Heat stress

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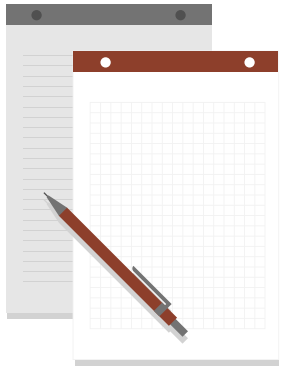
DEPARTMENT OF LABOR AND INDUSTRY

Source: osha.gov/heat-exposure/planning

Today’s agenda

- What is heat stress?
- Why does it matter?
- Heat-related illnesses
- First aid and response
- Methods of reducing heat stress and controls
- Helpful tools and information
- Heat illness prevention plan
- Standards, regulations and proposed rulemakings
- Other resources and links
- Questions?



Why talk about heat in November?

- This is an opportune time to build awareness and implement a plan.
- The majority of workplace heat fatalities occur within the **first week**, including workers starting or returning to a high-heat job after a long break.
- Start planning in advance of your summer jobs and construction projects now!

What is heat stress?

- Heat stress occurs when the body is unable to effectively regulate its temperature and get rid of excess heat.
- Occupational heat stress is the combination of the following, which results in the increased heat storage within the body:
  - metabolic heat (thermal energy generated by your body);
  - environmental heat; and
  - clothing and personal protective equipment (PPE).
- Heat stress can lead to “heat-related illnesses,” such as heat stroke, heat exhaustion, heat cramps and physical injuries, if not properly managed.

Source: cdc.gov/niosh/heat-stress/about/index.html

What is heat stress?

- Construction workers are at risk of experiencing heat stress because they may work outdoors in hot environments.
- Risk factors for heat-related illness, include the following:
  - high temperatures and humidity;
  - radiant heat sources;
  - limited air movement;
  - lack of acclimatization;
  - dehydration;
  - physical exertion;
  - physical conditions and pre-existing health problems; and
  - advanced age.

Source: cdc.gov/niosh/heat-stress/about/index.html

Why does it matter?

- Extreme heat is the deadliest weather-related hazard and causes more deaths than flooding, tornadoes and hurricanes combined, in the U.S.
- Millions of U.S. workers are exposed to heat in their workplaces.
- Thousands of workers become ill each year while working in hot or humid conditions and some cases are fatal.
- **Fifty percent to 70% of fatalities from outdoor heat occur in the first week of work because new and returning employees have not built a tolerance to heat.**
- The process of building heat tolerance is known as “acclimatization.”

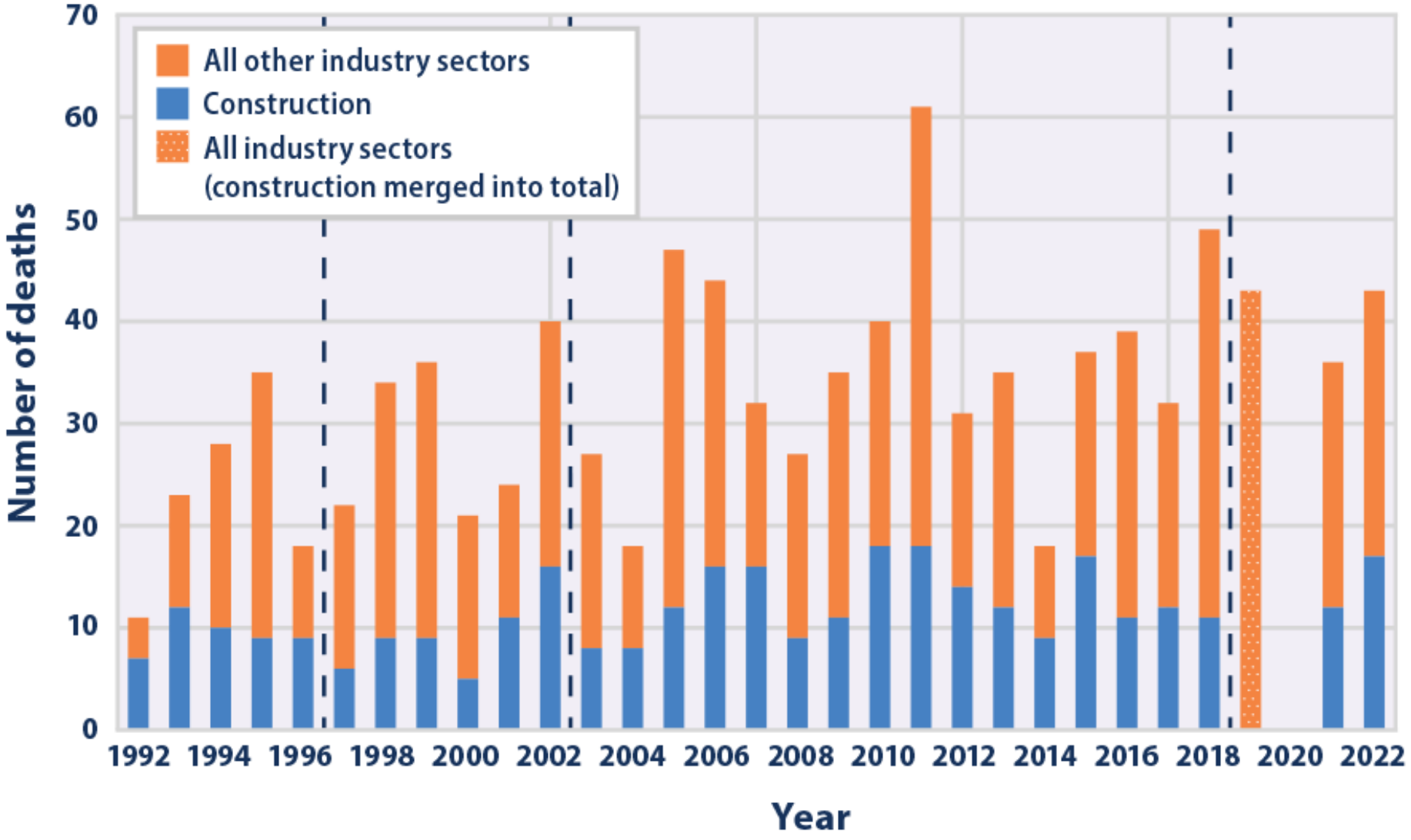
Sources: health.state.mn.us/communities/environment/climate/extremeheat.html; osha.gov/heat-exposure

