

Preventing Cold-Related Injuries and Illnesses

This WorkCare Fact Sheet discusses health hazards and injury prevention methods in cold environments.

Exposure to cold, windy or wet conditions can have serious health effects.

Exposure Risks

Health risk factors are higher for people who spend extended time working or recreating in cold environments. Many wintertime injuries occur at the end of the work or recreational day when the temperature drops, surfaces get icy and slick, and people are fatigued and/or dehydrated. Complacency or lack of awareness, especially in warmer climates, can also heighten injury risk.

Other contributing factors include:

- Wearing inadequate or wet clothing.
- Consuming alcohol or other substances that inhibit the body's response to cold and/or impair judgment.
- Poor physical fitness, a cardiovascular disorder or being ill with a cold or the flu.
- Becoming exhausted, immobilized, injured, lost or entrapped.
- Being male—men have a significantly higher rate of cold-related injury than women.

Cold-Related Injuries and Illnesses

The following are medical conditions that result from exposure to cold temperatures, wind, snow, ice and water:

Cold Stress

This condition occurs when the body struggles to maintain its normal temperature. Shivering, an early indicator of cold stress, causes blood to flow from the extremities and skin surface to the body's core (chest and abdomen).

A person suffering from cold stress may be re-warmed by wrapping his or her body in blankets, going indoors or inside a shelter, and providing a radiant heat source. The individual may be encouraged to move around to generate body heat and given a sweetened, warm, non-alcoholic beverage.

Hypothermia

When the body is unable to replace heat lost to the environment, hypothermia, or abnormally low body temperature, develops. Early symptoms include shivering, fatigue, loss of coordination, confusion (slurred speech) and disorientation. Signs of more advanced hypothermia include no shivering, blue skin, dilated pupils, shallow breathing and irregular heartbeat. In late stages, the victim may feel too warm and want to remove clothing. Untreated, hypothermia results in unconsciousness and eventually death.



When assisting a co-worker or companion with signs of hypothermia:

- Request immediate medical assistance.
- Move the person to a warm, dry room or shelter.
- Remove wet clothing, shoes and socks.
- Keep the person in a horizontal position and cover him or her with layers of blankets or towels and a vapor barrier (e.g., tarp, garbage bag). Cover the head and neck but not the face.
- If alert, offer a warm, sweetened, non-alcoholic beverage.
- Place warm bottles or hot packs in armpits, the groin area and along sides of the chest. Ask emergency technicians for additional rewarming instructions.

A person who is severely hypothermic (below 90°F) and unconscious is in a life-threatening situation. He or she should be wrapped in blankets and immediately transported to a medical facility. Rewarming should not be attempted. If a person is not breathing or has no pulse for a period of one minute, rescue breathing may be started. Chest compressions should only be applied under the direction of a 911 operator or emergency medical technician.

Immersion Hypothermia

When exposed to cold water, immersion hypothermia develops. Serious health effects occur much more quickly when a person is wet because water conducts heat away from the body 25 times faster than air.

Typically people in temperate climates don't consider themselves at risk, but hypothermia can occur in any water temperature below 70°F. Survival times can be lengthened by:

- Wearing proper clothing (wool and synthetics, not cotton).
- Using a personal flotation device (life vest, immersion suit or dry suit).
- Having a means of signaling rescuers (strobe lights, personal locator beacon, whistles, flares, waterproof radio).

Medical intervention is similar to non-immersion hypothermia.

Frostnip and Frostbite

Frostnip is a mild, reversible freezing of the top layers of skin tissue. Frostbite is an irreversible condition in which the skin freezes, causing ice crystals to form between cells. Toes, fingers, ears, cheeks and the nose are particularly prone to frostbite. In serious cases, subcutaneous tissues, muscle and bone may be affected. Symptoms include numbness, tingling or stinging, aching, and bluish or pale, waxy skin.



If caught early, it is possible to recover from frostbite. Mildly frozen tissue may be rewarmed and insulated until medical attention is received as long as there is no danger of refreezing. If you suspect frostbite:

- Get indoors immediately.
- Seek medical attention.
- Remove constrictive clothing and jewelry that could impair circulation.
- Place dry, sterile gauze between toes and fingers to absorb moisture and keep them from sticking together.
- Elevate the affected area to reduce pain and swelling.
- For superficial frostbite, place the affected area in warm, not hot, water until the tissue softens.

Deep frostbite is a medical emergency. It can permanently damage body tissues; severe cases can lead to amputation. In extremely cold temperatures, the risk of frostbite is increased in individuals who are not dressed properly or who have poor blood circulation. Walking on frostbitten feet or toes increases the likelihood of permanent damage.

