



## Guidelines/Procedures

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**SUBJECT:** ACC Guidelines for Employees Working in Hot Environments  
**Guideline/Procedure for AR#:3.03.006** Management Safety Statement  
**Date Effective:**

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**Value Statement:**

There is currently no specific regulatory standard for heat stress. However, as an employer, ACC is required to take action on known workplace hazards. ACC recognizes that jobs involving operations in hot environments have the potential to induce heat stress in employees. These operations include those which involve radiant heat sources, high humidity, direct contact with hot objects, or strenuous activities.

The National Institute of Occupational Safety and Health (NIOSH) the American Conference of Governmental Industrial Hygienists (ACGIH) and the Environmental Protection Agency (EPA) have promulgated recommended safety guidelines for working in hot environments. As guidance for employers of those individuals involved in these operations, OSHA has included a section on heat stress in the OSHA Technical Manual which references many of the guidelines put forth by NIOSH and ACGIH.

The effects of heat can range from a mild annoyance, such as heat rash, to death from heat stroke. Specific signs and symptoms of heat stress are described in Appendix A. With proper replacement of fluids and adherence to proper work/rest regimens, the adverse effects of working during hot weather can be prevented. A person's risk of developing an adverse effect from heat increases with ambient temperature and humidity, increased level of work, and increased amount of clothing. Examples of ACC employees who may be at risk of developing heat related effects include, but are not limited to:

Grounds Personnel  
Maintenance personnel (ex: personnel working in vicinity of boilers, on roofs, etc.)  
Campus Police  
Janitorial  
Welding area employees and students  
Building construction and trades employees and students  
Warehouse personnel

Certain personal lifestyle factors make a person more susceptible to the adverse effects of heat. These factors are:

1. lack of physical fitness;
2. lack of acclimatization to heat - increased risk during initial days of a heat wave;
3. dehydration- someone who is taking a water pill, or has been having diarrhea, or drank a large quantity of alcohol the day before;
4. obesity;
5. acute or chronic disease such as, infection, diarrhea;
6. sunburn

President/Executive Vice President: \_\_\_\_\_ Date: \_\_\_\_\_

## **I. HEAT HAZARD ASSESSMENT:**

The potential for an employee who works in a hot environment to be affected by heat stress depends on heat combined with physical labor, loss of fluids and fatigue, in addition to the factors listed below. An assessment of each job with these factors can assist in developing a strategy to prevent heat related problems.

### **A. Temperature and Humidity:**

Ambient temperature and humidity levels must be taken into consideration when assessing the potential for heat stress hazards. There are several different ways to evaluate heat index based on temperature and relative humidity. The EHS & I Office has purchased a Wet Bulb Globe Temperature (WBGT) index direct read out instrument. This temperature accounts for the effects of ambient temperature, humidity and radiant heat, and is an accepted measure of heat stress on an individual in the monitored environment. The EHS & I Office is complying data of WBGT for commonly preformed hot jobs on ACC campuses, and will provide heat stress monitoring as needed.

A commonly used “quick and easy” approach to determining heat stress index was developed by the National Weather Service and is known as the “General Heat Stress Index”. A copy of this index is provided in Appendix B. This index can be used to determine danger levels based on temperature and humidity.

The ACGIH has established various Threshold Limit Values (TLVs) for hot environments, as expressed in WBGT. A TLV is an average level for an eight-hour work day and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect (See Appendix C). These TLVs are valid for workers dressed in light summer clothing only. Extra caution must be exercised in establishing work practices for employees wearing personal protective equipment (PPE) that poses as a barrier to heat loss.( See Appendix C, table C-2)

### **B. Employee Work Rate:**

The rate at which an employee works and the activities being performed, will have a direct effect on their potential to experience heat stress. This work rate must be taken into consideration when establishing safe work practices for employees working in hot environments. See Appendix D for guidance in determining an employee’s work rate based on the activities they perform.

