UNIVERSITY OF TORONTO

ENVIRONMENTAL HEALTH & SAFETY

Guidelines on Heat Stress – Working in Hot Environments

1.0 INTRODUCTION

"Heat stress" is the net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors (e.g. air temperature, humidity, air movement, radiation from the sun or other hot surfaces/sources) and the clothing and equipment worn.

Heat stress can happen to anybody.
Factors that can cause heat stress include:

- Working in direct sunlight in the summer months
- Humidity in the workplace (more than 50% relative humidity)
- Working in certain workplaces such as foundries, steel mills, bakeries, construction sites, kitchens, grounds maintenance, dishwashing and steaming.

At the University of Toronto, indoor environments where heat exposure can occur include mechanical rooms/crawl spaces (particularly if steam heating is used) and in kitchens. Staff may also be exposed to heat stress outdoors when conducting grounds maintenance or field work in hot geographic regions.

Illnesses that can result from over-exposure to heat.

- heat stroke
- heat rashes,
- heat cramps
- fainting and
- heat exhaustion

Information on these heat-related illnesses are provided in ***Appendix A***. Workers on medication or with pre-existing medical conditions including pregnancy may be more susceptible to heat stress and should discuss their concerns with their physicians and their supervisor.

Scope

Under the Occupational Health and Safety Act, we must take every reasonable precaution in the circumstances for the protection of a worker.
This procedure applies to all University of Toronto staff who may be exposed to heat, either indoors or outdoors, during their work.

2.0 RESPONSIBILITIES

The roles and responsibilities for management, supervisors and workers are documented below. Workers should report concerns to their supervisors and at any time, the Office of Environmental Health and Safety (EHS) can be contacted for assistance or consultation.

Supervisors/Management/Principle Investigators

- Identify work areas/activities where exposure to heat may occur.
- Identify workers who may be exposed to heat during their work and require medical surveillance for heat stress (see Section E).
- Develop written procedures (e.g. heat stress control plan) and implement appropriate measures and precautions based on these procedures. The Office of Environmental Health and Safety (EHS) is available for consultation if assistance is needed. Where appropriate, create a site-specific heat stress control plan. The procedure should be based on the work environment (e.g. process heat due to furnace or oven) or hot weather (between May 1 and September 30 of each year).
- Ensure that a Job Safety Analysis (JSA) or written work procedure is completed where necessary and that they are readily available to workers. https://ehs.utoronto.ca/wp-content/uploads/2014/06/Job-Safety-Analysis-Form-November-2019.pdfEnsure controls

identified in the JSA or other work procedures are followed.
- Ensure that workers who are heat-exposed are provided with the equipment, personal protective equipment (PPE), training or other resources as identified by the JSA or other work procedures.
- Where work is contracted to external parties, equivalent procedures should be followed.
- Supervisors should be constantly monitoring workers for signs that could suggest a risk of illness due to heat stress.

Workers

- Report health and safety hazards, including heat stress, to supervisors
- Where requested, assist supervisors in identifying hot environments or heat-stress situations and participate in the development of the JSA, heat stress control plan or work procedure.
- Review applicable JSA or other work procedures before start of work.
- Follow safety procedures and use equipment and/or PPE as defined in the JSA or work procedure.
- Speak with their supervisors if workers have health conditions or are taking medications which would make them vulnerable to heat stress.

Office of Environmental Health & Safety

- Provide consultation and perform assessments on heat stress-related matters as needed.
- Update and maintain online training module on heat stress (EHS531 Heat Stress: Working in Hot Environments). Supervisors and workers may register via the EHS Training Registration website (https://ehs.utoronto.ca/training/my-ehs-training/)
- Update and maintain these Guidelines on a regular basis and/or when new information becomes available, e.g. follow the guidance in the American Conference of Governmental Industrial Hygienists (ACGIH) booklet, Threshold Limit Value (TLVs).

3.0 GENERAL CONTROLS FOR HEAT STRESS EXPOSURE IN THE WORKPLACE

Controls for reducing heat stress exposure fall into 4 categories:

A. Engineering controls
B. Administrative controls and work practices
C. Personal Protective Equipment (PPE)
D. Training

Help worker adjust to hot environments
Acclimatization is the concept that your body will become adjusted to working in the heat. While the human body can adjust and become better adapted to hot conditions, acclimatization can be problematic to achieve / maintain:
- Acclimatization must occur under the same physical conditions and the same level of physical activity as those anticipated for the work. Thermal comfort also depends on the metabolic rates (activities being done), the clothing a person wears, and radiant temperatures of other surfaces. For example, heavy activities include, intermittent heavy lifting with pushing or pulling (e.g. pick and shovel work), shoveling dry sand, while light activity could be using a table saw or standing with light or moderate work at a machine or bench and some walking about.
- Gradually increase the activity level over one to two weeks.
- Gradually increase the amount of time spent in hot working conditions.
- Acclimatization is gradual. It takes several days and may take longer if the worker is not experienced in the job.
- If the worker has health problems or is in poor physical shape, acclimatization may also take longer.
- There is substantial loss of acclimatization after 4 days (e.g. long weekend) and then entirely after nine or more days (e.g. away on vacation or other absence from work).

