

# California Institute of Technology

## Heat Illness Prevention Program



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## PURPOSE

Institute employees working in indoor and/or outdoor places of employment at times when environmental risk factors for heat illness are present, are at risk for developing heat illnesses if they do not protect themselves appropriately. The purpose of this Program is to heighten employee awareness regarding heat illness symptoms, knowledge of heat illness symptoms, ways to prevent illness, and what to do if symptoms occur to you or a colleague as defined under the [California Code of Regulations \(CCR\) Title 8, § 3395](#).

## SCOPE

The Heat Illness Prevention Program applies to all Institute personnel that may be at risk of heat illness in any indoor or outdoor place of employment where environmental risk factors for heat illness are present.

## RESPONSIBILITIES

**Directors, Managers, Supervisors, and Faculty/Researchers are responsible for the following:**

- Identifying all personnel who are required to work in indoor and outdoor areas where potential heat illness could occur.
- Assure that adequate water and shade or cooler areas are available when risk factors for heat illness are present.
- Ensure that all affected employees have received proper training in heat illness prevention.
- Ensure that the requirements of this Program are being met.

### Environmental Health and Safety

- Conduct periodic review of this Program.

## DEFINITIONS

**Acclimatization** – Temporary adaptation of the body to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within four or fourteen days of regular work for at least two hours per day in the heat.

**Clothing that Restricts Heat Removal** – Full-body clothing covering the arms, legs, and torso that is any of the following: Waterproof; designed to protect the wearer from chemical, biological, physical, radiological, fire hazard; or designed to protect the wearer from contamination.

**Cool-Down Area** – An indoor or outdoor area that is blocked from direct sunlight and shielded from other high radiant heat sources and is either open to the air or provided with ventilation or cooling. A cool-down area does not include areas where: environmental risk factors defeat the purpose of allowing the body to cool, employees are exposed to unsafe or unhealthy conditions, or employees are deterred or discouraged from accessing or using the cool-down area.

**Environmental Risk Factors for Heat Illness** – 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; or protective clothing and personal protective equipment worn by employees.

**Globe Temperature** – The temperature of the warmth from direct sunlight, measured by a globe thermometer, which consists of a thermometer sensor in the center of a six-inch diameter hollow copper sphere painted on the outside with a matte black finish, or equivalent. The globe thermometer may not be shielded from direct exposure to radiant heat while the globe temperature is being measured.

**Heat Illness** – A serious medical condition resulting from the body’s inability to cope with a particular heat load, and may include heat rash, heat cramps, heat exhaustion, and/or heat stroke.

**Heat Index** – A measure of heat stress developed by the National Weather Service for outdoor environments that takes into account the dry bulb temperature and the relative humidity. For purposes of this section, heat index refers to conditions in indoor work areas. Radiant heat is not included in the heat index.

**Heat Wave** – Any day in which the predicted high outdoor temperature for the day will be at least 80 degrees Fahrenheit AND at least ten degrees Fahrenheit greater than the average high daily outdoor temperature for the preceding five days.

**High Radiant Heat Area** – A work area where the warmth that radiates from direct sun is at least five degrees Fahrenheit greater than the general air temperature.

**Indoor** – A space that is under a ceiling or overhead covering that restricts airflow and is enclosed along its entire perimeter by walls, doors, windows, dividers, or other physical barriers that restrict airflow, whether open or closed. All work areas that are not indoor are considered outdoor.

**Personal Heat-Protective Equipment** – Equipment worn to protect the user against heat illness. Examples include: water-cooled garments, air-cooled garments, cooling vests, wetted over-garments, heat-reflective clothing, and supplied-air personal cooling systems.

**Personal Risk Factors for Heat Illness** – Factors such as an individual’s age, degree of acclimatization, health, water consumption, caffeine consumption, alcohol consumption, and use of prescription medications that affect the body’s water retention or other physiological responses to heat.

**Preventative Cool-Down Rest** – A rest taken in a cool-down area to prevent overheating.

**Radiant Heat** – Heat transmitted by electromagnetic waves and not transmitted by conduction or convection. Sources of radiant heat include the sun, hot objects, hot liquids, hot surfaces, and fire.

**Relative Humidity** – The amount of moisture in the air relative to the amount that would be present if the air were saturated such as during a rainstorm.

