

University of Illinois at Urbana-Champaign
Division of Safety and Compliance

Heat Stress Prevention Guidelines

Heat Stress Prevention Guidelines

I. PURPOSE

The University of Illinois at Urbana-Champaign (U of I), through the Division of Safety and Compliance (S&C), has established these Heat Stress Guidelines to protect the health of university students, faculty and staff.

These Heat Stress Guidelines have been developed to provide workers with the training and equipment necessary to protect them from heat related exposures and illnesses.

These Guidelines provide the minimum recommendations for unit-specific heat stress prevention programs. It is expected that campus units utilizing these Heat Stress Prevention Guidelines will develop unit-specific written standard operating procedures (SOPs) to complement and meet these recommendations.

II. POLICY

It is the policy of the U of I to protect its students, faculty and staff from respiratory hazards. This is accomplished in so far as possible with effective engineering controls, employee training, and administrative controls.

III. SCOPE

The provisions of the Heat Stress Prevention Guidelines shall apply to all employees who have to work in a high heat stress environment on the U of I campus.

IV. RESPONSIBILITIES

The division of responsibilities regarding general health and safety is outlined in the Campus Administrative Manual (CAM) Section V-B, Environmental Health and Safety, Parts 1.0 through 1.4. In addition, to those requirements the following shall be met:

The Division of Safety and Compliance shall:

- A. Develop Heat Stress Prevention Guidelines and review on an annual basis.
- B. Conduct hazard evaluations of high heat stress environments upon request and make recommendations as to abatement to ensure adequate protection of employees.
- C. Provide campus units with assistance in creating Heat Stress Programs and site-specific SOPs.
- D. Assist campus units in the selection of appropriate equipment to abate high heat stress environments.
- E. Provide training on heat stress warning signs, abatement tools, and/or methodologies upon request.

Deans, Department Heads, and Directors of academic/administrative units shall:

- A. Ensure that the unit-specific Heat Stress Program meet the recommendations of these Heat Stress Prevention Guidelines.

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- B. Provide fiscal and administrative resources for the implementation of their unit-specific Heat Stress Program.
- C. Ensure that all personnel within their unit affected by heat stress receive proper training.
- D. Designate a competent person that will be responsible for implementing the unit-specific Heat Stress Program.

Heat Stress Competent Person shall:

- A. Understand the requirements of this Heat Stress Policy and applicable OSHA regulations.
- B. Have the knowledge and/or experience to create, maintain, revise, implement, and enforce the unit-specific Heat Stress Program.
- C. Attend training.
- D. Identify personnel who require heat stress training.
- E. Train or arrange training for all affected personnel on the requirements of the unit-specific Heat Stress Program.
- F. Ensure that the requirements of the unit-specific Heat Stress Program are followed.
- G. Maintain a training record for all employees that have been trained in the components of the unit-specific Heat Stress Program.

Supervisors of employees who may be required to comply with the unit-specific Heat Stress Program shall:

- A. Attend training on the requirements of the unit-specific Heat Stress Program.
- B. Identify personnel who require heat stress training and ensure that they have received the proper training before allowing work to commence in a heat stress environment.
- C. Understand and follow the protocols of this Heat Stress Policy, unit-specific Heat Stress Program, and site-specific standard operating procedures.
- D. Ensure that the requirements of the unit-specific Heat Stress Program are followed.

Affected employees shall:

- A. Attend training on the requirements of the unit-specific Heat Stress Program.
- B. Know and understand the hazards and warning signs of heat stress.
- C. Understand and follow the protocols of this Heat Stress Policy, unit-specific Heat Stress Program, and site-specific standard operating procedures.

V. DEFINITIONS

Acclimatization is the beneficial physiological adaptations that occur during repeated exposure to a hot environment. These physiological adaptations include:

- Increased sweating efficiency (earlier onset of sweating, greater sweat production, and reduced electrolyte loss in sweat).
- Stabilization of the circulation.
- The ability to perform work with lower core temperature and heart rate.
- Increased skin blood flow at a given core temperature.

