stress events to ensure workers can adhere to the heat stress work activity restrictions without fear of reprisals or losing income.

Q3. How can MLITSD best help employers, especially small businesses, to implement the proposed new requirements?

Since the Ministry itself with all the OHSCO prevention partners played an important role in the development of the Humidex Plan, which is a simplification of the ACGIH TLV, the obvious thing the MLITSD could do to help employers, especially small businesses, to protect Ontario workers would be to renew their previous recognition and endorsement of the OHSCO Humidex plan. In complex heat conditions and in cases of dispute, the ACGIH TLV could still be considered the "gold standard" for dispute and complex problem resolution, however for other workplaces who are simply trying to create a "hot weather plan" and do not have any significant heat sources other than the ambient weather conditions, the Humidex Plan is a simple, inexpensive, and effective way to manage heat stress/strain.

OHSCO and OHCOW Heat Stress Materials:

Humidex Hot Weather Plan: https://www.ohcow.on.ca/wp-content/uploads/2022/06/humidex-based-heat-response-plan-01-14-21.pdf

Online Humidex Calculator: https://www.ohcow.on.ca/resources/apps-tools-calculators/humidex-based-heat-stress-calculator-plan/

Heat Stress Awareness Guide:
https://www.ohcow.on.ca/edit/files/heatstressawareness/Heat%20Stress%20Awareness%20Guide.pdf

Indoor Workplace Humidex poster: https://www.ohcow.on.ca/wp-content/uploads/2022/03/humidex_poster.pdf

For small agricultural businesses that may lack resources to implement engineering controls (e.g., shade and air-conditioned spaces and structures), the MLITSD, or other government departments, could offer financial incentive programs to support employers providing these protective measures.

The Ministry also can develop training and educational resources about heat stress and safety, using effective formats for workers in target sectors, including temporary foreign workers who face language, literacy, and other information access barriers. Ensuring these resources are available to employers will help them comply with their training requirements. Make this training available in a variety of formats, ensuring an accessible version is available (in person and hands-on), especially for workers who do not have experience with virtual sessions, or find it ineffective.

Temporary Foreign Agricultural Workers infographics:

More recently, through federal project funding, we have expanded our outreach efforts and connected to more Ontario temporary foreign agricultural workers, including those employed in greenhouses. We have continued to engage outdoor and indoor agricultural workers on issues of heat and sun safety. This summer it led to new infographics about heat and sun safety, translated into multiple worker languages. We have been actively distributing them to a significant number of Ontario workers, employers, and other key stakeholders. These infographics can be found here:

Heat Stress – A Serious Hazard for Outdoor Workers Infographic:
https://www.ohcow.on.ca/posts/heat-stress-outdoor-workers/

Heat Stress – A Year-Round Concern in Greenhouses: https://www.ohcow.on.ca/posts/heat-stress-greenhouses/

Stay Hydrated in the Heat: https://www.ohcow.on.ca/posts/stay-hydrated-in-the-heat/

Enforcement:

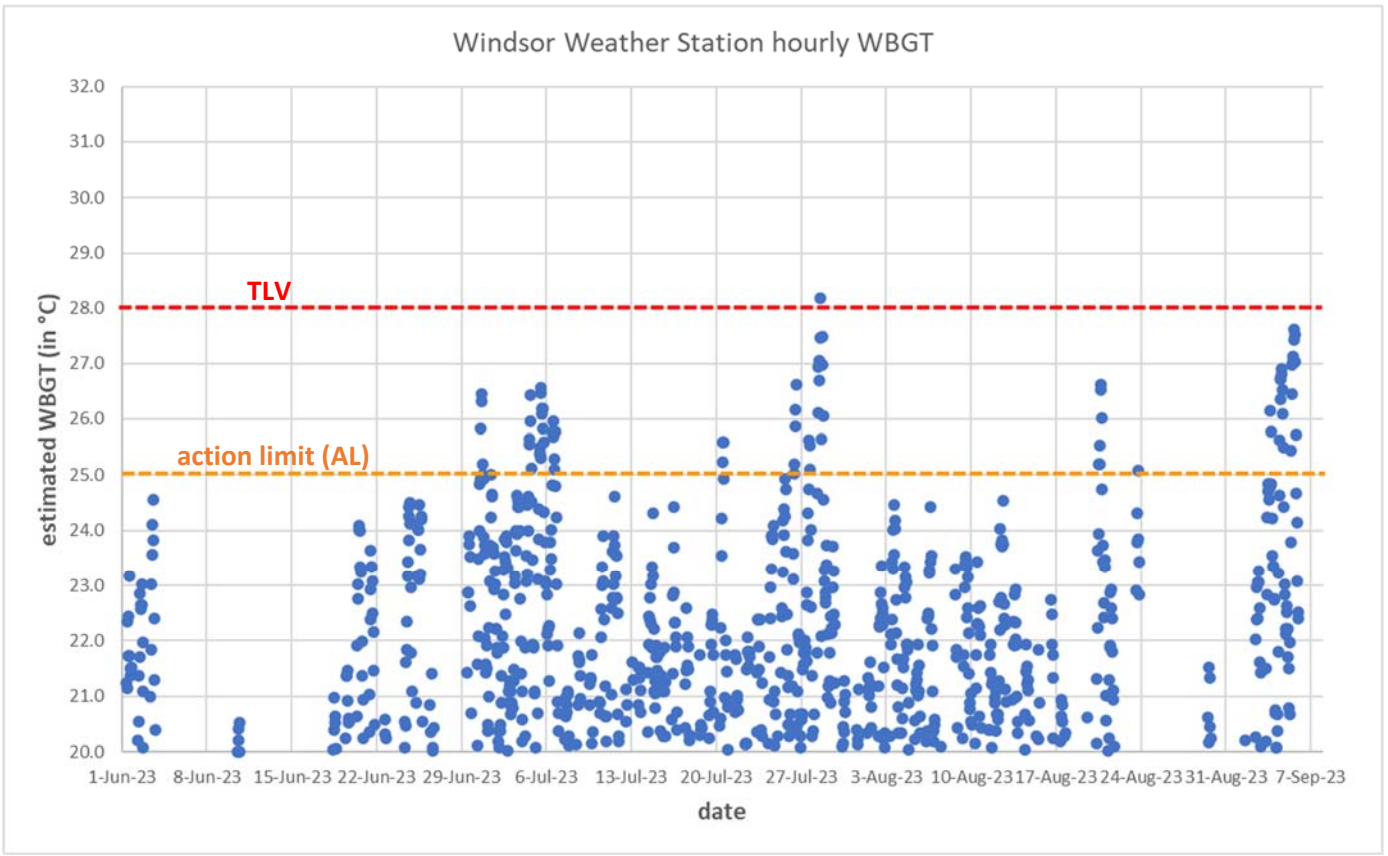
The stories we have heard from workers suggest the need to strengthen and improve proactive inspections and enforcement blitzes and anti-reprisal protections for workers. During OHCOW's recent heat and sun safety activities with temporary foreign agricultural workers, we heard concerns with high temperatures in employer-provided housing. In one case, workers raised the concern with the employer, who offered the "solution" of leaving the door to their quarters open all day. That posed a security risk to workers and their belonging and did little to reduce the heat levels. When government inspectors arrived to investigate the situation, the employer selected workers who would be allowed to communicate with the inspectors, but the inspectors did not bring an interpreter and could not directly communicate with the workers.