**Shade** – Blockage of direct sunlight. One indicator that blockage is sufficient is when objects do

not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of shade, which is to allow the body to cool. For example, a car sitting in the sun does not provide acceptable shade to a person inside it, unless the car is running with air conditioning. Shade may be provided by any natural or artificial means that does not expose employees to unsafe or unhealthy conditions and that does not deter or discourage access or use.

**Shielding** – A physical barrier between radiant heat sources and employees that reduce the transmission of radiant heat.

**Temperature** – The dry bulb temperature in degrees Fahrenheit is obtainable by using a thermometer freely exposed to the air without considering humidity or radiant heat, to measure the temperature in the immediate area where employees are located.

## TYPES OF HEAT ILLNESS

**Heat Rash** – Heat rash occurs when sweat ducts become clogged and the sweat can't get to the surface of the skin. Instead, it becomes trapped beneath the skin's surface causing a mild inflammation or rash.

- Symptoms:
  - Looks like a red cluster of pimples or small blisters.
  - Most likely to occur on the neck and upper chest, in the groin, under the breasts, and inner elbow creases.

**Heat Cramps** – Heat cramps usually affect workers who sweat a lot during strenuous activity. This sweating depletes salt and moisture levels. Low salt levels in muscles causes painful cramps. Heat cramps can also be a symptom of heat exhaustion.

- Symptoms:
  - Muscle pain or spasms usually in the abdomen, arms, or legs.

**Heat Exhaustion** – Heat exhaustion is the body's response to an excessive loss of water and salt, usually through excessive sweating. Workers most prone to heat exhaustion are those that are elderly, have high blood pressure, and those working in a hot environment.

- Symptoms:
  - Heavy sweating.
  - Extreme weakness or fatigue.
  - Dizziness.
  - Nausea.
  - Clammy moist skin.
  - Pale or flushed complexion.
  - Muscle cramps.

- Slightly elevated body temperature.
- Fast and shallow breathing.

**Heat Stroke** – Heat Stroke is the most serious of heat illnesses and is considered a medical emergency. Heat stroke often occurs as a progression from milder heat-related illnesses such as heat cramps, heat syncope (fainting episode or dizziness), and heat exhaustion. Heat stroke can kill or cause damage to the brain or other internal organs.

- Symptoms:
  - Throbbing headache.
  - Lack of sweating despite the heat.
  - Red, hot, and dry skin.
  - Nausea and vomiting.
  - Rapid heartbeat, which may be either strong or weak.
  - Behavioral changes such as confusion, disorientation, or staggering.
  - Very high body temperature.
  - Seizures.
  - Unconsciousness.

## PROVISION OF WATER

All personnel shall have access to potable drinking water that meets the following requirements: it must be fresh, pure, suitably cool, and provided free of charge. The water shall be located as close as practicable to immediate work areas and in indoor cool-down areas. Where drinking water is not plumbed or otherwise continuously supplied, it shall be provided in sufficient quantity at the beginning of the work shift to provide one quart per person per hour for drinking for the entire shift. Employers may begin the shift with smaller quantities of water if they have effective procedures for replenishment during the shift as needed to provide one quart or more per hour per person. The frequent consumption of water shall be encouraged.

## ACCESS TO COOL DOWN AREAS

The cool-down area shall be at least large enough to accommodate the number of workers on recovery or rest periods, so that they can sit in a normal posture fully in the cool-down areas without having to be in physical contact with each other. The cool-down area shall be located as close as practicable to their work areas. Subject to the same specifications, the size of the cool-down area during meal periods shall be at least large enough to accommodate the number of people on the meal period who remain onsite.

All personnel will be allowed and encouraged to take a preventative cool-down rest in a cool-down area when they feel the need to protect themselves from overheating.

An individual who takes a preventative cool-down rest will:

1. Be monitored and asked if they are experiencing heat illness symptoms.
2. Be encouraged to remain in the shade.
3. Will not be allowed to work until signs or symptoms of heat illness have abated.
4. If the employee still exhibits signs or symptoms of heat illness, the supervisor will contact Security and request a Pasadena Fire Department paramedic.

**Outdoors:** When the outdoor temperature exceeds 80 degrees Fahrenheit, shade shall be provided and maintained in one or more areas while workers are present that are either open to the air or provided with ventilation or cooling.

