# Preventing Cold Stress

Instructor Guide

Safety Talk Overview

Safety Talks are a method to refresh an employee’s knowledge and skills, maintain their interest in safety and illustrate the organization’s commitment to creating a healthy & safe work environment. Safety Talks can be performed on a weekly basis or before the start of a new scope of work and should be about 15 minutes in duration. Generally, these Safety Talk meetings are led by a supervisor and should be mandatory for all crew members to attend. The content should be centred on a single topic (e.g. a safety rule, safe job procedures, recent incident, Joint Health & Safety Committee (JHSC) meeting minutes, inspection results, etc.).

Topic Overview:

The four environmental conditions that cause cold related stress are low temperatures, cool high wind, dampness, and cold water. Wind chill, a combination of temperature and velocity, is a crucial factor to evaluate when going outside. A dangerous situation of rapid heat loss may occur from an individual exposed to high winds and cold temperatures.

Demonstration and Discussion Topics

🞏 **Discuss** the hazards of working outdoors

🞏 **Tour** the work area with workers pointing out where the accidents can occur.

🞏 **Distribute** the “Do’s & Don’ts” section of this handout.

🞏 **Use** the “Instructor Guide” section of the handout as your discussion guide

🞏 **Discuss** how accidents can happen.

🞏 **Remind** employees that they are required to wear adequate personal protective equipment.

🞏 **Explain** what can be done to minimize the risk of accidents (Do’s & Don’ts in handout)

🞏 **Emphasize** that following safe work procedures is mandatory.

🞏 **Make it real** by telling at least two true stories of injuries from your experience.

🞏 **Discuss** the attitude of “it won’t happen to me”. Remind them that an injury can and will happen if they take shortcuts or are careless.

🞏 **Answer** any questions or concerns they might have.

🞏 **Set a good example** by working safely at all times.

🞏 **Document** the Safety Talk by completing the “Safety Talk Record” section and filing it.

# Preventing Cold Stress



SAFETY TALK RECORD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Discussion Leader: | | | Date: | | | |
| Department: | | | Time: | | | |
| Attendees (Please print your name and sign beside it. If you are a contractor, also include your company name): | | | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| 🞏 | | 🞏 | | | | |
| Near Miss/Incidents and Investigations Reviewed: (None this month 🞏) | | | | | | |
| (Industry alerts can be discussed here as well) | | | | | | |
| Safety Topic Discussed: | | | | | | |
| Title: | | | | Date: | | |
| Any questions or concerns from workers? | | | | | | |
|  | | | | | | |
|  | | | | | | |
|  | | | | | | |
|  | | | | | | |
|  | | | | | | |
| Action Needed: | Person responsible: | | | | Due Date: | Completed Date: |
|  |  | | | |  |  |
|  |  | | | |  |  |
| Reviewed By: |  | | | |  |  |
| *Supervisor/Manager Print Name & Sign:* | | | | | *Date:April 11th 2015* | |

# Preventing Cold Stress

**What factors modify our response to cold?**

A cold environment challenges the worker in three ways: by air temperature, air movement (wind speed), and humidity (wetness). In order to work safely, these challenges have to be counterbalanced by proper insulation (layered protective clothing), by physical activity and by controlled exposure to cold (work/rest schedule).

**Humidity** (wetness): Water conducts heat away from the body 25 x faster than dry air.

**Physical Activity:** The production of body heat by physical activity (metabolic rate) is difficult to measure. Metabolic heat production is measured in kilo calories (kcal) per hour. One kilocalorie is the amount of heat needed to raise the temperature of one kilogram of water by 1°C.

**What is the wind-chill temperature?**

At any temperature, you feel colder as the wind speed increases. The combined effect of cold air and wind speed is expressed as "equivalent chill temperature" (ECT) or simply "wind chill" temperature in degrees Celsius or Fahrenheit. It is essentially the air temperature that would feel the same on exposed human flesh as the given combination of air temperature and wind speed. It can be used as a general guideline for deciding clothing requirements and the possible health effects of cold. This is a measurement of a heat loss rate caused by exposure to wind and it is expressed as the rate of energy loss per unit area of exposed skin per second.

**Are there regulated exposure limits for working in cold environments?**

In Canada, there are no maximum exposure limits for cold working environments.