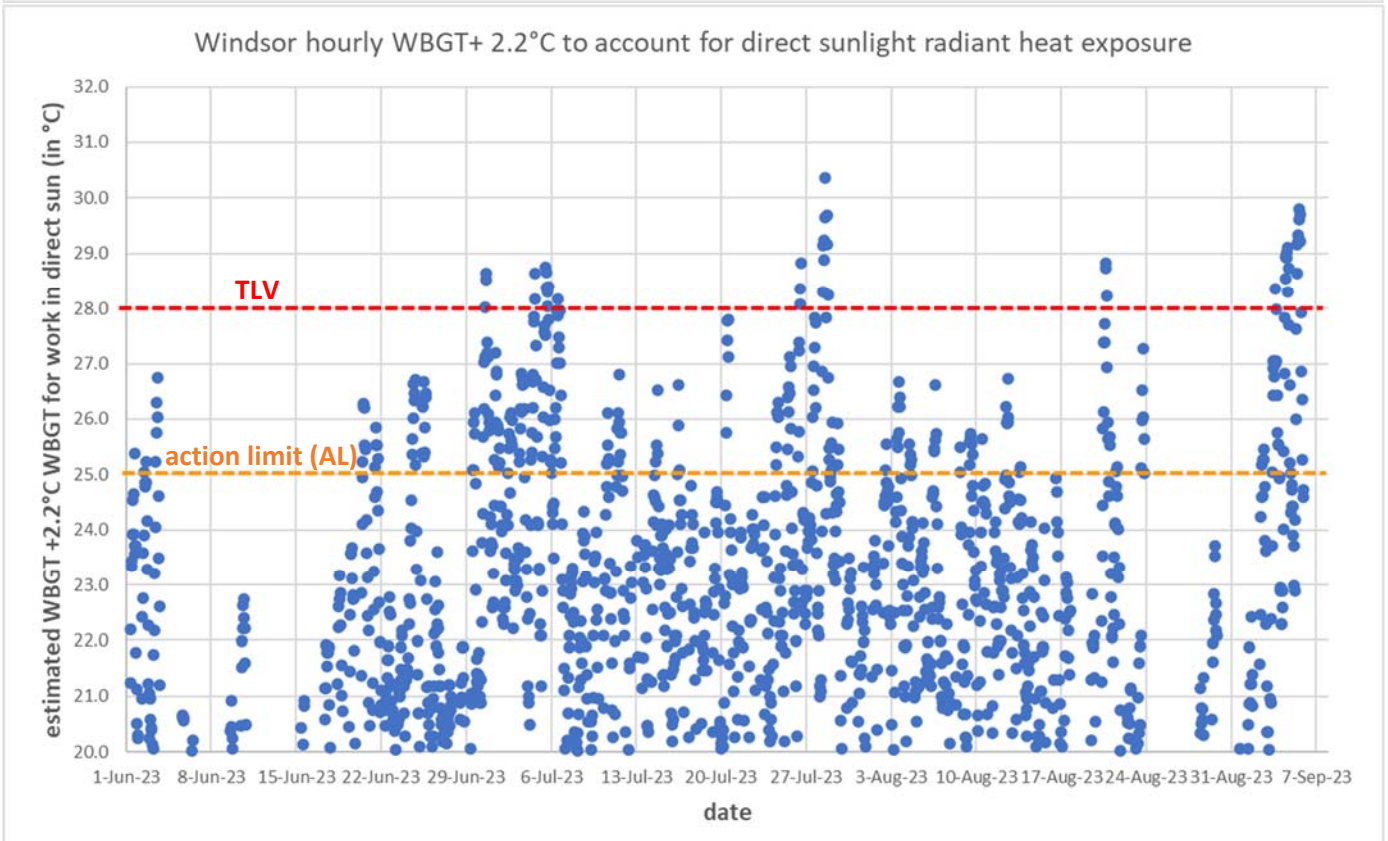
Relying solely on workers to report cases of employer non-compliance, especially in sectors where workers (including temporary foreign andother precarious workers) continue to report intimidation and reluctance to report OHS concerns and situations of unsafe or unhealthy conditions for fear of reprisals, will not adequately protect such vulnerable workers. Any regulation and enforcement activity needs to be clear that workers have a right to raise OHS concerns and/or refuse dangerous work, without reprisals.