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Conduction is the transfer of heat between materials that contact each other. Heat passes from the warmer material to the cooler material. For example, a worker's skin can transfer heat to a contacting surface if that surface is cooler, and vice versa.

Convection is the transfer of heat in a moving fluid. Air flowing past the body can cool the body if the air temperature is cool. On the other hand, air that exceeds 35°C (95°F) can increase the heat load on the body.

Evaporative cooling takes place when sweat evaporates from the skin. High humidity reduces the rate of evaporation and thus reduces the effectiveness of the body's primary cooling mechanism.

Heat is a measure of energy in terms of quantity.

Heat collapse is a loss of consciousness caused by excessive heat stress.

Heat cramps are painful muscle cramps caused by excessive sweating.

Heat exhaustion is a condition marked by dizziness, nausea, and weakness caused by excessive heat stress.

Heat fatigue is a feeling of weakness brought on by excessive heat stress.

Heat rash is the result of the obstruction of the sweat ducts during high heat and humidity causing a breakout on the skin.

Heat stroke is the loss of the body's ability to cool itself.

Metabolic heat is a by-product of the body's activity.

Radiation is the transfer of heat energy through space. A worker whose body temperature is greater than the temperature of the surrounding surfaces radiates heat to these surfaces. Hot surfaces and infrared light sources radiate heat that can increase the body's heat load.

Wet Bulb Globe Temperature (WBGT) is a composite temperature taking into account air temperature, radiant heat, air movement, and humidity to determine the level of heat stress placed upon an individual.

VI. RECOMMENDATIONS

Training

All employees who are or may be exposed to potential heat related illnesses will receive training on the following:

- **The environmental and personal risk factors that cause heat related illnesses;**
- The employer's procedures for identifying, evaluating and controlling exposures to the environmental and personal risk factors for heat illness;

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- The importance of frequent consumption of small quantities of water, up to 4 cups per hour under extreme conditions of work and heat;
- The importance of acclimatization;
- The different types of heat illness and the common signs and symptoms of heat illness;
- The importance of immediately reporting to the employer, directly or through the employee's supervisor, symptoms or signs of heat illness in themselves, or in co-workers.
- The employer's procedures for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary;
- Procedures for contacting emergency medical services, and if necessary, for transporting employees to a point where they can be reached by an emergency medical service provider;
- How to provide clear and precise directions to the work site.

Provision of Water

Employees should have access to potable water. Water should be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking the entire shift for a total of two (2) gallons per employee per 8-hour shift. Employees may begin the shift with smaller quantities of water if effective procedures for replenishment of water during the shift have been implemented to provide employees one quart or more per hour.

Access to Shade

Employees suffering from heat illness or believing a preventative recovery period is needed should be provided access to an area with shade that is either open to the air or provided with ventilation or cooling for a period of no less than five minutes. Such access to shade shall be permitted at all times. Shade areas can include trees, buildings, canopies, lean-tos, or other partial and/or temporary structures that are either ventilated or open to air movement. The interior of cars or trucks are not considered shade unless the vehicles are air conditioned or kept from heating up in the sun in some other way.

VII. PROGRAM REVIEW

These Heat Stress Prevention Guidelines will be reviewed annually by S&C. Unit-specific programs and written standard operating procedures specific to the units utilizing respirators should be reviewed and updated by those units at least annually and more frequently as hazards, tasks, procedures and/or equipment change.

General Information

Area Description: _____
Heat stress incidents from OSHA 300 log: _____
Previous history (if any) of heat-related problems: _____

Weather at Time of Review: _____
Day typical of recent weather conditions? Yes No Explain: _____
Outside WBGT: _____ Inside WBGT: _____
Heat-producing equipment/processes: _____
Type of heat source(s): _____
At "hot" spots:
Is the heat steady or intermittent? _____
Number of employees exposed? _____
For how many hours per day? _____

