

ACC Employee Heat Stress Guidelines



What You Need to Know About Heat Stress

Health Effects and Prevention

12 Key Points to Know About Heat Stress

Heat stress is a build-up of heat in the body. Heat injury or illness is a disruption of physical or mental functions caused by the body's response to heat stress.

1. Heat exhaustion is an acute heat injury with hyperthermia caused by dehydration. Early symptoms can include headache, dizziness, weakness, and irritability.
2. More advanced symptoms of heat exhaustion include pale and clammy skin, confusion, loss of coordination, upset stomach, vomiting, and fainting.
3. Insufficient fluid in the body is the #1 cause of daytime fatigue.
4. Most people are chronically dehydrated and start their workday with a fluid deficit.
5. The single best measure for reducing risks of heat stress is to drink water frequently throughout the day to replace the fluid that is lost as sweat, as much as 1 quart of water per hour during strenuous work in hot weather.
6. Most people do not feel thirsty until their fluid loss is 2 percent or more of body weight and their performance is already reduced. Thirst is an unreliable, usually lagging, indicator for when the body needs water.
7. The body operates best at a temperature of 98.6 °F. Both heat and the body's processes for getting rid of excess heat have effects on a person's comfort, performance, accident risk, and long-term health.
8. Most of the heat load in a body, when working, comes from its own metabolism. About 3/4s of the stored calories that the body converts to move muscles turn into heat rather than motion.
9. Hot weather and high humidity increase the risk of heat injury by slowing down the movement of heat from the body to the environment.
10. Increasing blood flow to the body surface for cooling diverts some of the flow that brings oxygen and nutrients to muscles, brain, and other internal organs.
11. The loss of fluid as sweat not only decreases the volume of blood to supply internal organs, but also reduces the ability to get rid of excess heat later.
12. Health effects of heat stress – information below.

Health Effects of Heat Stress

High temperatures and humidity stress the body's ability to cool itself, and heat illness becomes a special concern during hot weather. There are three major forms of heat illnesses: **heat cramps**, **heat exhaustion**, and **heat stroke**, with heat stroke being a life threatening condition.

Heat Cramps

Heat cramps are muscle spasms which usually affect the arms, legs, or stomach. Frequently they don't occur until sometime later after work, at night, or when relaxing. Heat cramps are caused by heavy sweating, especially when water is replaced by drinking, but not salt or potassium. Although heat cramps can be quite painful, they usually don't result in permanent damage. To prevent them, drink electrolyte solutions such as Gatorade during the day and try eating more fruits like bananas.

Heat Exhaustion

Heat exhaustion is more serious than heat cramps. It occurs when the body's internal air-conditioning system is overworked, but hasn't completely shut down. In heat exhaustion, the surface blood vessels and capillaries which originally enlarged to cool the blood collapse from loss of body fluids and necessary minerals. This happens when you don't drink enough fluids to replace what you're sweating away.

The symptoms of heat exhaustion include: headache, heavy sweating, intense thirst, dizziness, fatigue, loss of coordination, nausea, impaired judgment, loss of appetite, hyperventilation, tingling in hands or feet, anxiety, cool moist skin, weak and rapid pulse (120-200), and low to normal blood pressure.

Somebody suffering these symptoms should be moved to a cool location such as a shaded area or air-conditioned building. Have them lie down with their feet slightly elevated. Loosen their clothing, apply cool, wet cloths or fan them. Have them drink water or electrolyte drinks. Try to cool them down, and have them checked by medical personnel. Victims of heat exhaustion should avoid strenuous activity for at least a day, and they should continue to drink water to replace lost body fluids.

Heat Stroke

Heat stroke is a life threatening illness with a high death rate. It occurs when the body has depleted its supply of water and salt, and the victim's body temperature rises to deadly levels. A heat stroke victim may first suffer heat cramps and/or the heat exhaustion before progressing into the heat stroke stage, but this is not always the case. It should be noted that, on the job, heat stroke is sometimes mistaken for heart attack. It is therefore very important to be able to recognize the signs and symptoms of heat stroke - and to check for them anytime an employee collapses while working in a hot environment.

The early symptoms of heat stroke include a high body temperature (103 degrees F); a distinct absence of sweating (usually); hot red or flushed dry

skin; rapid pulse; difficulty breathing; constricted pupils; any/all the signs or symptoms of heat exhaustion such as dizziness, headache, nausea, vomiting, or confusion, but more severe; bizarre behavior; and high blood pressure. Advance symptoms may be seizure or convulsions, collapse, loss of consciousness, and a body temperature of over 108° F.

It is vital to lower a heat stroke victim's body temperature. Seconds count. Pour water on them, fan them, or apply cold packs. Call Campus Police Dispatch at **222** or **223-7999** and get an ambulance on the way as soon as possible.

