Cold Stress Overview – Quick Tips



Know the risk factors and warning signs of cold stress.

No specific Occupational Safety and Health Administration (OSHA) standard currently covers employees who work in cold conditions. While there's no regulation to follow, employers are required under the General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health (OSH) Act of 1970, to protect workers from recognized hazards causing or likely to cause death or serious physical harm. Because of this, it's vital for employers and employees to have an awareness of cold stress, the illnesses and injuries cold stress can cause and how to prevent these environmentally induced maladies.

In moderation, exposure to cold conditions can lead to little more than temporary discomfort. For hardy winter recreation enthusiasts, cold conditions set the stage for an outdoor wintertime "blast." Regardless of which side of the cold appreciation spectrum you fall, exposures to cold temperatures in excess can lead to cold stress.

Risk Factors

A cold environment forces the body to work harder to maintain its temperature. According to the National Institute for Occupational Safety and Health (NIOSH), what constitutes cold stress and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered factors for cold stress. Whenever temperatures drop decidedly below normal and as wind speed increases, heat can more rapidly leave your body.

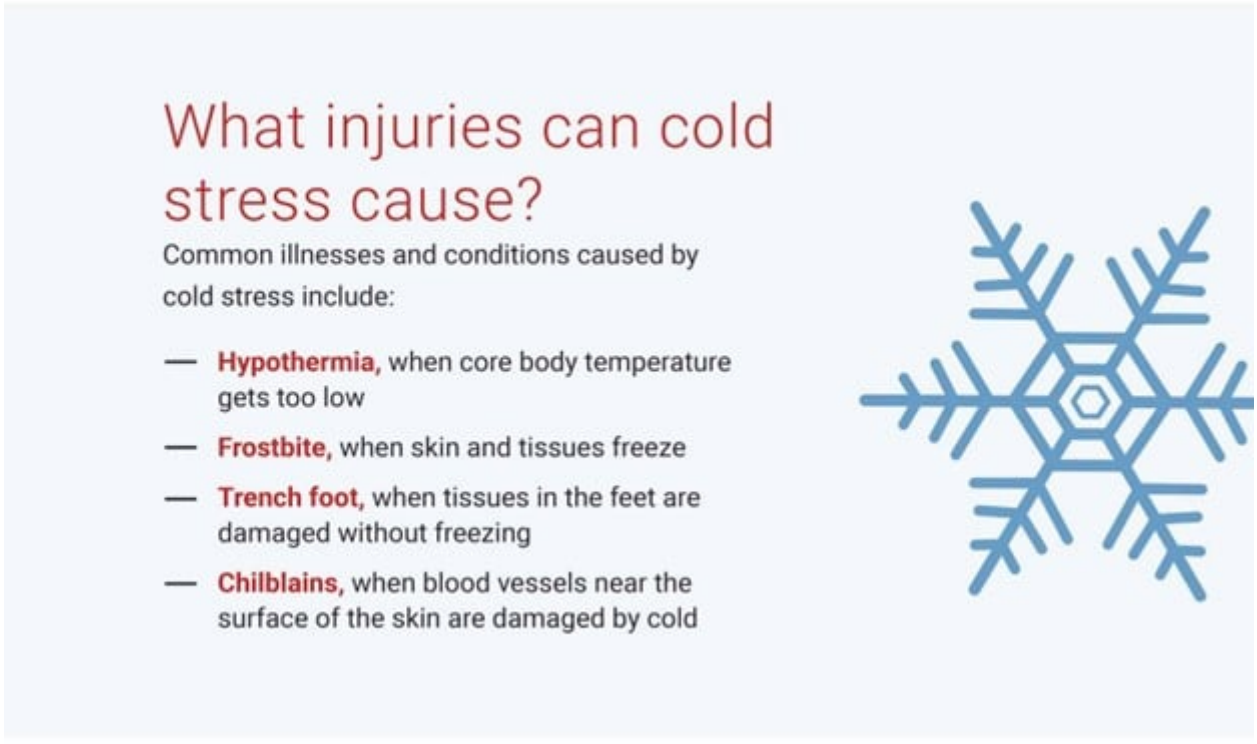
According to OSHA, cold stress occurs by driving down the skin temperature and eventually the internal body, or core, temperature. Most of the body's energy in a cold environment is used to keep the internal core temperature warm. Over time, the body begins to shift blood flow from the extremities (hands, feet, arms and legs) and outer skin to the core (chest and abdomen). This can lead to serious health problems and can cause tissue damage, possibly even death.