Given that data on outdoor weather conditions are available on an hourly basis, the Ministry could issue proactive regional directives for workplaces based on forecasts of hot weather conditions. We believe that Nova Scotia has experimented with such alert programs.

The Ministry's current heat stress guideline requires workplaces (who don't have extra process heat sources) to develop a hot weather plan based on the ACGIH TLV or demonstrated equivalent. The Ministry should ensure such plans are developed and effectively implemented. Joint health and safety committees or health and safety representatives must be involved in developing those plans.

Appendix #1: Application of ACGIH TLV and Action Limit to 2023 WBGT Converted Weather Data for Windsor, Toronto, and Ottawa


Windsor Weather Station hourly WBGT
estimated WBGT (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
20-Jul-23
27-Jul-23
3-Aug-23
10-Aug-23
17-Aug-23
24-Aug-23
31-Aug-23
7-Sep-23
date


Windsor hourly WBGT+ 2.2°C to account for direct sunlight radiant heat exposure
estimated WBGT +2.2°C WBGT for work in direct sun (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
20-Jul-23
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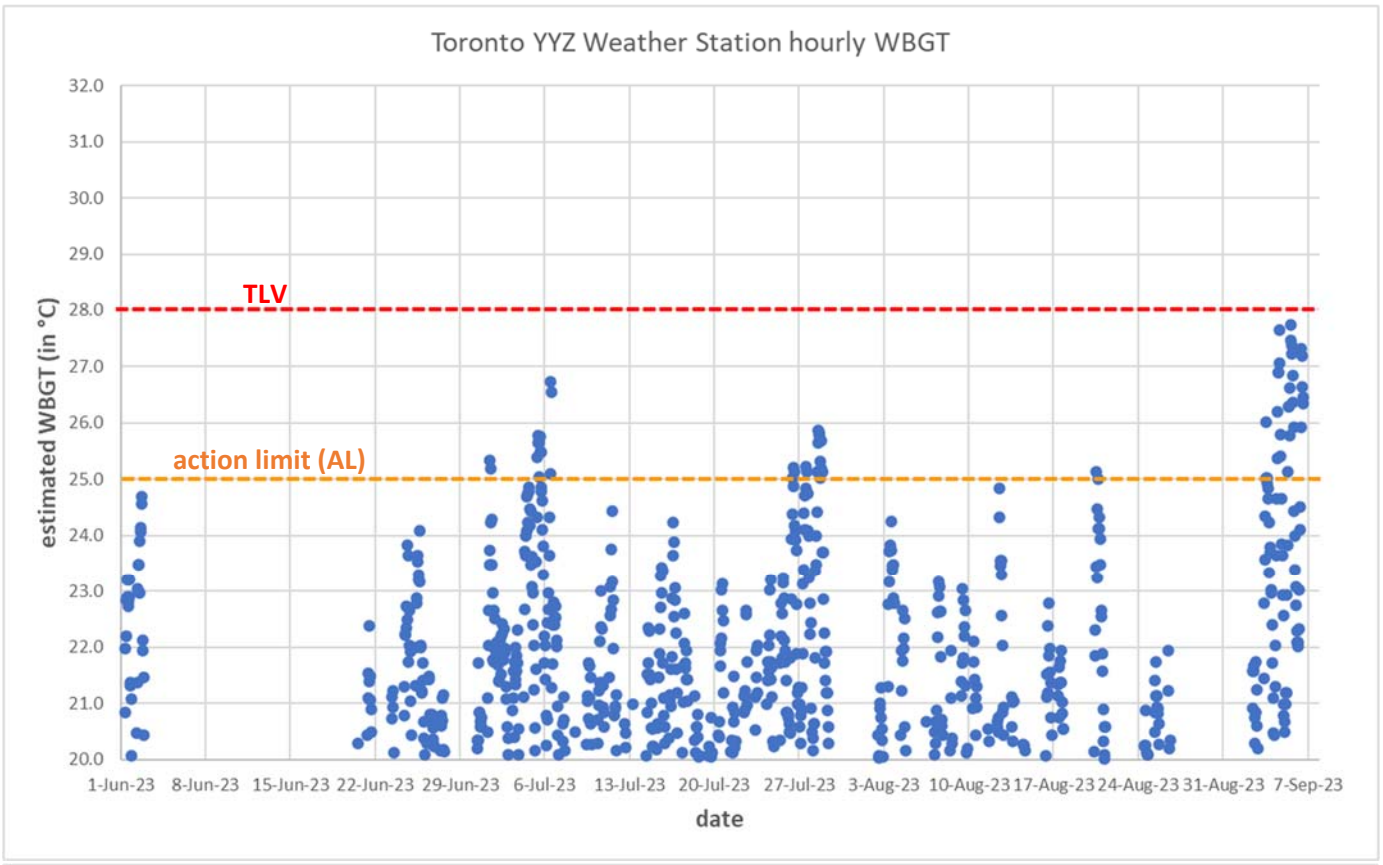
10-Aug-23
17-Aug-23
24-Aug-23
31-Aug-23
7-Sep-23
date