Anyone can suffer a heat illness, but by taking a few simple precautions, they can be prevented:

- Condition yourself for working in hot environments - start slowly then build up to more physical work. Allow your body to adjust over a few days.
- Drink lots of liquids. Don't wait until you're thirsty, by then, there's a good chance you're already on your way to being dehydrated. Drink small volumes (approximately 1 cup) of cool water about every 20 minutes. Electrolyte drinks are good for replacing both water and minerals lost through sweating. Never drink alcohol, and avoid caffeinated beverages like coffee and pop.
- Take a break if you notice you're getting a headache or you start feeling overheated. Cool off for a few minutes before going back to work.
- Wear light weight, light colored clothing when working out in the sun.
- Take advantage of fans and air-conditioners.
- Get enough sleep at night.

With a little caution and common sense, you can avoid heat illnesses.

SIGNS AND SYMPTOMS OF HEAT STRESS

Adapted from "Extreme Heat: A prevention Guide to Promote you Personal Health and Safety", Office of Public Affairs, Center for Disease Control and Prevention 6/01/96 and the OSHA Technical Manual, Section III: Chapter 4, Heat Stress

Illness	Signs and Symptoms
Early Heat Illness	Mild dizziness, fatigue or irritability; decreased concentration; impaired judgment
Heat Rash ("Prickly Heat")	Tiny blister-like red spots on the skin; pricking sensation, commonly found on clothed areas of the body
Heat Cramps	Painful spasms of leg, arm, or abdominal muscles; Heavy sweating, thirst occur during or after hard work
Heat Exhaustion	<p>Fatigue, headache, dizziness, muscle weakness, loss of coordination, fainting, collapse</p> <p>Profuse sweating, pale, moist, cool skin; excessive thirst, dry mouth, dark yellow urine</p> <p>Fast pulse, if conscious</p> <p>Low or normal oral temperature</p> <p>May also have heat cramps, nausea, urge to defecate, rapid breathing, chills, tingling of the hands or feet, confusion, giddiness, slurred speech, irritability</p>
Heat Stroke	<p>LIFE THREATENING MEDICAL EMERGENCY</p> <p>Often occurs suddenly</p> <p>Headache, dizziness, confusion, irrational behavior, coma</p> <p>Sweating may slow down or stop</p> <p>Fast pulse, if conscious</p> <p>Rapid breathing</p> <p>Rectal Temperature 104° F and over</p> <p>May also have convulsions, nausea, incoherent speech, very aggressive behavior</p>

Symptoms of Heat Injuries

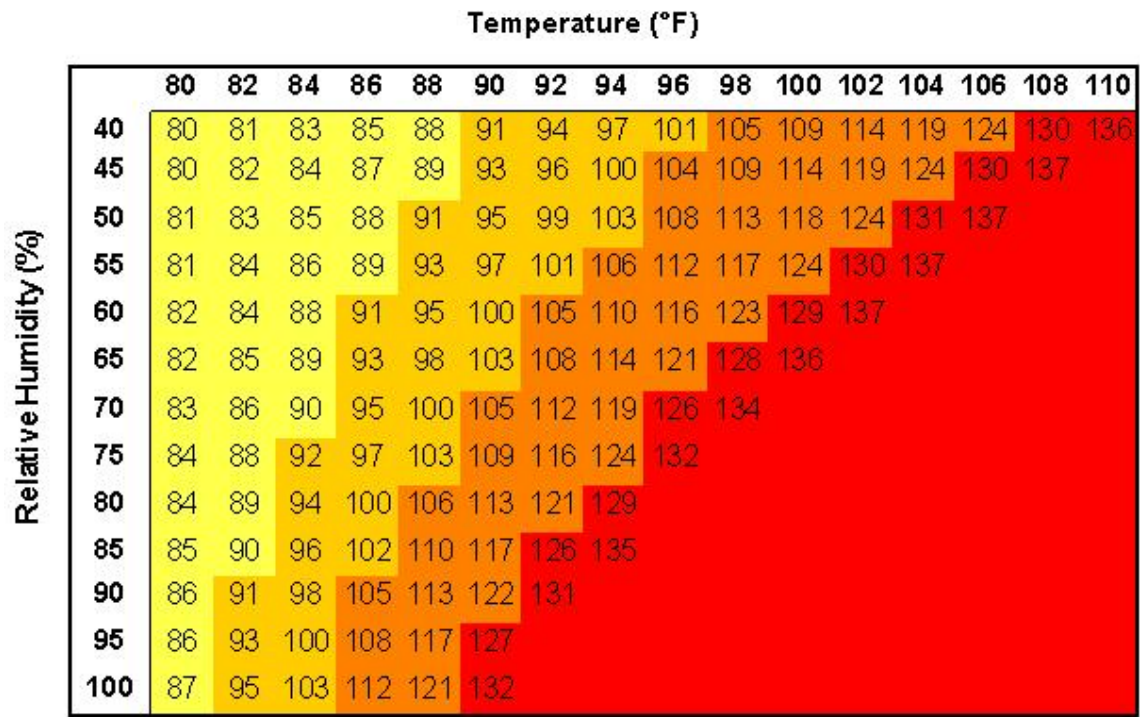
The table below is reproduced from the National Safety Council's Fundamentals of Industrial Hygiene, 4th edition.

