

HEAT-RELATED ILLNESS

In the Outdoor Work Environment

Table of Contents

Introduction	3
Symptoms of Heat-Stress related illnesses.....	4
Safety training should include at a minimum:	4
Definitions:	5
Heat Stress Prevention Program.....	6
Recognizing and Avoiding Heat Stress.....	6
Heat Stress in Construction	6
Recognizing Heat Stress Disorders	6
Heat Rash.....	6
Heat Cramps	7
Heat Exhaustion.....	7
Heat Stroke.....	7
Heat Stress Risk Assessment Factors	8
Environmental Factors.....	8
Job Factors	9
Measures for Evaluating Heat Stress	9
Thermal Environment	9
Type of Work.....	10
Type of Clothing	11
Controlling Heat Stress.....	11
Training and Education	11
Employee Training	11
Supervisor Training	12
Engineering Controls	12
Work Procedures.....	12
Management	12
Labor	12
Workplace Responsibilities Regarding Heat Stress	13
Employers.....	13
Workers.....	13
Conclusion	13
Heat Stress Symptoms & First Aid Requirements.....	14

Introduction

"Heat Related Illness" (HRI) is a well-known, recognized workplace hazard. All work operations involving exposure to temperature and humidity extremes have the potential for inducing heat stress and heat related illness.

Any employer that has employees who do work in moderate to high temperature and/or humidity conditions, and that elevates the heart rate and causes increased perspiration, needs to be prepared for potential heat related illness (HRI). There are four rules which will reduce the risk of heat induced stress/illness. Those rules are:

- 1) Evaluate if heat could be a problem on a particular day based on temperature and humidity levels, and then implement adequate controls, methods, or procedures to reduce the risk of HRI.
- 2) Address the provisions that will be put in place to reduce the potential for heat related illness/stress and when to implement those provisions (such as a training program informing employees about the effects of heat stress, health conditions that may increase risk. Implement an acclimatization program, establish provisions for a work/rest regimen so that exposure time to high temperatures and/or the work rate is decreased, and provide access to areas that will provide for cooling down when necessary, etc.)
- 3) Provide and encourage workers to drink adequate amounts of safe drinking water.
- 4) Ensure appropriate first aid is available. Teach employees to recognize heat-related illness symptoms and take steps to prevent heat-induced illnesses. Have specific procedures to be followed for employees exhibiting symptoms of heat-related illness and ensure prompt medical attention.

It is up to the employer to determine when applicable controls and methods should be implemented for their worksite. Employer's should evaluate their workplace and assess if their employees could be at risk for heat stress. Factors such as air temperature, humidity, workload, clothing insulation, personal protective equipment use, and employee reports of symptoms must be taken into consideration to make a reasonable determination of risk.

The "**Heat Stress Index**" (HSI) issued by the National Oceanic and Atmospheric Administration (NOAA) is to predict risk. It has been determined that an HSI of 100 or higher warrants the implementation of precautionary measures to ensure protection of employees to heat related illness or stress. (NOTE: It is up to the employer to determine when applicable controls and methods should be implemented for their worksite.)

Notifications should be issued when workers are exposed to high temperature or high humidity conditions and adequate controls, methods or procedures have not been implemented. The notification should cite these conditions as a serious situation. If the HSI is less than 100, no notification needs to be issued.

Employers should include an element on heat related illness/stress (HRI) in their Safety and Health manual. The program should describe:

- How the employer will assess risk for HRI.
- A training element that provides employees information on what the employer will do in hot weather work conditions.
- An element on first aid including how to identify HRI symptoms and proper first aid application for an individual that is suffering from HRI, and procedures for summoning medical aid personnel.
- An element on ensuring adequate drinking water will be available.

The following are some questions to ask:

- What are the potential sources of heat?
- What heat stress problems have been encountered?
- Are supervisors trained to detect/evaluate heat stress symptoms?
- Does the company have procedures in place to address a heat stress illness?

The following are some questions to ask employees:

- What heat stress problems or symptoms they have experienced?
- What type of action has the employee or employer taken to minimize heat stress?
- Are cool rest areas provided?
- Are employee's provided with sufficient breaks and/or water during extreme temperatures?
- Are employee's aware of what the symptoms are for heat stress?
- Does the employer check on work crews more often during extreme temperatures?