**What can be done to help prevent the adverse effects of cold?**

The risk of cold injury can be minimized by proper equipment design, and appropriate clothing.

**Education**

Workers and supervisors involved with work in cold environments should be informed about symptoms of adverse effect exposure to cold, proper clothing habits, safe work practices, physical fitness requirements for work in cold, and emergency procedures in case of cold injury. While working in cold, a buddy system should be used. Look out for one another and be alert for the symptoms of hypothermia.

**Clothing**

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

* Clothing should be worn in multiple layers which provide better protection than a single thick garment. The air between layers of clothing provides better insulation than the clothing itself.
* Having several layers also gives you the option to open or remove a layer before you get too warm and start sweating or to add a layer when you take a break. It also allows you to accommodate changing temperatures and weather conditions. Successive outer layers should be larger than the inner layer; otherwise the outermost layer will compress the inner layers and will decrease the insulation properties of the clothing.
* For work in wet conditions, the outer layer of clothing should be waterproof. If the work area cannot be shielded against wind, an easily removable windbreak garment should be used. Under extremely cold conditions, heated protective clothing should be made available if the work cannot be done on a warmer day.
* Almost 50 percent of body heat is lost through the head. Wool knit cap or a liner under a hard hat can reduce excessive heat loss. Clothing should be kept clean since dirt fills air cells in fibers of clothing and destroys its insulating ability. Clothing must be dry, and moisture should be kept off clothes by removing snow prior to entering heated shelters.
* If fine manual dexterity is not required, gloves should be used below 4°C for light work and below -7°C for moderate work. For work below -17°C, mittens should be used. Cotton is not recommended as it tends to get damp or wet quickly, and loses its insulating properties. Wool and synthetic fibers, on the other hand, do retain heat when wet.

**Socks**

Always wear the right thickness of socks for your boots. If they are too thick, the boots will be "tight," and the socks will lose much of their insulating properties when they are compressed inside the boot. The foot would also be "squeezed" which would slow the blood flow to the feet and increase the risk for cold injuries. If the socks are too thin, the boots will fit loosely and may lead to blisters.

**Face and Eye Protection**

In extremely cold conditions, where face protection is used, eye protection must be separated from the nose and mouth to prevent exhaled moisture from fogging and frosting eye shields or glasses. Select protective eye wear that is appropriate for the work you are doing, and for protection against ultraviolet light from the sun, glare from the snow, blowing snow/ice crystals, and high winds at cold temperatures.

*Balanced meals and adequate liquid intake are essential to maintain body heat and prevent dehydration. Eat properly and frequently. Working in the cold requires more energy than in warm weather because the body is working to keep the body warm. It requires more effort to work when wearing bulky clothing and winter boots especially when walking through snow.*

*Drink fluids often especially when doing strenuous work. For warming purposes, hot non-alcoholic beverages or soup are suggested. Caffeinated drinks such as coffee should be limited because it increases urine production and contributes to dehydration. Caffeine also increases the blood flow at the skin surface which can increase the loss of body heat.*

*Alcohol should not be consumed as it causes expansion of blood vessels in the skin (cutaneous vasodilation) and impairs the body's ability to regulate temperature (it affects shivering that can increase your body temperature). These effects cause the body to lose heat and thus increase the risk of hypothermia.*

**What are the health effects of exposure to cold?**

Cooling of body parts may result in various cold injuries - nonfreezing injuries, freezing injuries - and hypothermia which is the most serious. Nonfreezing cold injuries include chilblain, immersion foot and trench foot. Frost nip and frostbite are freezing injuries.

Toes, fingers, ears and nose are at greatest risk because these areas do not have major muscles to produce heat. In addition, the body will preserve heat by favoring the internal organs and thus reducing the flow of blood to the extremities under cold conditions. Hands and feet tend to get cold more quickly than the torso because

* They lose heat more rapidly since they have a higher surface area-to-volume ratio, and
* They are more likely to be in contact with colder surfaces than other parts of the body.

If the eyes are not protected with goggles in high wind chill conditions, the corneas of the eyes may freeze.

The most severe cold injury is hypothermia which occurs from excessive loss of body heat and the consequent lowering of the inner core temperature (internal temperature of the body). Hypothermia can be fatal.