Why does it matter?

Outdoors	Indoors
Agriculture	Bakeries, kitchens and laundries (sources with indoor, heat-generating appliances)
Construction – especially road, roofing and other outdoor work	Electrical utilities (particularly boiler rooms)
Fire service	Fire service
Landscaping	Iron and steel mills and foundries
Mail and package delivery	Manufacturing with hot local heat sources, like furnaces (such as paper products, concrete, foundry)
Oil and gas well operations	Warehousing

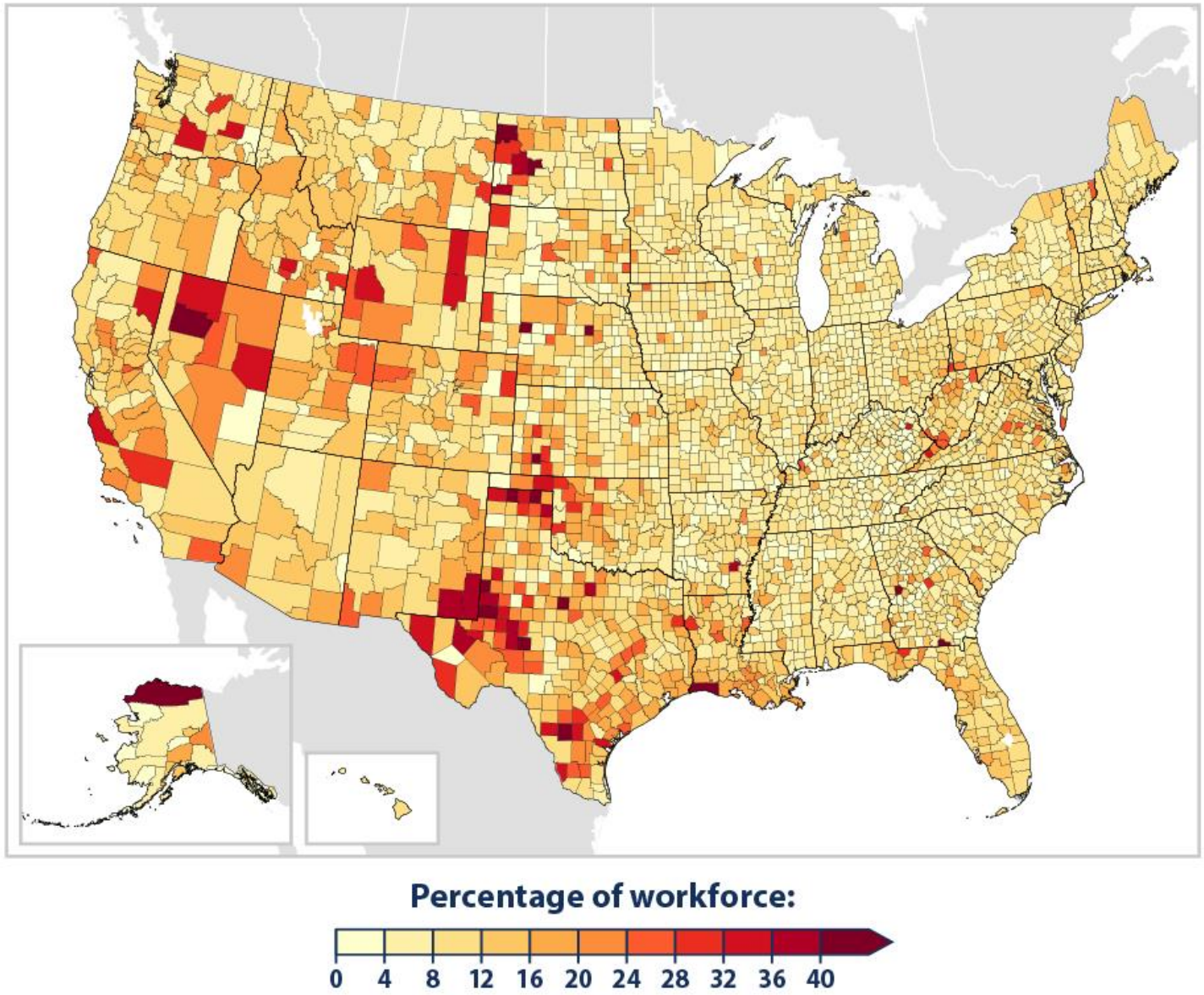
Source: osha.gov/heat-exposure

Heat-related workplace deaths in the U.S. (1992-2022)



Source: epa.gov/climate-indicators/closer-look-heat-related-workplace-deaths

Prevalence of outdoor workers in the U.S. (2018-2022)



Source: epa.gov/climate-indicators/closer-look-heat-related-workplace-deaths

Key points and statistics

- Between five to 10 million U.S. workers are exposed to outdoor heat beyond safe levels every year.
- From 1992 to 2022, a total of 986 workers in the U.S. – across all industry sections – died from exposure to heat (an average of 34 deaths a year).
- In the same period, 334 construction workers died due to heat stress – meaning **the construction sector accounted for 34% of all deaths**.
- These statistics are based on what has been reported properly – some deaths might not be properly categorized as heat-related and **some work-related deaths might go unreported by employers**, particularly in industries with many undocumented workers.

Source: epa.gov/climate-indicators/closer-look-heat-related-workplace-deaths

Heat-related illnesses

- Several heat-related illnesses can affect workers and some of the symptoms are non-specific. This means that when a worker is performing physical labor in a warm environment, any unusual symptom can be a sign of overheating. Below are common heat-related illnesses.
  - Heat stroke
  - Heat exhaustion
  - Heat cramps
  - Heat syncope
  - Heat rash
  - Rhabdomyolysis

Source: osha.gov/heat-exposure/illness-first-aid

Heat-related illnesses

- Heat stroke (most serious)
