

To The Point Occupational Heat Stress

Heat is the leading cause of death among weather-related hazards in the United States, and climate change is expected to make heat waves more frequent and more intense. Excessive heat can worsen existing health conditions such as asthma, kidney disease, and heart disease, and can lead to heat stroke or death if not addressed quickly. Workers in both indoor and outdoor settings face increasing risk of hazardous heat exposure and heat-related illness, especially in workplaces that lack adequate climate control, cooling, or other heat mitigation measures. According to the National Institute for Occupational Safety and Health (NIOSH), an average of 3,389 work-related heat injuries and illnesses resulting in days away from work were reported annually between 2011 and 2020, and nearly 1,000 U.S. workers died from environmental heat exposure between 1992 and 2021.¹

Handling Extreme Heat

The human body has a natural mechanism to regulate its internal temperature, but when working in extreme heat conditions, this mechanism may become overloaded, leading to heat-related incidents and illnesses. Both indoor and outdoor workers can experience heat stress. New workers, temporary workers, and workers transitioning from indoor to outdoor settings during periods of extreme heat who are not acclimated to such temperatures are particularly at risk. In addition to heat-related illnesses, a review of OSHA data found that the risk of workplace injury increases when the daily heat index is above 85°F, with a sharp increase above 90°F.² This means that employees in a variety of occupations are vulnerable to heat-related injuries and illnesses.

Therefore, it is important for employers to understand the causes of heat stress, how to recognize symptoms, and what measures can be taken to prevent and respond to various heat illnesses.

Heat Stress Illnesses

Occupational heat stress occurs when a worker's body accumulates excessive heat due to a combination of high outdoor temperature, increased metabolic heat from physical activity, and the insulating effects of clothing and personal protective equipment (PPE). Heat stress can result in several different heat-related illnesses, including heat rash, heat exhaustion, and heat stroke. Even milder forms of these health outcomes can put workers at risk, such as being unsteady when working at heights.

These illnesses can occur due to high temperatures, high humidity, lack of air movement, direct exposure to the sun, and physical activity. Heat illnesses can occur while working either indoors or

outdoors. Symptoms of heat illnesses include excessive sweating, dehydration, nausea, muscle cramps, dizziness, headaches, and increased body temperature. Especially since severe forms of heat illness can impact rational thinking, workers should be informed of early-stage indicators of a heat-related health event, higher-risk circumstances, and appropriate response measures.

Specific heat-related illnesses include:

- **Heat rash** is a common skin condition that occurs when sweat ducts become clogged and cause irritation and a red rash. It often occurs in hot and humid weather conditions and can be aggravated by tight clothing or excessive sweating.
- **Heat exhaustion** is a milder condition that occurs when a person gets dehydrated or loses too much salt through sweating. A person with heat exhaustion may experience heavy sweating, a rapid heartbeat, dizziness, headache, fatigue, and muscle cramps. Heat exhaustion can usually be treated by getting the person to a cooler place, offering them fluids, and resting.
- **Heat stroke** is a more serious condition that occurs when the body's temperature regulation system fails and the body overheats. A person with heat stroke may experience symptoms such as a body temperature of 104°F (40°C) or higher, confusion or disorientation, seizures, a rapid heartbeat, dry and hot skin, and loss of consciousness. Heat stroke is a medical emergency and requires immediate medical attention, which includes getting the person to a cooler place, removing excess clothing, and calling for emergency medical help. Heat stroke can be fatal if not treated immediately.

Risk Factors

Heat stress is a serious workplace concern and can harm employee health and safety. Heat stress factors can profoundly affect various populations, especially those who are more vulnerable due to physiological, environmental, or socioeconomic circumstances. Key factors that increase the risk of heat-related illnesses include an individual's age, overall physical condition, use of prescribed medications, history of heat-related illnesses, pregnancy, and the presence of chronic health conditions.

Employers should take proactive measures to protect their employees from the risks of heat stress by implementing a heat stress prevention program. Following preventive measures and educating employees on recognizing symptoms can help prevent injuries and fatalities caused by heat exposure.

Wet Bulb Globe Temperature Monitoring

Wet bulb globe temperature (WBGT) is an essential measurement for assessing workplace conditions regarding heat exposure. In contrast to a typical temperature forecast or reading, WBGT considers risk factors such as temperature, humidity, wind speed, sun angle, and cloud cover. WBGT is the most comprehensive way to monitor the potential for heat-related illnesses. There are currently a variety of wearables and other devices that can provide information regarding WBGT. Employers should pay close attention to WBGT levels and take regular intervention measures to protect workers and adapt to temperature conditions.

Training

A heat illness training program provides workers with the knowledge and skills necessary to recognize, prevent, adapt, and respond to heat-related illnesses in the workplace. Components include identification of hazards, prevention measures, symptom monitoring, and emergency response procedures. Annual training should occur prior to warmer weather.

Acclimatization Program

An acclimatization program for heat stress involves gradual exposure to hot environments to help workers' bodies adjust and reduce the risk of heat-related illnesses. According to the National Institute for Occupational Safety and Health, the standard recommendation for worker acclimatization is the "Rule of 20 Percent." This rule stipulates an employee should work a 20% daily increase in hours.³ For example, an employee who works an 8-hour shift would work two hours on Monday, four hours on Tuesday, six hours on Wednesday, and begin the full 8-hour shift on Thursday.

