HEAT STRESS PROGRAM

Contents

1.0 Purpose

This Heat Stress Program outlines how to assess the level of heat stress an individual may experience when working outdoors and provides recommendations on types of controls that can be used to minimize this impact.

2.0 Scope

This program is to be used for all outdoor work and applied to all staff, faculty and fieldwork and is considered active when any of the following environmental criteria are met:

- 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.

3.0 Definitions

Acclimatization
The gradual physiological adaptation that improves an individual's ability to tolerate heat stress. The Ministry of Labour 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.

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

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.

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

4.0 Roles and Responsibilities

4.1 Department/Supervisor/Principal Investigator

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 duties are met:

- Identify conditions in which heat stress may be a concern.
- Implement controls to reduce risk when heat stress is a concern.
- Train workers on what controls will be implemented and how to implement them.
- Provide guidance on the use of any PPE that is required.
- Schedule more physically demanding tasks prior to 11 am and after 3 pm on high humidex days.

4.2 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 as written or required for the work they are performing.
- Follow all legislative requirements as prescribed.
- Attend any training sessions deemed necessary to complete their work in a competent manner.
- Understand the signs and symptoms of heat-related illnesses and watch for these symptoms in co-workers.

4.3 Safety Office

The Safety Office acts on behalf of the University of Waterloo to support legislative requirements and the overall reduction of risk to workers, students, faculty 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.

5.0 Procedures

5.1 Assessment of Heat Stress

Once the Heat Stress Program is activated, assessment of the heat stress experienced by an individual 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^oC, shade= 2^oC)
- C: Clothing Factor:
  - For cotton pants and long-sleeved cotton t-shirt, the factor is 0^oC.
  - For cotton overalls overtop summer clothing, the factor is 5^oC.
  - 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 2: Physical demands categories

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 ▪ Operating a riding mower ▪ Sweeping	▪ Spreading mulch ▪ Hammering nails ▪ Planting plants	▪ Sawing by hand ▪ Shoveling dry sand ▪ Moving mulch loaded wheel barrow	▪ Shoveling wet sand ▪ Moving gravel loaded wheelbarrow

Step 3: identify control measures to minimize risk

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

Table 3: Summary of actions

Humidex 1: Use for moderate work	Humidex 2: Use for light work	Action Recommended
30^0C - 37^0C	36^0C - 42^0C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
38^0C - 39^0C	43^0C - 44^0C	Work with 15 mins relief per hour
40^0C - 41^0C	45^0C – 46^0C	Work with 30 mins relief per hour
42^0C - 44^0C	47^0C - 49^0C	Work with 45 mins relief per hour
45^0C +	50^0C +	Hazardous to continue physical activity

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

See Appendix A for an example of how to apply this method.

6.0 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.

Appendix A: Examples

Example 1 – Parking Services

Situation: At 10 am, the humidex for Kitchener-Waterloo reached 35°C. Parking services has numerous people performing duties on at this time campus.

Assessment: A supervisor for Parking Services notifies the workers that the Heat Stress Program is in effect. This is because the humidex from Environment Canada 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°C because the workers are wearing cotton shorts and t-shirts

H_R = 3°C because work is taking place in full sun

Therefore H_F = 35°C + 0°C + 3°C = 38°C

Step 2 – Determine the physical demands of the work

Work performed by parking services is considered "light" work.

Step 3 – Determine actions (if any)

The work being performed by Parking Services is generally considered light work. Humidex 2 will be used for this assessment (2nd column). The recommended action when H_F = 38°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 30 minutes until the value drops below 35°C.

Humidex 1: Use for moderate work	Humidex 2: Use for light work	Action Recommended
30°C - 37°C	36°C - 42°C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
38°C - 39°C	43°C - 44°C	Work with 15 mins relief per hour
40°C - 41°C	45°C – 46°C	Work with 30 mins relief per hour
42°C - 44°C	47°C - 49°C	Work with 45 mins relief per hour
45°C +	50°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 on C2.

Assessment: The supervisor for this technician notifies the workers that the Heat Stress Program is in effect. This is because the humidex from Environment Canada 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°C because the workers are wearing long sleeve shirt and pants

H_R = 3°C because work is taking place in full sun

Therefore H_F = 35°C + 0°C + 3°C = 38°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)

In this particular case, the work being performed by this refrigeration technician is considered moderate work. Humidex 1 will be used for this assessment (1st column). The recommended action when H_F = 38°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 30 minutes until the value drops below 35°C.

Humidex 1: Use for moderate work	Humidex 2: Use for light work	Action Recommended
30°C - 37°C	36°C - 42°C	Warn workers to watch symptoms and consume 1 cup of water every 20 minutes
38°C - 39°C	43°C - 44°C	Work with 15 mins relief per hour
40°C - 41°C	45°C – 46°C	Work with 30 mins relief per hour
42°C - 44°C	47°C - 49°C	Work with 45 mins relief per hour
45°C +	50°C +	Hazardous to continue physical activity

7.0 Record of Revisions

Date	Author/Editor	Change	Version
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