

Temperature Extremes	S.O.P. 5H		Page 1 of 6
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STANDARD OPERATING PROCEDURE			

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I. SCOPE AND PURPOSE

- A. This procedure establishes safety and health guidance to prevent injury from heat and cold stress to personnel.

II. RELATED PROCEDURES

- A. S.O.P. 1A, Incident Reporting and Investigating (With or Without Injuries)
- B. S.O.P. 5C, Treatment of Injuries (First Aid and Medical Transport)

III. PERSONNEL RESPONSIBILITY

- A. Supervisor
 - 1. Ensure the employee is given the opportunity to acclimate to the environment.
 - 2. Recognize the possible adverse effects and react to the potential of heat or cold and it's effect on the employee.
- B. Employee
 - 1. Consume sufficient amounts of fluid (water and electrolyte replacement fluids) throughout the day.

IV. HEAT STRESS

- A. One of the most common types of stress that can affect field personnel is heat stress. Current thinking is that heat stress may be the most serious hazard to workers at jobsites.
- B. Causes and Preventative Measures
 - 1. Heat stress usually is a result of protective clothing decreasing

natural body ventilation and therefore cooling; however, it may occur at any time work is being performed at elevated temperatures.

2. If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild to fatal. Because heat stress is one of the most common and potentially serious illnesses that workers encounter, regular monitoring and preventative measures are vital. Heat stress symptoms include fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement.
3. Site workers must learn to recognize and treat the various forms of heat stress.
4. At all sites, the following procedures shall be complied with
 - a. Suggest workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable 4-ounce cups and water. Urge workers to drink 1-2 gallons per day. Provide a cool, preferable air-conditioned area for rest breaks. Discourage the use of alcohol during non-working hours, and discourage the intake of coffee during work hours. Monitor for signs of heat stress. If an individual has high blood pressure, he must be monitored more often and precautions taken (e.g., drink more water).
 - b. Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.
 - c. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. An example of a cooling aid is long cotton underwear, which acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
 - d. Install showers and/or hoses-down facilities to reduce body temperature and cool protective clothing.
 - e. Ensure that adequate shelter is available to protect personnel against heat, as well as cold, rain; snow, etc., which can decrease physical efficiency and increase the probability of both heat and cold stress. If possible, Set up the command post in the shade.
 - f. Good hygienic standard must be maintained by frequent changes of clothing and showers. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

C. Heat Stroke

1. Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body, i.e., the individual's temperature control system that causes sweating stops working correctly.

Body temperature raises so high that brain damage and death results if the person is not cooled quickly.

2. Symptoms
 - a. Symptoms of heat stroke include red, hot, dry skin, although the person may have been sweating earlier; nausea; dizziness; confusion, extremely high body temperature, rapid respiratory and pulse rate, unconsciousness, or coma
3. Treatment
 - a. Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result Soak the victim in cool (but not cold) water, sponge the body with cool water, or pour water on the body to reduce the temperature to a safe level (102° F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

D. Heat Exhaustion

1. Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. This condition is much less dangerous than heat stroke, but it nonetheless must be treated
2. Symptoms
 - a. Symptoms of heat exhaustion include pale, clammy, moist skin, profuse perspiration, and extreme weakness Body temperature is normal, pulse is weak and rapid, and breathing is shallow The person may have a headache, may vomit, or may be dizzy
3. Treatment
 - a. Remove the person to a cool place, loosen clothing, place in a head-low position, and provide bed rest. Consult physician, especially in several cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have the patient drink 1-2 cups of water immediately, and every 20 minutes thereafter, until symptoms subside Total water consumption should be 1-2 gallons per day

E. Heat Cramps

1. Heat cramps are caused by perspiration that is not balanced by adequate fluid intake Heat cramps are often the first sign of a condition that can lead to heatstroke.
2. Symptoms
 - a. Symptoms of heat cramps include acute painful spasms of voluntary muscles; e.g., abdomen and extremities.
3. Treatment
 - a. Remove victim to a cool area and loosen clothing Have patient drink 1-2 cups of water immediately, and every 20 minutes thereafter, until symptoms subside: Total water consumption should be 1-2 gallons per day. Consult with a physician.

