

OCCUPATIONAL HEALTH & SAFETY ISSUES: COLD STRESS

When we think of potentially harmful exposures in the workplace we often think about chemical hazards, but there are also physical elements like ergonomic hazards, noise, vibration, radiation, and thermal stress (hot and cold) that can injure or even kill us.

Preventing a worker's core body temperature from falling below 36°C or tissue temperature below 0°C will help prevent injuries such as hypothermia and frostbite

Every winter season multitudes of workers are exposed to dangerous levels of cold in their workplaces, and this exposure can be a matter of life and death. Even though illness from exposure to cold is preventable, every year, thousands become sick from occupational cold stress, and in some cases, die from this potentially dangerous exposure. The hazards of thermal stress and working in cold conditions are often overlooked and underrecognized.

WHAT IS COLD STRESS?

Cold stress occurs when a worker is exposed to the cold - and skin temperature or internal body temperature are no longer maintained at normal levels. This is not the same as thermal comfort, which is best described as a worker feeling satisfied with their thermal environment (not too hot/cold).

HOW ARE WORKERS EXPOSED TO COLD STRESS?

Workers can be exposed to cold stress through the natural environment or artificially cooled environments in the workplace. As a worker's body and skin temperature begin to decrease, the likelihood that a worker is experiencing cold stress increases.

Many Unifor members in all sectors spend at least some part of their working lives exposed to a cold working environment. Factors that affect a worker's exposure to cold stress may include:

JOB RELATED DEMANDS

- The type of work being conducted, the physical demands required, the duration of the exposure to cold, and the frequency of the exposure greatly determine a worker's exposure to cold stress.

COLD TEMPERATURES

- Cold environments and temperatures force the body to automatically regulate its temperature, placing stress on the body to use energy in order to maintain its core temperature.

WIND CHILL

- Wind chill is the combination of air movement and air temperature. Higher wind speeds and lower air temperatures increase worker exposure to cold stress more than low wind speeds and higher temperatures.

The job-related physical demands, conditions, durations, and frequencies greatly determine the exposure to cold stress. Hazard assessments must take into consideration any/all combinations of factors that can contribute to cold stress.

DAMPNESS AND WATER

- Heat loss can happen through physical contact with another object (conduction) or through the movement of air or water molecules across the skin (convection). Any dampness from sweat, environmental factors such as rain or snow, and exposure or immersion to water increase the rate of heat loss a worker's body experiences.

CLOTHING AND PPE

- The type of clothing and selection of PPE will vary based on the results of an effective hazard assessment. Protective clothing must be adequate and include protection for vulnerable areas such as hands, ears, face and head. Some considerations may include the number of layers of clothing, the insulation required, how tight or loose the clothing is, and ensuring clothing and PPE is dry.

WHAT ARE THE HEALTH EFFECTS OF COLD STRESS?

When a worker is exposed to the cold and the body is unable to adequately warm itself, serious cold related illnesses and injuries may occur, including permanent tissue damage and death.

FROSTBITE

Continued exposure to cold temperatures forces the body to shift blood flow from the extremities and outer skin to the core (chest and abdomen). This shift in blood flow makes the outer skin and extremities (nose, ears, cheeks, fingers, toes) cool rapidly and increases the risk of frostbite. Frostbite can also occur due to contact with cold surfaces and objects or exposure to extreme cold temperatures. Symptoms of frostbite include:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Numbness
- Tingling or stinging
- Aching
- Bluish or pale, waxy skin

TRENCH FOOT

Trench foot occurs when a worker's feet are exposed to wet and cold conditions (below 10°C) for a prolonged period. This can cause damage to the muscle and nerves of the foot along with changing the colour of the skin. Symptoms of trench foot include:

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (the foot may turn dark purple, blue, or gray)



HYPOTHERMIA

Hypothermia is often caused by continued exposure to cold temperatures. When a worker's body begins to lose heat faster than it is produced – over time the workers core body temperature decreases. Hypothermia occurs when core body temperature falls below 35 °C. The decrease in core temperature is then followed by varying degrees of injury and illnesses to the worker, which in some cases may be fatal.

EARLY HYPOTHERMIA SYMPTOMS

- Involuntary, excessive shivering
- Fatigue or slurred speech
- Loss of coordination
- Confusion and disorientation
- Drowsiness

LATE HYPOTHERMIA SYMPTOMS

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

PRECAUTIONARY PRINCIPLE

After the SARS inquiry in 2003, Ontario Commissioner Justice Archie Campbell wrote that "we cannot wait for scientific certainty before we take reasonable steps to reduce risk." Campbell's report identified the precautionary principle as an approach for protecting workers in circumstances of scientific uncertainty. This reflects the need to take prudent action in the face of potentially serious hazards without having to wait for complete scientific proof that a course of action is necessary. In other words, we do not need to be certain that we are correct when we act to protect ourselves when dealing with an occupational hazard.