  - Confusion
  - Slurred speech
  - Unconsciousness
  - Seizures
  - Heavy sweating or hot, dry skin
  - Very high body temperature
  - Rapid heart rate

Source: osha.gov/heat-exposure/illness-first-aid

Heat-related illnesses

- Heat exhaustion (can lead to heat stroke)
  - Fatigue
  - Irritability
  - Thirst
  - Nausea or vomiting
  - Dizziness or lightheadedness
  - Heavy sweating
  - Elevated body temperature or fast heart rate

Sources: osha.gov/heat-exposure/illness-first-aid; cdc.gov/niosh/heat-stress/about/illnesses.html

Heat-related illnesses

- Heat cramps
  - Muscle spasms or pain
  - Usually in legs, arms or trunk
- Heat syncope (sudden or brief loss of consciousness)
  - Fainting
  - Dizziness
- Heat rash
  - Clusters of red bumps on skin
  - Neck, upper chest and skin folds
- Rhabdomyolysis (muscle breakdown)
  - Muscle pain
  - Dark urine or reduced urine output
  - Weakness

Source: osha.gov/heat-exposure/illness-first-aid

First aid and response – heat stroke

- **If heat stroke is suspected, immediately call 911 (even when in doubt).**
- Stay with the worker until emergency medical services arrive.
- Move the worker to a shaded, cool area and remove their outer clothing.
  - Immerse the worker in cold water or an ice bath (best method).
  - Wet the skin; place cold wet cloths on the skin.
  - Soak the worker's clothing with cool water.
  - Circulate air around the worker to speed cooling.
  - Place cold wet cloths or ice on the workers' head, neck, armpits and groin.

Sources: cdc.gov/niosh/heat-stress/about/illnesses.html; osha.gov/heat-exposure/illness-first-aid

First aid and response – heat exhaustion

- Take the worker to a clinic or emergency room for medical evaluation and treatment.
- Call 911 if medical care is unavailable.
- Remove the worker from the hot area and give them liquids to drink; encourage frequent sips of cool water.
- Remove unnecessary clothing from the worker, including shoes and socks.
- Cool the worker with cold compresses or have the worker wash their head, face and neck with cold water.