Toronto YYZ Weather Station hourly WBGT
estimated WBGT (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
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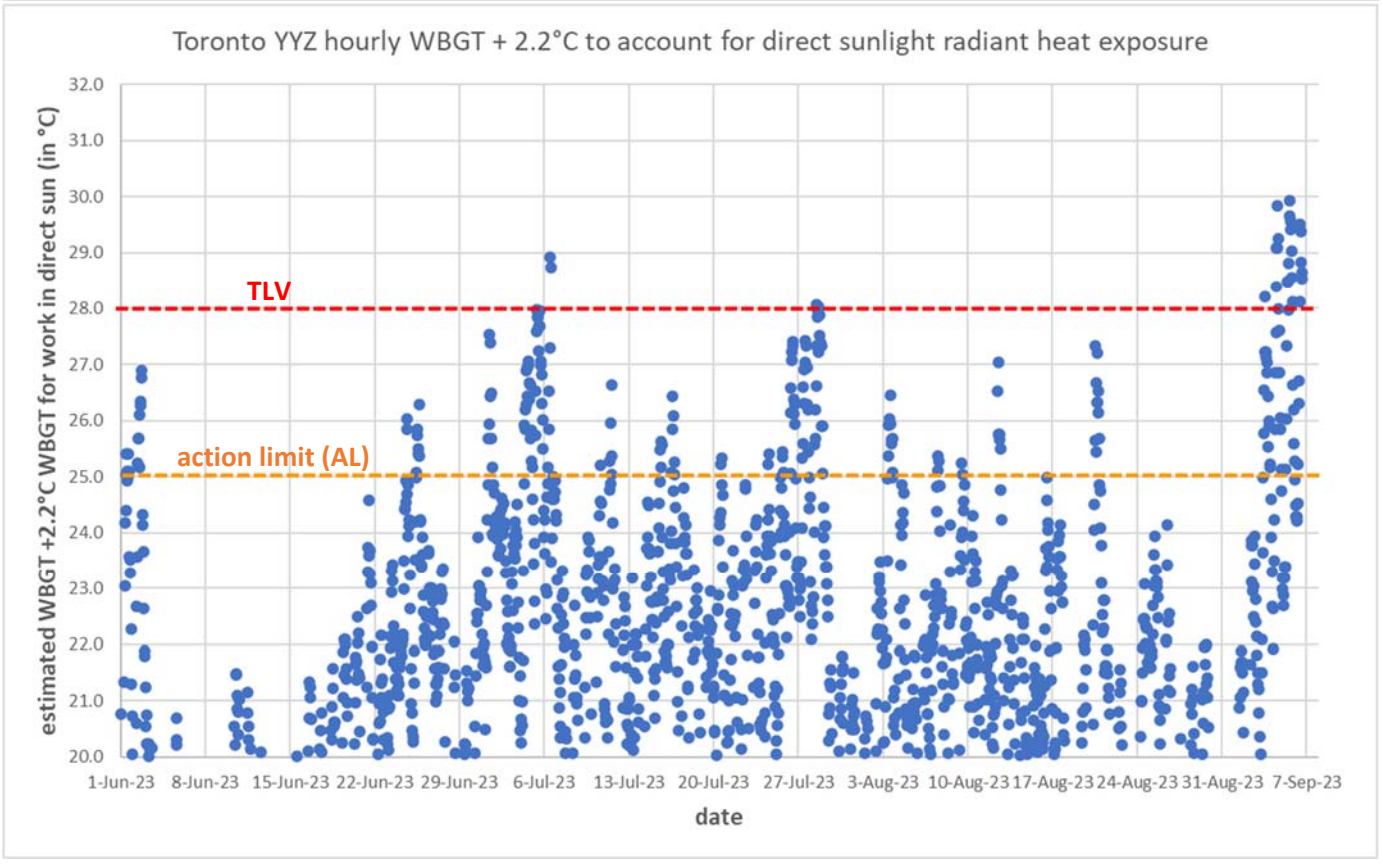
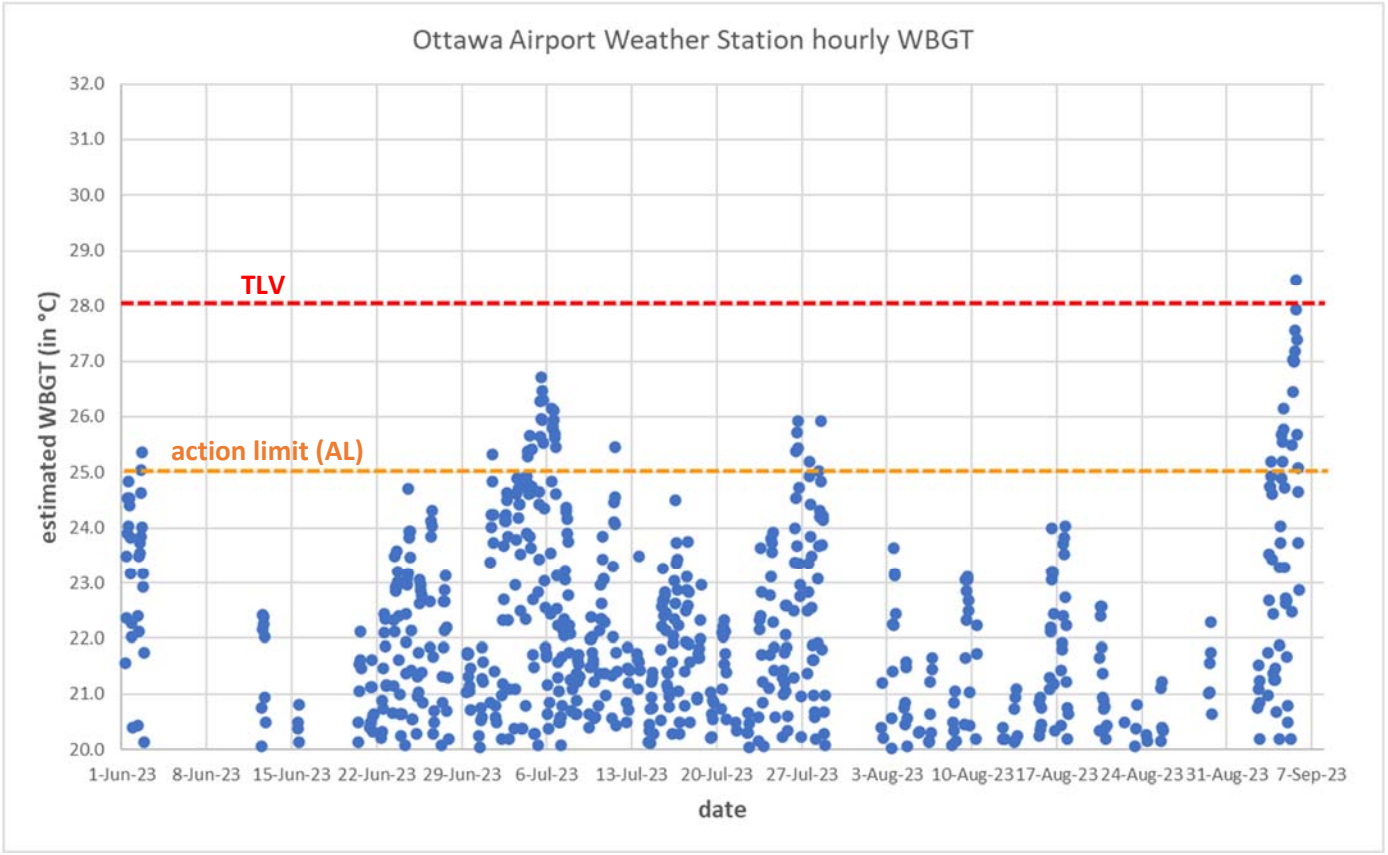
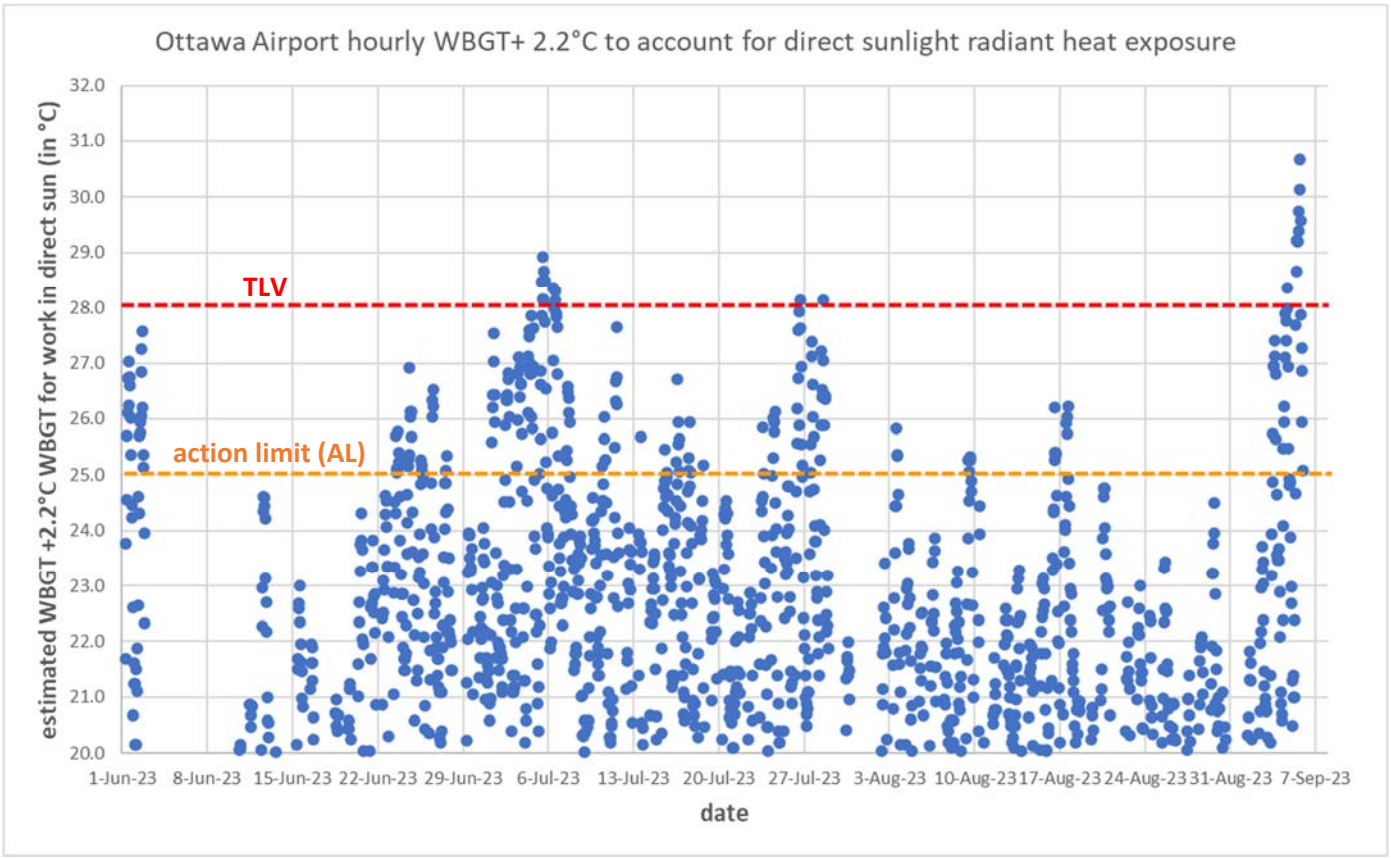
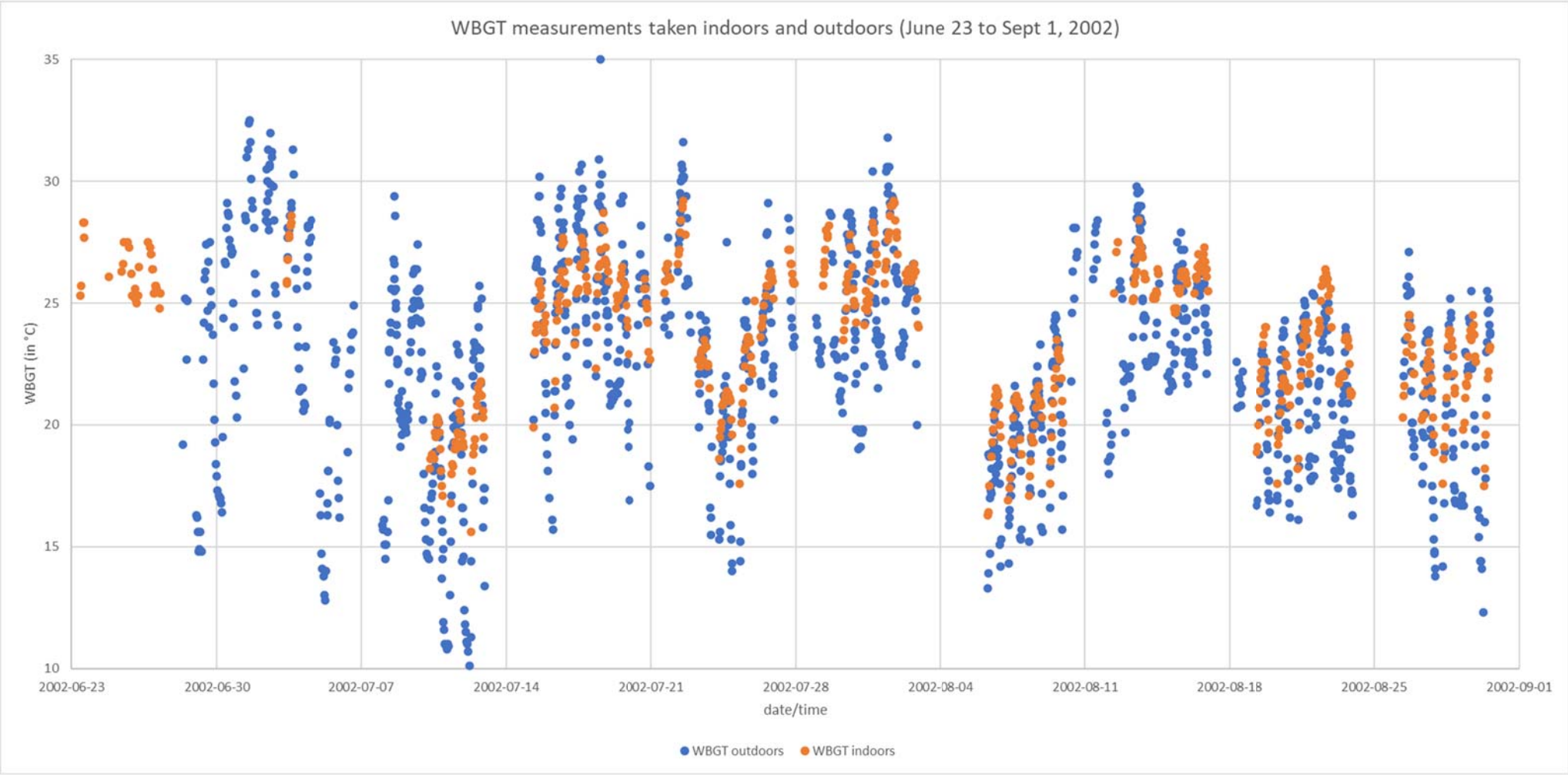
31-Aug-23
7-Sep-23
date