Symptoms of Heat-Stress related illnesses

Heat Cramps — are painful muscle spasms that usually occur in the legs or abdomen. They are caused by the failure to replace fluids or electrolytes, such as sodium or potassium. Heat cramps are the least severe of heat related illnesses. Treatment includes moving a person to a cooler place, stretching muscles for cramps, and giving cool water or electrolyte-containing fluid to drink.

Heat Exhaustion — is an early indicator that the body's cooling system is becoming overwhelmed. Symptoms include headaches, dizziness, lightheadedness, or fainting; weakness and clammy or moist skin; mood changes such as irritability or confusion; upset stomach or vomiting. It can lead to heat stroke if ignored. Treatment includes moving the person to a cooler place, and if the person is conscious, providing small amounts of cool water to drink. Fan the victim to circulate the air while applying water with a cool cloth.

Heat Stroke — is a medical emergency caused by the failure of the body's cooling system. Symptoms include dry, hot skin with no sweating; mental confusion or losing consciousness; seizures or fits. Treatment includes all of the elements for heat exhaustion and contacting 911 immediately for medical assistance.

NOTE: Pesticide poisoning has similar symptoms as heat exhaustion.

Safety training should include at a minimum:

- The environmental and personal risk factors for heat stress.
- The different types of heat stress and the common signs and symptoms of heat stress.
- Procedures for identifying, evaluating, and controlling exposure.
- Procedures for responding to symptoms of possible heat related illness, including a process to summon medical aid personnel.

Safety training must be provided prior to job assignment with periodic evaluations to determine the need for additional training (e.g., once a year).

Definitions:

"Heat Related Illness" (HRI) means a serious medical condition resulting from the body's inability to cope with a particular heat load, and includes heat cramps, heat exhaustion, heat syncope, and heat stroke.

"Environmental risk factors for heat illness" means working conditions that create 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. These conditions will be considered when determining that (the employer) is implementing controls and methods to reduce the potential for heat related illness.

"Personal risk factors for heat illness" means factors such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and use of prescription medications that affect the body's water retention or other physiological responses to heat.

"Shade" means blockage of direct sunlight. Canopies, umbrellas and other temporary structures or devices may be used to provide shade. Some shade producing areas are not adequate to cool the body; for instance, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning.

Heat Stress Prevention Program

This Company has implemented this plan to ensure that no employee is exposed to "Heat Stress Illnesses" in the workplace and will evaluate if heat could be a problem on a particular day based on temperature and humidity levels, and then implement adequate controls, methods, or procedures to reduce the risk of HRI.

Recognizing and Avoiding Heat Stress

Heat Stress in Construction

Construction operations involving heavy physical work in hot, humid environments can put considerable heat stress on workers. Hot and humid conditions can occur either indoors or outdoors.

Outdoors

- Road building
- Residential construction
- Work on bridges
- Trenching
- Pouring and spreading tar or asphalt
- Roofing operations
- Steel Erection
- Excavation and grading

Indoors

- Steel mills and foundries
- Boiler rooms
- Pulp and paper mills
- Electrical utilities
- Petrochemical plants
- Smelters
- Furnace operations
- Oil and chemical refineries
- Electrical vaults
- Interior construction and renovation

Asbestos removal, work with hazardous wastes, and other operations that require workers to wear semi-permeable or impermeable protective clothing can contribute significantly to heat stress. Heat stress causes the body's core temperature to rise.

When the Body's Core Temperature Rises

The human body functions best within a narrow range of internal temperature. This "core" temperature varies from 96.8° F to 100.4° F. A construction worker performing heavy work in a hot environment builds up body heat. To get rid of excess heat and keep internal temperature below 100.4° F, the body uses two cooling mechanisms:

- 1) The heart rate increases to move blood – and heat – from heart, lungs, and other vital organs to the skin.
- 2) Sweating increases to help cool blood and body. Evaporation of sweat is the most important way the body gets rid of excess heat.

