

HEAT STRESS PROGRAM

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1.0 Purpose

This Heat Stress Program outlines how to assess the level of heat stress an individual may experience while working in various environments, the potential impacts and health consequences of exposure to heat stress and recommendations on types of controls that can be used to minimize this impact.

2.0 Scope

This program is to be applied to all work performed by staff and faculty. The program should be activated when any of the following environmental criteria are met:

For outdoor work:

- A humidex reading of 35°C
- A heatwave (3 or more days of air temperatures of 32°C or more)
- Environment Canada Humidex Advisory (air temperatures exceeding 30°C with a humidex value exceeding 40°C)
- Ontario Ministry of Environment Smog Alert

These criteria (except for the smog alert) are all obtained from the Environment Canada weather station closest to the working location.

For indoor work:

- An indoor temperature or humidex value at or exceeding 35°C

3.0 Definitions

Acclimatization

The gradual physiological adaptation that improves an individual's ability to tolerate heat stress. The Ministry of Labour, Immigration, Training & Skills Development considers that most outdoor workers in Ontario are not acclimatized to work at hot temperatures because the elevated hot conditions do not last long enough for workers to become acclimatized.

Heat Stress

The net heat load due to physical demands, clothing requirements, and the environment (air temp, humidity, radiant heat, and air movement) to which a worker may be exposed.

Heat Strain

The body's physiological response to the heat stress experienced. A normal physiological response is dedicated to the dissipation of excess heat from the body.

Humidex

A calculated value combining the effects of temperature and humidity. It intends to provide a measure of how one feels based on the given humidity and temperature. Table 1 provides a summary of how Environment Canada relates the humidex value to the comfort of an average adult (see Table 1).

Table 1: Humidex values with respect to degree of comfort

Humidex Range	Degree of Comfort
20 – 29	Comfortable
30 – 39	Some discomfort
40 – 45	Great discomfort, avoid exertion
Above 45	Dangerous, heat stroke possible

Relative Humidity

Humidity refers to the amount of water vapour present in the air. Relative humidity is the current amount of water vapour in air in comparison to the maximum amount of water vapour in air at a given temperature. Relative humidity is expressed as a percentage.

Temperature

A measure of how hot something is. For air, it is normally expressed in degrees Celsius (°C) or degrees Fahrenheit (°F).

4.0 Hazards Associated with Heat Stress

A healthy person maintains an internal body temperature within one degree of 37°C. A change of 1°C or more will occur during illness or if environmental and/or other conditions are too extreme for the body to regulate. During times of excessive heat gain the body will pump more blood to the skin to facilitate sweating. As sweat cools, it evaporates, releasing heat to the environment. If the body's cooling mechanisms cannot keep up with the stresses placed on it due to environmental conditions, work conditions and/or the clothing worn, serious illness could result.

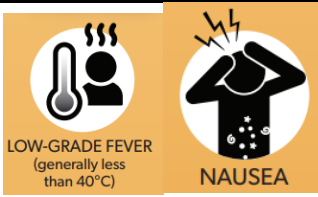
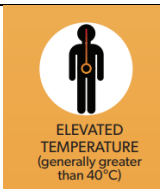


Table 1: Signs and symptoms of common heat stress ailments (Taken from OHCOW <https://www.ohcow.on.ca/wp-content/uploads/2024/02/heat-stress-symptoms.pdf>)

Condition	Symptoms	Actions
Heat Rash – A harmless skin rash that appears in places where sweat collects, such as the armpits, back, under the breasts, chest, groin, elbow creases and back of the knees, and the waist.	 RED BUMPY RASH SEVERE ITCHING	• Change into dry clothes oen and avoid hot environments. • Rinse skin with cool water. • Wash regularly to keep skin clean and dry.
Heat Syncope – Fainting: Heat causes the blood vessels to expand (dilate), so body fluid moves into the legs by gravity, which causes low blood pressure and may result in fainting	 COOL, MOIST SKIN  WEAK PULSE	• Get medical attention immediately. • Assess need for CPR. • Move to a cool area. • Loosen clothing. • Make person lie down. • Offer sips of cool water, if the person is conscious. Note: 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 the problem. Muscles most often affected include the calves, arms, abdomen, and back – although the cramps may involve any muscle group involved in the exercise.	 INTENSE MUSCLE SPASMS	If you suspect heat cramps: • Rest briefly and cool down • Drink water or an electrolyte-containing sports drink. • Use gentle, range-of-motion stretching and massage of the affected muscle group.