Toronto YYZ hourly WBGT + 2.2°C to account for direct sunlight radiant heat exposure
estimated WBGT +2.2°C WBGT for work in direct sun (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
20-Jul-23
27-Jul-23
3-Aug-23
10-Aug-23
17-Aug-23
24-Aug-23
31-Aug-23
7-Sep-23
date


Ottawa Airport Weather Station hourly WBGT
estimated WBGT (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
20-Jul-23
27-Jul-23
3-Aug-23
10-Aug-23
17-Aug-23
24-Aug-23
31-Aug-23
7-Sep-23
date


Ottawa Airport hourly WBGT+ 2.2°C to account for direct sunlight radiant heat exposure
estimated WBGT +2.2°C WBGT for work in direct sun (in °C)
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
TLV
action limit (AL)
1-Jun-23
8-Jun-23
15-Jun-23
22-Jun-23
29-Jun-23
6-Jul-23
13-Jul-23
20-Jul-23
27-Jul-23
3-Aug-23
10-Aug-23
17-Aug-23
24-Aug-23
31-Aug-23
7-Sep-23
date

Appendix #1: Comparison of 2000 Indoor and Outdoor WBGT Measurements



This data was collected in a mid-sized auto parts plant located in southwestern Ontario. The plant had heated presses (400°F, i.e., inside work with some radiant heat contribution) as part of the manufacturing process. The company hired 3 summer students to take heat stress measurements continually on an hourly cycle from late June to early September 2002. This graph that shows the indoor vs. outdoor hourly measurements (roughly 2000 measurements). It is clear from the graph, for the clear majority of the time, the outdoor WBGT measurements are higher than the indoor WBGT measurements (which stands to reason as the sun's radiant heat contribution is greater than the radiant heat from the presses).

Appendix #3: OHCOW Humidex-Based Heat Response Plan

Humidex Based Heat Response Plan

What is it?

- The Humidex plan is a simplified way of protecting workers from heat stress which is based on the 2022 ACGIH Heat Stress TLV® (Threshold Limit Value®) which uses wet bulb globe temperatures (WBGT) to estimate heat strain. These WBGT's were translated into Humidex.
- The ACGIH specifies an action limit and a TLV® to prevent workers' body temperature from exceeding 38°C (38.5°C for acclimatized workers). Below the action limit (Humidex 1 for work of moderate physical activity) most workers will not experience heat stress. General and Job-Specific heat stress controls are to be provided for all workers both in the Humidex 1 and Humidex 2 categories. The TLV® (Humidex 2) only applies to healthy, well-hydrated, acclimatized** workers.
- **Note:** in the translation process some simplifications and assumptions have been made, therefore, **the plan may not be applicable in all circumstances and/or workplaces** (follow steps #1-5 to ensure the Humidex plan is appropriate for your workplace).

