Document Number: HSE21-001	June 1, 2013

HEAT STRESS

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Rev Date	Rev Seq	Description	Revised By
06/01/13	1	Reformat	A. Holland

1. PURPOSE AND SCOPE

1.1. Proper training and preventative measures will help avert serious illness and loss of work productivity. Assessing applicable aspects of heat stress may prove to effectively reduce heat stress potential. The following information helps to outline the various factors that must be considered when assessing and treating heat stress.

2. ASSESSING HEAT STRESS

2.1. Factors that should be considered in assessing heat stress include:

2.1.1. **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:

2.1.1.1. **Weight -** Workers who are overweight are less efficient at losing heat.

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

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

2.1.1.4. **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.

2.1.1.5. **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.

2.1.1.6. **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.

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

2.1.1.8. **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.

2.1.1.9. **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.

2.1.2. **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.

2.1.2.1. **Radiant Heat -** Radiation is the transfer of heat from hot objects through air to the body. Working around heat sources will increase heat stress. Additionally, working in direct sunlight can substantially increase heat stress. A worker is far more comfortable working at 24°C under cloudy skies than working at 24°C under sunny skies.

2.1.2.2. **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.

2.1.2.3. **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.

2.1.3. **Job Factors**

2.1.3.1. **Clothing and Personal Protective Equipment (PPE) -** Heat stress can be caused or aggravated by wearing PPE such coated and non-woven materials used in protective garments. These types of clothing 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 too that darker-colored clothing absorbs more radiant heat than lighter-colored clothing.

2.1.3.2. **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 23°C to prevent heat disorders. This is especially true for workers who are not acclimatized to the heat.

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.

3. PREVENTING HEAT STRESS- Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. One or more of the following recommendations will help reduce heat stress.

3.1. Adjust work schedules.
3.2. Modify work/rest schedules according to monitoring requirements.
3.3. Mandate work slowdowns as needed.
3.4. Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
3.5. Add additional personnel to work teams.
3.6. Perform work during cooler hours of the day if possible.
3.7. Provide shelter or shaded areas to protect personnel during rest periods.
3.8. Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 18 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
    3.8.1. Maintain water temperature at 50° to 60°F (10° to 15.6°C).
    3.8.2. Provide small disposable cups that hold about 4 ounces (0.1 liter).
    3.8.3. Have workers drink 16 ounces (0.5 liters) of fluid before beginning work
3.9. Encourage workers to maintain an optimal level of physical fitness.
3.10. Acclimatize workers to site work conditions: temperature, protective clothing, and workload.
3.11. Urge workers to maintain normal weight levels.
3.12. Train workers to recognize and treat heat stress.

4. HEAT RELATED ILLNESSES

The following table indicates the causes, symptoms, and treatments of various heat related illnesses:

	Cause	Symptoms	Treatment
Heat rash	Hot humid environment; plugged sweat glands.	Red bumpy rash with severe itching. Prickling sensation on the skin where sweating occurs.	Change into dry clothes and avoid hot environments. Rinse skin with cool water. 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.
Sunburn	Too much exposure to the sun.	Red, painful, or blistering and peeling skin.	If the skin blisters, seek medical aid. Use skin lotions (avoid topical anesthetics) and work in the shade.
Heat cramps	Profuse perspiration with inadequate fluid intake and chemical replacement (especially salts).	Painful cramps in arms, legs or stomach which occur suddenly at work or later at home. Cramping creates hard painful lumps within the muscles. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing and drink cool salted water (1 tsp. salt per gallon of water) or commercial fluid replacement beverage. Stretch and massage muscles. If the cramps are severe or don't go away, seek medical aid.
Fainting	Fluid loss and inadequate water intake.	Sudden fainting after at least two hours of work; cool moist skin; weak pulse	GET MEDICAL ATTENTION. Assess need for CPR. Move to a cool area; loosen clothing; make person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.
Heat exhaustion	Fluid loss and inadequate salt and water intake causes a body's cooling system to start to break down. 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.	Heavy sweating; cool moist skin; body temperature over 38°C; weak pulse; normal or low blood pressure; tired and weak; nausea and vomiting; very thirsty; panting or breathing rapidly; vision may be blurred. convulsions.	GET MEDICAL AID. This condition can lead to heat stroke, which can kill. Move the person to a cool shaded area; loosen or remove excess clothing; if the person is conscious, provide small amounts of cool water to drink; fan and spray with cool water; apply cool, wet towels to the skin. .
Heat stroke	If a person's body has used up all its water and salt reserves, it will stop sweating. Temperature regulation fails and the body temperature rises to critical levels. Body must be cooled immediately to prevent severe injury and/or death. Competent medical help must be obtained immediately.	High body temperature (over 41°C) and any one of the following: the person is weak, confused, upset or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person may pass out and have convulsions **EMERGENCY. PROMPT ACTION MAY SAVE THE CASUALTY'S LIFE.**	CALL 911. This condition can kill a person quickly. Remove excess clothing; wrap casualty in cool, wet sheets and fan rapidly; provide immediate, aggressive, general cooling; offer sips of cool water if the person is conscious; do not give anything by mouth to an unconscious casualty