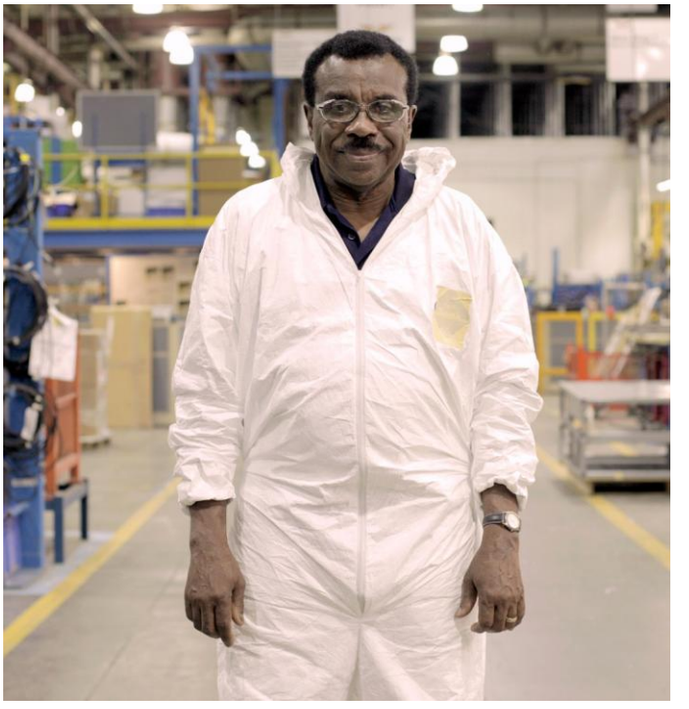
PREVENTION

Always use the hierarchy of controls to reduce the potential for injury or disease in your workplace. The most effective way to manage the risk of exposure to cold stress is to eliminate the source of exposure. If that's not possible, there are other controls that can be implemented. PPE should be the last resort or should be used as a supplementary control measure.

We must use the Precautionary Principle whenever we encounter uncharted or new workplace hazards

Elimination or Substitution: Eliminating the hazard by substituting a safer process or material, where possible, is the most effective control. Some questions to consider:

- Can the cold stress hazard be eliminated?
- Is the work schedule planned in advance taking into consideration whether cold temperatures or extreme cold conditions are expected?
- Can employer schedule work to be completed outdoors in warmer months or warmest part of the day?



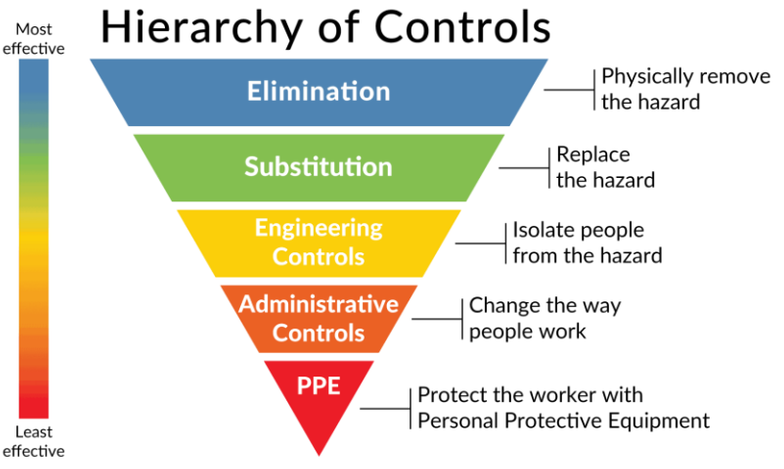
Engineering Controls: Making physical modifications to facilities, equipment, and processes can reduce exposure. Some questions to consider:

- Can the workplace be enclosed or shielded to reduce exposure to the cold, wind, or water?
- Are radiant heaters or other heating systems available for workplaces?
- Are ventilation systems for workplaces adequate?

- Are warm-up locations or heated warming shelters readily available?

Administrative Controls: These involve changing work practices and work policies. Providing awareness tools and training also count as administrative controls.

- Does my employer have a thermal stress management program, policy, or plan?
- Has a cold stress hazard assessment been completed?
- Are written safe work procedures for cold temperatures developed and are workers trained in these procedures?
- Is there a cold weather monitoring procedure and an emergency response procedure?