Humidex 1	Response	Humidex 2
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	work with 15 minutes relief per hour can continue; provide adequate cool (10-15°C) water; at least 1 cup (240 mL) of water every 20 minutes worker with symptoms should seek medical attention	43 – 44
40 – 41	work with 30 minutes relief per hour can continue in addition to the provisions listed previously	45 – 46*
42 – 44	if feasible, work with 45 minutes relief per hour can continue in addition to the provisions listed above	47 – 49*
45 or over	only medically supervised work can continue	50* or over

Humidex calculator: http://www.ohcow.on.ca/edit/files/general_handouts/heat-stress-calculator.html

***at Humidex exposures above 45, heat stress should be managed as per the ACGIH TLV®**

General Controls: General controls apply to all workers and include providing annual heat stress training, encouraging adequate fluid replacement, permitting self-limitation of exposure, encouraging watching out for symptoms in co-workers, and adjusting expectations for workers coming back to work after an absence. Workers doing moderate work are considered acclimatized in Ontario only if they regularly work around heat sources (e.g., in foundries, around ovens, etc.). **NOTE:** clothing and radiant heat must also be taken into account when using this guideline (see steps #1-5 outlined on page 3).

Job-Specific Controls: Job-specific controls include (in addition to general controls) engineering controls to reduce physical job demands, shielding of radiant heat, increased air movement, reduction of heat and moisture emissions at the source, adjusting exposure times to allow sufficient recovery, and personal protective equipment that provides for body cooling.

Occupational Health Clinics for Ontario Workers Inc.

August 2023

Humidex Heat Stress Response Plan

Limitations: this table is based on work with **little or no radiant heat**, assuming wearing **regular summer clothing**; if your specific working conditions vary from these assumptions, see the steps 1-5 listed below to make adjustments

	Relative Humidity (in %)																	
Temp (in °C)	**100%**	**95%**	**90%**	**85%**	**80%**	**75%**	**70%**	**65%**	**60%**	**55%**	**50%**	**45%**	**40%**	**35%**	**30%**	**25%**	**20%**	**15%**	**10%**
49																			50
48	NEVER IGNORE ANYONE'S SYMPTOMS DESPITE YOUR MEASUREMENTS!!!																		49
47	Moderate Unacclimatized & Heavy Acclimatized							Moderate Acclimatized & Light Unacclimatized										50	47
46																		49	46
45																	50	47	45
44		Action															49	46	43
43	45+	only medically supervised work						50+*								49	47	45	42
42	42-44	work with 45 min/hr relief						47-49*							50	48	46	43	41
41	40-41	work with 30 min/hr relief						45-46*							48	46	44	42	40
40	38-39	work with 15 min/hr relief						43-44						49	47	45	43	41	39
39	34-37	warn for symptoms & extra water						40-42					49	47	45	43	41	39	37
38	30-33	alert for symptoms & extra water						36-39				49	47	45	43	42	40	38	36
37	25-29	water as needed						32-35			49	47	45	44	42	40	38	37	35
36	*for Humidex 45+, heat stress should be managed as per the ACGIH TLV®								50	49	47	45	44	42	40	39	37	35	34
35								50	48	47	45	43	42	40	39	37	36	34	33
34							49	48	46	45	43	42	40	39	37	36	34	33	31
33					50	48	47	46	44	43	41	40	39	37	36	34	33	32	30
32			50	49	48	46	45	44	42	41	40	38	37	36	34	33	32	30	29
31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30	29	28
30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	31	30	29	28	27
29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28	27	26
28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25		
26	39	38	37	36	35	34	33	33	32	31	30	29	28	27	26	25			
25	37	36	35	34	33	33	32	31	30	29	28	27	26	26	25				
24	35	34	33	33	32	31	30	29	28	28	27	26	25						
23	33	32	31	31	30	29	28	28	27	26	25								
22	31	30	30	29	28	27	27	26	25	25									
21	29	29	28	27	26	26	25												
	100%	**95%**	**90%**	**85%**	**80%**	**75%**	**70%**	**65%**	**60%**	**55%**	**50%**	**45%**	**40%**	**35%**	**30%**	**25%**	**20%**	**15%**	**10%**

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848 Main Street E.,
Hamilton, L8M 1L9
905-549-2552

South Western
171 Kendall Street,
Sarnia, N7V 4G6
519-337-4627

3129 Marentette Ave.,
Unit #1
Windsor, N8X 4G1
519-973-4800

Central
970 Lawrence Ave. W.,
Suite #110
Toronto, M6A 3B6
416-449-0009

Northern
432 Westmount Ave,
Unit AB
Sudbury, P3A 5Z8
705-523-2330

North Western
1151 Barton Street,
Suite 103B
Thunder Bay, P7B 5N3
807-623-3566

Eastern
1545 Carling Ave.,
Suite 101
Ottawa, K1Z 8P9
613-725-6999

OHCOW TOLL FREE 1-877-817-0336

Humidex Based Heat Response Plan

Step #1: Training

- the Humidex plan by itself cannot guarantee that workers will not be affected by heat stress. It is absolutely essential that workers learn to recognize the early signs and symptoms of heat stress and know what to do to prevent them!
- if at all possible, workers need to be able to alter their pace of work, rest breaks, and fluid intake in response to early symptoms (240 mL every 20 minutes).
- the ideal heat stress response plan would let workers regulate their own pace by "listening to their body" without need for measurements.