For the reasons listed above, where there is a potential or exposure to heat stress, control measures A-D should be taken to prevent heat exposure in the workplace. Refer also to https://www.ccohs.ca/products/posters/pdfs/keepyourcool.pdf '*Keep Your Cool'* awareness poster .

A: Engineering Controls

- Reduce physical demands of work task through mechanical assistance (hoists, lift–tables, etc.).
- Control the heat at its source by using insulating and reflective barriers (e.g. insulate furnace walls).
- Exhaust hot air and steam produced by operations.
- Reduce the temperature and humidity through air cooling.
- Provide cool, shaded work areas.
- Provide air–conditioned rest areas.

- Increase air movement if temperature is *below 35°C* (e.g. use fans). Fanning air greater than 35°C will cause workers to become hotter.
- Provide, where feasible, cool, shaded work areas (could be a tree shaded area) and air-conditioned rest areas

B: Administrative Controls and Work Practices

- Assess the demands of all jobs and have monitoring and control strategies in place for hot weather and hot process work environments. Refer to Environment Canada (https://weather.gc.ca/canada_e.html) and the Ontario Ministry of the Environment, Conservation and Parks reports and alerts (e.g. air temperature that exceeds 30 degrees Celsius (C) and humidex of 40, smog alerts, heat waves predicted for three or more days).

Policies, Procedures, Work Schedules and Training:

- Increase the frequency and length of rest breaks – EHS can assist in interpreting available guidelines.
- Schedule strenuous jobs to cooler times of the day.
- Provide cool drinking water near workers and remind them to drink a cup about every 15 to 20 minutes or more frequently, to stay hydrated. **Do not wait until thirsty.**
- Avoid sugary, caffeinated or alcoholic drinks.
- Caution workers to avoid direct sunlight.
- Assign additional workers or slow down the pace of work.
- Make sure workers have time to acclimatize to a modified intensity of work
- Train workers to recognize the signs and symptoms of heat stress and start a 'buddy system' since people are not likely to notice their own symptoms. *Refer to Appendix A*
- Investigate any heat–related incidents reported by workers.
- Where appropriate, develop an emergency response plan should be in place in the event of a heat related illness. Assure workers trained in First Aid are available and on-site.
- Pregnant workers and workers with a medical condition – or those taking certain medications – should discuss with their physicians and their supervisors regarding working in the heat.

C: Personal Protective Equipment (PPE)

- Light summer, loose-fitting clothing made of breathable fabric should be worn to allow free movement of cool, dry air over the skin's surface thus maximizing heat removal by both evaporation and convection. Evaporation of sweat from the skin is usually the predominant heat removal mechanism.
- If working outdoors, wear light-coloured clothing, preferably long-sleeve shirt and pants, and cover the head to prevent exposure to direct sunlight.
- In a high radiant heat situation, wearing reflective clothing to shield radiant heat may help.
- For very hot environments, consider air, water or ice–cooled insulated clothing.
- Vapour barrier clothing, such as chemical protective clothing, greatly increases the amount of heat stress on the body. Extra caution may be required and consultation with EHS is recommended.

D: Training

- Workers who are exposed to heat as part of their job and their supervisors should take the online training course EHS531 Heat Stress: Working in Hot Environments. Supervisors and workers may register via the EHS Training Registration website https://ehs.utoronto.ca/training/my-ehs-training/).
- Supervisors and managers should also take the course on Job Safety Analysis. This tool assists supervisors and managers in planning out a job safely from beginning to end. Visit the above EHS Training Registration Website if interested (EHS303 Job Safety Analysis).
- In addition to formal training such as the online course, supervisors can also take the opportunity to review department- or work-specific procedures for heat stress (or other health and safety requirements) in other forums such as toolbox talks, operations meetings, etc. Refer also to https://www.ccohs.ca/products/posters/pdfs/keepyourcool.pdf 'Keep Your Cool' awareness poster.

E: Medical Surveillance

- Supervisors/management/principle investigators who identify workers who may be exposed to heat stress during their work are recommended to have those employees partake in the medical surveillance survey. Refer to **Appendix B**: Hot/Cold Exposure Medical Surveillance Survey, a screening tool that can be used by the department to determine if there are any workers exposed to hot/cold working environments who have health conditions which require an additional review by Occupational Health.

