

**U.S. CONCRETE, INC.
SAFETY POLICY and PROCEDURE MANUAL**

FUNCTION	Safety
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TOPIC	Heat Stress Prevention Plan
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OBJECTIVE(S):

- Heat stress hazards are among the most neglected health hazards in the workplace. People have a tendency to equate heat stress with just being hot and uncomfortable. But it is much more. Heat stress is a serious health hazard. Death and serious injuries can and do result everyday to thousand of workers.
- Our main goals for this session are to help you understand what heat stress is and to minimize your risk of experiencing a heat-related illness on the job.
- We'll start by looking at how the body handles heat, the strain heat puts on the body, and some of the health dangers that can result when the body's internal cooling mechanisms break down.
- Next we'll take a look at some of the various heat disorders that can affect you on the job, such as heat stroke and heat exhaustion. We'll look at ways you can recognize symptoms in yourselves or co-workers and how you should respond if they occur.
 - Finally, we'll turn to prevention, which can be thought of as two stages - knowing some of the factors that put you at risk and knowing what steps you can take ahead of time to prevent illness. We'll look at some of the physical, environmental, and personal factors that can increase your risk and require extra caution. Then we'll turn to things you can do to beat the heat.

GENERAL POLICY: (Defined below)

APPLICATION: U.S. Concrete, Inc.

RESPONSIBILITY: President/General Manager

How the Body Responds to Heat

- Understanding heat stress starts with understanding how your body copes with heat. Our bodies attempt to maintain a constant internal temperature - 98.6 degrees Fahrenheit on average. But sometimes, due to the air temperature or the physical activities we're engaged in, our internal body temperature can exceed 98.6. When

this happens, the body tries to bring its temperature back down by getting rid of excess heat. This is done in two ways.

- The first is to vary the rate and amount of blood circulating at the skin surface. Your heart begins to pump more blood and the capillaries which run through the upper layers of your skin expand and fill with blood. As the blood circulates closer to the surface of the skin, excess heat is released.
- But sometimes this isn't enough. When it isn't, your body senses it's still overheating and signals your sweat glands to release sweat onto the skin surface. Evaporation of sweat cools the skin and eliminates excess heat from the body.
- When these two mechanisms work well, your core body temperature drops or stabilizes to a safe level.

Effects of Body' Response:

- Even when your body's internal cooling mechanism is working right, the effects of coping with heat can put you at risk of injury.
- With so much blood going to the skin surface, less and less goes to your brain. This reduces your alertness and mental capacity. You'll find yourself less able to retain and recall information.
- More blood at the skin surface also means less blood for your active muscles and other internal organs. This causes you to feel you're losing your strength or growing fatigued much sooner than you normally would.
- In addition, sweat can also cause problems. Slipperiness of sweaty palms may cause you to drop items. Your safety goggles might also fog up, affecting your vision.
- All of this can add up to safety hazards. In fact, studies have shown that more accidents tend to occur in hot environments. Why? As we've seen, working in a hot environment lowers your mental alertness and physical performance. In addition, a higher body temperature and the physical discomfort of battling the heat also tend to make us irritable and angry and cause us to overlook safety procedures or divert our attention from hazardous tasks.

When Cooling Mechanisms Fail:

- Even when the body's internal cooling mechanism is working right, heat can still cause problems. But sometimes, under certain conditions, your natural cooling systems fails. When this happens, you could face even more serious medical problems; some could be fatal.
- One problem occurs when the outside air temperature is as warm or warmer than your skin surface. In this case, blood brought to the skin surface doesn't help cool you. So there goes your body's plan A.
- With Plan A gone, your body falls back on Plan B - cooling down by sweating. The problem here is that for sweating to effectively cool the body, moisture has to evaporate off the skin. But when you have high humidity, your sweat doesn't evaporate as fast. There goes Plan B.
- Now we start to have some problems. We'll consider some of the distinct medical conditions of heat-related illness next.