**Frostbite** is a common injury caused by exposure to extreme cold or by contact with extremely cold objects (especially those made of metal). It may also occur in normal temperatures from contact with cooled or compressed gases. Frostbite occurs when tissue temperature falls below the freezing point (0°C/32°F), or when blood flow is obstructed. Blood vessels may be severely and permanently damaged, and blood circulation may stop in the affected tissue. In mild cases, the symptoms include inflammation of the skin in patches accompanied by slight pain. In severe cases, there could be tissue damage without pain, or there could be burning or prickling sensations resulting in blisters. Frostbitten skin is highly susceptible to infection, and gangrene (local death of soft tissues due to loss of blood supply) may develop.

**What first aid can I do if someone has frostbite?**

First aid for frostbite, as well as immersion or trench foot, includes:

* Seek medical attention.
* If possible, move the victim to a warm area.
* Gently loosen or remove constricting clothing or jewelry that may restrict circulation.
* Loosely cover the affected area with a sterile dressing. Place some gauze between fingers and toes to absorb moisture and prevent them from sticking together.
* Quickly transport the victim to an emergency care facility.
* DO NOT attempt to rewarm the affected area on site (but do try to stop the area from becoming any colder) - without the proper facilities tissue that has been warmed may refreeze and cause more damage.
* DO NOT rub area or apply dry heat.
* DO NOT allow the victim to drink alcohol or smoke.

**What is hypothermia?**

* In moderately cold environments, the body's core temperature does not usually fall more than 1°C to 2°C below the normal 37°C because of the body's ability to adapt. However, in intense cold without adequate clothing, the body is unable to compensate for the heat loss and the body's core temperature starts to fall. The sensation of cold followed by pain in exposed parts of the body is one the first signs of mild hypothermia.
* As the temperature continues to drop or as the exposure time increases, the feeling of cold and pain starts to diminish because of increasing numbness (loss of sensation). If no pain can be felt, serious injury can occur without the victim's noticing it.
* Next, muscular weakness and drowsiness are experienced. This condition is called hypothermia and usually occurs when body temperature falls below 33°C. Additional symptoms of hypothermia include interruption of shivering, diminished consciousness and dilated pupils. When body temperature reaches 27°C, coma (profound unconsciousness) sets in. Heart activity stops around 20°C and the brain stops functioning around 17°C.

Mild Hypothermia

* Normal, shivering may begin.
* Cold sensation, goose bumps, unable to perform complex tasks with hands, shivering can be mild to severe, hands numb.

Moderate:

* Shivering, intense, muscles incoordination becomes apparent, movements slow and labored, stumbling pace, mild confusion, may appear alert. Use sobriety test, if unable to walk a 9 meter (30 foot) straight line, the person is hypothermic.
* Violent shivering persists, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, difficulty speaking, signs of depression, withdrawn.

Severe:

* Shivering stops, exposed skin blue of puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness
* Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.
* Unconscious, a heartbeat and respiration erratic, a pulse may not be obvious.
* Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.

**What first aid can I do for hypothermia?**

Hypothermia is a medical emergency. At the first sign, find medical help immediately. The survival of the victim depends on their co-workers ability to recognize the symptoms of hypothermia. The victim is generally not able to notice his or her own condition.

First aid for hypothermia includes the following steps:

* Seek medical help immediately. Hypothermia is a medical emergency.
* Ensure that wet clothing is removed.
* Place the victim between blankets (or towels, newspaper, etc.) so the body temperature can rise **gradually**. Body-to-body contact can help warm the victim's temperature slowly. Be sure to cover the person's head.
* Give warm, sweet (caffeine-free, nonalcoholic) drinks unless the victim is rapidly losing consciousness, unconscious, or convulsing.
* Quickly transport the victim to an emergency medical facility.
* Do not attempt to rewarm the victim on a site (e.g., do not use hot water bottles or electric blankets).
* Perform CPR (cardiopulmonary resuscitation) if the victim stops breathing. Continue to provide CPR until medical aid is available. The body slows when it is very cold and in some cases, hypothermia victims that have appeared "dead" have been successfully resuscitated.

|  |
| --- |
|  |
|  |  |