- Have workers been trained on what cold stress is, why it is dangerous,
how to protect themselves, all cold stress risk factors, and how to recognize and respond to signs and symptoms of a cold stress related injury or illness?
- Does my Joint Health and Safety Representative or Committee have a copy of the American Conference of Governmental Industrial Hygienists ACGIH TLVs for cold stress? Do they understand it?
- Are measurements of actual conditions at the worksite taken using an appropriate monitoring tool?
- Is there a competent person taking the measurements and monitoring the conditions regularly?
- Are all cold stress risk factors being regularly monitored and assessed?
- Are calculation methods used to make appropriate health and safety modifications?
- Are appropriate health and safety modifications being utilized as the conditions change?
- Are workers being monitored, supervised or working in pairs to consistently assess one another?
- Is the work planned to pace workers to minimize significant sweating and perspiration?
- Are workers acclimatized to the cold?

Personal Protective Equipment: This is the least effective control.

- Do workers have the correct PPE to protect against cold stress? (e.g. multi-layer or insulated clothing that includes insulated hats and hoods, face coverings, insulated gloves, etc)
- Do workers have water-proof or water-resistant PPE that protects against cold stress if required?
- Has equipment been insulated to protect worker exposure to the cold?

- Has equipment been designed or adapted to be operated without workers needing to remove PPE or thermal layers?
- Are any additional hazards created by any of the PPE provided (e.g. too much insulation where
  a worker cannot correctly grasp an object with whole hand and is only gripping with fingers)
- Do workers have access to change into dry clothing when necessary?
- Is the PPE appropriately sized and fitted for women, having regard to all relevant factors including body types?



REGULATIONS, STANDARDS, AND GUIDELINES

In many jurisdictions cold stress exposure is not regulated, however all employers have a general obligation or duty to ensure that every precaution reasonable in the circumstances is taken for the protection of a worker.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends threshold limit values (TLVs) for cold stress. The threshold limit value (TLVs) is also known as the time-weighted average (the highest recommended amount of exposure over a set time). Some Canadian jurisdictions have adopted the ACGIH TLVs as requirements whereas other Canadian jurisdictions refer to them as guidelines.

Regardless of jurisdiction, workers exposed to cold working environments must ensure employers have assessed any potential exposures and developed safe work plans, implemented effective controls, and adequately monitor the conditions of the workplace to prevent injury and illness.

OCCUPATIONAL EXPOSURE LIMITS

Employers have a duty and shall take all measures reasonably necessary in the circumstances to protect workers from hazardous exposure to the cold—regardless of whether exposed workers are indoors or outdoors

In all circumstances when you are concerned about your health and safety, or unsure of what to do when encountering an uncontrolled hazard, do not be afraid to exercise your rights to:

- **know about hazards**
- **to participate by raising concerns**
- **refuse unsafe work**

Jurisdiction	Regulation/Standard/ Guideline or Source	Occupational Exposure
All Jurisdictions	General Duties Clause	Consult your jurisdictions general duties clause
Federal	Canada Labour Code Part II	Section 125(1)(n): Employer must ensure that levels of ventilation, lighting, temperature, humidity, sound and vibration meet prescribed standards
	Canada Occupational Health and Safety Regulations	Section 9.9: personal service room and food preparation area: 18°C minimum/29°C maximum
British Columbia	Occupational Health and Safety Regulations	Sections 7.33 to 7.38: current ACGIH TLVs®
Alberta	Occupational Health and Safety Code	Part 2: Requires employers to assess and control hazards workers may be exposed to at the work site
	Best Practice – Work Safe Alberta	Best Practice – Working Safely in the Heat and Cold
Saskatchewan	Occupational Health and Safety Regulations	Section 6–7: Thermal conditions: Provide and maintain measures to protect workers, and offer reasonable thermal comfort to workers indoor and outdoor
	Guideline - WorkSafe Saskatchewan	Working in Cold Conditions – Fact Sheet
Manitoba	Workplace Safety and Health Regulation	Section 4.12: Thermal Stress: current ACGIH TLVs® for heat and cold exposure Section 4.13: Thermal Conditions – indoor workplaces: appropriate to work being done
	Guideline – Safe Work Manitoba	Guideline for Thermal Stress