Heat Stress Controls

Ventilation operating? Yes No N/A Explain: _____
Air conditioning operating? Yes No N/A Explain: _____
Fans operating? Yes No N/A Explain: _____
Shields/insulation between heat and employees? Yes No N/A
Are reflective faces of shields clean? Yes No N/A
Acclimatization program? Yes No
Work/rest schedule? Yes No
Liquid replacement program? Yes No
Work scheduling (cooler parts of shift, etc.) Yes No
Cool rest areas? Yes No
Heat monitoring program? Yes No
Ice and/or water-cooled garments in use? Yes No N/A
Wetted undergarments (used with reflective or impermeable clothing) in use? Yes No N/A
Reflective clothing in use? Yes No N/A
Other heat-reducing engineering controls _____
Procedures for getting medical attention? Yes No Explain: _____
Are supervisors trained in heat stress? Yes No Explain: _____
Employees trained in heat stress? Yes No Explain: _____

Suggested heat stress control measures: _____

Inspector: _____

Date: _____

Heat Rash (Prickly Heat)

A rash that can develop after a person sweats far more than usual and sweat glands become blocked. It causes an itchy rash of small red raised red spots with a prickling or stinging sensation.

Heat rash usually affects parts of the body covered by clothes, such as the back, abdomen, neck, upper chest, groin or armpits.

In most cases, heat rash will clear up on its own in a few days if the affected area is kept cool and dry. Avoid excessive heat and humidity and cool off with a fan, take a cool shower or bath and let your skin air dry, or if you have air-conditioning, use this to cool yourself. Once the skin is cool and dry again, don't use any type of oil-based product, which might block your sweat glands. Calamine lotion and/or hydrocortisone cream can relieve itching and irritation.

If a heat rash does not go away within a few days, or if an infection develops where the bumps have burst, seek medical advice.

Dehydration occurs when the loss of body fluids exceeds the amount that is taken in. With dehydration, more water is moving out of our cells and bodies than what we take in through drinking.

Along with the water, small amounts of electrolytes are also lost. When we lose too much water, our bodies may become out of balance or dehydrated. Severe dehydration can lead to death.

The signs and symptoms of dehydration range from minor to severe and include:

- Increased thirst
- Dry mouth and swollen tongue
- Weakness
- Dizziness
- Palpitations (feeling that the heart is jumping or pounding)
- Confusion
- Sluggishness fainting
- Fainting
- Inability to sweat
- Decreased urine output

Heat cramps are painful, brief muscle cramps. Muscles may spasm or jerk involuntarily. Heat cramps can occur during exercise or work in a hot environment or begin a few hours later.

Heat cramps usually involve muscles that are fatigued by heavy work, such as calves, thighs, and shoulders.

- People are at greatest risk while doing work or activities in a hot environment. This is usually during the first few days of an activity.
- Risk increases if you sweat a great deal during exercise and drink large amounts of water or other fluids that lack salt.

Symptoms of heat cramps are muscle spasms that are:

- Painful

- Involuntary
- Brief
- Intermittent
- Usually self-limited (go away on their own)

Move to a cool area at once if cramping is experienced. Loosen clothing and drink cool water or an electrolyte replacement beverage, such as Gatorade®. Seek medical aid if the cramps are severe, or don't go away.

Heat exhaustion can occur after you've been exposed to high temperatures for several days and have become dehydrated.

There are two types of heat exhaustion:

- Water depletion. Signs include excessive thirst, weakness, headache, and loss of consciousness.
- Salt depletion. Signs include nausea and vomiting, frequent muscle cramps, and dizziness.

The most common signs and symptoms of heat exhaustion include:

- Confusion
- Dark-colored urine (a sign of dehydration)
- Dizziness
- Fainting
- Fatigue
- Headache
- Muscle cramps
- Nausea
- Pale skin
- Profuse sweating
- Rapid heartbeat

Although heat exhaustion isn't as serious as heat stroke, it isn't something to be taken lightly. Without proper intervention, heat exhaustion can progress to heat stroke, which can damage the brain and other vital organs, and even cause death. If you, or anyone else, have symptoms of heat exhaustion immediately get out of the heat and rest, preferably in an air-conditioned room. If you can't get inside, try to find the nearest cool and shady place.