Sources: cdc.gov/niosh/heat-stress/about/illnesses.html; osha.gov/heat-exposure/illness-first-aid

Heat Exhaustion

ACT FAST

- Move to a cooler area
- Loosen clothing
- Sip cool water
- **Seek medical help if symptoms don't improve**

Dizziness

Thirst

Heavy Sweating

Nausea

Weakness

Confusion

Dizziness

Becomes Unconscious

Heat Stroke

ACT FAST

CALL 911

- Move person to a cooler area
- Loosen clothing and remove extra layers
- Cool with water or ice

***Heat exhaustion** can lead to heat stroke.*

***Heat stroke** can cause death or permanent disability if emergency treatment is not given.*

Stay Cool, Stay Hydrated, Stay Informed!

Source: weather.gov/safety/heat-illness

First aid and response – rhabdomyolysis and syncope

- Rhabdomyolysis (breakdown, rupture and death of muscle tissue)
  - Stop activity.
  - Drink more liquids (water preferred).
  - Seek immediate care at the nearest medical facility.
  - Ask to be checked for rhabdomyolysis (for example, blood sample analyzed for creatin kinase).
- Heat syncope (fainting or dizziness)
  - Sit or lie down in a cool place.
  - Slowly drink water, clear juice or a sports drink.

Sources: cdc.gov/niosh/heat-stress/about/illnesses.html; osha.gov/heat-exposure/illness-first-aid

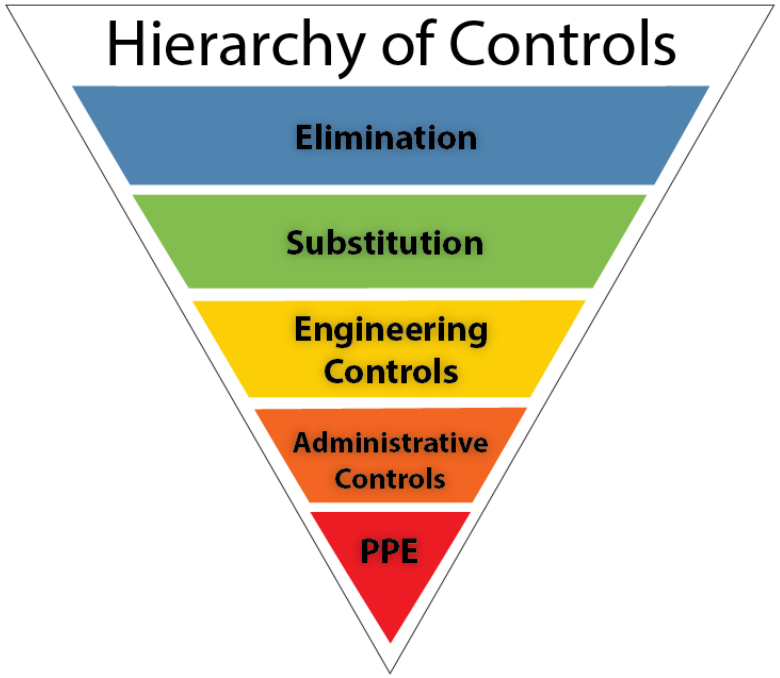
First aid and response – heat cramps and rash

- Heat cramps
  - Drink water and have a snack to replace carbohydrates and electrolytes; consume every 15 to 20 minutes.
  - Get medical help if the worker has heart problems, is on a low sodium diet and cramps do not subside within one hour.
- Heat rash
  - Work in a cooler, less humid environment.
  - Keep rash area dry; apply powder to increase comfort.
  - Do not use ointments and creams.

Sources: cdc.gov/niosh/heat-stress/about/illnesses.html; osha.gov/heat-exposure/illness-first-aid

Methods of reducing heat stress and controls

- Employers should follow the “hierarchy of controls” when determining how to eliminate and reduce hazards. Engineering controls should be used first followed by work practices and then personal protective equipment.



Source: cdc.gov/niosh/hierarchy-of-controls/about/index.html

Methods of reducing heat stress and controls

- Engineering controls
  - Air conditioning (air-conditioned equipment cab or break rooms)
  - Increased general ventilation (for indoor areas)
  - Cooling fans
  - Local exhaust ventilation at points of high heat production or moisture
  - Reflective shields to redirect radiant heat; elimination of steam leaks
  - Cooled seat or benches for rest breaks; misting fans
  - Use of mechanical equipment to decrease manual work (for example, forklifts)

Source: osha.gov/heat-exposure/planning

Methods of reducing heat stress and controls

- Work practices (also known as “administrative controls”)
  - Modify works schedule and activities; **allow employees to acclimatize**.
  - Require mandatory breaks in a cooler environment.
  - Schedule work at cooler times of the day (early morning or late afternoon).
  - Reduce physical demands as much as possible and rotate job functions.
  - Ensure workers drink an adequate amount of water or electrolytes.
  - Have an emergency plan and ensure it is communicated to employees and supervisors.
  - Implement a buddy system.