***Appendix A**: Heat-Related Illnesses and Disorders*

Source: Ontario Ministry of Labour Health and Safety Guidelines: Managing Heat Stress at work (June 21, 2019) and Health Canada, Infographic: Staying Healthy in the Heat, Published: 2019-04-09, https://www.canada.ca/en/health-canada/services/publications/healthy-living/infographic-staying-healthy-heat.html

	Cause	Symptoms	Treatment	Prevention
Heat Rash	Hot humid environment; plugged sweat glands.	Red bumpy rash with severe itching.	Change into dry clothes and avoid hot environments. Rinse skin with cool water.	Wash regularly to keep skin clean and dry.
Heat Cramps	Heavy sweating from strenuous physical activity drains a person's body of fluid and salt, which cannot be replaced just by drinking water. Heat cramps occur from salt imbalance resulting from failure to replace salt lost from heavy sweating.	Painful cramps occur commonly in the most worked muscles (arms, legs or stomach); this can happen suddenly at work or later at home. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing, gently massage and stretch affected muscles and drink cool salted water (1½ to 2½ mL salt in 1 litre of water) or balanced commercial fluid electrolyte replacement beverage. If the cramps are **severe or don't go away after salt and fluid replacement, seek medical aid.** Salt tablets are not recommended.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Fainting	Fluid loss, inadequate water intake and standing still, resulting in decreased blood flow to brain. Usually occurs in unacclimatized persons.	Sudden fainting after at least two hours of work; cool moist skin; weak pulse.	GET MEDICAL ATTENTION. Assess need for cardiopulmonary resuscitation (CPR). Move to a cool area; loosen clothing; have the person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Move around and avoid standing in one place for too long. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Exhaustion	Fluid loss and inadequate salt and water intake causes a person's body's cooling system to start to break down.	Heavy sweating; cool moist skin; body temperature above 38°C; skin rash, muscle cramps, dizziness or fainting, heavy sweating, headache, weak pulse; normal or low blood pressure; person is tired and weak, has nausea and vomiting; is very thirsty; or is panting or breathing rapidly; vision may be blurred. Dark urine and decreased urination.	GET MEDICAL ATTENTION. This condition can lead to heat stroke, which can cause death quickly. Move the person to a cool shaded area and drink liquids; water is best; loosen or remove excess clothing, fan and spray with cool water. Do not leave affected person alone.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Stroke (Medical Emergency)	If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise.	High body temperature (over 41°C) and any one of the following: the person is weak, confused, lack of coordination, upset	CALL AN AMBULANCE. (9) 9-1-1 https://www.utoronto.ca/campus-status	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke

	Cause	Symptoms	Treatment	Prevention
	Heat stroke may develop suddenly or may follow from heat exhaustion.	or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness/fainting. In later stages, a person may pass out and have convulsions. No sweating but very hot, red skin.	This condition can kill a person quickly. While waiting for help – move them to a cool place, if you can; Remove excess clothing; fan and spray the person with cool water; offer sips of cool water if the person is conscious.	

Hot/Cold Exposure Medical Surveillance Survey

Parts A and B of this form to be completed by the supervisor of any worker identified with potential exposure to hot or cold working environments.

Part C of this form is to be completed by the worker

- Completed surveys are to be kept on file by the department
- If the employee indicates "Yes" to any of the medical conditions listed in Part C, the supervisor is required to contact Occupational Health Services https://ehs.utoronto.ca/aboutus/contact-us/

Part A: PERSONNEL INFORMATION

Last Name:	First Name: _
Personnel Number:	Telephone:
Department:	Job Title:
Supervisor name:	

Part B: CONDITIONS PERTAINING TO HEAT OR COLD STRESS

Check all that apply:

	Indoor/Outdoor Humidex > 30 degrees Celsius (C)
	Continuous work; >30 minutes in hot indoor areas (e.g. steam plant, mechanical rooms)
	Continuous work; >30 minutes in temperatures <-15C or wind chill < -25C

Part C: WORKER HEALTH CONDITIONS

(Circle or mark an 'X' at YES or NO only. ***Do not specify health condition*****)**

Some conditions can seriously affect your ability to safely work in hot or cold environments. *Do you have or do you experience any of the following, or other conditions that may affect working in hot or cold environments?*

Hot Environment –	**Yes**	**No**	**Cold Environment –**	**Yes**	**No**
Shortness of breath			Shortness of breath		
Breathing difficulties			Breathing difficulties		
Chronic Bronchitis			Chronic Bronchitis		
Emphysema			Emphysema		
Lung Disease			Lung Disease		
Severe Allergies			Heart Problems		
Heart Problems			Chest pain on exertion		
Chest pain on exertion			Hypertension		

Hot Environment –	**Yes**	**No**
Cardiovascular disease		
Diabetes		
Fainting spells		
Seizures		
Asthma		
Pacemaker		
Skin conditions		
Peripheral Vascular Disease		
Anhidrosis		

Cold Environment –	**Yes**	**No**
Diabetes		
Fainting spells		
Seizures		
Panic attacks		
Asthma		
Pacemaker		
Chronic Obstructive Pulmonary Disease (COPD)		
Cystic Fibrosis		
Cold Agglutinins Disease		
Raynaud's Disease		
Any Rheumatic Disease (Systemic lupus erythematosus, SLE, rheumatoid arthritis, RA, spondyloarthritis, SA)		

Other condition(s) affecting ability to work in hot or cold environments not indicated above (circle 'Yes').

Signature of Employee: _____	Date: