

Physical Agents

Humidex Rating and Work

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What is humidex?

Humidex measures how hot we feel in hot, humid weather. It is a parameter intended for the general public to express how the combined effects of warm temperatures and humidity are perceived. It provides a number that describes how hot people feel, much in the same way the equivalent chill temperature, or "wind chill factor," describes how cold people feel.

Environment Canada uses humidex ratings to inform the general public when conditions of heat and humidity are potentially uncomfortable.

Humidex Range	Degree of Comfort
20-29	Little discomfort
30-39	Some discomfort
40-45	Great discomfort; avoid exertion
46 and over	Dangerous; heat stroke possible

Source: [Warm season weather hazards](#). Government of Canada

What is the importance of humidity?

The body attempts to maintain a constant internal temperature of 37°C at all times. In hot weather, the body produces sweat, which cools the body as it evaporates. As the humidity or moisture content in the air increases, sweat does not evaporate as readily. Sweat evaporation stops entirely when the relative humidity reaches about 90 percent. Under these circumstances, the body temperature rises and may cause illness.

What are some of the hazards of working in hot environments?

There are several common heat-related illnesses. Some are more severe than others.

Heat rash, or prickly heat, occurs when blocked sweat glands become inflamed. This painful rash reduces the body's ability to sweat and tolerate heat.

Heat cramps are painful muscle spasms. The muscles used in doing the work are most susceptible. The spasms are caused by the body's failure to replace its lost body salts and usually occur after heavy sweating.

Heat exhaustion results when the body loses large amounts of fluid by sweating during work in hot environments. The skin becomes cool and clammy. Symptoms include profuse sweating, weakness, dizziness, nausea, and headaches.

Heat stroke is the most serious condition and requires immediate medical attention. The body temperature becomes very high (even exceeding 41°C). Complete or partial loss of consciousness is possible. Sweating is not a good symptom of heat stress as there are two types of heat stroke – "classical," where there is little or no sweating (usually occurs in children, persons who are chronically ill, and the elderly), and "exertional" where the body temperature rises because of strenuous exercise or work and sweating is usually present.

What index should workplaces use to monitor conditions that may result in heat-related illness?

Occupational (industrial) hygienists recommend using the Wet Bulb Globe Temperature (WBGT) index to measure workplace conditions. This method closely relates to the human body's response to heat.

The WBGT measurement takes into account air temperature, air movement, radiant heat and humidity. There are direct-reading WBGT meters. These are also called "heat-stress indicators," commercially available. The WBGT measurements can then be related to the physical demands of the job. Only qualified professionals, whether they be in-house staff, consultants, or from the local occupational health and safety regulatory agency, should perform the measurement.

Direct comparison between WBGT and humidex is not possible--there are no conversion tables or mathematical formulas to make such conversions. However, one can estimate WBGT and humidex for a given ambient air temperature and humidity when radiant heat sources (hot and cold surfaces) are absent, and air movement is less than 0.5 m/sec (100 feet per minute). Under these conditions, the globe temperature equals room temperature. The natural wet bulb temperature (on the WBGT apparatus) is approximately 2°F (1.1°C) higher than the wet bulb temperature measured using a psychrometer.

Standard charts are available to determine wet bulb temperature from given air temperature and relative humidity values.

WBGT can be calculated based on whether it is measured in direct sun or in shaded or indoor conditions by using the following formulas:

WBGT (in direct sun) = 0.7 x natural wet-bulb temperature + 0.2 x globe temperature + 0.1 x dry-bulb temperature

WBGT (shaded or indoor conditions) = 0.7 x natural wet-bulb temperature + 0.3 x globe temperature

[Source: 2024 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, p.232 to 240]

Can workplaces use humidex to monitor conditions that may result in heat-related illness?

Humidex, as reported by weather forecasters, is intended for the general public to express the combined effects of warm temperatures and humidity.

Heat-related illnesses depend on many workplace factors, in addition to air temperature and humidity. Wind speed or air movement, workload, radiant heat sources, and a person's physical condition are also important.

Under certain workplace conditions, the humidex may serve as an indicator of discomfort resulting from occupational exposure to heat.

For example, when humidity is high, but when workload, wind speed, and radiant heat sources do not significantly contribute to the heat burden, humidex may be useful. Offices are typical of workplaces where humidex could be used. It is important to use the values of the temperature and relative humidity obtained by actual measurements taken in the workplace. Conditions inside the workplace may significantly differ from those given by the weather forecasters.

How do I know what the humidex is?