When the body's cooling mechanisms work well, core temperature drops or stabilizes at a safe level (around 98.6° F). But when too much sweat is lost through heavy labor or working under hot, humid conditions, the body does not have enough water left to cool itself. The result is dehydration. Core temperature rises above 100.4° F. A series of heat-related illnesses, or heat stress disorders, can then develop.

Recognizing Heat Stress Disorders

Heat stress disorders range from minor discomforts to life-threatening conditions:

- Heat Rash
- Heat Cramps
- Heat Exhaustion
- Heat Stroke

Heat Rash

Heat rash – also known as prickly heat – is the most common problem in hot work environments.

Symptoms include:

- Red blotches and extreme itchiness in areas persistently damp with sweat
- Prickling sensation on the skin where sweating occurs.

Treatment — cool environment, cool shower, thorough drying. In most cases, heat rashes disappear a few days after heat exposure ceases. If the skin is not cleaned frequently enough, the rash may become infected.

Heat Cramps

Under extreme conditions, such as removing asbestos from hot water pipes for several hours in heavy protective gear, the body may lose salt through excessive sweating. Heat cramps can result. These are spasms in larger muscles – usually back, leg, and arm. Cramping creates hard painful lumps within the muscles.

Treatment — stretch and massage muscles; replace salt by drinking commercially available carbohydrate/electrolyte replacement fluids.

Heat Exhaustion

Heat exhaustion occurs when the body can no longer keep blood flowing to supply vital organs and send blood to the skin to reduce body temperature at the same time. Signs and symptoms of heat exhaustion include:

- Weakness
- Difficulty continuing work
- Headache
- Breathlessness
- Nausea or vomiting
- Feeling faint or actually fainting
- Workers fainting from heat exhaustion while operating machinery, vehicles, or equipment can injure themselves and others.

Treatment — heat exhaustion casualties respond quickly to prompt first aid. If not treated promptly, however, heat exhaustion can lead to heat stroke—a medical emergency.

- Call 911
- Help the casualty to cool off by:
 - 1) Resting in a cool place
 - 2) Drinking cool water
 - 3) Removing unnecessary clothing
 - 4) Loosening clothing
 - 5) Showering or sponging with cool water

It takes at least 30 minutes to cool the body down once a worker becomes overheated and suffers heat exhaustion.

Heat Stroke

Heat stroke occurs when the body can no longer cool itself and body temperature rises to critical levels.

WARNING: Heat stroke requires immediate medical attention.

The primary signs and symptoms of heat stroke are:

- Confusion
- Irrational behavior
- Loss of consciousness
- Convulsions
- Lack of sweating
- Hot, dry skin
- Abnormally high body temperature — for example, 104° F

Treatment — For any worker showing signs or symptoms of heat stroke, Call 911.

- Provide immediate, aggressive, general cooling.
- Immerse casualty in tub of cool water or
- Place in cool shower or
- Spray with cool water from a hose

- Wrap casualty in cool, wet sheets and fan rapidly
- Transport casualty to hospital
- Do not give anything by mouth to an unconscious casualty

WARNING — Heat stroke can be fatal even after first aid is administered. Anyone suspected of suffering from heat stroke should not be sent home or left unattended unless that action has been approved by a physician. If in doubt as to what type of heat-related disorder the worker is suffering from, call for medical assistance.

Heat Stress Risk Assessment Factors

Factors that should be considered in assessing heat stress include:

- Personal Risk Factors
- Environmental Factors
- Job Factors. **Personal Risk Factors**

It is difficult to predict just who will be affected by heat stress and when, because individual susceptibility varies. There are, however, certain physical conditions that can reduce the body's natural ability to withstand high temperatures:

Weight – Workers who are overweight are less efficient at losing heat.

Poor physical condition – Being physically fit aids your ability to cope with the increased demands that heat places on your body.

Previous heat illnesses – Workers are more sensitive to heat if they have experienced a previous heat-related illness.

Age – As the body ages, its sweat glands become less efficient. Workers over the age of 40 may therefore have trouble with hot environments. Acclimatization to the heat and physical fitness can offset some age-related problems.

