



Risk Control

Protecting Against Heat Stress

Many workers spend part of their working day in hot environments, both indoors and outdoors. Workers performing physical labor in industries such as foundries, laundries, construction, manufacturing and landscape operations are often exposed to hazardous heat conditions that can have severe health and safety outcomes.

Working in Hot Environments

Four environmental factors – temperature, humidity, radiant heat and air velocity – affect the amount of stress a worker faces while working in a hot work area. Additionally, occupational risk factors (e.g. prolonged or strenuous physical activity, environmental conditions, lack of acclimatization, clothing type, donning PPE) and personal risk factors such as age, weight, physical fitness, medical conditions and alcohol/drug consumption can affect the outcome of heat exposure.

Physiological and Biological Effects of Heat

When exposed to high external temperatures, the human body reacts by increasing the blood circulation to the skin to remove excess heat through the skin. Blood required for muscle use during physical labor limits blood available to cool the body.

The sweating mechanism is another means to maintain stable internal body temperature. Sweating can be effective if humidity levels are low enough to permit evaporation, and lost fluids and salts are adequately replaced through proper hydration.

If the body cannot dispose of excess heat, it will store it. When this happens, the body's core temperature rises and the heart rate increases. As body core temperature rises, the worker can experience symptoms characterized by:

- Increased heart rate
- Loss of concentration and difficulty focusing
- Becoming irritable or sick
- Losing the desire to drink
- Heat stress

Heat Stress-Related Illness

Heatstroke is the most serious heat-related health problem experienced by workers in hot environments.

Heatstroke occurs when the body's temperature rises rapidly, sweating stops and the body can no longer rid itself of excess heat to cool down. Symptoms include:

- Confusion, delirium, slurred speech
- Loss of consciousness, seizures or coma
- A body temperature of 106 degrees F or higher
- Hot, dry skin which may be red, mottled or bluish

Heatstroke can be fatal if not treated promptly. Emergency medical services should be contacted immediately if heatstroke is suspected. The following first aid treatments should be administered:

- Immediately move the worker to a cool area and remove their outer clothing.
- Cool the worker quickly by soaking with cool water or an ice bath.
- Circulate the air around the worker to increase cooling.

Heat exhaustion develops as a result of the loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt. Symptoms may include:

- Sweating
- Extreme weakness, fatigue, nausea or headaches
- Clammy, moist skin, pale or flushed complexion
- Body temperature normal or slightly higher
- In severe cases, vomiting or loss of consciousness

Heat cramps cause painful spasms of the large muscles and are commonly attributed to a continuous loss of salt in the sweat due to workers drinking large quantities of water without replacing the salts lost through sweat. Cramps can be relieved by the ingestion of water and fluids that correct electrolyte imbalance (i.e., drinks containing electrolytes and carbohydrates).

Preventing Heat Stress

Most heat-related illnesses can be prevented or the risk of developing them reduced. Prevention requires employers and workers to recognize heat-related hazards and take steps to mitigate them. See below for common heat stress prevention solutions:

Engineering Controls

- Increased general ventilation and spot cooling by local exhaust ventilation at points of high heat production
- Reflective shielding of radiant heat sources
- Evaporative cooling and mechanical refrigeration to reduce heat
- Cooling and misting fans to reduce heat in hot conditions
- Eliminating steam leaks and equipment modifications to reduce heat sources
- Availability of power tools to reduce heavy physical labor
- Alternative “facial” PPE options (face shields and/or surgical masks) provided where cloth face coverings can exacerbate heat illness

Work Practices

When work areas cannot be cooled by engineering controls, employers should consider using work practice controls.

- Employers should develop and implement a heat acclimatization plan. [Acclimatization](#) to heat should be started with short exposures. For new workers, the schedule should be no more than a 20% exposure on day 1 with an increase of no more than 20% on each additional day. For workers who have had previous experience with the job, the acclimatization regimen should be no more than a 50% exposure on day 1, 60% on day 2, 80% on day 3, and 100% on day 4.

- Make plenty of drinking water available – as much as one quart per worker per hour.
- Alternate between work and rest periods with longer rest periods in cool areas.
- Schedule heavy work during cooler parts of the day.
- Provide appropriate protective clothing. In hot outdoor environments, workers should wear light-colored, loose-fitting clothing.
- Move work to a cooler place if possible. When possible, avoid work areas that are exposed to direct sunlight, as it can increase the heat index value by up to 15 degrees F.

Employee Education

- Emphasize the importance of drinking small amounts of water throughout the day, before becoming thirsty.
- Employees and supervisors should be taught to recognize symptoms and early signs of dehydration, exhaustion, fainting, heat cramps, heat exhaustion and heatstroke.
- Train first-aid workers to recognize and treat heat stress disorders and post the names of trained staff in common areas.
- Permit workers to interrupt their work if they are extremely uncomfortable.

Using the Heat Index

The heat index, also known as the apparent temperature, is what the temperature feels like to the human body when relative humidity is combined with the air temperature. It can be used to help determine the risk of heat-related illness for outdoor workers and what actions are needed to protect workers. Protective measures include hydration, acclimatization, work breaks, limiting physical exertion, heat illness recognition training and communication. For specific guidance, refer to [OSHA Heat Illness Protective Measures](#).

Additional Heat Illness Prevention Resources

[NIOSH-Heat Stress](#)

[OSHA Heat Stress Prevention](#)

[OSHA Heat Acclimatization](#)

To learn more about how to manage your risks and increase efficiencies, visit cna.com/riskcontrol.