Table 2. Heat-Related Disorders Including the Symptoms, Signs, Causes, and Steps for First Aid and Prevention

Disorder	Symptoms	Signs	Cause	First Aid	Prevention
Heat Stroke	Chills Restlessness Irritability	Euphoria, Red face, Disorientation, Hot, dry skin (usually, but not always), Erratic behavior, Collapse, Shivering, Unconsciousness, Convulsions, Body temp. ≥ 104 F (40 C)	Excessive exposure; subnormal heat tolerance (genetic or acquired), Drug /alcohol abuse	Immediate, aggressive, effective cooling. Transport to hospital. Take body temperature.	Self-determination of heat stress exposure. Maintain a healthy lifestyle. Acclimation
Heat Exhaustion	Fatigue Weakness Blurred vision Dizziness, headache	High pulse rate, Profuse sweating, Low blood pressure, Insecure gait Pale face Collapse Body Temp: Normal-slightly increased	Dehydration (caused by sweating, diarrhea, vomiting) Distribution of blood to the periphery Low level of acclimation Low level of fitness	Lie down flat on back in cool environment Drink water Loosen clothing	Drink water or other fluids frequently Add salt to food Acclimation
Dehydration	No early symptoms Fatigue / weakness Dry mouth	Loss of work capacity Increased response time	Excessive fluid loss caused by sweating, illness (vomiting or diarrhea), alcohol consumption	Fluid and salt replacement	Drink water or other fluids frequently Add salt to food
Heat Syncope	Blurred vision (grey-out) Fainting (brief black out) Normal temperature	Brief fainting or near-fainting behavior	Pooling of blood in the legs and skin from prolonged static posture & heat exposure	Lie on back in cool environment Drink water	Flex leg muscles several times before moving Stand or sit up slowly.
Heat Cramps	Painful muscle	Incapacitating	Electrolyte	Rest in cool	If hard physical

Disorder	Symptoms	Signs	Cause	First Aid	Prevention
	cramps, especially in abdominal or fatigued muscles	pain in muscle	Imbalance caused by prolonged sweating without adequate fluid and salt intake	environment Drink salted water (0.5% salt solution) Massage muscles	work is part of the job, workers should add extra salt to their food
Heat Rash (prickly heat)	Itching skin Skin eruptions Reduced sweating	Skin eruptions	Prolonged, uninterrupted sweating Inadequate hygiene practices	Keep skin clean and dry. Reduce heat exposure.	Keep skin clean and periodically allow the skin to dry

Note: Salting foods are encouraged as both treatment and prevention of some heat-related disorders. Workers on salt-restricted diets must consult their personal physicians.



Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

 Caution
 Extreme Caution
 Danger
 Extreme Danger

[Help Workers Cope with Heat Stress](#) University of Arizona

HI	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity
90°F - 105°F	Heat cramps and heat exhaustion possible
105°F - 130°F	Heat cramps and heat exhaustion likely, and heat stroke possible
130°F or greater	Heat stroke highly likely with continued exposure

Figure 2

Categories	
Light Up to 200 kcal/hour	Sitting with moderate arm and leg movements Standing with light work at machine or bench while using mostly arms Using a table saw Standing with light or moderate work at machine or bench and some walking about
Moderate 200-350 kcal/hour	Scrubbing in a standing position Walking about with moderate lifting or pushing Walking on a level surface at 4 mi/hr while carrying 7 lb weight load
Heavy 350-500 kcal/hour	Heavy physical work is any activity that requires great physical exertion. It is characterized by a high energy consumption and severe stresses on the heart and lungs. Examples: railroad track laying, digging, barking trees Carpenter sawing by hand, shoveling dry sand, laying block, Demolition.
	See EHS and Insurance to calculate approximate kcal/hour rate
Reference	http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_4.html

Always monitor signs and symptoms of heat-stressed workers. **Discontinue any activity for a person when:**

- Sustained heart rate greater than 160 beats per minute for those under 35 and 140 for those 35 and over.
- There are complaints of sudden and severe fatigue, nausea, dizziness, lightheadedness, or fainting.
- There are periods of inexplicable irritability, malaise or flu-like symptoms.
- Sweating stops and the skin becomes hot and dry.

Recommended Work Rest Regimen:

From OSHA Technical Manual, Section III: Chapter 4, Heat Stress Table C-1:

ACGIH THRESHOLD LIMIT VALUES FOR HOT ENVIRONMENTS

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous Work	86 °F	80 °F	77 °F
75% Work 25% Rest, each hour	87 °F	82 °F	78 °F
50% Work 50% Rest, each hour	89 °F	85 °F	82 °F
25% Work 75% Rest, each hour	90 °F	88 °F	86 °F

ACGIH THRESHOLD LIMIT VALUES FOR HOT ENVIRONMENTS, AS MEASURED IN WET BULB GLOBE TEMPERATURE INDEX

These TLV's are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C (100.4° F). They are also based on the assumption that the Wet Bulb Globe Temperature Index (WBGT) of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average should be used (consult the *ACGIH 1992-1993 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (1992). Contact EHS and Insurance Office for assistance.