Source: osha.gov/heat-exposure/planning

More on acclimatization and tips

- Heat acclimatization is an increase in heat tolerance through gradually increasing intensity and/or duration of work in hot environments.
- **Nearly three out of four fatalities from heat illness occur in the *first week*.**
- Best results come from gradually increasing work over a period of seven to 14 days.
- Eating regular meals aids acclimatization; food replaces electrolytes.
- Acclimatization will begin to be lost after one week from working in the heat; **after one month, most people's heat tolerance will return to baseline**.

Sources: osha.gov/sites/default/files/publications/OSHA3743.pdf; cdc.gov/niosh/docs/mining/UserFiles/works/pdfs/2017-124.pdf

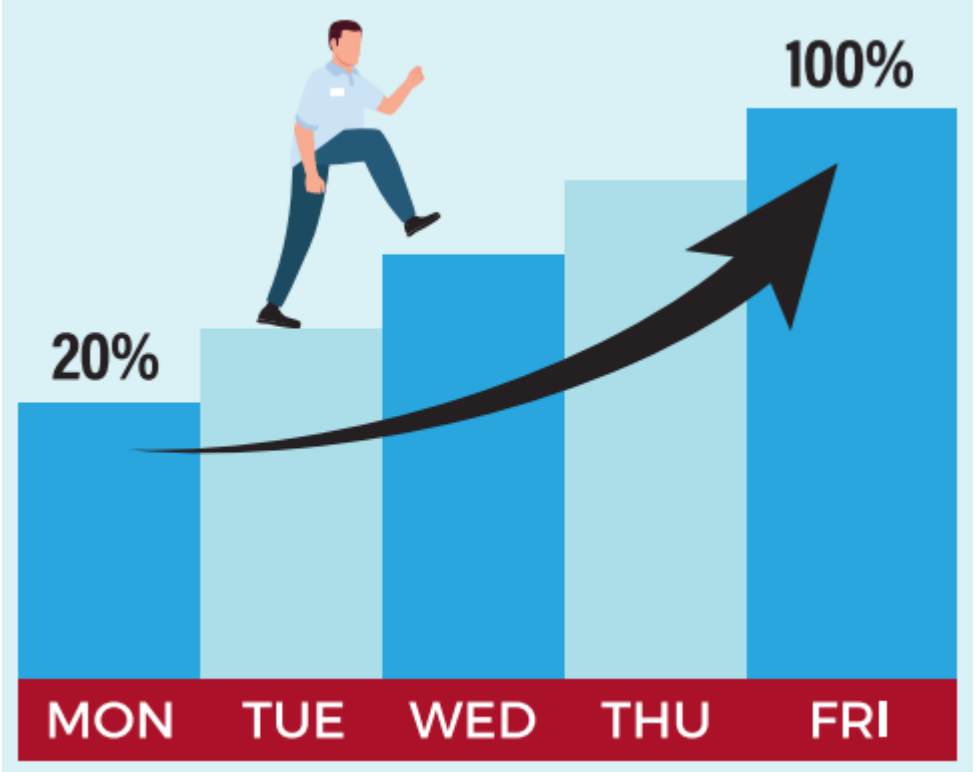
Physiological adaptions of acclimatization

- Increased sweating efficiency (earlier onset of sweating, increased sweat production and reduced electrolyte loss)
- Increased stabilization of the circulatory system
- Increased ability to perform work with lower core body temperature and heart rate
- Increased skin blood flow at a given core temperature
- Body will acclimatize to the level of work demanded of it

Source: cdc.gov/niosh/heat-stress/recommendations/acclimatization.html

The “20% rule”

- Allow new or returning workers to gradually increase their workload and exposure by following the “20% rule.”
- Begin with 20% exposure on the first day and then increase work duration by 20% on subsequent days.
- Full acclimatization may take up to 14 days or longer.



Sources: cdc.gov/niosh/heat-stress/recommendations/acclimatization.html; osha.gov/sites/default/files/publications/OSHA3743.pdf

Methods of reducing heat stress and controls

- Personal protective equipment
  - Insulated suits, reflective clothing, infrared reflecting face shields, cooling neck wraps
  - Vests that receive cooled air from a vortex tube connected to an external compressed air source
  - Jackets or vests with reusable ice packs or phase change cooling packs in the pockets
- Note: Certain PPE (such as impermeable clothing, heavy gear and head coverings) can increase the risk of heat-related illness.