Heat Stroke:

- Heat stroke is the most serious of the heat stress disorders. It reflects a total breakdown of your body's temperature regulating system. Pumping blood to the skin surface and sweating becomes inadequate and your body temperature rises to potentially fatal levels. What makes heat stroke especially dangerous is that it comes with little warning. However, there are some danger signs.
- With your body temperature reaching 103 or greater, you may feel feverish. You may have stopped sweating and your skin has become hot, dry, red or spotted. You may experience a headache, rapid pulse, chills and have difficulty breathing. You may also find yourself becoming mentally confused and disoriented.
- If untreated, you may even go into convulsions or lose consciousness. Without quick medical attention, death can occur.

Heat Stroke – Treatment:

- Heat stroke should be treated as a serious medical emergency. Left untreated, it results in death. Four thousand Americans die annually from heat stroke.
- Victims of heat stroke require immediate hospitalization. If you find a co-worker you believe is suffering from heat stroke, immediately notify your supervisor and have someone call 911.
- Until medical help arrives, administer first aid care.
- Move the victim to a cool, shaded area. Lay him or her on the back, or if nausea exists, on the side. Loosen and remove any heavy clothing. Do not leave the victim unattended at any time.
- If conscious and not feeling sick, have the victim drink a small cup of water.
- If possible, immerse the victim in cool water. Cool the skin with a wet cloth or a wet sheet, or by spraying him or her with a cool mist of water or placing ice under the armpits or in the groin area. Fan vigorously to help improve cooling through evaporation.
- Remember, early recognition of heat stroke is the only means to prevent death.

Heat Exhaustion Cause – Treatment:

- The symptoms of heat exhaustion may resemble some of the early signs of heat stroke.
- Heat exhaustion is caused by the loss of large amounts of fluid through sweating, often accompanied by excessive loss of salt.
- Unlike heat stroke, someone suffering from heat exhaustion still is sweating - heavily. Skin will be pale and cool. Pulse will be rapid. Victim may experience extreme weakness or fatigue, accompanied by giddiness, nausea, headache or blurred vision. In more serious cases, the victim may also vomit or faint.
- Treatment in most cases involves having the victim rest in a cool area with legs elevated. Loosen and remove heavy clothing. Give victim plenty of liquids. Cool skin with a cool spray mist of water or with a wet cloth and then fan him or her. With this treatment, mild cases of heat exhaustion usually recover on the spot; however, those with severe cases may require further care over several days. If the victim doesn't feel better in a few minutes, notify your supervisor and get emergency help.

Heat Cramps Cause- Treatment:

- Heat cramps are painful muscle spasms that can sometimes occur after physical exertion in an extremely hot environment. Sweating causes your body to lose salt. When you replenish the fluids you sweat out by drinking water, this can dilute the remaining salt levels in the body. If the salt level in your muscles gets too low, they begin to cramp.
- Onset is sudden. Painful spasms occur in your arms, legs, abdomen and any tired muscles. Your skin will also be hot and moist. Although spasms will generally occur during or shortly after exertion, cramping can continue hours after work is completed.
- Treatment for heat cramps includes drinking plenty of fluids. Rest and massage the cramped muscles. Drinking salted liquids or off-the-shelf sports drinks like Gatorade help replace the salt and help you recover faster. To prevent a repeat case, if you know you're going to be performing hard, physical work in the heat, try adding a little extra salt to your food with your meals. Salt tablets are not recommended.

Dehydration Cause – Treatment:

- Dehydration occurs when the body gives off more fluids by sweating than it has taken in. Sometimes, as in the case with muscle cramps, salt levels may also fall too low.
- Signs and symptoms are overall fatigue and weakness, dry mouth.
- Treatment is fairly simple. Replace the lost fluids and salt.
- Just to expand a point on salt. Again, if you need to replace salt, the best way to do it is to just add a little extra salt to your food. Salt tablets should not be used. If you're on a low sodium diet, check with your physician.

Heat Rash Cause – Treatment:

- Heat rash (also known as prickly heat) occurs in hot, humid environments where sweat isn't easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. This causes sweat ducts to become plugged and a rash to appear. Left untreated, heat rash can become infected.
- Symptoms are small pink pimples accompanied by intense itching and in some cases a mild tingling.
- To treat heat rash, wash the affected area with soap and water. Then apply calamine or another soothing lotion to relieve the itchiness and discomfort.
- This condition can be prevented by resting in a cool place part of each day to allow the skin to dry and regularly bathing and drying the skin. During long days in a hot environment, consider showering at work, if possible, and changing into a new set of clothes.

Preventing Heat Stress:

- Now that we've seen some of the various heat-related illnesses that can affect your health. We're going to turn to prevention - what you need to watch out for and what you can do.
- We'll start by looking at some of the situations and conditions under which you're more likely to be at risk for a heat-related illness; the environment you're working in, the type of work you're doing, and your own physical condition - all three of these factors play a role in heat stress.

- Once we know what to watch out for and the times when you need to be even more aware of the heat stress, we'll turn to some of the steps that you can take to reduce the likelihood that you'll become a victim.

Environmental Factors:

- The most obvious environmental factor when it comes to heat stress is air temperature. The higher the air temperature, the faster your internal body temperature rises and the more difficult it is to cool down. Remember, if the temperature is above 98.6 degrees Fahrenheit, your body loses its ability to cool by pumping blood to your skin surface.
- It's not the heat, it's the humidity. Well it's both. Higher humidity not only helps increase your internal temperature, but at very high levels, humidity can impede your body's ability to cool itself by sweating.
- Heat that comes off a piece of equipment, for example, a furnace or boiler, is called radiant heat. When you're working near a piece of equipment that gives off heat, this increases the amount of heat your body is attempting to offset.
- When air is circulating, this generally tends to help your body cool down by helping your sweat evaporate. When you're working some place where there is little air circulating, your body will not be able to cool itself efficiently.
- Takeaway: Be aware of your environment. When you are working under any of these conditions, be alert for signs of heat-related illness and take preventative measures.

Work Related Factors:

- Next to your environment, the most important factor is workload - what are you doing. Heavy lifting, repetitive lifting, or actions likely to cause your body to expend a lot of energy raises your internal body temperature. When you're doing work that requires a lot of physical exertion in the heat, you need to take special care to monitor yourself for the signs and symptoms of heat stress.
- How long you're working is also important. Working for an extended period of time in the heat without rest reduces the amount of time your body has to recover and cool down, especially in terms of sweat evaporation. Repeated exertions have a cumulative effect - your internal thermometer keeps rising.
- Clothing is also a factor. Heavy clothing impedes your body's ability to get rid of heat. If you're working outdoors, you're more likely to feel the heat if you're wearing dark colors. Dark colors absorb heat; light colors reflect it.
- There may be times you need to wear some personal protective equipment (PPE) to accomplish a task. If you're wearing PPE, be careful. Know that respirators, full-body suits, face-shields, goggles, even gloves tend to reduce the efficiency of your body's cooling system, making it more likely that you'll be affected by a heat-related illness. So anytime you're working in a hot environment and using PPE, take special care to monitor yourself for signs and symptoms.

Personal Factors:

- It's difficult to predict who will be affected by heat stress and when, because individual susceptibility varies. But there are some general rules of thumb when it comes to who has increased risk and who should be even more alert in monitoring themselves for signs of illness.

- Age is one factor. Put simply, the older you are, the more at-risk you are for a heat disorder. Workers over 40 have an increased risk. Total body water decreases with age. The aging process tends to cause a sluggish response by the sweat glands.
- If you're overweight, you're also at increased risk - yet another reason to lose that spare tire. The increased layer of fat prevents your body from efficiently releasing heat and your body surface to body weight ratio is less favorable for heat release. In addition, that extra weight means a greater expenditure of energy when working and greater portion of blood flow spent on cooling.
- Drugs and alcohol should not be used on the job. Maybe that's another talk, but drugs, alcohol and excessive heat are a dangerous cocktail. Among other things, alcohol causes you're body to dehydrate faster. Caffeine also causes your body to loose water faster. So go easy on the coffee if you're going to work in the heat. If you're on medication, and you're doing heavy, physical work under hot conditions, make sure your doctor knows about it.
- Also, if you've had a heat-related illness in the past, be aware that you are much more likely than someone who hasn't to suffer a heat-related illness.

Prevention:

- Now that we've reviewed some of the factors that can increase your risk and put you on alert, we'll talk about steps you can to prevent heat-related illness.
- We've seen that many of the heat disorders are related to dehydration. So it's important to keep your water intake equal to the amount of sweat produced. You may produce as much as 2-3 gallons of sweat over the course of a workday. Don't depend on thirst to signal when it's time to drink. Interestingly, most workers exposed to hot conditions actually drink lower amounts of fluids because of insufficient thirst drive. When you're working in a hot environment, drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish fluids lost by sweating.
- When exposed to the heat, your body undergoes a series of changes that make continued exposure to heat more bearable. Under normal circumstances, this adjustment period takes about 3 to 5 days. Once you become acclimated to the heat, you'll find it possible to perform with less strain and distress.
- However, heat disorders are more likely to occur among workers who have been away from hot environments and have gotten accustomed to lower temperatures. If you return to work after a vacation or an extended illness, your body won't be up to the task right out of the gate. If possible, you should begin with 50% normal workload the first day and gradually build up to 100%.
- When working outdoors, wear light color clothing. Remember, dark colors absorb heat; light colors reflect it. Always wear the lightest weight clothing possible, preferably a breathable material like cotton that allows for heat to be released. Also, change from wet to dry clothing whenever you can.
- Use of PPE, such as full-face respirators, gloves, goggles, etc. can add to the heat load. Try to choose the lightest possible "breathable" PPE. However, if the trade-off is between comfort and safety, choose safety.
- If possible, use work-rest cycles. When working strenuously in the heat, take an occasional break in the shade or cool area to let your body recover.
- Try to perform the most stressful tasks during the cooler parts of the day - either early morning or night. Shift non-essential tasks to a time of the day when the heat is lower if you can.
- Eating right can also help prevent heat-related illness. Hot foods add directly to body heat. Heavy meals redirect blood flow to your digestive tract instead of the skin surface. It's best to eat light meals during work and your heaviest meal in the evening or when your work day is over.

- Sufficient sleep and good nutrition are important for maintaining a high level of heat tolerance. So when the heat is on, get plenty of rest and eat right.

Summary:

- Now we'll briefly recap what we've learned today. We started by looking at how the body copes with heat - getting rid of excess heat by increasing blood flow to skin surface and sweating - and saw that coping in this manner can lead to reduced mental alertness, cause weakness and fatigue and cause objects to become slippery - all of which increase the chance of accidents.
- We learned how high air temperature, high humidity, and losses of fluids and sodium can sometimes cause the body's cooling mechanisms break down and cause serious heat-related illness.
- We looked at how to recognize and treat the most common heat-related illnesses such as heat stroke - which can be deadly - heat exhaustion, heat cramps, dehydration and heat rash.
- We also reviewed some of the contributing factors to heat related illness, which include environmental factors such as air temperature and humidity; physical work factors such as the work you're doing and the clothing you're wearing; and personal factors such as your age or physical condition.
- We learned what can be done to prevent heat-related illness. Drink plenty of fluids. Give your body time to adjust to the heat. Choose proper clothing and schedule tasks to take the heat into account.

Approved by:	Original at US Concrete Houston
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Effective Date:	5/30/2006
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Signature:	Original at US Concrete Houston
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Exhibit 1

Heat Stress Safety

Quiz

1. If you know you are going to engage in strenuous physical activity in a hot environment or you need to replenish salt lost through excessive sweating, you should:
 - a. Add a little extra salt to your food
 - b. Take salt tablets
 - c. Drink a mixture of 10% salt and 90% water
 - d. All of the above

2. Which of the following factors can lead to increased risk of heat stress?
 - a. Age
 - b. Prior history of heat-related illness
 - c. Overweight
 - d. All of the above

3. Your body attempts to regulate its internal body temperature through all of the following EXCEPT:
 - a. Sweating
 - b. Rushing blood to the skin surface
 - c. Producing excess sodium
 - d. Monitoring its internal body temperature

4. True or false?
When the body's internal cooling mechanism is working right, there is no risk of injury.

5. In very high humidity, your body may be unable to cool itself down because _____ .
 - a. humidity causes increased heat rate
 - b. humidity may be the same or greater than as internal body temperature
 - c. humidity may prevent evaporation of sweat
 - d. humidity prevents blood brought to skin surface from giving off heat

6. The most serious of all heat-related illness is _____ , which can result in death if left untreated and kills 4,000 Americans each year:
 - a. heat exhaustion
 - b. dehydration
 - c. heat cramps
 - d. heat stroke

7. To treat a victim of heat stroke, perform all of the following EXCEPT:
 - a. Leave victim alone in cool area
 - b. Immerse victim in cool water
 - c. Fan vigorously

- d. Massage body with ice
8. Which of the following are most likely to put you at risk for a heat disorder:
- a. Wearing light colored clothing while working outdoors
 - b. Wearing personal protective equipment in a climate-controlled environment
 - c. Wearing dark colored clothing while working outdoors
 - d. Taking periodic breaks between physical tasks in the heat
9. If you are returning from vacation or an extended absence, your body undergoes a period of adjustment known as “acclimatization” which lasts
- a. From 3-5 weeks
 - b. From 3-5 hours
 - c. From 3-5 days
 - d. From 5-7 hours
10. If you are working strenuously and sweating heavily, make sure you replenish body fluids by drinking:
- a. 5-7 ounces of water every 20 minutes
 - b. 5-7 ounces of water every hour
 - c. 5-7 gallons of water every day
 - d. 5-7 gallons of water each week
11. When scheduling work tasks, if possible, try to perform most physically intense work:
- a. Just before noon
 - b. In the early morning or evening
 - c. In the early afternoon
 - d. Mid-afternoon

Name: _____

Date: _____

Heat Stress

Heat Stress - Goals

- How the body handles heat
- Heat disorders
 - Know how to recognize heat-related illnesses
 - Know what to do when they occur
- Prevention
 - Know the factors increasing your risk
 - Know how you can prevent heat-related illness

How the Body Responds to Heat

- The body tries to keep a constant internal temperature
- When internal temperature rises, it attempts to get rid of excess heat by:
 - Increasing blood flow to skin surface
 - Releasing sweat onto skin surface

Effects of Body's Response

- Reduced blood flow to brain
 - Reduced mental alertness and comprehension
- Reduced blood flow to active muscles
 - Fatigue, loss of strength
- Increased sweating
 - Slipperiness

When Cooling Mechanisms Fail

- High air temperature reduces effectiveness
- High humidity reduces evaporation of sweat
- Excess loss of salt
- Dehydration

Heat Stroke

- Cause:
 - Total breakdown of body's cooling system
- Signs & Symptoms:
 - High body temperature (>103)
 - Sweating stops and skin is hot, red, and dry
 - Headache, dizziness, weakness, rapid pulse, chills, difficulty breathing
 - If untreated, delirium and unconsciousness

Heat Stroke - Treatment

- Treat as a medical emergency
 - If left untreated, may result in death

—4,000 Americans die each year

- Move victim to cool area
- Give small cup of water (if not nauseous)
- Loosen and/or remove clothing
- Cool with water or massage with ice
- Fan vigorously to improve evaporation

Heat Exhaustion

- Cause:

—Excessive loss of water and salt through sweat

- Signs & Symptoms:

—Heavy sweating, intense thirst, skin is pale and cool, rapid pulse, fatigue/weakness, nausea & vomiting, headache, blurred vision, fainting

- Treatment:

—Move to cool area, rest with legs elevated, loosen clothing, give fluids, cool with water & fan

Heat Cramps

- Cause:

—Loss of salt

- Signs & Symptoms:

—Painful spasms in arms, legs and abdomen

—Hot, moist skin

- Treatment:

—Drink water, rest, massage cramped areas

Dehydration

- Cause:

—Excessive fluid loss

- Signs & symptoms:

—Fatigue, weakness, dry mouth

- Treatment:

—Fluids and salt replacement

Heat Rash

- Cause:

—Inflamed skin

- Signs & Symptoms:

—Rash w/ pink pimples, itching, tingling

- Treatment:

—Cleanse area & dry, apply calamine or other lotions

Preventing Heat Stress

- Know the factors that increase risk

—The environment you're working in

—The work you're doing

—Your own conditioning

- What you can do to prevent heat stress

Environmental Factors

- Air temperature
- Humidity
- Radiant heat source
- Air circulation

Work-related Factors

- Workload
 - Type of work
 - Level of physical activity
 - Time spent working
- Clothing
 - Weight (heavy v. breathable)
 - Color (dark v. light)
 - Personal protective equipment and clothing

Personal Factors

- Age
- Weight/fitness
- Use of drugs, alcohol, caffeine, medication
- Prior heat-related illness

Prevention

- Drink plenty of fluids
 - Don't rely on your thirst
 - 5-7 oz. Every 20 minutes
- Acclimatization: adjust to the heat
 - The body takes 3-5 days to get used to the heat
 - Be careful if returning from vacation or absence
- Choose proper clothing
 - Choose light colors and lightest weight possible
 - Select proper personal protective equipment
- Take heat into account when scheduling tasks
 - Work/rest cycles
 - Heaviest tasks early morning or dusk
- Eat properly
- Sleep and rest

Summary

- How the body responds to heat
- Why cooling mechanisms fail
- What factors contribute to heat-related illness
- How to recognize and treat the most common heat disorders
- How to prevent heat-related illness

Heat Stress

Safety Training Handout

■ **How does the body respond to heat?**

- The body tries to maintain a constant internal temperature by getting rid of excess heat
- It uses two methods to get rid of heat: (1) increasing blood flow to skin surface and (2) sweating
- Increasing blood flow to the skin surface means less blood flow to the brain and active muscles, which can cause reduced mental alertness & comprehension, fatigue, weakness, loss of strength
- Sweating can cause objects to become slippery, increasing chances of an accident

■ **Why do the body's cooling mechanisms sometimes fail?**

- High air temperature reduces effectiveness of heat release
- High humidity reduces evaporation of sweat
- Sweating leads to excess loss of fluid
- Sweating leads to excess loss of sodium

■ **What factors contribute to heat-related illness?**

- **Environmental factors:** Air temperature, humidity, radiant heat sources, air circulation
- **Physical work factors:** (1) type of work, level of physical activity and duration, and (2) clothing color, weight, and breath ability
- **Personal factors:** Age, weight/fitness, drug/alcohol use, prior heat-related illness

■ **Recognizing and treating the most common heat disorders**

Disorder	Cause	Signs & symptoms	Treatment
Heat stroke	Total breakdown of body's cooling system	High body temp (>103), sweating stops and skin is hot red and dry; headache, dizziness, weakness, rapid pulse	Treat as a medical emergency; move victim to cool area, immerse victim in cool water or massage victim's body with ice; do not give liquids
Heat exhaustion	Excessive loss of water and salt	Heavy sweating, intense thirst, skin is pale and cool, rapid pulse, fatigue/weakness, nausea & vomiting, headache, blurred vision, fainting	Move to cool area, rest with legs elevated, loosen clothing, drink plenty of fluids
Heat cramps	Excessive loss of water and salt	Painful spasms in arms, legs and abdomen; hot, moist skin	Drink fluids, massage cramped areas, rest
Dehydration	Excessive loss of water and salt	Fatigue, weakness, dry mouth	Drink fluids and replace salt
Heat rash	Clogged sweat glands	Rash of pink pimples, intense itching, tingling	Cleanse area & dry; apply calamine or other lotion.

■ **What can be done to prevent heat-related illness?**

- Drink plenty of fluids: 5-7 ounces every 20 minutes
- Give your body time to adjust to the heat: most workers require 3-5 days – so go slow
- Choose proper clothing: Wear light colors if working outside and choose lightweight/breathable material
- Try to perform your most strenuous activities in the early morning/early evening
- Use work/rest cycles when possible to give your body time to recover
- Eat properly: Save biggest meal until evening