

University of Ottawa
Thermal Comfort and Heat Stress Guideline
Version 2.0
August 2010

Scope

This guideline is intended for use by the University community who conduct the regular part of their job from an office environment. It is designed as a guideline for “Thermal Comfort” to be referenced during periods of warm, summer weather. This guideline is therefore in effect from May 1st to September 30th. Temperature values for which this guideline comes into effect are based on actual workplace temperature values and not from local media weather reports. Please speak to your supervisor if you have concerns regarding workplace temperatures. Physical Resources Service and the Office of Risk Management are available to assist as a resource, if required.

What is heat stress?

Everyone at some time or another manages heat stress. Managing heat stress is a natural function of the human body. When the body is in a warm, hot environment, the temperature of the body rises. The body must lower this effect through relief of heat; this is done through the evaporation of sweat produced from the body. If the body is unable to cool itself through this method, the body’s core temperature increases. When this happens, typical everyday functions such as thinking, concentrating, conducting a task, can become difficult depending on the exposure time and environmental conditions. A rise in the core body temperature can lead to feelings of exhaustion, panting, lightheadedness, nausea, among other symptoms. This may represent the start of more serious heat associated hazards. These hazards are briefly described on page 2.

Humidex

The humidex factor can make it feel like it is much warmer. This value takes into account the air temperature, combines it with the humidity in the air, and produces a value which is how warm it feels outside. The humidex is used as a measure of perceived heat that a person feels. Below, is a table from the Occupational Health and Safety Council of Ontario indicating air temperature on the y-axis and relative humidity on the x-axis. The point where the two values meet is the humidex factor. For example, an air temperature of 31°C with a relative humidity level of 100% yields a feeling of 50°C.

Heat stress reference chart

		RELATIVE HUMIDITY (%)																																				
		100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%																		
TEMPERATURE (°C)	49																			50	49																	
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	30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	32	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	
29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10			
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23	33	32	32	31	30	29	28	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
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	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%	15%	10%																			

Hazards of Heat stress

There are several types of hazards associated with exposure to significantly warmer (eg. prolonged heat exposure and high temperatures) than normal environments. These include, but are not limited to, the following...

- Heat rash – a red, bumpy, itchy rash on the skin
- Sunburn – red, sometimes painful, blistering of the skin
- Heat cramps – pain in arms and legs which occur suddenly; can be an indicator of a more serious issue
- Fainting – loss of consciousness, blacking out
- Heat exhaustion – heavy sweating, cool skin, core body temperature over 38°C, weak pulse, fatigue, nausea, vomiting, thirst, panting, rapid breathing, blurred vision
- Heat stroke – core body temperature over 41°C and any one of the following
 - Weakness
 - Confusion
 - Acting strange
 - Hot, dry, red skin
 - Rapid pulse
 - Dizziness

- Headache

How we cope with heat stress

As noted, humans cope with heat stress, primarily, by sweating. The sweat evaporates on the skin of the person leaving a cooling effect.

Hydration is also very important; keeping the body hydrated with a cool, non-alcoholic, non-carbonated, low sugar, drink is important when working in warm climates. The best drink for the body, and for the hydrating effect, is water.

Legal requirements / other legislation

In Ontario, there is no pre-set maximum working temperature for office workers. The duty to protect the worker(s) falls under section 25(2) (h) of the Ontario Occupational Health & Safety Act – the employer shall take every precaution reasonable for the protection of the worker(s). The Ontario Ministry of Labour has adopted the values of the American Conference of Governmental Industrial Hygienists (ACGIH) indicating that an unacclimatized worker's core body temperature shall not exceed 38°C. Body temperature is typically at 37°C for a healthy person – which means that your internal body temperature should not rise more than 1°C. As mentioned, this is controlled by your body through the production of sweat, and the intake of liquids.

In addition, the Canadian Standards Association has also released a standard dealing with optimal working temperatures – this is found in the [Office Ergonomics](#) – Z412-00 standard (section 6.6(b)). The standard indicates that the acceptable working temperature will depend on the activity level and clothing worn by the user. The ASHRAE standard (55-2004), for which the Canadian standard was based upon, is intended to accommodate 80% of individuals. Some workers, by virtue of personal factors, may need additional measures to accommodate them. The optimum temperature ranges are as follows:

Summer: 23 – 26 °C at 50% relative humidity

Winter: 20 – 23.5 °C at 50% relative humidity

(Note the overlap at 23 to 23.5 °C – people in summer dress would be slightly cool, while people in winter dress would be slightly warm)

The table below was adapted by the Canadian Centre for Occupational Health & Safety (CCOHS) from the ASHRAE 55-2004 and demonstrates what should represent a comfortable working environment based on the humidity level.