Heart disease or high blood pressure – In order to pump blood to the skin and cool the body, the heart rate increases. This can cause stress on the heart.

Recent illness – Workers with recent illnesses involving diarrhea, vomiting, or fever have an increased risk of dehydration and heat stress because their bodies have lost salt and water.

Alcohol consumption – Alcohol consumption during the previous 24 hours leads to dehydration and increased risk of heat stress.

Medication – Certain drugs may cause heat intolerance by reducing sweating or increasing urination. People who work in a hot environment should consult their physician or pharmacist before taking medications.

Lack of acclimatization – When exposed to heat for a few days, the body will adapt and become more efficient in dealing with raised environmental temperatures. This process is called acclimatization. Acclimatization usually takes 6 to 7 days.

Benefits include:

- Lower pulse rate and more stable blood pressure
- More efficient sweating (causing better evaporative cooling)
- Improved ability to maintain normal body temperatures

Acclimatization may be lost in as little as three days away from work. People returning to work after a holiday or long weekend – and their supervisors – should understand this. Workers should be allowed to gradually re-acclimatize to work conditions.

Environmental Factors

Environmental factors such as ambient air temperature, air movement, and relative humidity can all affect an individual's response to heat. The body exchanges heat with its surroundings mainly through radiation and sweat evaporation. The rate of evaporation is influenced by humidity and air movement.

Radiant Heat

Radiation is the transfer of heat from hot objects through air to the body. Working around heat sources such as kilns or furnaces will increase heat stress. Additionally, working in direct sunlight can substantially increase heat stress. A worker is far more comfortable working at 80° F under cloudy skies than working at 80° F under sunny skies.

Humidity

Humidity is the amount of moisture in the air. Heat loss by evaporation is hindered by high humidity but helped by low humidity. As humidity rises, sweat tends to evaporate less. As a result, body cooling decreases and body temperature increases.

Air Movement

Air movement affects the exchange of heat between the body and the environment. As long as the air temperature is less than the worker's skin temperature, increasing air speed can help workers stay cooler by increasing both the rate of evaporation and the heat exchange between the skin surface and the surrounding air.

Job Factors

Clothing and Personal Protective Equipment (PPE)

Heat stress can be caused or aggravated by wearing PPE such as fire - or chemical - retardant clothing. Coated and non-woven materials used in protective garments block the evaporation of sweat and can lead to substantial heat stress. The more clothing worn or the heavier the clothing, the longer it takes evaporation to cool the skin. Remember that darker clothing absorbs more radiant heat than lighter-colored clothing.

Workload

The body generates more heat during heavy physical work. For example, construction workers shoveling sand or laying brick in hot weather generate a tremendous amount of heat and are at risk of developing heat stress without proper precautions. Heavy physical work requires careful evaluation even at temperatures as low as 75° F to prevent heat disorders. This is especially true for workers who are not acclimated to the heat.

Measures for Evaluating Heat Stress

To prevent heat stress, scientists from the World Health Organization (WHO) have determined that workers should not be exposed to environments that would cause their internal body temperature to exceed 100.5° F. The only true way of measuring internal body temperature is rectally (oral or inner ear measurements are not as accurate). As an alternative, the American Conference of Governmental Industrial Hygienists (ACGIH) has developed a method of assessing heat stress risk based on a "**Wet Bulb Globe Temperature**" (WBGT) threshold.

This method of assessment involves the three main components of the heat burden experienced by workers:

- Thermal environment
- Type of work
- Type of clothing

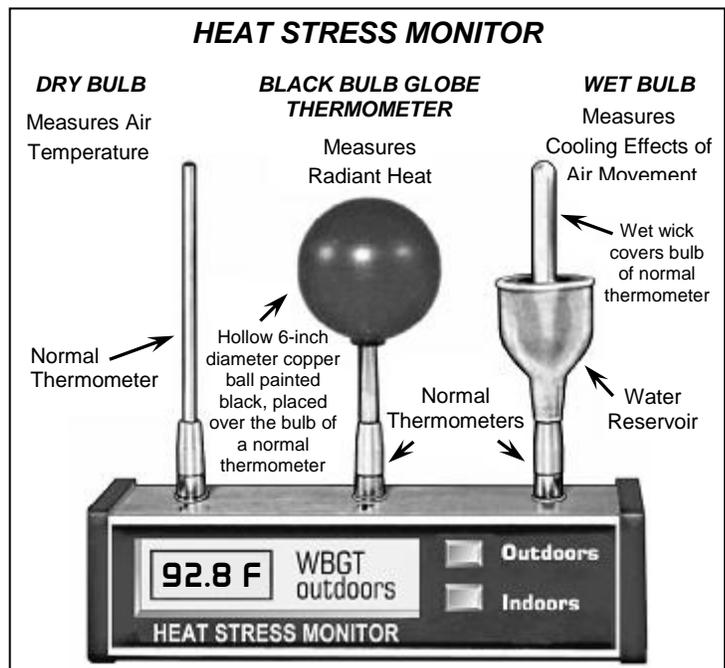
Thermal Environment

The first factor in assessing heat stress is the thermal environment as measured by WBGT index. WBGT is calculated in degrees Fahrenheit or Celsius using a formula which incorporates the following three environmental factors:

- Air temperature
- Radiant heat (heat transmitted to the body through the air from hot objects such as boilers or shingles heated by the sun)
- Cooling effects of evaporation caused by air movement (humidity).

To measure WBGT, a heat stress monitor consisting of three types of thermometers is required:

- A normal thermometer called a dry bulb thermometer is used to measure air temperature.
- Radiant heat is measured by a black bulb globe thermometer. This consists of a hollow, 6-inch diameter copper ball painted flat black and placed over the bulb of a normal thermometer.
- A wet bulb thermometer measures the cooling effect of evaporation caused by air movement (wind or fan). It consists of a normal thermometer wrapped in a wick kept moist at all times. As air moves through the wet wick, water evaporates and cools the thermometer in much the same way that sweat evaporates and cools the body.



Heat stress monitors currently available calculate WBGT automatically. The equipment required and the method of measuring WBGT can be found in the ACGIH booklet TLVs® and BEIs®: Threshold Limit Values...Biological Exposure Indices. The booklet also outlines permissible exposure limits for heat stress. Older instruments, however, require calculation by the operator.

Calculation depends on whether sunlight is direct (outdoors) or not (indoors).

Type of Work

The second factor in assessing heat stress is the type of work being performed. The table below shows four categories, with some examples of each:

Light Work	<input type="checkbox"/> Using a table saw <input type="checkbox"/> Some walking about <input type="checkbox"/> Operating a crane, truck, or other vehicle <input type="checkbox"/> Welding
Moderate Work	<input type="checkbox"/> Laying brick <input type="checkbox"/> Walking with moderate lifting or pushing <input type="checkbox"/> Hammering nails <input type="checkbox"/> Tying rebar <input type="checkbox"/> Raking asphalt <input type="checkbox"/> Sanding drywall
Heavy Work	<input type="checkbox"/> Carpenter sawing by hand <input type="checkbox"/> Shoveling dry sand <input type="checkbox"/> Laying block <input type="checkbox"/> Ripping out asbestos <input type="checkbox"/> Scraping asbestos fireproofing material
Very Heavy Work	<input type="checkbox"/> Shoveling wet sand <input type="checkbox"/> Lifting heavy objects

Type of Clothing

Free movement of cool, dry air over the skin maximizes heat removal. Evaporation of sweat from the skin is usually the major method of heat removal.

Specific protective clothing or garments such as encapsulating suits, thermal-insulated clothing, or clothing impermeable or highly resistant to water vapor or air movement severely restrict sweat evaporation and heat removal. As a result, body heat may produce life-threatening heat stress even when environmental conditions are considered cool.

Determine Work/Rest Schedules

The WBGT must never be used as an indicator of safe or unsafe conditions. It is only an aid in recognizing heat stress. The ultimate assessment and determination of heat stress must lie with the individual worker or co-worker trained to detect its symptoms. Supervisors must allow individual workers to determine if they are capable of working in heat.

