

Cold Stress

Cold Stress Can be Prevented



It is important for employers to know the wind chill temperature so that they can gauge workers' exposure risk better and plan how to safely do the work. It is also important to monitor workers' physical condition during tasks, especially new workers who may not be used to working in the cold, or workers returning after spending some time away from work.

The National Oceanic and Atmospheric Administration ([NOAA Weather Radio](#)) is a nationwide network of radio stations broadcasting continuous weather information from the nearest NWS office. It will give information when wind chill conditions reach critical thresholds. A Wind Chill Warning is issued when wind chill temperatures are life threatening. A Wind Chill Advisory is issued when wind chill temperatures are potentially hazardous.

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Who is affected by environmental cold?

Environmental cold can affect any worker exposed to cold air temperatures and puts workers at risk of cold stress. As wind speed increases, it causes the cold air temperature to feel even colder, increasing the risk of cold stress to exposed workers, especially those working outdoors, such as recreational workers, snow cleanup crews, construction workers, police officers and firefighters. Other workers who may be affected by exposure to environmental cold conditions include those in transit, baggage handlers, water transportation, landscaping services, and support activities for oil and gas operations.

Risk factors for cold stress include:

- **Wetness/dampness, dressing improperly, and exhaustion**
- **Predisposing health conditions such as hypertension, hypothyroidism, and diabetes**
- **Poor physical conditioning**

What is cold stress?

What constitutes cold stress, and its effects can vary across different areas of the country. In regions that are not used to winter weather, near freezing temperatures are considered factors for "cold stress." Increased wind speed also causes heat to leave the body more rapidly (wind chill effect). Wetness or dampness, even from body sweat, also facilitates heat loss from the body. Cold stress occurs by driving down the skin temperature, and eventually the internal body temperature. When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. Types of cold stress include: trench foot, frostbite, and hypothermia.

For more information, see OSHA's [Cold Stress Safety and Health Guide](#).

How can cold stress be prevented?

Although OSHA does not have a specific standard that covers working in cold environments, under the [Occupational Safety and Health Act \(OSH Act\) of 1970](#), employers have a duty to protect workers from recognized hazards, including cold stress hazards, that are causing or likely to cause death or serious physical harm in the workplace.

- Employers should train workers. Training should include:
 - How to recognize the environmental and workplace conditions that can lead to cold stress.
 - The symptoms of cold stress, how to prevent cold stress, and what to do to help those who are affected.
 - How to select proper clothing for cold, wet, and windy conditions.
- Employers should:
 - Monitor workers physical condition.
 - Schedule frequent short breaks in warm dry areas, to allow the body to warm up.
 - Schedule work during the warmest part of the day.
 - Use the buddy system (work in pairs).
 - Provide warm, sweet beverages. Avoid drinks with alcohol.
 - Provide engineering controls such as radiant heaters.

Types of Cold Stress

Immersion/Trench Foot

Trench foot is a non-freezing injury of the feet caused by prolonged exposure to wet and cold conditions. It can occur in temperatures as high as 60°F if feet are constantly wet. Injury occurs because wet feet lose heat 25-times faster than dry feet. [\[CDC/NIOSH\]](#)

What are the symptoms of trench foot?

Reddening skin, tingling, pain, swelling, leg cramps, numbness, and blisters.

First Aid

- Call 911 immediately in an emergency; otherwise seek medical assistance as soon as possible.
- Remove wet shoes/boots and wet socks.
- Dry the feet and avoid working on them.
- Keep affected feet elevated and avoid walking. Get medical attention.

Frostbite

Frostbite is caused by the freezing of the skin and tissues. Frostbite can cause permanent damage to the body, and in severe cases can lead to amputation. The risk of frostbite is increased in people with reduced blood circulation and among people who are not dressed properly for extremely cold temperatures.

What are the symptoms of frostbite?

Reddened skin develops gray/white patches in the fingers, toes, nose, or ear lobes; tingling, aching, a loss of feeling, firm/hard, and blisters may occur in the affected areas.

