Temperature-Related Injury Prevention

1. **Scope**

This procedure provides guidelines that deal with and explain how to recognize and prevent occupational injuries/illnesses that may occur from working in extreme hot and/or cold environments.

Factors the will be taken into consideration consist of but are not limited to:

- Task being performed.
- Location of the task being performed (inside or outside).
- Ambient temperatures and projected weather forecast.
- Heat indexes and/or wind chill factors.
- Availability and effectiveness of the engineering controls, administrative controls, safe work practices and personnel protective equipment.

2. **Heat-Related/ Heat Stress**

A. **Definition**

A physiological reaction that occurs when the body is accumulating heat faster than it can be dissipated. Heat stress is due primarily to sustained exertion in a warm or hot environment. Heat stress situations include heat cramps, heat exhaustion, and heat stroke. The following factors may contribute to an individual’s susceptibility to heat stress:

- Personal physical fitness.
- Degree of acclimatization.
- Rate at which water and salt that are lost through perspiration are replenished.
- Recent alcohol intake.
Temperature-Related Injury Prevention

Y Dehydration.
Y Obesity.
Y Medications such as diuretics, sedatives, tranquilizers, and some heart and blood medicines.

B. Administration
The potential for heat stress is greatest when working for long periods near heat sources, or when personnel are required to wear protective clothing for extended periods. During hot weather, the potential for heat stress is present in any un-air conditioned work location where temperatures exceed 85 degrees F.

Since measurement of deep body temperature is an impractical method of monitoring a worker’s heat load, ambient environmental factors are measured instead.

Y These environmental factors are similar to deep body temperature and other physiological responses to heat.
Y The simplest, most widely accepted measure of environmental heat factors is the WBGT.

Personnel should wear clothing with adequate air and vapor permeability.

Y When workers are required to wear clothing that does not have adequate air and vapor permeability, such as acid suites, recommended heat stress limits may be exceeded.
Y Vest that may be cooled with ice or circulation water may be used for personnel cooling purposes when excessive heat exposures are present.
Y Vortex cool devices are also recommended for use during jobs in hot environments.

Convective heat gain, which occurs when air temperature exceeds skin temperature, can be controlled by the type and amount of clothing worn. Clothing affects the exchange of heat between the body and the environment.
Radiate heat gain, which occurs when the temperature of surrounding solid objects exceeds skin temperature, can be reduced by the following means:

- Placing shields or barriers that are radiate-reflective or heat-absorbent between the source of radiant heat and personnel.
- Isolating the source of radiant heat.
- Modifying an operation or task.

Evaporative heat loss, which occurs when the body loses excess heat through evaporation, can be increased by the following means:

- Increasing air movement around personnel by fan or some other means of ventilations.
- Reducing the water-vapor content (humidity) of the air by air conditioning.
- Selecting clothing of the proper air- and water-vapor permeability.

When engineering controls are inadequate or not feasible, work modifications and hygienic practices must be introduced to control exposures to both environmental and metabolic heat. The following examples of preventive work and hygienic practices have proven effective for reducing heat stress:

- Limiting the time personnel spend in a hot environment through implementation of a work/rest cycle program.
- Reducing metabolic demands of the job through procedures such as mechanization, use of special tools, or increasing the number of personnel per task.
- Raising heat tolerance through either a heat acclimatization program or an increase in physical fitness.
- Training supervisors and personnel to prevent heat stress conditions, to recognize the early symptoms of heat illnesses, and administer first-aid procedures.
- Providing adequate amounts of cool (50 to 59 degrees F), potable water near work areas and encouraging all personnel to drink one cup of water every 15 to 20 minutes.
C. Training
GWC will ensure that all un-acclimatized personnel who work in areas where there is a likelihood of heat injury or illness participate in a continuing safety and health education program that keeps them informed on the following topics:
- Heat stress hazards.
- Signs and symptoms of heat injury and illness.
- Heat-stress prevention and first-aid procedures.
- Work practices and control procedures that protect the health and safety of workers, including reporting the development of heat-stress symptoms.
- The effects of therapeutic drugs, over-the-counter medications, and alcohol, which may reduce heat tolerance and increase the risk of heat injury or illness.
- Proper use of protective clothing and equipment.

