

## Working in Outdoor + Indoor Heat Environments

Millions of U.S. workers are exposed to heat in their workplaces. Although illness from exposure to heat is preventable, every year, thousands become sick from occupational heat exposure, and some cases are fatal.

**Most outdoor fatalities, 50% to 70%, occur in the first few days of working** in warm or hot environments because the body needs to build a tolerance to the heat gradually over time. The process of building tolerance is called heat acclimatization. Lack of acclimatization represents a major risk factor for fatal outcomes.

Occupational risk factors for heat illness include heavy physical activity, warm or hot environmental conditions, lack of acclimatization, and wearing clothing that holds in body heat. (See also, personal risk factors, below.)

Hazardous heat exposure can occur indoors or outdoors, and can occur during any season if the conditions are right, not only during heat waves. The following is a list of some industries where workers have suffered heat-related illnesses.



### Outdoors

Agriculture

Landscaping

Oil and gas well operations

Construction  
(roofing work)

Construction  
(esp. road, roofing, and other outdoor work)

Mail and package delivery

### Indoors

Fire Service

Warehousing

Iron and steel mills and foundries

Manufacturing with hot local heat sources, like furnaces  
(e.g., paper products or concrete)

Bakeries, kitchens, and laundries  
(sources with indoor heat-generating appliances)

Electrical utilities (particularly boiler rooms)

## Planning and Supervision

Employers should create plans to protect workers from developing heat-related illnesses. This Safety and Health Topics Page will help employers and workers recognize and evaluate these factors to develop effective ways to control heat risk.

### What is a Heat-Related Illness?

In a warm environment, especially when physically active, the human body relies on its ability to get rid of excess heat (i.e., heat dissipation) to maintain a healthy internal body temperature. Heat dissipation happens naturally through sweating and increased blood flow to the skin. Workers cool down more rapidly if the external (environmental) heat and physical activity (metabolic heat) are reduced.

If heat dissipation does not happen quickly enough, the internal body temperature keeps rising and the worker may experience symptoms that include thirst, irritability, a rash, cramping, heat exhaustion, or heat stroke.

Heat stroke is the most severe heat-related illness. Workers suffering from heat stroke experience mental dysfunction such as unconsciousness, confusion, disorientation, or slurred speech. Cool these workers immediately and call 911! You can learn more about these and other heat-related illnesses in Heat-Related Illnesses and First Aid: [osha.gov/heat-exposure/illness-first-aid](https://www.osha.gov/heat-exposure/illness-first-aid)

During heat waves, workers may experience a combination of two kinds of heat-related illness. “Exertional heat illness” results primarily from exertion (metabolic heat generated by muscle activity in the body). On the other hand, “environmental heat illness,” is attributed primarily to ambient conditions, including heat and relative humidity, and is related to heat waves and death in the elderly, urban heat islands, and hot motor vehicles (Bouchama 2002).



## How Can Heat-Related Illness Be Prevented?

Heat-related illness is preventable, especially with management commitment to providing the most effective controls. An effective heat-related illness prevention program is incorporated in a broader safety and health program and aligns with OSHA's Recommended Practices for Safety and Health Programs core elements: [osha.gov/safety-management](https://www.osha.gov/safety-management)

Workers who have not spent time recently in warm or hot environments and/or being physically active will need time to build tolerance (acclimatize or, less frequently used, acclimate) to the heat. During their first few days in warm or hot environments, employers should encourage workers to:

- + Consume adequate fluids (water and sport drinks)
- + Work shorter shifts
- + Take frequent breaks
- + Quickly identify any heat illness symptoms

Engineering controls such as air conditioning, with cooled air, and increased air flow, leading to increased evaporative cooling, can make the workplace safer. Other options for keeping body temperatures down in warm environments include making changes to workload and schedules. For example, empower supervisors and workers to slow down physical activity like reducing manual handling speeds or scheduling work for the morning or shorter shifts with frequent rest breaks in the shade or at least away from heat sources. Supervisors can encourage workers in warm environments to drink hydrating fluids. At a minimum, all supervisors and workers should receive training about heat-related symptoms and first aid.

Heat-related illnesses can have a substantial cost to workers and employers. Heat stress can cause fine motor performance (like rebar tying or keyboarding) to deteriorate even in acclimatized individuals. Heat illness can contribute to decreased performance, lost productivity due to illness and hospitalization, and possibly death. OSHA encourages water, rest, and shade as prevention as well as treatment for heat-related illness.

## How Hot is Too Hot?

Occupational heat exposure is a combination of many factors. Body heat results from the equilibrium of heat gain, from internal work and outside addition, and heat loss, primarily from evaporative cooling, i.e., sweat evaporation. Contributors include:

- + Physical activity
- + Air temperature
- + Humidity
- + Sunlight
- + Air movement
- + Heat sources (e.g., ovens or furnaces, heat-absorbing roofs, and road surfaces)
- + Clothing that hampers the body's ability to lose excess heat, such as protective gear
- + Individual/personal risk factors, (e.g., pre-existing health conditions and lifestyle)

Management should commit to considering all factors that contribute to body temperature increase when determining if a heat hazard is present in a workplace. Physical activity (workload) can be estimated using tables. Employers should also be aware of whether workers' clothing increases risk.

In addition to a thermometer, use these resources to assess heat stress:

- + Use an on-site wet bulb globe temperature (WBGT) meter - the most accurate way (Morris 2018) to measure environmental heat impact on body temperature. WBGT incorporates temperature, humidity, sunlight, and air movement into a single measurement. See OSHA's guidance for using and interpreting WBGT: [osha.gov/heat-exposure/hazards#environmentalheat](https://www.osha.gov/heat-exposure/hazards#environmentalheat)
- + Download the NIOSH/OSHA Heat App on the App Store or Google Play to access a simple heat calculator on your device. Remember that the Heat App provides only heat index (HI), not WBGT, although it does also provide workload guidance.



## Personal Risk Factors

Some workers are more susceptible to heat-related illness. Personal risk factors include medical conditions, lack of physical fitness, previous episodes of heat-related illness, alcohol consumption, drugs, and use of certain medication. Management should commit to preventing heat-related illness for all employees regardless of their heat tolerance levels. Measurement of heart rate, body weight, or body temperature (physiologic monitoring) can provide individualized data to aid decisions about heat controls.

## What Other Resources are Available?

OSHA has a Campaign to Keep Workers Safe in the Heat.

OSHA's Technical Manual (OTM) Section III: Chapter 4-Heat Stress provides technical information about assessing heat hazards.

A Federal agency collaboration that includes OSHA, the National Integrated Heat Health Information System, has also compiled a list of guidelines, web pages, and documents with information about keeping the public, including workers, safe in the heat.

## Standards

Washington, Minnesota, and California have specific laws governing occupational heat exposure. Federal OSHA has a General Duty Clause (Section 5[a][1] of the Occupational Safety and Health Act of 1970) that requires employers to provide a place of employment that is "free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees." The OSHA Technical Manual Chapter on Heat Stress establishes that OSHA uses WBGT to determine if a heat hazard was present.

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