Other recommended strategies include:

- Drink plenty of fluid (avoid caffeine and alcohol).
- Remove any tight or unnecessary clothing.
- Take a cool shower, bath, or sponge bath.
- Apply other cooling measures such as fans or ice towels.

If such measures fail to provide relief within 30 minutes, contact a doctor because untreated heat exhaustion can progress to heat stroke.

After you've recovered from heat exhaustion, you'll probably be more sensitive to high temperatures during the following week. So it's best to avoid hot weather and heavy exercise until your doctor tells you that it's safe to resume your normal activities.

Heat stroke is the most serious form of heat injury and is a medical emergency. Heat stroke often occurs as a progression from milder heat-related illnesses such as heat cramps and heat exhaustion. But it can strike even if you have no previous signs of heat injury.

Heat stroke often results from prolonged exposure to high temperatures -- usually in combination with dehydration -- which leads to failure of the body's temperature control system. The medical definition of heat stroke is a core body temperature greater than 105° Fahrenheit, with complications involving the central nervous system that occur after exposure to high temperatures. Other common symptoms include nausea, seizures, confusion, disorientation, and sometimes loss of consciousness or coma.

The hallmark symptom of heat stroke is a core body temperature above 105° Fahrenheit. But fainting may be the first sign.

Other symptoms may include:

- Throbbing headache
- Dizziness and light-headedness
- Lack of sweating despite the heat
- Red, hot, and dry skin
- Muscle weakness or cramps
- Nausea and vomiting
- Rapid heartbeat, which may be either strong or weak
- Rapid, shallow breathing
- Behavioral changes such as confusion, disorientation, or staggering
- Seizures
- Unconsciousness

If you suspect that someone has heat stroke -- also known as sunstroke -- you should call 911 immediately. Until help arrives, move the victim to a cool area and remove excess clothing. Fan and spray them with cool water. Offer sips of water if the victim is conscious.

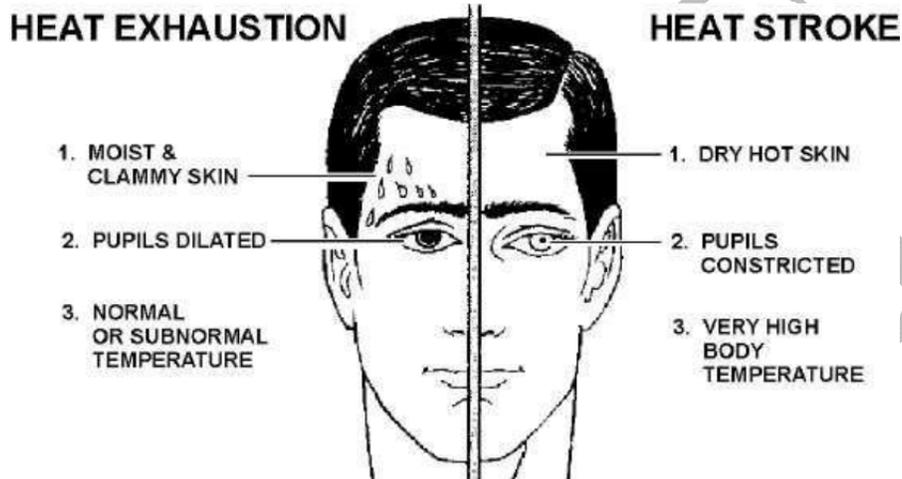
You may also try these cooling strategies:

- Fan air over the patient while wetting his or her skin with water from a sponge or garden hose.
- Apply ice packs to the patient's armpits, groin, neck, and back. Because these areas are rich with blood vessels close to the skin, cooling them may reduce body temperature.
- Immerse the patient in a shower or tub of cool water, or an ice bath.

If emergency response is delayed, call the hospital emergency room for additional instructions.

After you've recovered from heat stroke, you'll probably be more sensitive to high temperatures during the following week. So it's best to avoid hot weather and heavy exercise until your doctor tells you that it's safe to resume your normal activities.