When the outdoor temperature does not exceed 80 degrees Fahrenheit, shade shall be available and provided within a timely manner upon request.

**Indoors:** Indoor cool-down areas shall be provided and maintained at less than 82 degrees Fahrenheit at all times while personnel are present.

## OUTDOOR HIGH HEAT PROCEDURES

Caltech will implement high-heat procedures when the temperature reaches or exceeds 95 degrees Fahrenheit. These procedures include the following:

1. Communication will be maintained by voice, observation, or electronic means so that employees can contact a Supervisor when needed.
2. Personnel will be observed for alertness and signs or symptoms of heat illness. Observation/monitoring will be done by one or more of the following:
  - a. Supervisor or designee observation of 20 or fewer persons, or
  - b. Mandatory buddy system, or
  - c. Regular communications with sole worker with either a radio or cell phone, or
  - d. Other effective means of observation.
3. Designating one or more people to contact Security (626-395-5000) and request a Pasadena Fire Department paramedic.
  - a. Others may contact Security and request a Pasadena Fire Department paramedic when no designated person is available.
4. Remind workers to drink plenty of water during their workday.
5. Pre-shift meetings to review high heat procedures, encourage drinking plenty of water, and remind workers of their right to take a cool-down rest when necessary.

## EMERGENCY RESPONSE PROCEDURES

Caltech will implement the following emergency response procedures:

1. Ensure that effective communications by voice, observation, or cell phone is maintained so a Supervisor or Security (626-395-5000) can be contacted.
2. Responding to signs and symptoms of heat illness and notification procedures to Security.
  - a. If a Supervisor observes, or any worker reports, any signs or symptoms of severe

- heat illness, the Supervisor will take immediate action.
- b. If the signs or symptoms are indicators of severe heat illness, such as decreased level of consciousness, staggering, vomiting, disorientation, irrational behavior, or convulsions, Security must be notified immediately.
  - c. An individual showing signs or symptoms of heat illness will be monitored and not left alone or sent home without being offered medical assistance.
3. In the event of a non-life threatening emergency, the person will be transported to the Holliston parking structure for transportation to an occupational health clinic.
  4. In the event of a life threatening emergency, Security will direct the Pasadena Fire Department to the individual's location.

## ACCLIMATIZATION

1. All workers will be closely observed by a Supervisor or designated employee during a heat wave for heat illness signs or symptoms.
2. Anyone who has been employed and is from an area that is not a high heat area shall be closely observed by a Supervisor or designee for the first 14 days of employment.

## TRAINING

Effective training in the following topics shall be provided to all personnel prior to commencing work that should reasonably be anticipated to result in exposure to the risk of heat illness.

### Training will consist of the following:

1. The environmental and personal risk factors for heat illness, as well as the added burden of heat load on the body caused by exertion, clothing, and personal protective equipment (PPE).
2. The Institute's responsibilities and procedures to provide water, cool-down areas, cool-down rests, control measures, and access to medical treatment, as well as the workers' right to exercise their labor rights under this section without retaliation.
3. The importance of frequent consumption of small quantities of water, up to four cups per hour, when the work environment is hot, and workers are likely to sweat more than usual in the performance of their duties.
4. The concept, importance, and methods of acclimatization and of close observation during acclimatization.
5. The different types of heat illness, and the common signs and symptoms of heat illness. Proper procedures for the different types of heat illness and that heat illness can progress quickly from mild symptoms and signs to serious and life threatening illness.
6. The importance of workers immediately reporting signs and symptoms of heat illness in themselves or their co-workers.
7. The procedures for responding to signs or symptoms of heat illness and how to notify Security.
8. The procedures for requesting transportation by Security to an Occupational Health Clinic for a non-threatening heat illness.



9. The procedures for requesting the Pasadena Fire Department for a life-threatening heat illness. These procedures will include designating a person to be available to ensure that emergency procedures are invoked.

**Supervisor training will consist of the following:**

1. The required training topics are to be provided to all personnel working in indoor or outdoor areas that are subject to high temperatures.
2. The procedures the Supervisor is to follow to implement the Heat Illness Prevention Program.
3. The procedures the Supervisor is to follow when an individual exhibits signs or symptoms of heat illness, including emergency response procedures.
4. How to monitor weather reports and respond to hot weather advisories.