Step #2: Adjust for Clothing

- evaporating sweat is the primary way the body gets rid of excess heat build-up, therefore, the best clothing is the kind that makes it easiest for sweat to evaporate. The Humidex plan assumes regular summer clothes (light shirt & pants, underwear and socks and shoes).
- for workers who wear cotton overalls on top of summer clothes one should add 5° Humidex (roughly equal to 3°C WBGT) to the workplace Humidex measurement.
- for different clothing configurations, estimate correction factor by comparing them with cotton overalls (e.g. gloves, hard hat, apron, protective sleeves might be equivalent to a little less than half the evaporation resistance as overalls so add 1° or 2° Humidex).
- If clothes do not allow sweat evaporation (encapsulated suits) heat stress should be managed by monitoring vital signs (see ACGIH TLV®)

Step #3: Select a Measurement Location

- split the workplace into heat stress zones and put a thermal hygrometer in each zone.
- identify a representative location within the zone where measurements can be taken (if you want to base your actions on a single reading, select the highest heat stress zone).

Note: The Humidex Heat Stress Response Plan is **based on workplace measurements not weather station or media reports**
(temperatures inside buildings **do not** usually correspond with outdoor temperatures)

Step #4: Measure Workplace Humidex

- a thermal hygrometer (usually $10-$50 at hardware or office supply stores) is a simple way to measure the temperature and relative humidity in your workplace
- once you have the temperature and humidity, use the table above to determine the corresponding Humidex value and the appropriate heat stress prevention response (remember to adjust for clothing (step #2) and radiant heat (step #5))
- measurements should be recorded at least hourly if the Humidex is above 30° or temperature above 26°C

NEVER IGNORE ANYONE'S SYMPTOMS NO MATTER WHAT THE HUMIDEX!

Step #5: Adjusting for Radiant Heat

- for outdoor work in direct sunlight between the hours of 10 am and 5 pm, add 3-4 Humidex units (pro-rate according to percentage cloud cover) to your Humidex measurement
- for indoor radiant heat exposures, use common sense to judge whether the exposure of concern involves more or less radiant heat than direct sunlight and adjust the Humidex measurement by adding the 3-4 unit correction factor appropriately

Occupational Health Clinics for Ontario Workers Inc.

Health Effects of Heat Stress*

Health Effect	Symptoms	Treatment
Heat Rash	Red bumpy rash with severe itching.	Change into dry clothes often and avoid hot environments. Rinse skin with cool water. Wash regularly to keep skin clean and dry.
Fainting	Sudden fainting after at least two hours of work; cool moist skin; weak pulse.	**GET MEDICAL ATTENTION**. Assess need for CPR. Move to a cool area; loosen clothing; make person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.
Heat Cramps	Heat cramps are painful, involuntary muscle spasms that usually occur during heavy exercise in hot environments. Inadequate fluid intake often contributes to this problem. The spasms may be more intense and more prolonged than typical nocturnal leg cramps. Muscles most often affected include the calves, arms, abdomen, and back – although the cramps may involve any muscle group involved in the exercise.	**If you suspect heat cramps:** Rest briefly and cool down. Drink water or an electrolyte-containing sports drink. Practice gentle, range-of-motion stretching and gentle massage of the affected muscle group.
Heat Exhaustion	Signs and symptoms of heat exhaustion often begin suddenly, sometimes after excessive exercise, perspiration and inadequate fluid intake. Features resemble shock and include: feeling faint, nausea, ashen appearance, rapid heartbeat, low blood pressure, hot, red, dry or sweaty skin, low-grade fever, generally less than 40°C.	**If you suspect heat exhaustion:** Get the person out of the sun and into a shady or an air-conditioned location. Lay the person down and elevate the feet slightly. Loosen or remove the individual's clothing. Have the person drink cold water, not iced, or a sports drink containing electrolytes. Cool the person by spraying him or her with cool water and fanning. Monitor the person carefully. Heat exhaustion can quickly become heatstroke. **If fever — especially greater than 40°C — fainting, confusion or seizures occur, CALL FOR EMERGENCY MEDICAL ASSISTANCE.**
Heat Stroke	The main sign of heatstroke is a markedly elevated temperature — generally greater than 40°C — with hot, dry skin and changes in mental status ranging from personality changes to confusion and coma. Other signs may include: rapid heartbeat, rapid and shallow breathing, elevated or lowered blood pressure, cessation of sweating, irritability, confusion or unconsciousness, fainting, which can be the first sign in older adults.	**If you suspect heatstroke:** Move the person out of the sun and into a shady or an air-conditioned space. Dial 911 or **CALL FOR EMERGENCY MEDICAL ASSISTANCE**. Cool the person by covering him or her with damp sheets or by spraying with cool water. Direct air onto the person with a fan or newspaper.

 Heat Rash and Fainting adapted from Ontario Ministry of Labour Heat Stress Guideline: http://www.labour.gov.on.ca/english/hs/pubs/gl_heat.php (accessed Jan/21).

Vulnerability to Heat Stress: There are many permanent or temporary conditions (e.g., age, heart or lung conditions, dehydration, fatigue, some medications, etc.) that can make a person more vulnerable to heat strain. Despite these conditions, workers may be able to cope given adequate knowledge of the signs and symptoms of heat stress and, given the latitude to make the appropriate adjustments to their pace of work. It is more often the young, fit workers who may think they are invincible who succumb to heat strain. Some workers may need medical advice about what accommodations would be right for them.

****Acclimatization:** The MOL heat stress guideline states that "hot spells in Ontario seldom last long enough for workers to acclimatize". Workers performing "moderate" work (e.g., work with some pushing, lifting) would also not be assumed to be acclimatized by the same criteria, unless there is significant radiant heat associated with the work. Workers performing "heavy" work (e.g., shovelling dry sand), however, could probably be considered acclimatized once into the warm weather season. The acclimatized heavy work WBGT numbers are similar to the moderate unacclimatized. Since the TLV® is based on data derived from 20-year-old males weighing an average of 154 lbs., "real" workers probably burn up more calories than the TLV® light category assumes. Selecting the "moderate" work category will account to some extent for workers who are somewhat dehydrated, older (e.g., over 40), not male, and heavier than 154 lbs.

September 2023