Source: osha.gov/heat-exposure/planning

Helpful tools and information

- OSHA-NIOSH Heat Safety Tool app
  - Allows workers and supervisors to calculate the **heat index** for their worksite.
  - Displays a risk level to outdoor workers and has reminders about protective measures (caution, warning, danger).
  - You can get reminders about the protective measures that should be taken at that risk level.
  - Available in English and Spanish for Android and iPhone devices.

Source: osha.gov/heat/heat-app

Helpful tools and information

- American Industrial Hygiene Association (AIHA) Heat Stress app
  - Developed by AIHA and East Carolina University for use in preventing heat-related illnesses for outdoor workers and managers of outdoor workers.
  - Focuses on an adjusted **wet bulb globe temperature (WBGT)** to inform heat risk, alerts and action steps.
  - The WBGT calculation algorithm is key mechanism in this app versus other apps.
  - The user inputs include location (pulls weather data from the National Weather Service), workload intensity, type of clothing and cloud cover.
  - Available for free download for Android and iPhone devices at aiha.org/public-resources/healthierworkplaces/healthier-community-resources/thermal-heat-stress-resources-oehs-professionals.

Source: aiha.org/public-resources/healthierworkplaces/healthier-community-resources/thermal-heat-stress-resources-oehs-professionals

Helpful tools and information: Monitoring

- A WBGT device incorporates the four major environmental heat factors:
  1. ambient air temperature;
  2. relative humidity;
  3. air movement (wind); and
  4. radiant heat.

- In contrast, the heat index only combines air temperature and relative humidity, and does not account for the effects of wind, sunlight, radiant heat sources or workload.

Source: osha.gov/heat-exposure/hazards

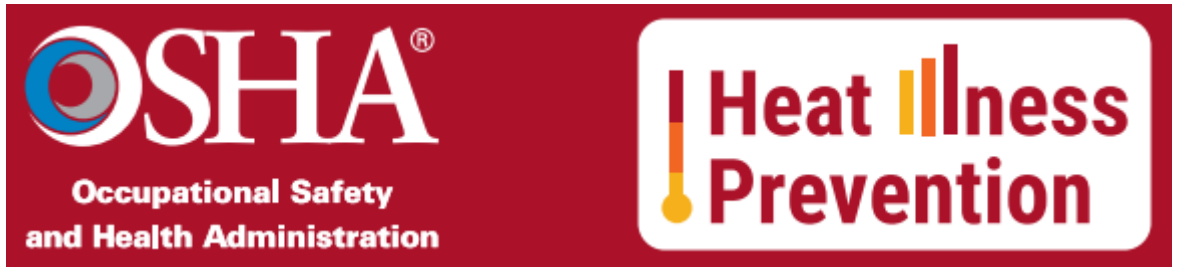
Helpful tools and information: ACGIH

- The American Conference of Governmental Industrial Hygiensits (ACGIH) provides additional guidelines regarding heat stress and strain.
- The goal of the “threshold limit values” (TLVs) is to limit heat stress exposures to those that may be sustained for hours; where healthy acclimatized individuals can achieve and maintain thermal equilibrium.
- The TLVs incorporate WBGTs, metabolic rate categories (light, moderate, heavy, very heavy) and clothing adjustment values (CAV) for its guidance.
- ACGIH also contains guidance on developing a heat stress management program, including general controls and job-specific controls.

Source: 2025 ACGIH TLV/BEI book and TLB/BEI documentation

Heat illness prevention plan

- Under the OSH Act, employers are required to provide their employees with a place of employment that “is free from recognized hazards that are causing or likely to cause death or serious harm to employees.”
- Thus, employers are responsible for protecting workers from heat-related hazards.
- A heat illness prevention program is an effective system that plans for and ensures heat safety. This includes identifying heat hazards, establishing controls, and monitoring and evaluating the controls to ensure they are effective.
- **OSHA has identified 12 elements of a heat illness prevention program.**



Source: osha.gov/sites/default/files/publications/OSHA3743.pdf

Heat illness prevention plan – elements one through three

- Create a plan and provide training.

1. **Develop a plan** that includes monitoring, work and rest schedules, a buddy system and protocols for emergencies and first aid.
2. **Designate someone to oversee the heat illness prevention plan**, someone trained in heat hazards, heat illness symptoms and heat controls; designate one or more **heat safety representative** who can develop, implement and mange the program.
3. **Provide training about heat illness**; provide training regularly (at least annually) for all workers about heat illness risks, symptoms, response procedures and prevention methods. **Train workers in a language and format they can understand.**

Source: osha.gov/sites/default/files/publications/OSHA3743.pdf

Heat illness prevention plan – elements four through six

- Plan work schedules.

4. **Acclimatize workers:** Allow new or returning workers to gradually increase their workload and exposure by following the **"20% rule,"** beginning with 20% exposure on the first day and then increasing work duration by 20% on subsequent day. Full acclimatization may take up to 14 days or longer.