Symptoms of Heat Exhaustion and Heat Stroke



http://navyadvancement.tpub.com/14325/css/14325_407.htm

Factors that May Cause Heat-related Illness	
Environmental	<ul style="list-style-type: none"> • High temperature and humidity • Direct sun exposure (with no shade) or extreme heat • Limited air movement (no breeze or wind)
Job-Specific	<ul style="list-style-type: none"> • Physical exertion • Use of bulky protective clothing and equipment

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning
91°F to 103°F	Moderate	Implement precautions and heighten awareness
103°F to 115°F	High	Additional precautions to protect workers
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures

https://www.osha.gov/SLTC/heatillness/heat_index/protective_veryhigh.html

The following measures will help prevent the development of heat-related illnesses.

1. Slow down in hot weather. Your body's temperature regulating system faces a much greater workload when temperature and humidity are high.
2. Heed early warnings of heat stress, such as headache, heavy perspiration, high pulse rate, and shallow breathing. Take a break immediately and get to a cooler location. **Watch for heat stress signs among your co-workers.**
3. Dress for hot weather. Lightweight, light-colored clothing reflects heat.
4. **Drink plenty of water.**
5. Consider beverages that replace electrolytes lost when you sweat, such as Gatorade®.
6. Try to get used to warm weather gradually. Take it easy for those first two or three hot days. Your body will have a better chance to adjust if you take it slow.
7. Get out of the heat occasionally. Physical stress increases with time in hot weather. Take breaks in a cool, shady location.
8. Don't try to get a suntan while you are working! It's harder for your internal cooling system to work through sunburned skin. Wear a hat and light-colored long-sleeved shirt to prevent burning (which we know can increase the risk of skin cancer.)

		Relative Humidity (%)												
°F		40	45	50	55	60	65	70	75	80	85	90	95	100
Air Temperature	110	136												
	108	130	137											
	106	124	130	137										
	104	119	124	131	137									
	102	114	119	124	130	137								
	100	109	114	118	124	129	136							
	98	105	109	113	117	123	128	134						
	96	101	104	108	112	116	121	126	132					
	94	97	100	103	106	110	114	119	124	129	135			
	92	94	96	99	101	105	108	112	116	121	126	131		
	90	91	93	95	97	100	103	106	109	113	117	122	127	132
	88	88	89	91	93	95	98	100	103	106	110	113	117	121
	86	85	87	88	89	91	93	95	97	100	102	105	108	112
	84	83	84	85	86	88	89	90	92	94	96	98	100	103
	82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	80	81	82	82	82	83	84	84	85	86	86	87	

Extreme Danger – Heat Stroke Likely
Danger - Heat Cramps/Exhaustion Likely
Extreme Caution - Heat Cramps/Exhaustion Possible
Caution - Fatigue possible

Supervisors

- Give workers frequent breaks in a cool area away from heat.
- Adjust work practices as necessary when workers complain of heat stress.
- Oversee heat stress training and acclimatization for new workers and for workers who have been off the job for a period of time.
- Monitor the workplace to determine when hot conditions arise.
- Increase air movement by using fans where possible.
- Provide potable water in required quantities.
- Determine whether workers are drinking enough water.
- Make allowances for workers who must wear personal protective clothing (welders, etc.) and equipment that retains heat and restricts the evaporation of sweat.
- Schedule hot jobs for the cooler part of the day; schedule routine maintenance and repair work in hot areas for the cooler times of the day.
- Make available to all workers, cooling devices (hard hat liners/bibs/neck bands) to help rid bodies of excessive heat.

Workers

- Follow instructions and training for controlling heat stress.
- Be alert to symptoms in yourself and others.
- Determine if any prescription medications you're required to take can increase heat stress.
- Wear light, loose-fitting clothing that permits the evaporation of sweat.
- Wear light colored garments that absorb less heat from the sun.
- Drink small amounts of water – approximately 1 cup every 15 minutes.
- Avoid beverages such as tea or coffee.
- Avoid eating hot, heavy meals.
- Do not take salt tablets unless prescribed by a physician.
- Review Attachment 1 for additional information.

Changes

April 27, 2016:	Review and update appendices
April 22, 2014:	Review and update document