Workload Management

A work/rest schedule is a strategy designed to prevent heat stress in the workplace by managing the duration and frequency of work and rest periods. This type of schedule involves implementing regular breaks and rest periods in a cool, shaded area, which can help reduce the risk of heat stress. Adjusting workloads during hot and humid conditions can help reduce physical exertion and minimize the risk of overheating.

Fluid Replacement Program

A fluid replacement program is designed to prevent dehydration and maintain optimal hydration levels during physical activity or work in hot and humid environments. Encouraging and providing access to water can help workers stay hydrated and reduce the risk of dehydration and heat stress. For moderate activities in the heat that last less than 2 hours, NIOSH recommends drinking cool water and encouraging workers to drink small amounts frequently (about 1 cup every 15–20 minutes) during heat exposure.⁴

Consideration of Engineering Controls

Engineering controls are often considered the best option for controlling heat stress because they can eliminate or reduce the risk of exposure to heat sources and provide a consistent and reliable way to reduce exposure to heat sources. Some examples include installing barriers for shading, providing cooled seats or benches for breaks, adding fans and misters to work sites, adding air conditioning to equipment cabs, and automating manual labor.

Protective clothing

Appropriate clothing can assist in moderating heat exposure. Examples of protective clothing include insulated suits, reflective clothing, infrared-reflecting face shields, cooled neck wraps, wetted clothing, and cooling vests. Electric-cooled garment options are also available to promote the body's thermoregulation.

Emerging Technologies

Employers can consider looking to technology solutions that enable adaptation to extreme heat conditions, including:

- Wearable devices such as cooling vests may integrate phase-change materials that change from liquid to solid and lower body temperatures.
- Smart wearables and sensors such as wristbands or patches can monitor body temperature, heart rate, and hydration levels, and alert workers or supervisors to heat risks.
- Cooling building materials such as cooling paints and roofing materials can be used in the built environment to provide cooler indoor temperatures. It is important to remember that workers indoors can be susceptible to heat stress, especially if they engage in strenuous activities, wear heavy clothing or PPE, or work in non-air-conditioned environments.
- Shade structures including portable or modular structures, can be installed or transported to workplaces to provide cooling and/or misting. Some structures may be solar-powered or use phase-change materials to deliver efficient cooling.

Importance of Heat Stress Programs

Heat stress is a serious health concern and can lead to heat-related illnesses such as heat stroke, heat exhaustion, and heat cramps. By implementing a heat stress risk management program, employers can take proactive measures to protect their employees and prevent heat-related injuries while helping employees stay comfortable and maintain productivity.

An effective program also educates employees about the risks of working in a hot environment, allowing for early symptom reporting and prevention of accidents. A heat stress program is vital for protecting employee health and safety, complying with regulations, promoting productivity, preventing accidents, and enhancing employee morale. As the frequency, severity, and intensity of heat waves continue to rise, the importance of such programs will only continue to grow.

Standards and Regulations

Some U.S. states have adopted standards and regulations for workers in extreme heat environments, which may include guidelines on scheduled rest breaks, access to water and shade, or acclimatization procedures. Regulations and standards include:

- **California** – [California Heat Illness Prevention](#)
- **Colorado** – [Agricultural Labor Conditions Rules for Heat](#)
- **Maryland** – [Maryland Occupational Safety and Health Heat Stress Standard](#)
- **Minnesota** – [Indoor Ventilation Temperature in Places of Employment Regulation](#)
- **Oregon** – [Heat Illness Prevention Standard](#)
- **Washington** – [Outdoor Heat Exposure Rules](#)
- **Federal** – while no federal heat illness regulation currently applies, OSHA has released a proposed rule on [Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings](#)

Occupational Heat Stress Checklist

The [Occupational Heat Stress Checklist](#) is a companion resource that supports organizations in assessing and strengthening their occupational heat stress prevention efforts. It provides a practical way to review management commitment, program elements, controls, training, and employee protection measures to help identify gaps and reinforce best practices.

Resources

[OSHA's Heat-Related Illnesses and First Aid](#)

[OSHA's Heat Illness Prevention](#)

[OSHA's Working in Outdoor and Indoor Heat Environments](#)

[OSHA's Heat Safety Tool app](#)

[NIOSH's Heat Stress and Workers](#)

[NIOSH's Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments](#)

[OSHA Proposed Heat Injury Rule, Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings](#)

Learn More & Connect

For more information on protecting your business, contact your local risk engineer, visit the [Chubb Risk Consulting Library](#), or check out www.chubb.com/riskconsulting.

1. "Heat Injury and Illness SBREFA," <https://www.osha.gov/heat/sbrefa>
2. "Nearly 28,000 Work Injuries Every Year are Linked to Hot Weather," <https://publichealth.gwu.edu/nearly-28000-work-injuries-every-year-are-linked-hot-weather>
3. "Acclimatization," <https://www.cdc.gov/niosh/heat-stress/recommendations/acclimatization.html>
4. "Workplace Recommendations," <https://www.cdc.gov/niosh/heat-stress/recommendations/index.html>

Chubb is the marketing name used to refer to subsidiaries of Chubb Limited providing insurance and related services. For a list of these subsidiaries, visit our website at www.chubb.com. Insurance provided by ACE American Insurance Company and its U.S. based Chubb underwriting company affiliates. This document is advisory in nature and is offered for informational purposes only as a resource to be used together with your professional insurance advisors in maintaining a loss prevention program. The information contained in this document is not intended as a substitute for legal, technical, or other professional advice. Chubb, 202 Hall's Mill Road, Whitehouse Station, NJ 08889-1600. Form 09-10-1106 (Ed. 05/26)