If you know the temperature and relative humidity, the [humidex table](#) from the Government of Canada can be used to determine the humidex rating. For example, if the temperature is 30°C and the relative humidity is 70%, the humidex rating is 41. This level is considered a level of "great discomfort," and exertion should be avoided.

As noted by the Government of Canada:

"An extremely high Humidex reading is any reading over 40. In such conditions, you should reduce all unnecessary physical activity. If the reading is in the mid to high 30s, then you should tone down or modify certain types of outdoor exercise, depending on the individual age and health, physical shape, the type of clothes worn and other weather conditions.

If working outdoors is an absolute necessity, drink plenty of liquids and take frequent rest breaks. In hot, humid conditions, there is a considerable risk of heat stroke and sunstroke."

How is humidex interpreted?

The relationship between humidex and comfort is subjective. It varies widely between individuals.

Workplaces must use caution when applying the humidex rating. A high humidex rating can serve as a cue to assess workplace conditions more precisely.

For more information, please see the OSH Answers fact sheets on:

- [Temperature Conditions - Hot](#)
- [Hot Environments - Control Measures](#)
- [Hot Environments - Health Effects and First Aid](#)

While technically, there is no way to compare WBGT and humidex values directly, the Occupational Health Clinics for Ontario Workers Inc. (OHCOW) created a humidex-based [heat stress calculator and response plan](#). As stated by OHCOW, this calculator provides three methods of calculation based on the information you have access to, including a Humidex-based method, a WBGT estimate method, and a detailed WBGT method. This plan is based on actual humidity and temperature measurements in the work area, not weather stations or media reports.

After answering a series of questions about the conditions in the workplace, the clothing and personal protective equipment being used, and the education and training status of workers, the OHCOW heat stress response plan provides a sample response plan. OHCOW notes that in the translation process, some simplifications and assumptions have been made versus using the WBGT equations directly. Therefore, the plan may not be applicable in workplaces with additional sources of heat and or humidity. Follow the questions in the heat stress calculator to make sure the guidance is appropriate for your workplace. OHCOW's plan assumes moderate, unacclimatized work.

OHCOW has also published three reference guides to support its [heat stress toolkit](#).

See Table 2 for details.

Note:

- Always consult with health and safety legislation regarding heat conditions in your jurisdiction and follow the required method for measuring heat stress.
- When required or when expertise is available, follow the American Conference of Governmental Industrial Hygienists (ACGIH) Heat Stress and Strain Threshold Limit Value (TLV®). The American Conference of Governmental Industrial Hygienists (ACGIH) specifies an action limit and a Threshold Limit Value (TLV®) to prevent workers' body temperature from exceeding 38°C (38.5°C for acclimatized workers).

Table 2
OHCOW: Humidex-Based Heat Response Plan

Adjusted* Humidex	Response	Effective** WBGT (°C)
25 - 29	<ul style="list-style-type: none"> Supply water to workers on an "as needed" basis 	≤ 23.0°C
30 - 33	<ul style="list-style-type: none"> post Heat Stress Warning notice; encourage workers to drink extra water; start recording hourly temperature and relative humidity 	23.1 - 24.0°C
34 - 37	<ul style="list-style-type: none"> post Heat Stress Warning notice; notify workers that they need to drink extra water; ensure workers are trained to recognize symptoms 	24.1 - 25.0°C
38 - 39	<ul style="list-style-type: none"> Work with 15 minutes relief per hour can continue; provide adequate cool (10-15 °C) water; at least 1 cup (240mL) of water every 20 minutes worker with symptoms should seek medical attention 	25.1 - 26.0°C
40 - 41	<ul style="list-style-type: none"> Work with 30 minutes relief per hour can continue in addition to the provisions listed previously 	26.1 - 27.0°C
42 - 44	<ul style="list-style-type: none"> If feasible, work with 45 minutes relief per hour can continue in addition to the provisions listed above 	27.1 - 29.0°C
45*** or over	<ul style="list-style-type: none"> Only medically supervised work can continue 	29.1°C*** or over

Source : OHCOW: Humidex-Based Heat Response Plan

*Adjusted means adjusted for additional clothing and radiant heat

**Effective means adjusted for clothing

***At Humidex above 45 (29.0°C WBGT), heat stress is to be managed as per the ACGIH TLV®.

IMPORTANT: Consult the OHCOW heat stress calculator and response plan for how to interpret and use this chart. **ALWAYS** follow the steps listed in this plan. **NEVER ignore someone's heat stress symptoms regardless of your measurements or the general response plan guidance.**

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