Controlling Heat Stress

Heat stress can be controlled through education, engineering, and work procedures. Controls will:

☐ Protect Health

Illness can be prevented or treated while symptoms are still mild.

☐ Improve Safety

Workers are less liable to develop a heat-related illness and have an accident. Heat stress often creeps up without warning. Many heat-induced accidents are caused by sudden loss of consciousness.

☐ Increase Productivity

Workers feel more comfortable and are likely to be more productive as a result.

Training and Education

According to the National Institute of Occupational Safety and Health (NIOSH), heat stress training should cover the following components:

- Knowledge of heat stress hazards.
- Recognition of risk factors, danger signs, and symptoms.
- Awareness of first-aid procedures for, & potential health effects of, heat stroke.
- Employee responsibilities in avoiding heat stress.
- Dangers of using alcohol and/or drugs (including prescription drugs) in hot work environments.

Employee Training

Training in the following topics will be provided to all supervisory and non-supervisory employees:

- Environmental and personal risk factors for heat illness.
- Procedures for identifying, evaluating, and controlling exposures to the environmental and personal risk factors for heat illness.
- The importance of frequent consumption of water.
- The importance of acclimatization.
- Different types of heat illness and common signs and symptoms of heat illness.
- The importance of immediately reporting to the employer or designee symptoms or signs of heat illness.
- 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 medical service personnel.
- How to provide clear and precise directions to the work site.

Supervisor Training

Prior to assignment to supervision of employees working in the heat, training on the following topics will occur:

- The information provided for employee training.
- Procedures the supervisor will follow to implement controls as determined by the employer.
- Procedures the supervisor will follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

Engineering Controls

Engineering controls are the most effective means of preventing heat stress disorders and should be the first method of control. Engineering controls seek to provide a more comfortable workplace by using:

- Reflective shields to reduce radiant heat.
- Fans and other means to increase airflow in work areas.
- Mechanical devices to reduce the amount of physical work.

Given the constantly changing nature of construction sites, engineering controls are not usually feasible. Proper work procedures are therefore required to prevent heat stress disorders.

Work Procedures

The risks of working in hot construction environments can be reduced if labor and management cooperate to help control heat stress.

Management

- Give workers frequent breaks in a cool area away from heat. The area should not be so cool that it causes cold shock – around 75° F is ideal.
- Increase air movement by using fans where possible. This encourages body cooling through the evaporation of sweat.
- Provide unlimited amounts of conveniently located drinking water.
- Allow sufficient time for workers to become acclimated. A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Such a program exposes employees to work in a hot environment for progressively longer periods. NIOSH recommends that for workers who have had previous experience in hot jobs, the regimen should be:
 - 50% exposure on day one
 - 60% on day two
 - 80% on day three
- 100% on day four For new workers in a hot environment, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.
- Make allowances for workers who must wear personal protective clothing 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 seasons of the year.
- Consider the use of cooling vests containing ice packs or ice water to help rid bodies of excess heat.

Labor

- Wear light, loose clothing that permits the evaporation of sweat.
- Drink plenty of water or sports beverages to keep hydrated. Do not wait until you are thirsty.
- Avoid beverages such as tea, coffee, or beer that make you pass urine more frequently.
- Where personal PPE must be worn:
- Use the lightest weight clothing and respirators available.
- Wear light-colored garments that absorb less heat from the sun.

- Use PPE that allows sweat to evaporate.
- Avoid eating hot, heavy meals. They tend to increase internal body temperature by redirecting blood flow away from the skin to the digestive system.
- Do not take salt tablets unless a physician prescribes them. Natural body salts lost through sweating are easily replaced by a normal diet.

Workplace Responsibilities Regarding Heat Stress

Employers

- Adjust work practices as necessary when workers complain of heat stress.
- Make controlling exposures through engineering controls the primary means of control wherever possible.
- Oversee heat stress training and acclimatization for new workers and for workers who have been off the job for a while.
- Provide worker education and training, including periodic safety meetings on heat stress during hot weather or during work in hot environments.
- Monitor the workplace to determine when hot conditions arise.
- Determine whether workers are drinking enough water.
- Determine a proper work/rest regimen for workers.
- Arrange first aid training for workers.
- When working in a manufacturing plant, for instance, a contractor may wish to adopt the plant's heat stress program if one exists.

Workers

- Follow instructions and training for controlling heat stress.
- Be alert to symptoms in yourself and others.
- Avoid consumption of alcohol, illegal drugs, and excessive caffeine.
- Find out whether any prescription medications you are required to take can increase heat stress.
- Get adequate rest and sleep.
- Drink small amounts of water regularly to maintain fluid levels and avoid dehydration.

Conclusion

Heat stress at its simplest is the stress placed on the body by heat. Heat stress can be as minor as a heat rash or as critical as heat stroke. The foregoing plans, procedures, and actions have been established to manage activities under hot, humid conditions.

Heat Stress Symptoms & First Aid Requirements

The following table indicates symptoms and treatment for the six different types of heat stress. These are general guidelines only.

TYPE OF HEAT STRESS	SYMPTOMS	TREATMENT
Heat Rash	Red bumpy rash with severe itching	Change into dry clothes and avoid hot environments. Rinse skin with cool water.
Sunburn	Red, painful, or blistering and peeling skin	If the skin blisters, seek medical aid. Use skin lotions and work in shade if possible.
Heat Cramps	Painful cramps in legs, stomach, or arms. Cramps may be an indication of a more serious condition.	Move to cool area, loosen tight or restrictive clothing. Drink fluid replacement to replenish vital nutrients. Drink fluid replacement to replenish vital nutrients. If cramps continue, seek medical attention.
Fainting	Sudden loss of consciousness after at least two hours of work; cool moist skin and a weak pulse.	Get medical aid immediately. Assess breathing and heart rate. Loosen tight or restrictive clothing. If person regains consciousness, offer sips of cool water.
Heat Exhaustion	Heavy sweating, cool moist skin, weak pulse; person is tired, weak, or confused and complains of thirst; vision may be blurred.	Get medical aid immediately. This condition can progress quickly to heat stroke. Move person to cool shaded area. Remove excess clothing, spray with cool water, and fan to increase cooling. Deliver ongoing care until medical aid is provided.
Heat Stroke	Person may be confused, weak, clumsy, tired, or acting strangely. Skin is flushed, red, and dry; rapid pulse; headache or dizziness. Person may lose consciousness.	Get medical aid immediately. Time is very important. Remove excess clothing, spray with cool water, and fan to increase cooling. If person loses consciousness, monitor breathing and heart rate. Place person in recovery position. Deliver ongoing care until medical aid is provided.

Remember: Workers feeling ill, regardless of temperature or humidity, should consult their supervisor.

Attached on the following page is the National Oceanic and Atmospheric Association's Heat Stress Index (HSI). Staff will use this index as a tool to determine if heat related illness/stress (HRI) may be a concern for an employer.

Employers are **NOT** required to use this graph to assess risk of HRI; they must determine when adequate controls and methods are needed for their work site.

NOAA's National Weather Service Heat Stress Index

Heat Index	General Effect of Heat Index on People in Higher Risk Groups
80° to 89° Caution	Fatigue possible with prolonged exposure and/or physical activity
90° to 104° Extreme Caution	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
105° to 129° Danger	Sunstroke, heat cramps or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
130° or higher Extreme Danger	Heat/Sunstroke highly likely with continued exposure

130 *Extreme Danger*
105 *Danger*
90 *Extreme Caution*
80 *Caution*

Relative Humidity

		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100		
AIR TEMPERATURE (DEGREES FAHRENHEIT)	140	125																						
	135	120	128																					
	130	117	122	131																				
	125	111	116	123	131	141																		
	120	107	111	116	123	130	139	148																
	115	103	107	111	115	120	127	135	143	151														
	110	99	102	105	108	112	117	123	130	137	143	150												
	105	95	97	100	102	105	109	113	118	123	129	135	142	149										
	100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144								
	95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136						
	90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122				
85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108			
80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91			
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80			
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	71	71	71	71	71	71	71	72	

Apparent Temperature
Is how hot the heat-humidity combination makes it feel.

Heat Stress Prevention Program Notes