### **C. Location of Heat Sources:**

An employee who works in an environment which is generally cool, but in close proximity to hot objects may be at risk for heat stress. Sources of heat must be identified and their location in relation to the employee considered when assessing potential for heat stress.

### **D. Individual Risk Factors for Heat Stress:**

Certain factors can put employees at greater risk for heat stress. Employees will be

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made aware of these risk factors, and given the opportunity for medical consolation if those risk factors apply to them. Training will consist of a video and review of this written program.

**E. Physical Barriers to Heat Loss:**

Extra caution must be exercised in establishing work practices for employees wearing personal protective equipment (PPE) that poses as a barrier to heat loss. This equipment could include coveralls, gloves and respirators, and chemical protective clothing. Guidelines for work-rest regimens for employees wearing PPE is provided in Appendix E.

**II. EMPLOYEE HEALTH EVALUATIONS:**

Employee health evaluations may be requested if an employee who has been assigned work in hot environments is aware of individual risk factors that are present and may put them at greater risk for heat stress. Health evaluations shall also be provided in the event that an employee experiences health effects that are suspected to be heat illness or injury related.

**III. HEAT STRESS PREVENTION:**

The reduction of heat stress can be accomplished through the following controls:

1. Train employees to recognize heat stress.
2. Where possible, isolate, or even eliminate a source of heat and/or humidity through environmental controls.
3. Allow time for employee acclimation to hot environments.
4. Supervisors should schedule tasks during cooler parts of the day, and provide for alternate tasks when possible.
5. Proper Clothing will help prevent heat stress. Employees should wear reflective clothing when appropriate, loose fitting light colored clothes when outside.
6. Encourage workers to drink adequate replacement fluids. A person should drink 1 1/2 gallons of water per day. Salt pills or sport drinks with added salt are unnecessary as the typical American has enough salt in their diet. If a person loses 1.5% of their total body weight in a workday, they are not drinking enough fluids (for example, if a 200 pound employee loses more than 3 pounds in a day, they need to drink more fluid).
7. Take breaks in a shaded, or if possible air-conditioned area following the frequency indicated in Appendix D. Cool fluids must be available during breaks.
8. Someone who develops symptoms of heat exhaustion or heat stroke should be removed to a cool area, provided fluids and be medically evaluated.
9. Use the buddy system (never working alone in hot areas) to monitor co-worker for heat stress.
10. Encourage employees to maintain physical fitness.

**IV. EMPLOYEE TRAINING:**

Employees and students involved in operations which put them at risk for heat stress will be trained to recognize operations and individual risk factors that can put them at

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risk for heat stress. Employees / students will also be trained to recognize signs and symptoms of heat stress in themselves and co-workers. This training shall be conducted by the employee's department, with assistance from the EHS & I Office when necessary. Training will consist of a video on heat stress, and review of this written plan.

**V. RECORDKEEPING:**

Departments will maintain records of heat stress training.

**VII. RESPONSIBILITIES:****A. Environmental Health Safety and Insurance Office**

The EHS & I Office is responsible for the overall coordination and implementation of these guidelines. The EHS & I will provide technical support when needed, and provide training materials for departments.

**B. Unit Administrator:**

The Unit Administrator is responsible for adherence to these guidelines within his/her area of responsibility. It is expected that each administrator will appoint a contact person to serve as a liaison with the EHS & I Office to coordinate heat hazard assessments and pre-placement screenings when needed.

**C. Supervisors / Instructors:**

It is the direct responsibility of an employee's supervisor to ensure appropriate safety measures are followed. This includes the recognition of the potential for heat stress hazards, enforcement of heat stress precautions, and accommodation for these guidelines to be followed. See Appendix B for a checklist to use when investigating a workplace for potential heat stress.

**D. Employee / Students:**

Safety is each individual's responsibility. Utilization of the guidelines provided within this document, and precautionary measures established through training is first and foremost the individual employee's / student's concern. It is also incumbent on each employee / student to follow instructions regarding heat stress prevention.