First Aid

- Follow the recommendations described below for hypothermia.
- Protect the frostbitten area, e.g., by wrapping loosely in a dry cloth and protect the area from contact until medical help arrives.
- DO NOT rub the affected area, because rubbing causes damage to the skin and tissue.
- Do not apply snow or water. Do not break blisters.
- DO NOT try to re-warm the frostbitten area before getting medical help, for example, do not use heating pads or 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 alert (no alcohol).

Hypothermia

Hypothermia occurs when the normal body temperature (98.6°F) drops to less than 95°F. Exposure to cold temperatures causes the body to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up the body's stored energy. The result is hypothermia, or abnormally low body temperature. Hypothermia is most likely at very cold temperatures, but it can occur even at cool temperatures (above 40°F) if a person becomes chilled from rain, sweat, or immersion in cold water.

What are the symptoms of hypothermia?

An important mild symptom of hypothermia is uncontrollable shivering, which should not be ignored. Although shivering indicates that the body is losing heat, it also helps the body to rewarm itself. Moderate to severe symptoms of hypothermia are loss of coordination, confusion, slurred speech, heart rate/breathing slow, unconsciousness and possibly death. Body temperature that is too low affects the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know what is happening and won't be able to do anything about it.

First Aid

- Call 911 immediately in an emergency:
- Move the worker to a warm, dry area.
- Remove any wet clothing and replace with dry clothing. Wrap the entire body (including the head and neck) in layers of blankets; and with 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.

Basic Life Support (when necessary)

Co-workers trained in cardiopulmonary resuscitation (CPR) may help a person suffering from hypothermia that has no pulse or is not breathing:

- 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 for 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 3 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*
- Reassess patient's physical status periodically.

*Chest compressions are recommended only if the patient will not receive medical care within 3 hours.

Wind Chill Temperature: A Guide for Employers

Outdoor workers exposed to cold and windy conditions are at risk of cold stress, both air temperature and wind speed affect how cold they feel. Wind Chill is the term used to describe the rate of heat loss from the human body, resulting from the combined effect of low air temperature, and wind speed. The Wind Chill Temperature is a single value that takes both air temperature, and wind speed into account. For example, when the air temperature is 40°F, and the wind speed is 35mph, the wind chill temperature is 28°F; this measurement is the actual effect of the environmental cold on the exposed skin.

[National Weather Service \(NWS\) Wind Chill Calculator](#): With this tool, one may input the air temperature and wind speed, and it will calculate the wind chill temperature.

The American Conference of Governmental Industrial Hygienists (ACGIH) developed the following Work/Warm-up Schedule for a 4-hour shift takes both air temperature and

wind speed into account, to provide recommendations on scheduling work breaks and ceasing non-emergency work.

Know Your Winter Weather Terms

Blizzard Warning: Issued for sustained or gusty winds of 35 mph or more, and falling or blowing snow creating visibilities at or below 1/4 mile; these conditions should persist for at least 3 hours.

Wind Chill Advisory: Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.

Wind Chill Warning: Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.

Winter Storm Warning: Issued when hazardous winter weather in the form of heavy snow, blizzard conditions, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin.

Winter Storm Watch: Alerts the public to the possibility of a blizzard, heavy snow, heavy freezing rain, or heavy sleet. Winter Storm watches are usually issued 12 to 48 hours before the beginning of a Winter Storm.

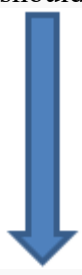

Winter Weather Advisories: Issued for accumulations of snow, freezing rain, freezing drizzle, and sleet which will cause significant inconveniences and, if caution is not exercised, could lead to life threatening situations.

(From: National Oceanic and Atmospheric Administration (NOAA))



OSHA is a Weather-Ready Nation Ambassador committed to working with NOAA and other Ambassadors to strengthen national preparedness for and resilience against extreme weather.

Work/Warm-up Schedule for a 4-Hour Shift

Air Temperature -- Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind	
°C (approximate)	°F (approximate)	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks	Maximum Work Period	Number of Breaks
-26 to -28	-15 to -19	(Normal Breaks) 1		(Normal Breaks) 1		75 min	2
-29 to -31	-20 to -24	(Normal Breaks) 1		75 min	2	55 min	3
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease 	
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease 			
-43 & below	-45 & below	Non-emergency work should cease					