For deep frostbite:

- Follow guidelines for the treatment of hypothermia.
- Do not rub or massage the affected area to warm it.
- Do not apply snow or water, or break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the frostbitten area without professional medical assistance. For example, do not place in warm water. Rewarmed tissue sustains further damage if it refreezes.
- Warm with radiant heat. Do not use a heating pad, heat lamp or the heat of a stove, fireplace or radiator. Numb extremities can be easily burned.

Trench/Immersion Foot

Trench/immersion foot is caused by prolonged exposure to wet and cold conditions. To reduce heat loss, the body constricts blood vessels to shut down circulation in the feet. Skin tissue begins to die because of lack of oxygen, nutrient loss and toxin buildup. Trench foot can occur at temperatures as high as 60°F if the feet are constantly wet.

Trench/immersion foot develops within 3-12 hours of exposure. Prolonged exposure can cause significant tissue damage.

Symptoms include numbness, a tingling and/or itching sensation with redness, swelling, leg cramps, blisters or ulcers, and bleeding under the skin. In some cases, gangrene may turn feet dark purple, blue or gray.



For immediate care, avoid walking, remove footwear and socks, and dry the feet. Moving to a warm, dry area and using rewarming techniques is usually only minimally effective. Seek medical treatment.

Chilblains

Chilblains are damaged capillary beds (groups of small blood vessels) in the skin. They are caused by repeated exposure to temperatures just above freezing to as high as 60°F. Damage is permanent. Redness and itching—usually on cheeks, ears, fingers and toes—occurs with repeated exposure. Other symptoms may include blistering, inflammation and, in severe cases, ulceration.

Care recommendations:

- Avoid scratching.
- Slowly warm the skin.
- Use corticosteroid creams to relieve itching and swelling.
- Keep blisters and ulcers clean and covered.
- Seek medical advice.

Cold-Weather Work Precautions

- Allow new employees to adjust to cold-weather working conditions.
- Educate employees about signs and symptoms of cold-related injuries and illnesses, rewarming techniques, first-aid treatment, appropriate clothing, and eating and drinking recommendations.
- Direct employees to work in a buddy system, especially when temperatures are below 10°F.
- When possible, ensure that required physical activity is not so intense that it causes heavy sweating.
- As feasible, schedule work during the warmest hours of the day; allow employees to set their own work pace and take breaks, as needed.
- Direct workers to wear eye protection when exposed to blowing snow and ice.
- Use safe heat sources such as air jets and radiant heaters to warm workers in outdoor security stations. If possible, shield work areas from drafts or wind to reduce wind chill.

Wind chill increases injury risk. For example, when it's 40°F and wind speed is 35 mph, the body feels it as 28°F. The National Weather Service has a [*formula for calculating wind chill*](#) based on current conditions.



Preventive Measures

The following health and safety measures are recommended when working or recreating in cold environments.

Use common sense: Check the weather forecast and be prepared for changing conditions. If working or recreating on ice, be sure it's thick enough to safely support applied weight. Take extra precautions if you are unaccustomed to the cold or exerting yourself at higher elevations.

Clothing: Wear cold-weather clothing in layers to retain body heat and repel water. Unlike cotton, wool, silk and most synthetics retain their insulating properties when they are wet. Pack extra clothing in case you get wet. Wear goggles or sunglasses to protect your eyes and sunscreen to protect your skin, even when it's overcast.

Equipment and Training: Obtain professional advice when selecting and using outdoor work or sports equipment.

Conditioning and Stretching: Staying fit year-round is one of the best ways to manage fatigue and prevent serious injuries. Follow an exercise regimen that helps build strength, stamina and flexibility. Always stretch before and after your activity. Take a break in a warm place if you are in pain or feel exhausted.

Be Courteous and Aware: Injuries tend to occur when people disregard their surroundings or are discourteous to others. Stay focused and be patient. Carry a mobile phone in case of an emergency, but don't send texts or make calls while engaged in your activity.

Eat and Stay Hydrated: To avoid fatigue, keep your body fueled and well-hydrated. Drink plenty of water, eat nutritious meals and carry snacks to boost your energy. Cold-weather workers who wear heavy, protective clothing require 10-15 percent more calories a day compared to those working in temperate climates.

Recommended Resources

1. [*Cold Stress*](#): National Institute for Occupational Safety and Health
2. [*Cold Stress Guide*](#): Occupational Safety & Health Administration
3. [*Extreme Cold - A Prevention Guide to Promote Your Personal Health and Safety*](#): Centers for Disease Control and Prevention
4. [*What to Do When Winter Has You in its Icy Grip*](#): National Safety Council