In its Safety and Health Guide on Cold Stress, OSHA points out the following risk factors that can contribute to cold stress:

- Wetness/dampness
- Dressing improperly
- Predisposing health conditions such as hypertension, hypothyroidism and diabetes
- Poor physical conditioning
- Exhaustion

While cold temperatures are commonly thought of as a health concern for construction and utility workers, firefighters, emergency responders and other outdoor occupations, workers in meat packing facilities, cold storage warehouses and other refrigerated indoor facilities are also at risk.



Potential Health Impacts of Cold Stress

OSHA and NIOSH identify the following as the most common cold-induced illnesses/injuries:

- Hypothermia
- Frostbite
- Trench foot
- Chilblains
- Cold water immersion

The following are symptomatic overviews and first aid measures for these conditions.

Hypothermia

Hypothermia occurs when body heat is lost faster than it can be replaced and normal body temperature (98.6 F) drops to less than 95 F. Hypothermia is most likely at very cold temperatures, but can occur even at cool temperatures (above 40 F) if a person becomes chilled from rain, sweat or submersion in cold water.

What are the symptoms of hypothermia?

- Mild symptoms:
  - An exposed worker is alert.
  - He/she may begin to shiver and stomp the feet in order to generate heat.
- Moderate to severe symptoms:
  - As the body temperature continues to fall, symptoms will worsen and shivering stops.
  - The worker may lose coordination and fumble with items in the hand, become confused and disoriented.
  - He/she may be unable to walk or stand, pupils become dilated, pulse and breathing slow, and loss of consciousness can occur. A person could die if help is not received immediately.

What can be done for a person suffering from hypothermia? According to OSHA, you should:

- Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible.
- Move the person to a warm, dry area.
- Remove wet clothes and replace with dry clothes. Cover the body (including the head and neck) with layers of blankets and a vapor barrier (e.g., tarp, garbage bag). Do not cover the face.
- If medical help is more than 30 minutes away:
  - Give warm sweetened drinks if alert (no alcohol) to help increase the body temperature. Never try to give a drink to an unconscious person.
  - Place warm bottles or hot packs in armpits, sides of chest and groin. Call 911 for additional rewarming instructions.
- If a person is not breathing or has no pulse, OSHA recommends you:
  - Call 911 for emergency medical assistance immediately.
  - Treat the worker as per instructions for hypothermia, but be very careful and do not try to give an unconscious person fluids.
  - Check him/her for signs of breathing and a pulse. Check for 60 seconds.
  - If after 60 seconds the affected worker is not breathing and does not have a pulse, trained workers may start rescue breaths for three minutes.
  - Recheck for breathing and pulse. Check for 60 seconds.
  - If the worker is still not breathing and has no pulse, continue rescue

breathing.
    - Only start chest compressions per the direction of the 911 operator or emergency medical services. (NOTE: Chest compressions are recommended by the American Heart Association only if the patient will not receive medical care within three hours.)
    - Reassess the patient's physical status periodically.

Frostbite

Frostbite is an injury caused by freezing of the skin and underlying tissues. The lower the temperature, the more quickly frostbite will occur. Frostbite typically affects the extremities, particularly the feet and hands. Amputation may be required in severe cases.

What are the symptoms of frostbite?

- Reddened skin develops gray/white patches
- Numbness in the affected part
- Feels firm or hard
- Blisters may occur in the affected part in severe cases

What can be done for a person suffering from frostbite?

- Follow the recommendations described above for hypothermia.
- Do not rub the affected area to warm it; this action can cause more damage.
- Do not apply snow/water.
- Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the frostbitten area before getting medical help; for example, do not place in warm water. If a frostbitten area is rewarmed and gets frozen again, more tissue damage will occur. It is safer for the frostbitten area to be rewarmed by medical professionals.
- Give warm sweetened drinks if the person is alert. Avoid alcohol.