Table 2: Signs and Symptoms of common Heat Stress Ailments continued (taken from OHCOW <https://www.ohcow.on.ca/wp-content/uploads/2024/02/heat-stress-symptoms.pdf>)

Condition	Symptoms	Actions
Heat Exhaustion - . Heat exhaustion is most likely to affect: • people with high blood pressure • those working in a hot environment • the elderly Heat exhaustion often comes on suddenly, sometimes after excessive exercise, perspiration and inadequate fluid intake.		If you suspect heat exhaustion: • Move the person out of the sun and into a shady or an air-conditioned location. • Lay the person down, 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. • Call for emergency medical assistance if fever, fainting, confusion or seizures occur.
Heat Stroke - Heat stroke is the most serious form of heat injury. It is a condition caused by your body overheating, usually as a result of prolonged exposure to or physical exertion in high temperatures. Heat stroke can occur if your body temperature rises to 104° F (40° C) or higher.		If you suspect heatstroke: • Move the person out of the sun and into a shady or an air-conditioned space. • 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. • Call for emergency medical assistance immediately.

5.0 Roles and Responsibilities

5.1 Supervisor

Under the Occupational Health and Safety Act, the supervisor is the individual most directly responsible for the safety of workers. Supervisors must ensure the following:

- Identify conditions in which heat stress may be a concern by using the WeatherCAN App
- Implement controls to reduce risk when heat stress is a concern.
- Train workers on the signs and symptoms associated with heat stress
- Train workers on what controls will be implemented and how to follow them.
- Provide guidance on the use of any PPE that is required.

5.2 Workers

Workers are expected to:

- Be familiar with this program and the procedures associated with it.
- Report any hazards, incidents, or injuries to their direct supervisor.
- Follow all procedures to control heat stress required for the work they are performing.
- Receive training on and understand the signs and symptoms of heat-related illnesses and watch for these symptoms in co-workers.

5.3 Safety Office

The Safety Office acts on behalf of the University to support legislative requirements and the overall reduction of risk to workers, students, and visitors. To this end, the Safety Office has developed this Heat Stress Program and will maintain it for use by departments, supervisors, staff, and faculty.

6.0 Legislative Requirements

The body's response to heat is influenced by several factors, including environmental conditions (temperature, humidity, and air movement), work demands (metabolic rate), and clothing. Given these variables, establishing a single temperature limit is impractical. Accordingly, the American Conference of Governmental Industrial Hygienists (ACGIH) developed Threshold Limit Value (TLV) ranges tailored to specific conditions. These TLVs are based on measurements obtained using the Wet Bulb Globe Thermometer (WBGT), which integrates temperature, humidity, radiant heat, and air speed to better reflect perceived heat stress.

While Ontario recommends the ACGIH approach for assessing heat stress, it also recognizes that WBGT measurement can be complex. As such, employers may use alternative assessment methods. One widely accepted alternative is the humidex-based approach developed by the Occupational Health Clinics for Ontario Workers (OHCOW). This method uses Environment Canada's humidex values, combined with other factors, to establish action-based ranges. The University of Waterloo primarily uses the OHCOW method, as outlined in the procedures section.

6.1 Offices and Administrative Areas

For office settings, temperature guidance comes from the CSA Office Ergonomics Standard Z412-00. It suggests the following temperature and humidity ranges for achieving optimal *comfort* in office environments:

- **Summer:** 23–26°C at 50% relative humidity
- **Winter:** 20–23.5°C at 50% relative humidity

7.0 Procedures – Outdoor Work

7.1 Activating the Program

The Heat Stress Program is activated when the humidex reaches 35°C or higher. At the University of Waterloo, this is monitored using the WeatherCAN app by Environment Canada. Supervisors should download the app and enable notifications to receive alerts when the humidex reaches this threshold.

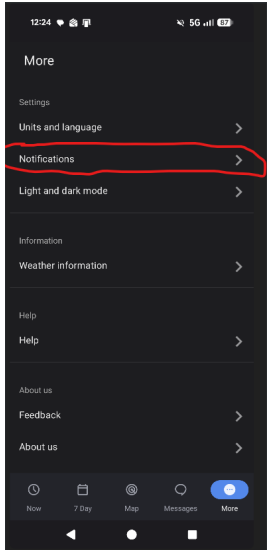
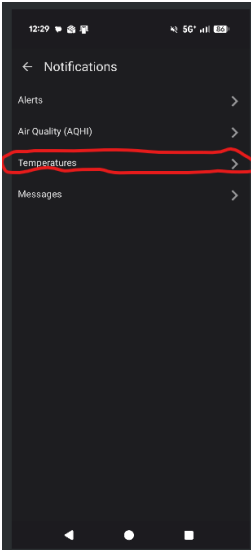
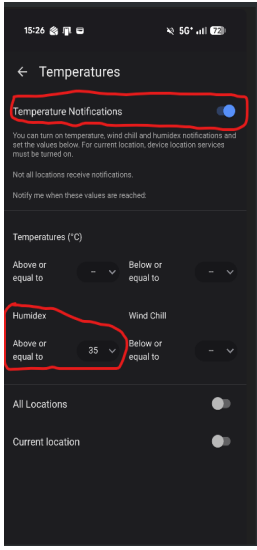
To configure notifications:

1. Open the WeatherCAN app and navigate to the home screen.

2. Select the “More” option in the bottom-right corner.
3. Go to the “Notifications” section.
4. Choose “Temperature” notifications.
5. Turn notifications on and set the humidex threshold to 35°C.

The configuration process is also illustrated below in Table 3.

Table 3: Setting the WEATHERCAN App settings.

Step 1: Homescreen	Step 2: Notifications	Step 3: Temperature	Step 4: Humidex
			

7.2 Assessment of Heat Stress

Once the Heat Stress Program is activated, assessment of the heat stress experienced by an individual performing outdoor work will take place using the following three steps.

Step 1: Identify the environmental and clothing factors experienced by the individual

Use the following formula to identify the heat stress contributions of the environment and clothing on an individual:

$$H_F = H_{env} + C + H_R$$

Where:

- H_F : Final Humidex Value
- H_{env} : Environmental Humidex Factor (taken from Environment Canada`s site for nearest location)
- H_R : Radiant Heat Factor for outdoor workers full sun= 3°C, shade= 2°C

- **C: Clothing Factor:**
 - For cotton pants and long-sleeved cotton t-shirt, the factor is 0°C.
 - For cotton overalls overtop summer clothing, the factor is 5°C.
 - Other ensembles should be evaluated by the Safety Office.

Step 2: Categorize the physical demands of the work

The easiest way to categorize the physical demands of the work is to categorize it into one of the four categories presented in Table 2.

Table 4: Physical demands categories for indoor work

Category	Low	Moderate	High	Very High
Explanation	Sitting with light manual work, light hand/arm work, occasional walking.	Sustained moderate hand/arm work, leg work, and trunk work (light pushing and pulling or normal walking).	Intense arm and trunk work (carrying heavy loads and walking at a fast pace).	Very intense activity at fast to maximum pace.
Examples	▪ Spotting for construction vehicles	▪ Pushing standard 4-wheeled carts ▪ Moving/decanting bottles in labs ▪ Painting ▪ Walking through parking lots	▪ Erecting barriers for abatement/construction ▪ Sanding wood ▪ Cutting and fitting plumbing piping ▪ Hanging electrical fixtures	▪ Moving heavy furniture ▪ Moving full drums of material

Step 3: Identify control measures to minimize risk

Table 3 below outlines the minimum actions to take based on the results of steps 1 and 2.

Table 5: Summary of required actions

Humidex 1: Use for light work	Humidex 2: Use for moderate work	Humidex 3: Use for heavy work	¹ Action Recommended
36°C - 40°C	30°C - 37°C	25°C - 30°C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
40°C - 42°C	38°C - 39°C	30°C - 37°C	Work with 15 mins relief per hour + Action 1
42°C - 45°C	40°C - 41°C	38°C - 39°C	Work with 30 mins relief per hour + Action 1
45°C - 47°C	42°C - 44°C	N/A	Work with 45 mins relief per hour + Action 1
47°C +	45°C +	39°C +	Hazardous to continue physical activity

* For humidex ranges above 45, heat stress should be managed using the WBGT methods.

¹Acclimatized workers may use Humidex 2 while performing moderate work

See Appendix A for examples of how to apply this method.

As a note, Supervisors of work classified as “outdoor work” may require assistance to determine the parameters in this assessment and are encouraged to ask the Safety Office to provide in-person guidance should it be required.

8.0 Procedures – Indoor Work

Indoor work at the University predominantly occurs in climate-controlled environments. Where climate control is not available or is interrupted, heat stress becomes a possibility. Situations where climate control is not available include:

- 1.) HVAC systems are not present (tunnels, mechanical rooms, electrical rooms, etc)
- 2.) HVAC systems are temporarily taken off-line due to construction or renovation activities (prevention of construction fumes or contaminants being distributed through the building).
- 3.) HVAC systems are temporarily taken off-line due to repair or maintenance considerations
- 4.) Power outages

As indicated in Section 2.0 Scope, when indoor temperatures reach or exceed 35°C this plan shall be activated. The first step in assessing risk is classification of work as sedentary work or other indoor work.