3. Cold Stress/ Hypothermia

A. Definition
Physiological reaction that occurs when body loses heat faster than it can produce it and the deep body temperature falls below 97 degrees F. Cold stress situations include pain in the extremities, shivering, and hypothermia.

B. Administration
As outlined by the OSHA’s contractor electronic library, contractors/contractors will ensure employees trained in how to prevent hypothermia/cold stress, which includes, but is not limited to the following:

Cold weather training addresses:
- Proper clothing and equipment.
- Safe work practices.
- Guidelines for eating and drinking.
- Risk factors that increase the health effects of cold exposure.
- How to recognize signs and symptoms of frostbite.
- How to recognize signs and symptoms of hypothermia.
✓ Appropriate first aid treatment, including re-warming procedures.

Understand the wind-chill factor, especially employees working in uncontrolled environment such as:
✓ Working on roofs.
✓ Operating open cab equipment or equipment with unheated cabs.
✓ Hanging or working on structural steel.
✓ Working in elevated areas, such as buildings open to wind.
✓ Outside work during cold weather.

Ensuring employees:
✓ Are medically fit and are acclimated to the cold.
✓ Understand the importance of high-caloric foods when working in cold environments, including the importance of proper dietary needs based on work conditions.
✓ Select and wear the appropriate protective clothing suited for the cold, the job, and the level of physical activity, as outlined in the references, such as:
   • Wearing several layers of clothing rather than one thick layer (air captured between layers acts as an insulator).
   • Wearing synthetic fabrics such as polypropylene next to the skin because these whisk away sweat; clothing should not restrict flexibility.
✓ Wearing waterproof, water repellent and wind-resistant clothing if conditions are wet.

NOTE: If employees’ clothing gets wet at air temperatures of 35.6°F or less, contract/subcontract supervision must provide the employees a change of clothing and have the checked and/or treated for hypothermia.

✓ Encouraging/requiring employees to wear hats and hoods to prevent heat loss from the head and to protect ears; balaclavas or other face covers may also be necessary under certain conditions.
Footwear should be large enough to allow wearing either one thick or two thin pairs of socks; wearing too many socks can tighten fit and harm rather than help.

Workers who get hot while working should open their jackets but keep hats and gloves on.

GWC will provide climate controlled shelters near the locations where employees are working and we will encourage employees to go to these shelters at regular intervals depending on wind-chill factor. It is recommended that employees;

- Performing work continuously in the cold are allow rest and warm-up breaks.
- Showing signs of shivering, frostbite, fatigue, drowsiness, irritability, or euphoria return to the shelter immediately
- Entering heated shelter remove their outer layer of clothing and loosen other clothing to let sweat evaporate, in some cases, a change of clothing may be necessary.
- Practice the buddy system whenever employees’ are working in isolated areas.

4. Definitions

**Acclimatization** – Physiological adjustment to environmental change.

**Cold Stress** – Physiological reaction that occurs when body loses heat faster than it can produce it and the deep body temperature falls below 97 degrees F. Cold stress situations include pain in the extremities, shivering, and hypothermia.

**Convective Heat** – Heat transfer through circulation of air. Convective heat also represents the amount of heat energy transferred between the skin and air.

**Dehydration** – The process of depletion of bodily fluids.

**Heat Stress** – A physiological reaction that occurs when the body is accumulating heat faster than it can be dissipated. Heat stress situations include heat cramps, heat exhaustion, and heat stroke.

**Hypothermia** - When the body can no longer maintain core temperature by constricting blood vessels, it shivers to increase heat production.
Maximum severe shivering develops when the body temperature has fallen to 35ºC (95ºF).

*Metabolic Heat* – Heat produced by the body from the oxidation of food.

*Wet-Bulb Globe Temperature (WBGT)* – An index that correlates with deep body temperature and other physiological responses to heat.

*Wind Chill* - The combined effect of air temperature and air movement.