**APPENDIX A**

**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

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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	Fatigue, headache, dizziness, muscle weakness, loss of coordination, fainting, collapse  Profuse sweating, pale, moist, cool skin; excessive thirst, dry mouth, dark yellow urine  Fast pulse, if conscious  Low or normal oral temperature  May also have heat cramps, nausea, urge to defecate, rapid breathing, chills, tingling of the hands or feet, confusion, giddiness, slurred speech, irritability
Heat Stroke	<b>LIFE THREATENING MEDICAL EMERGENCY</b>  Often occurs suddenly  Headache, dizziness, confusion, irrational behavior, coma  Sweating may slow down or stop  Fast pulse, if conscious  Rapid breathing  Rectal Temperature 104° F and over  May also have convulsions, nausea, incoherent speech, very aggressive behavior

Table 1: Heat Disorders

DISORDER	CAUSE	SIGNS & SYMPTOMS	TREATMENT
Heat Cramps	Heavy sweating Loss of salt	-Painful spasms of arms, legs and abdomen -Sudden onset -Hot, moist skin	Drink water Massage cramped area Rest
Heat Exhaustion	Dehydration Non-acclimatized	Heavy sweating Intense thirst Pale, moist, cool skin Rapid pulse Fatigue, weakness Fainting, collapse	-Move to shade or an air-conditioned space -Rest, lying down, legs elevated -Loosen clothing -Drink water
Heat Stroke	-Excessive exposure to hot environments -Body's system of temp. regulation fails -Body temp. rises to critical levels	High body temperature Lack of sweating Hot, red, dry skin Rapid pulse Chills Difficulty breathing Disoriented Weakness Unconsciousness	MEDICAL EMERGENCY Call for emergency help Immerse person in water Massage body with ice

APPENDIX B

GENERAL HEAT STRESS INDEX  
 From the National Weather Service

General Heat Stress Index										
Danger Category	Apparent Temp. (°F) (Humiture)					Heat Syndrome				
IV. Extreme Danger	≥130°					Heatstroke or sunstroke imminent				
III. Danger	105°-130°					Sunstroke, heat cramps, or heat exhaustion likely. Heatstroke possible with prolonged exposure and physical activity				
II. Extreme Caution	90°-105°					Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and physical activity				
I. Caution	80°-90°					Fatigue possible with prolonged exposure and physical activity				
*Note: Degree of heat stress may vary with age, health, and body characteristics										
Relative Humidity										
	10%	20%	30%	40%	50%	60%	70%	80%	90%	
Temp °F	104	98	104	110	120	≥130	≥130	≥130	≥130	≥130
	102	97	101	108	117	125	≥130	≥130	≥130	≥130
	100	95	99	105	110	120	≥130	≥130	≥130	≥130
	98	93	97	101	106	110	125	≥130	≥130	≥130
	96	91	95	98	104	108	120	128	≥130	≥130
	94	89	93	95	100	105	111	122	128	≥130
	92	87	90	92	96	100	106	115	122	128
	90	85	88	90	92	96	100	106	114	122
	88	82	86	87	89	93	95	100	106	115
	86	80	84	85	87	90	92	96	100	109
	84	78	81	83	85	86	89	91	95	99
	82	77	79	80	81	84	86	89	91	95
	80	75	77	78	79	81	83	85	86	89
	78	72	75	77	78	79	80	81	83	85
	76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77	

Example: The temperature stands at 94°F and the RH is now 62%. The heat stress temperature is over 111°F, in the Danger area

**APPENDIX B  
 GENERAL HEAT STRESS INDEX**

From the National Weather Service

**Example:** The temperature stands at 94°F and the RH is now 62%. The heat stress temperature is over 111°F, in the **Danger** area

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

**Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity**

Caution
  Extreme Caution
  Danger
  Extreme Danger

**APPENDIX C**

4.18.07

## ACC Employee Guidelines for Working in Hot Environments

## ACGIH THRESHOLD LIMIT VALUES

## FOR HOT ENVIRONMENTS, AS MEASURED IN WET BULB GLOBE TEMPERATURE INDEX

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

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)).