- Sedentary work – work that involves little movement and results in low metabolic rates. This is typically office or administrative work.
- Other indoor work – work that involves moderate to high metabolic rates (movement and/or exertions), may occur near radiant heat sources (furnaces, ovens, electrical equipment), and/or may require specialized clothing (Tyvek suits, encapsulating suits, thick coveralls, etc)

8.1 Assessing risks associated with Sedentary work

Office or Administrative work is generally considered sedentary and does not involve work near radiant heat sources or require specialized clothing. In these cases, the following controls shall be considered for implementation by department or manager/supervisor and where feasible:

8.1.1 Engineering Controls:

- *Ventilation and air conditioning to the affected area;
- Increase movement of the air using fans;

- Use reflective barriers to limit sources of heat (eg. curtains / blinds to block sunlight).

*Note – in most cases this option will not be feasible because normal climate control systems are not functioning.

8.1.2 Administrative:

- Slightly increase length and frequency of breaks;
- Limit total time spent in the warm environment;
- Recommend workers drink 1 cup of water approximately every 20 minutes
- Slow the pace of work;
- Re-schedule work to a cooler time of day (early morning / evening);
- Work from another location – preferably an on-campus office (where possible) or from home if necessary.

8.1.3 Personal Protective Measures

- Wear cool, light-weight clothing;
- Use a cooling towel or wrap (wetted fabric that you wrap around your neck)

Other indoor work is work that will involve at least one of the following three factors:

- 1.) Moderate to high metabolic rates – work involves walking or moving with higher exertion rates than just sitting.
- 2.) Close proximity to radiant heat sources
- 3.) Involves specialized clothing that may cause a body's cooling system to not function properly (thick coveralls, Tyvek suits, encapsulating suits).

Work of this nature is assessed similar to outdoor work, and the process will be as follows:

Step 1: Identify the environmental and clothing factors experienced by the individual

Use the following formula to identify the heat stress contributions of the environment and clothing on an individual:

$$H_F = H_{env} + C + H_R$$

Where:

- H_F : Final Humidex Value
- H_{env} : Environmental Humidex Factor (measured and calculated using a thermometer, humidity reader and humidex table)
- H_R : Radiant Heat Factor for indoor workers must be assessed by the Safety Office.

- C: Clothing Factor:
 - For cotton pants and long-sleeved cotton t-shirt, the factor is 0°C.
 - For cotton overalls overtop summer clothing, the factor is 5°C.
 - Other ensembles should be evaluated by the Safety Office.

Step 2: Categorize the physical demands of the work

Physical demands can be categorized into one of the four categories presented in Table 4.

Table 6: Physical demands categories for Other indoor work

Category	Low	Moderate	High	Very High
Explanation	Sitting with light manual work, light hand/arm work, occasional walking.	Sustained moderate hand/arm work, leg work, and trunk work (light pushing and pulling or normal walking).	Intense arm and trunk work (carrying heavy loads and walking at a fast pace).	Very intense activity at fast to maximum pace.
Examples	▪ Walking about ▪ Watering plants ▪ Seated administrative tasks or computer work	▪ Hammering nails ▪ Painting ▪ Cooking/baking ▪ Vacuuming ▪ Sweeping	▪ Sawing by hand ▪ Manual sanding of parts ▪ Mopping ▪ Equipment installation ▪ Furniture assembly	▪ Frequent and heavy lifting, pushing or pulling ▪ Moving full 55 gallon drums

Step 3: Identify control measures to minimize risk

Supervisors of work classified as “other indoor work” should request Safety Office assistance for completing this assessment.

9.0 Training

The Safety Office provides a Heat Stress Awareness online training module for workers (available through LEARN) and a classroom training session for supervisors. Contact the Safety Office for information on the supervisor classroom session.

10.0 References

American Conference for Governmental Hygienists, (2017). TLV Guide, Heat Stress and Strain. Electronic Report.

Canadian Center for Occupational Health and Safety (2024, July). Humidex Rating and Work. CCOHS. https://www.ccohs.ca/oshanswers/phys_agents/humidex.html

Canadian Standards Association (2025). CSA Office ergonomics - An application standard for workplace ergonomics Z412-24. Electronic Guideline

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University of Ottawa (2018). Thermal Comfort and Heat Stress – Offices. Office of Risk Management, University of Ottawa. Electronic Guide.

Appendix A: Outdoor Work Examples

Example 1 – Parking Officer

Situation: At 10 am, the humidex for Kitchener-Waterloo reached 35°C. Parking officers are working outdoors for most of the day.

Assessment: A supervisor notifies the workers that the Heat Stress Program is in effect because the humidex has reached 35°C.

Step 1 – Determine environmental contribution to the heat stress

$$H_F = H_{ENV} + C + H_R$$

H_{ENV} is the current humidex value, which is 35°C

$C = 0^\circ\text{C}$ because the workers are wearing cotton shorts and t-shirts

$H_R = 3^\circ\text{C}$ because work is taking place in full sun

Therefore $H_F = 35^\circ\text{C} + 0^\circ\text{C} + 3^\circ\text{C} = 38^\circ\text{C}$

Step 2 – Determine the physical demands of the work

Work performed is considered “light” work.

Step 3 – Determine actions (if any)

Humidex 1 will be used for this assessment (2nd column). The recommended action when $H_F = 38^\circ\text{C}$ is for the supervisor to instruct workers to drink 1 cup of water every 20 minutes. The supervisor will continue to monitor the humidex every 60 minutes until the value drops below 35°C .

Humidex 1: Use for light work	Humidex 2: Use for moderate work	Humidex 3: Use for heavy work	¹ Action Recommended
36°C - 40°C	30°C - 37°C	25°C - 30°C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
40°C - 42°C	38°C - 39°C	30°C - 37°C	Work with 15 mins relief per hour + Action 1
42°C - 45°C	40°C - 41°C	38°C - 39°C	Work with 30 mins relief per hour + Action 1
45°C - 47°C	42°C - 44°C	40°C - 41°C	Work with 45 mins relief per hour + Action 1
47°C +	45°C +	42°C +	Hazardous to continue physical activity

Example 2 – HVAC Maintenance

Situation: At 10 am, the humidex for Kitchener-Waterloo reached 35°C . At this time, a Refrigeration Technician is performing maintenance of a rooftop unit.

Assessment: The supervisor notifies the worker that the Heat Stress Program is in effect. This is because the humidex has reached 35°C .

Step 1 – Determine environmental contribution to the heat stress

$$H_F = H_{ENV} + C + H_R$$

H_{ENV} is the current humidex value, which is 35°C

$C = 0^\circ\text{C}$ because the workers are wearing long sleeve shirt and pants

$H_R = 3^\circ\text{C}$ because work is taking place in full sun

Therefore $H_F = 35^\circ\text{C} + 0^\circ\text{C} + 3^\circ\text{C} = 38^\circ\text{C}$

Step 2 – Determine the physical demands of the work

Work performed by this technician is considered “moderate” work.

Step 3 – Determine actions (if any)

Humidex 1 will be used for this assessment (1st column). The recommended action when $H_F = 38^\circ\text{C}$ is for the supervisor to instruct workers to take 15 mins relief per hour of activity. They should also drink 1 cup of water every 20 minutes.

The supervisor will continue to monitor the humidex every 60 minutes until the value drops below 35°C.

Humidex 1: Use for light work	Humidex 2: Use for moderate work	Humidex 3: Use for heavy work	¹ Action Recommended
36°C - 40°C	30°C - 37°C	25°C - 30°C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
40°C - 42°C	38°C - 39°C	30°C - 37°C	Work with 15 mins relief per hour + Action 1
42°C - 45°C	40°C - 41°C	38°C - 39°C	Work with 30 mins relief per hour + Action 1
45°C - 47°C	42°C - 44°C	40°C - 41°C	Work with 45 mins relief per hour + Action 1
47°C +	45°C +	42°C +	Hazardous to continue physical activity

11.0 Record of Revisions

Date	Author/Editor	Change	Version
May 2026	Dhananjai Borwankar	- Included indoor heat stress conditions, assessment strategies and controls - Included a summary of signs, symptoms and immediate treatments for heat stress related ailments - Added a references section	Heat Stress Program_v.1.4_MAY2026
March 2025	Dhananjai Borwankar	Removed "/" from tables.	Heat Stress Program_v.1.3_MAR2025
September 2022	Dhananjai Borwankar	No changes	Heat Stress Program_v.1.2_SEP2022
September 2021	Dhananjai Borwankar	- Added second example (HVAC maintenance) to the appendix - Minor wording changes – no context is changed	Heat Stress Program_v.1.2_SEP2021

September 2020	Dhananjai Borwankar	No changes	Heat Stress Program_v.1.1_SEP2020
September 2019	Dhananjai Borwankar	Added section 8.0 Record of Revisions	Heat Stress Program_v.1.1_SEP2019