Trench Foot

Trench foot or immersion foot is caused by prolonged exposure to wet and cold temperatures. It can occur in temperatures as high as 60 F if the feet are constantly wet. This nonfreezing injury occurs because wet feet lose heat 25 times faster than dry feet. To help prevent heat loss, the body constricts the blood vessels to shut down circulation in the feet. The skin tissue begins to die because of a lack of oxygen and nutrients and due to the buildup of toxic products.

What are the symptoms of trench foot?

- Redness of the skin, swelling, numbness and blisters

What can be done for a person suffering from immersion foot?

- Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible.
- Remove the shoes/boots and wet socks.
- Dry the feet.

Chilblains

According to the NIOSH Cold Stress Resource Page, chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 60 F. The

cold exposure causes damage to the capillary beds (groups of small blood vessels) in the skin. This damage is permanent and the redness and itching will return with additional exposure. The redness and itching typically occurs on cheeks, ears, fingers and toes.

What are the symptoms of chilblains?

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

What can be done for a person suffering from chilblains?

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

Cold Water Immersion

Immersion in cold water can greatly expedite the stages of hypothermia because water conducts heat away from the body 25 times faster than air. NIOSH refers to this as immersion hypothermia. People in temperate climates typically don’t consider themselves at risk from hypothermia in the water, but hypothermia can occur in any water temperature below 70 F. Survival times can be lengthened by wearing proper clothing (wool, silk or synthetics; not cotton); using a personal flotation device (PFD), life vest, immersion suit or dry suit; having a means of both signaling rescuers (strobe lights, personal locator beacon, whistles or flares); and having a means of being retrieved from the water.

Preventing Cold Stress

OSHA offers guidance when it comes to cold stress prevention. The agency lists engineering controls, training, safe work practices and personal protective equipment (PPE), such as appropriate cold weather attire, as the foundational components for employers to build into their cold condition work plans.

Employers should provide engineering controls. For example, radiant heaters may be used to warm workers in outdoor security stations. If possible, shield work areas from drafts or wind to reduce wind chill. When practical, use insulating material on equipment handles when temperatures are below 30 F.

Employers should train workers on how to help prevent and recognize cold stress illnesses and injuries and how to apply first aid treatment. Workers should be trained on the appropriate engineering controls, work practices and PPE to reduce the risk of cold stress.

Employers should use safe work practices. For example, since it is easy to become dehydrated in cold weather, OSHA recommends that employers provide plenty of warm sweetened liquids. Alcoholic drinks must be avoided. If possible, schedule heavy work during the warmer part of the day and assign workers to tasks in pairs (buddy system) so that they can monitor each other for signs of cold stress. Workers should be allowed to interrupt their work if they are extremely uncomfortable. Employers should give workers frequent breaks in warm areas. Let new workers and those returning after time away from work acclimate to the conditions by gradually increasing their workload, allowing more frequent breaks in warm areas as they build up a tolerance

for the cold environment.



Dressing properly is extremely important to help prevent cold stress. The type of fabric worn also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of loose-fitting clothing. Layering provides better insulation. Do not wear tight-fitting clothing.
    - An inner layer of wool, silk or synthetic to keep moisture away from the

body.
    - A middle layer of wool or synthetic to provide insulation even when wet.
    - An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood to help keep your whole body warmer. Hats reduce the amount of body heat that escapes from your head.
- Use a knit mask to cover the face and mouth (if needed).
- Protect hands with insulated gloves(water resistant if necessary).
- Wear insulated and waterproof boots(or other footwear).

Commonly Asked Questions

Q: Do OSHA rules require employers to pay for cold weather attire?

A: No, with one exception. According to OSHA's Enforcement Guidance for Personal Protective Equipment in General Industry that went into effect Feb. 11, 2011, "employers are not required to pay for ordinary clothing, skin creams, or other items used solely for protection from weather such as winter coats, jackets, gloves, and parkas that employees would normally have to protect themselves from the elements." The guidance calls out the exception to this rule with the following enforcement note: "In the rare case that ordinary weather gear is not sufficient to protect the employee and special equipment or extraordinary clothing is needed to protect the employee from unusually severe weather conditions, the employer is required to pay for such protection. Clothing used in artificially controlled environments with extreme hot or cold temperatures, such as freezers, is not considered part of the weather gear exception."

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