- F. Heat Rash
 - 1. Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.
 - 2. Symptoms
 - a. Heat rash symptoms include mild red rash, especially in areas of the body in contact with protective gear
 - 3. Treatment
 - a. Decrease the amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.
- G. Heat Stress Monitoring
 - 1. For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedure may be used to monitor the body's physiological response to heat and to manage the work cycle. This procedure may be instituted when the ambient temperature exceeds 70° F
 - 2. Measure Heart Rate
 - a. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute for most individuals. The maximum rate is based on individual's base rate. Base rates vary across the population. If the HR is higher, the next work period should be shortened by 33 percent, while in length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats/minute.

V. **COLD STRESS**

- A. The effects of work in cold environments depend upon factors such as air temperature and wind, duration of exposure, type of protective clothing and equipment, type of work, level of physical effort, and health status of the worker.
- B. In some cold environments, overexposure can cause serious effects on the body. Cold may affect the exposed body surfaces or the deeper body tissues.
- C. Hypothermia
 - 1. Hypothermia results when the body loses heat faster than it can produce it. When this occurs, the blood vessels in the skin constrict to conserve the important vital heat, usually affecting the hands and feet first. Involuntary shivering is the first sign of hypothermia. Further heat loss produces speech difficulty, forgetfulness, loss of manual dexterity, collapse, and finally death.
- D. Frostbite
 - 1. Frostbite occurs when there is actual freezing of the body tissues, normally when temperatures are below freezing. The injury can result from

exposure to cold wind, from prolonged exposure to cold temperatures, or from skin contact with objects whose temperatures are below freezing. The tissue damage can be superficial near the skin or extend to deeper body tissues and cause gangrene. The skin may first have a prickly or tingling sensation and later become numb with cold; the appearance may range from superficial redness of the skin to white frozen-looking tissues.

E. Immersion Foot or Trench Foot

1. These two cold injuries occur as a result of exposure to cool or cold water. Immersion foot usually results from prolonged exposure when air temperatures are above freezing, whereas trench foot normally occurs from shorter exposure at temperatures near freezing. The symptoms for each disorder are similar and include tingling, itching, swelling, pain in some cases or numbness in others, lack of sweating, and blisters.

F. Treatment of Cold Disorders

1. The intent of all treatment is to increase the deep body temperature to 98.6° F. Symptoms include heavy shivering, drowsiness, excessive fatigue, and confusion, in addition to those listed above. Cold work should be discontinued for any worker with these symptoms, and the worker should be brought to a warm area. Since wet clothing contributes to clod stress, wet clothing should be removed if possible and replaced by dry clothing. A warm, non-alcoholic non-caffeinated drink or soup may be given. Re-warming should be gradual.
2. For frostbite also, the victim should be sheltered from the wind and cold and given warm drinks. The frozen part should be covered with extra clothing or blankets or be warmed against your body. Do not use direct heat and do not rub the affected area. Warming should be rapid but gentle.

G. Avoidance of Cold-Related Emergencies

1. Adequate, appropriate clothing shall be worn to keep body warmth in and cold out. No one type of clothing is suitable for all purposes. Multiple layers of light clothes are best because the dead air space between layers serves as insulation with the:
 - a. Innermost layer trapping heat and allowing ventilation of perspiration; cotton is a good material.
 - b. Insulating layer being of wool or fiberfill
 - c. Outer protective layer to be windproof and waterproof; nylon or waterproof suits are protective.
2. Air purifying respirators (APRs) shall not be worn at temperatures below 32° F without the nose cup.
3. Powered APR's (PAPR's) shall not be used in temperatures below 40° F because of the wind-chill created in the face piece.
4. All workers shall be trained in the recognition of symptoms, treatment of cold stress disorders, and wind-chill index.
5. Work shall be carefully scheduled to avoid heavy perspiration by workers
6. Extremities of the body shall be adequately protected. Hands should be

covered with gloves and for temperatures below 0° F, mittens. Caps, hoods, hard hats with liners, etc. should be used to cover the head and ears. Feet should be protected with insulated boots, layer of socks or boot covers as appropriate.

7. There shall be an appropriate work-rest regime or schedule and a heated shelter for relief from the cold.
8. A change of dry work clothing shall be on hand for each worker.
9. Warm, non-alcoholic drinks (avoid or minimize coffee or other caffeine) and/or soups should be available.
10. Bare metal equipment controls, seats, etc., should be covered with non-conducting materials.
11. The buddy system shall be utilized at all times.
12. Work planning shall consider the fact that the additional weight and bulkiness of clothing may affect work performance. Work planning shall minimize standing still or sitting still for long periods.
13. Work shall be performed away from windy or drafty areas or unprotected areas as much as possible.