Table 1			
Temperature / Humidity Ranges for Comfort			
Conditions	Relative Humidity	Acceptable Operating Temperatures	
		°C	°F
Summer (light clothing)	If 30%, then	24.5 - 28	76 - 82
	If 60%, then	23 - 25.5	74 - 78
Winter (warm clothing)	If 30%, then	20.5 - 25.5	69 - 78
	If 60%, then	20 - 24	68 - 75

Refer to the CCOHS guidelines for additional information. The guideline can be accessed at http://www.ccohs.ca/oshanswers/phys_agents/thermal_comfort.html

Additionally, radiant temperature also affects the surrounding areas. For example, unacceptable or uncomfortable temperatures can be caused by large cold / warm surfaces, such as poorly insulated windows, direct sunlight on surfaces, computer rooms, etc.

How heat stress may arise at uOttawa?

While most workers at uOttawa do not work in consistently warm environments, everyone at some point will be exposed to a warm environment through nature – eg. warm / hot, humid, summer weather. This will generally be the most common type of heat issue encountered at uOttawa.

While some buildings have air conditioning, there are also some parts of campus which do not have this feature; meaning hot, summer temperatures are more likely to affect these locations.

Other considerations include:

- Construction / Renovations

Ventilation (and therefore subsequent cooling of the air) may need to be reduced or even closed within the building due to fumes / smells produced by work on / off campus

- Repairs

Air conditioning, like other mechanical systems, will need preventative maintenance or overall repairs / replacement of parts to ensure that they are properly functioning

In any case, should ventilation need to be shut down or reduced for any period of time, Physical Resources Service will notify building and facility managers / occupants through

the 2222 service. Where possible, repairs are scheduled for down times (eg. prior to and following University designated working hours; 8h45 to 17h00) and typically do not have an effect on building occupants. However, there are cases where work is not able to be postponed or rescheduled.

Triggers

For the purposes of taking every precaution reasonable for the protection of the uOttawa workers, trigger points where controls need to be implemented to protect workers are as follows:

- Temperature and / or humidex in an office setting reaching / exceeding 35°C
- Environment Canada humidex advisory (air temperature reaching 30°C and humidex exceeding 40°C)

(adapted from Ministry of Labour Heat Stress Guidelines - http://www.labour.gov.on.ca/english/hs/pubs/gl_heat.php; accessed on 15-Mar-2010)

For temperatures which do not reach the trigger point(s) for action described below, please speak with your supervisor to determine if alternate arrangements can be made for the individual worker(s)

Effective dates – this is intended to be a seasonal document in effect from May 1 to September 30

Controls (engineering; administrative; PPE)

Below are ways to control heat stress – the best way to do so is to eliminate the elevated heat altogether; although this is sometimes not possible, it is the best method.

Examples are provided below:

Engineering

- Ventilation and air conditioning to the affected rooms
- Reduce physical demands of the job / task
- Increase movement of the air through the use of fans (2222 request)
- Reflective barriers to sources of heat (eg. use of curtains / blinds to block sunlight)

Administrative

- Slightly increase length and frequency of breaks
- Limit total time spent in the warm environment
- Slow the pace of work
- Re-schedule work to a cooler time of day (early morning / evening)

- Working from another location – preferably an on-campus office (where possible) or from home. **Exhaust all possible on-campus possibilities prior to considering a “work-from-home” option**

Other measures to consider

- Wear cool, light-weight, light coloured, clothing
- Drink lots of water / liquids to stay hydrated

Reporting

If you have any concerns about the hazards of heat stress, please inform your supervisor or contact the Employee Health Wellness & Leave sector of Human Resources Service.

Should a situation arise where a warm environment affects a previously existing medical condition (i.e. asthma), please notify the Employee Health, Wellness and Leave Sector.

Should the heat issue remain unresolved, please contact Physical Resources Service at ext. 2222 and / or the Office of Risk Management at ext. 5892 or safety@uottawa.ca

Resources

There are several resource websites available for more information on heat stress and the hazards thereof; they are found below:

Canadian Centre for Occupational Health & Safety –
http://www.ccohs.ca/oshanswers/phys_agents/heat_health.html

Ontario Ministry of Labour –
http://www.labour.gov.on.ca/english/hs/pdf/gl_heat.pdf

Workplace Safety & Insurance Board –
<http://www.wsib.on.ca/wsib/wsibsite.nsf/Public/PreventHeatStress>

Occupational Health Clinics for Ontario Workers –
<http://www.ohcow.on.ca/menuweb/heatstressguide.pdf>

Construction Safety Association of Ontario –
http://www.csa.org/t.tools/t6.news/heat_stress.cfm

Office of Risk Management (ORM) –
www.uottawa.ca/services/ehss