Jurisdiction	Regulation/Standard/ Guideline Exposure or Source	Occupational
Ontario	Industrial Establishment for Regulations	Section 129: minimum temperature of 18 °C Industrial establishments
	Guideline No. 33: Working In employers, extreme temperature conditions personnel	Guideline No. 33: intended to assist workers, and other workplace in understanding the effects of extreme temperatures on the body
Quebec	Regulation respecting occupational health and safety	Appropriate temperature considering the being done. Section 118: Lunch rooms - minimum temperature of 20 °C (but does not apply to facilities used as offices) Sections 121 to 124: Heat Stress Schedule IV: Standards of Temperature in Establishments. Minimum depends on work being done (e.g., heavy work 12°C; light work 20°C) Schedule V: Evaluation of Heat Stress – Outlines work/ rest schedule and Wet Bulb-Globe Temperature (WBGT) equations. Section 154: Change rooms minimum - temperature of 20 °C
New Brunswick	General Regulations	Section 21: Temperature Section 22: Extremes of Temperature / ACGIH TLVs (2016) Section 23: Competent person Section 44: Protective Clothing
Nova Scotia	Workplace Health and Safety TLVs® for Regulation	Section 2.1 and 2.3: current ACGIH heat and cold exposure (physical agents)
Prince Edward Island	General Regulations	Section 11.10 and 11.11: In an enclosed place of employment and type of work being done (e.g., heavy work 12°C; light work 20°C). Exceptions apply. Section 42.1: Current ACGIH TLVs® for extremes of temperature

Jurisdiction	Regulation/Standard/ Guideline or Source	Occupational Exposure
Newfoundland and Labrador	Occupational Health and Safety Regulations	Section 44: Reasonable and consistent Section 44: Reasonable and consistent with the nature and degree of work performed, as established by current ACGIH TLVs® Section 566: Refuge station to be at minimum 10°C
Northwest Territories and Nunavut	Occupational Health and Safety Regulations	Section 74: Thermal conditions. Appropriate to nature of the work, effective protection of worker health and safety, and reasonable thermal comfort
	Mine Health and Safety Regulations	Sections 9.57 to 9.62: Program required when thermal conditions and nature of work can cause distress. 1994-1995 ACGIH TLVs®.
Yukon Territory	Workplace Health Regulations	Section 9: Thermal environment. Reasonable and appropriate to the work performed.

ROLE OF THE JOINT WORKPLACE HEALTH AND SAFETY COMMITTEE

Across Canada, Joint Health and Safety Committees (JHSCs), workplace health and safety committees, and health and safety representatives play a critical role in identifying cold stress hazards and recommending effective prevention and control measures. Their involvement should include reviewing workplace hazard assessments, cold weather procedures, incident and near-miss reports, the availability and adequacy of warming facilities, personal protective equipment, and work-rest schedules.

Meaningful worker participation is essential to ensuring that preventive measures are practical and responsive to actual workplace conditions. Committees and representatives should raise concerns identified through workplace inspections, gather input from workers who regularly perform tasks in cold environments, and evaluate whether existing controls remain effective during periods of extreme weather or changing environmental conditions. Where gaps or deficiencies are identified, committees and representativesrshouldrmakerrecommendationsrtortheremployerrandrmonitorrtheremployer'sr response to ensure that appropriate corrective actions are implemented in accordance with applicable occupational health and safety legislation.

NEGOTIATE COLD STRESS LANGUAGE IN YOUR COLLECTIVE AGREEMENTS

“There is a time and place for everything,” the old saying goes. While few employers actually agree to all cold stress control recommendations made by union health and safety representatives or JH&SCs,rtherерisrartimerwhenremployersrdorhavertor“comertorthertable”—and that is during contract negotiation time.

Recommendations made to the employer that have been rejected during the formal JH&SC recommendation procedures in the past should be discussed with your bargaining committee and acted upon during contract negotiations. Ensure that your bargaining committee knows that cold stress languagerisrarpriorityratrcontractrtime.rDon’trletrtheremployer off the hook during this important time to protect the membership from the dangers of cold stress. Focus on the hierarchy of controls when making heat stress related demands!

USING COLD STRESS TOOLS FOR WORKER PROTECTION

There are a number of tools that can be used to measure the cold stress in the workplace. One of the tools is cold stress calculator by the Occupational Health Clinics for Ontario Workers (OHCOW). It can be used as a simple means for determining what precautions should be taken to protect workers from cold stress related adverse health outcomes. Workers can enter outdoor temperature and wind speed in the calculator to calculate the adjusted temperature or wind chill temperature.

WHO CAN HELP?



If you have concerns talk to your Supervisor and Worker Safety Representative. You have the right to know, participate, and refuse unsafe work. Unifor can also provide help. Any occupational related illness must be reported to the employer, compensation board and to the local union and the Unifor National office.

For any further questions regarding cold stress in the workplace or issues related to this fact sheet, please contact the National Health, Safety and Environment Department at healthandsafety@unifor.org

DISCLAIMER: Although every effort is made to ensure the accuracy, currency and completeness of the information, Unifor does not guarantee, warrant, represent or undertake that the information provided is correct, accurate or current. Unifor is not liable for any loss, claim, or demand arising directly or indirectly from any use or reliance upon the information.