5. **Modify work schedules to reduce heat exposure:** Reschedule non-essential work on days with reduced heat index; shift physically demanding work to cooler times; rotate workers, add workers or split shifts; and stop work, if needed.

6. **Allow frequent rest breaks:** Breaks should be long enough to allow sufficient time to recover given the temperature, humidity, workloads and other conditions.

Source: osha.gov/sites/default/files/publications/OSHA3743.pdf

Heat illness prevention plan – elements seven through nine

- Set controls and monitor on-site activity.

7. **Identify heat hazards:** Recognize the risk of heat illness due to high temperature, humidity, sun and other thermal exposures, work demands, clothing or PPE.

8. **Check the temperature before work:** Use various apps and tools to track heat, such as the OSHA-NIOSH Heat Safety Tool app, to plan activities based on how hot it is throughout the day; use a **wet bulb globe temperature**, which incorporates various environmental factors.

9. **Monitor for heat illness symptoms:** Train workers to monitor each other using a **buddy system**, which can help supervisors on large jobsites; for a more robust plan, establish a medical monitoring and evaluation program to monitor worker heat strain (for example, core temperature, hydration, pulse and/or blood pressure).

Source: osha.gov/sites/default/files/publications/OSHA3743.pdf

Heat illness prevention plan – elements 10 through 12

- Set controls and monitor on-site activity.

10. **Designate a break area and encourage hydration:** Designate a shady or cool area and provide cool drinking water. Use portable tents and shelters if there is no natural shade. Encourage workers to drink one liter of water each hour (one cup every 15 to 20 minutes); do not over hydrate (no more than 48 ounces an hour).

11. **Dress for the heat:** Wear hats and loose-fitting, breathable clothing where possible; some clothing and attire may contribute to the overall heat burden.

12. **Be prepared for an emergency:** Have a plan for each worksite and communicate it to workers and supervisors; include **what to do when someone is showing symptoms of heat illness; how to contact emergency services; the lapse time until services arrive*; and appropriate first-aid measure until help arrives**.

Source: osha.gov/sites/default/files/publications/OSHA3743.pdf

Standards, regulations and proposed rulemaking

- There is no current Minnesota or federal OSHA standard for outdoor heat.
- Employers must still adhere to the general duty clause under the OSH Act.
- For **indoor workplaces** in Minnesota for **general industry**, employers must adhere to Minnesota Rules 5205.0110, Indoor ventilation and temperature in places of employment, subpart 2, table 1).

Two-hour time-weighted average permissible exposure limits	
Work activity	**Wet bulb globe temperature**
Heavy work	77°F
Moderate work	80°F
Light work	86°F

Source: revisor.mn.gov/rules/5205.0110/

Standards, regulations and proposed rulemaking

- OSHA proposed rulemaking
  - OSHA has initiated the rulemaking process for a“Heat injury and illness prevention in outdoor and indoor work settings” standard.
  - Updates regarding the process and status, including links to the proposed rulemaking, are online at osha.gov/heat-exposure/rulemaking.
  - The informal public hearing concluded July 2, 2025; individuals who submitted a notice of intention to appear, participated in the post-hearing comment period, which was extended to Oct. 30, 2025.
  - To assist with the preparation of post-hearing comments, a compilation of questions is available through the link above.

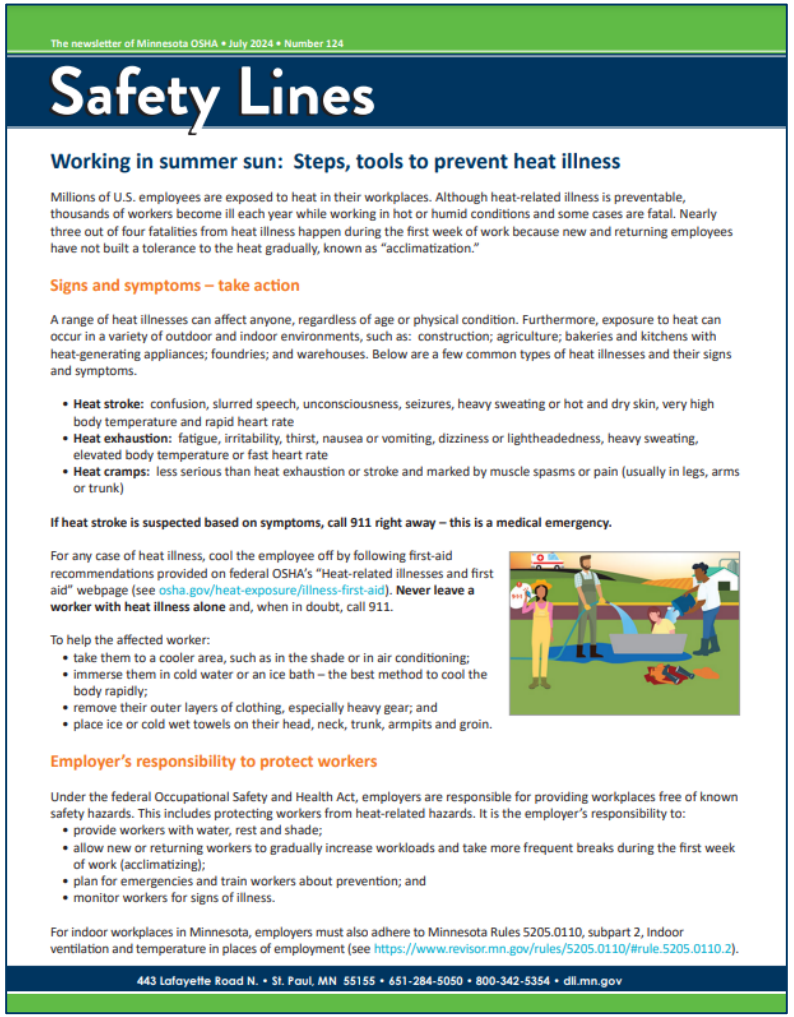
Source: osha.gov/heat-exposure/rulemaking

Other resources and links

- Additional resources and links from federal OSHA: osha.gov/heat-exposure/resources
- Minnesota Department of Health (MDH) resources:
  - MDH has additional information for all Minnesotans about staying hydrated, informed and cool at health.state.mn.us/communities/environment/climate/extremeheat.html.
  - The MDH website has a variety of handouts and links about preventing heat-related illnesses.
  - It describes vulnerable groups that are most at risk of heat-related illnesses, including adults 65 and older, young children, people with disabilities, people with certain health conditions and pregnant people.
  - The Minnesota Extreme Heat Toolkit contains flexible heat safety strategies and guidance to meet unique needs of Minnesota communities. It is available at health.state.mn.us/communities/environment/climate/heatpro.html.

Other resources and links: MNOSHA's newsletter

- *Safety Lines* is an online, quarterly publication of the Minnesota Department of Labor and Industry.
- Its purpose is to promote occupational safety and health and to inform readers of the purpose, plans and progress of Minnesota OSHA.
- Sign up via email to receive notification online at dli.mn.gov/business/workplace-safety-and-health/mnosha-compliance-safety-lines-newsletter.



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Safety Lines

Working in summer sun: Steps, tools to prevent heat illness

Millions of U.S. employees are exposed to heat in their workplaces. Although heat-related illness is preventable, thousands of workers become ill each year while working in hot or humid conditions and some cases are fatal. Nearly three out of four fatalities from heat illness happen during the first week of work because new and returning employees have not built a tolerance to the heat gradually, known as "acclimatization."

Signs and symptoms – take action

A range of heat illnesses can affect anyone, regardless of age or physical condition. Furthermore, exposure to heat can occur in a variety of outdoor and indoor environments, such as: construction; agriculture; bakeries and kitchens with heat-generating appliances; foundries; and warehouses. Below are a few common types of heat illnesses and their signs and symptoms.

- **Heat stroke:** confusion, slurred speech, unconsciousness, seizures, heavy sweating or hot and dry skin, very high body temperature and rapid heart rate
- **Heat exhaustion:** fatigue, irritability, thirst, nausea or vomiting, dizziness or lightheadedness, heavy sweating, elevated body temperature or fast heart rate
- **Heat cramps:** less serious than heat exhaustion or stroke and marked by muscle spasms or pain (usually in legs, arms or trunk)

If heat stroke is suspected based on symptoms, call 911 right away – this is a medical emergency.

For any case of heat illness, cool the employee off by following first-aid recommendations provided on federal OSHA's "Heat-related illnesses and first aid" webpage (see osha.gov/heat-exposure/illness-first-aid). **Never leave a worker with heat illness alone** and, when in doubt, call 911.

To help the affected worker:

- take them to a cooler area, such as in the shade or in air conditioning;
- immerse them in cold water or an ice bath – the best method to cool the body rapidly;
- remove their outer layers of clothing, especially heavy gear; and
- place ice or cold wet towels on their head, neck, trunk, armpits and groin.

Employer's responsibility to protect workers

Under the federal Occupational Safety and Health Act, employers are responsible for providing workplaces free of known safety hazards. This includes protecting workers from heat-related hazards. It is the employer's responsibility to:

- provide workers with water, rest and shade;
- allow new or returning workers to gradually increase workloads and take more frequent breaks during the first week of work (acclimatizing);
- plan for emergencies and train workers about prevention; and
- monitor workers for signs of illness.

For indoor workplaces in Minnesota, employers must also adhere to Minnesota Rules 5205.0110, subpart 2, Indoor ventilation and temperature in places of employment (see https://www.revisor.mn.gov/rules/5205.0110/#rule.5205.0110.2).

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Thank you

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