These TLV's apply to physically fit and acclimatized individuals wearing light summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLV's in Table C-1 must be reduced by the corrections shown in Table C-2

WBGT CORRECTION FACTORS IN °F

Clothing type	Clo* value	WBGT correction
Summer lightweight working clothing	1.08	0
Cotton coveralls	1.8	-3.6
Winter work clothing	2.5	-7.2
Water barrier, permeable	2.1	-6.9

\*Clo: Insulation value of clothing. One clo = 5.55 kcal/m<sup>2</sup>/hr of heat exchange by radiation and convection for each degree °C difference in temperature between the skin and the adjusted dry bulb temperature.

## WBGT CORRECTION FACTORS IN °F

Clothing type Clo\* value WBGT correction

## APPENDIX D

DETERMINATION OF EMPLOYEE  
WORK RATES

From EPA "A Guide to Heat Stress in Agriculture", 1993

APPROXIMATE WORKLOAD LEVELS	
Light	Sitting at ease, writing/typing, sorting light materials, inspecting crops, driving mobile equipment on paved roads, piloting spray aircraft
Moderate	Using a chain saw, off-road operation of mobile equipment, periodic handling of moderately heavy materials, weeding, hoeing, picking fruits or vegetables, air blast and boom spraying, knapsack spraying on level ground, pushing or pulling light-weight carts or wheelbarrows, washing vehicles, walking 2-3 mph
Heavy	Transferring heavy materials, shoveling, digging, hand mowing, loading sacks, stacking hay, planting seedlings, hand-sawing wood, pushing or pulling loaded hand carts or wheelbarrows, moving irrigation pipe, laying cinder blocks, knapsack spraying on rough ground or an incline, walking 4 mph
Very Heavy	Heavy shoveling or digging, ax work, climbing stairs, ramps, or ladders, lifting more than 44 pounds at 10 lifts per minute, walking faster than 4 mph, jogging, running

**Appendix G: Definitions**

**"Acclimatization"** means a temporary adaptation of the body's systems to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within four to fourteen days of regular work for at least two hours per day in heat. A noticeable loss of acclimatization begins after four days of discontinuation of exposure to conditions of heat stress.

**"Cooled area"** means a cooled indoor rest and recovery area where the temperature is maintained at or below 80F or where the combination of temperature and humidity are maintained at a Heat Index value below 90 F.

**"Heat Illness"** is a serious medical condition that results from the body's inability to cope with a particular heat load, and includes, but is not limited to, heat cramps, heat exhaustion, heat syncope and heat stroke.

**"Impermeable clothing"** means clothing designed to prevent free movement of air or vapors including chemical protective clothing.

**"Occupational risk factors for heat illness"** means working conditions that affect the possibility that heat illness could occur, including air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, protective clothing and personal protective equipment worn by employees, and degree of acclimatization. Employers are encouraged to use the National Weather Services Heat Index as a guide to determine when temperature and humidity create a danger, but this shall not exempt the employer from other provisions of this regulation including responding to indications of the risk for, or presence of, heat illness.

**"Palatable water"** means potable water that does not have an offensive taste or odor which interferes with adequate water consumption.

**"Potable water"** means water that meets the primary standards for drinking purposes found in

**"Protective clothing or equipment"** means uniforms, smocks, or other work clothing that, relative to cotton shirt and trousers, substantially reduces the ability of the body to exchange heat with the environment through the evaporation of sweat and convection.

**"Rest and Recovery Period"** means a period of time to rest and recover from the heat in order to prevent heat illness, including a rest or meal break in a shaded outdoor or cooled indoor area.

**"Shade"** means complete blockage of direct sunlight. Canopies, umbrellas and other temporary structures or devices may be used to provide shade. One indicator that blockage is complete is when objects do not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning.