OCCUPATIONAL-HEALTH PROGRAM

06/2026

PHYSICAL RISKS

Thermal Stress Due to Cold

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This is a translation of the original French version available at: Programmes de santé au travail pour les établissements | Commission des normes de l'équité de la santé et de la sécurité du travail - CNESST. In the event of any discrepancy or inconsistency between the French and English versions, the French version shall prevail.

Commission des normes, de l'équité,
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CNESST

1. INTRODUCTION

1.1. Context

Workers can be exposed to cold in the context of their tasks, and this in several professions and trades. Exposure to cold can occur due to outdoor weather conditions or ambient indoor conditions.

The effects on workers' health can lead to localized lesions caused by cold (frostbite), hypothermia and other effects such as musculoskeletal problems and aggravation of existing health problems. Depending on the case, it may be a question of serious medical conditions. Consequently, workplaces must set up preventive measures to eliminate this risk or, barring elimination, control it.

1.2. Legal Obligations of Workplaces Relative to This Risk

This occupational-health program (OHP) was designed in accordance with section 107 of the *Act respecting occupational health and safety* (*AOHS*). The employer has the obligation to take it into account in its prevention program (*AOHS*, section 59) or its plan of action (*AOHS*, section 61.2). This health program contains recommendations for preventing the risk linked to exposure to thermal stress due to cold. It particularly presents the preventive measures to set up in order to protect the health and safety of exposed workers. Thus, the employer must determine the occupational-health program's actions to be considered and included in its prevention program or plan of action in accordance with the situation in its workplace.

As stipulated in section 61 of the *AOHS*, the *CNESST* can order an employer to submit a prevention program or amend its content, particularly to ensure its compliance with the elements of the health programs that that body establishes. Section 127.1 of the *AOHS* stipulates that the director of Public Health can evaluate the health elements of a prevention program or plan of action and formulate recommendations for the employer, the *CNESST* and, as applicable, the health and safety committee.

The information presented in this health program includes general guidelines. For more precise preventive actions to carry out in workplaces, it is strongly recommended to consult the tools outlined in the section *To Learn More* of this document.

2. PROFILE OF THE RISK

2.1. A Glimpse

Working in the cold corresponds to a situation where the body is subject to heat loss, which can lead to harmful effects on workers' health or safety. This can occur during outdoor tasks, especially during the cold season, or indoors, during tasks in refrigerated or insufficiently heated spaces, as well as in tasks performed in cold water. In that sense, any task performed at a temperature lower than that of thermal comfort is considered as being performed in cold surroundings.

2.2. Risk Factors

The temperature of the human body is normally maintained between 36.5°C and 37.5°C. This is the result of an equilibrium between the heat produced in the body and that exchanged with the surrounding air (through the skin).

However, when the work environment Is cold, windy or humid and clothing does not provide sufficient insulation, or if the body does not generate enough heat, that equilibrium is upset. The body then risks losing its heat. To compensate, shivering increases heat generation. Further, blood circulation adjusts to reduce heat transfer: less blood is sent to the extremities and skin, which makes them more vulnerable. After a certain time, the body's temperature begins to drop, first at the extremities and then at the core.

Below a certain level, the human body functions less efficiently. The individual may feel various symptoms. Productivity drops and accidents can occur. At the extreme, too low a body temperature will lead to irreversible damage to the cells and organs and can even cause death.

The principal risk factors linked to cold are:

- presence of particular ambient thermal conditions such as a low temperature, the presence of humidity, precipitation (e.g., snow, rain, freezing rain) or wind (its effect is shown in Appendix 1: Wind Chill);
- skin contact with a cold surface (e.g., tools, controls);
- characteristics of the task to perform, in particular its duration and nature (immobile or very active; isolated work);
- characteristics of the clothing and equipment used.

More information on these factors can be found in Appendix 2: Definition of the Parameters of the Summary Assessment.

The presence of certain health characteristics or conditions[1] can have negative effects on the capacity to tolerate cold and adapt to it. Further, poor physical condition, inadequate diet, dehydration as well as use of alcohol, drugs or nicotine can also lower cold tolerance.

Finally, certain socioeconomic aspects can be factors in preparing for work in the cold (e.g., young workers, recent immigration). Other factors can influence adhesion to directives relative to these circumstances (e.g., linguistic barrier).

[1] Individuals with health problems or other sensitivities (e.g., history of cold injuries, age, disease, use of certain medications, limitation, handicap, pregnancy) should follow the recommendations of their attending physician or other health professional. Another source of information is the Government of Québec's page The effects of cold temperatures on health | Gouvernement du Québec.

2.3. Impacts of Cold on Health and Safety

The cold can have various effects on health and safety (see Figure 1).

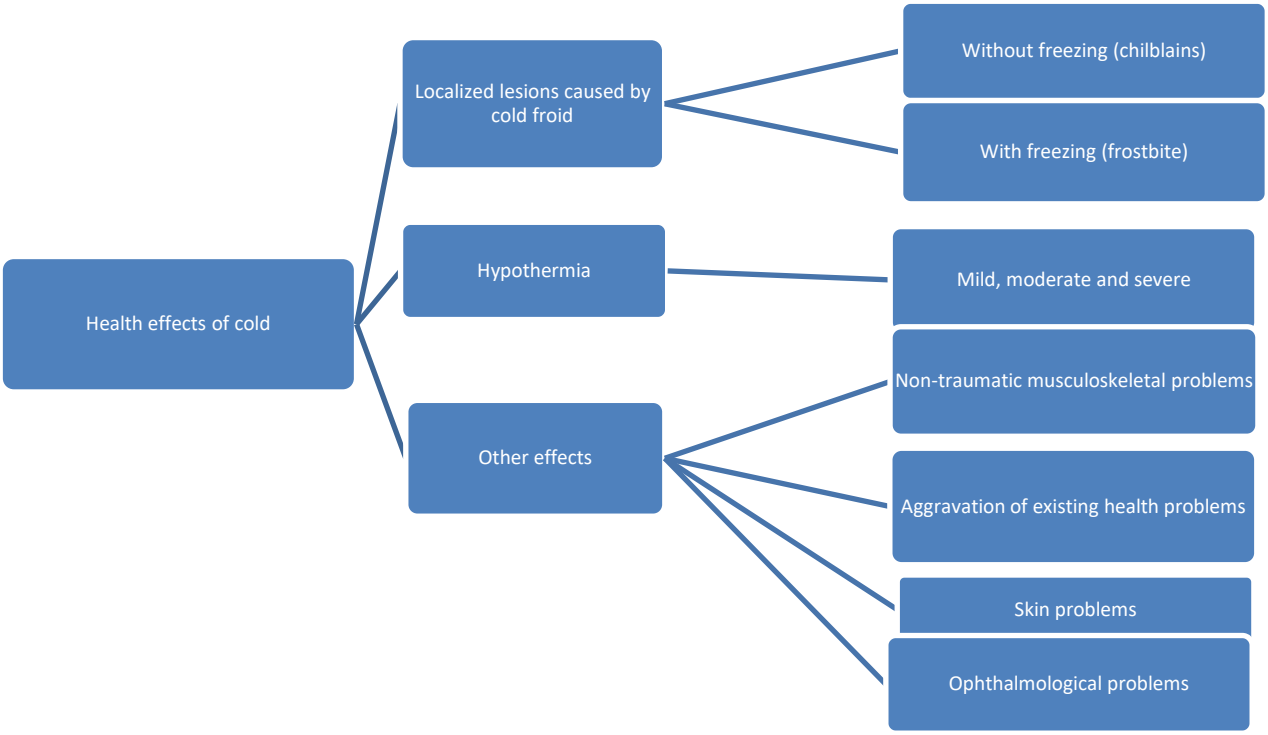


Figure 1: Effects of cold on health

2.3.1. Impacts on Health

Pregnant or Breast-Feeding Workers

In extreme cold, pregnant or breast-feeding workers could be entitled to measures such as reassignment or preventive withdrawal in accordance with the program For a Safe Maternity Experience (FSME).

2.3.1.1. Localized Lesions Caused by Cold

There are two main categories of localized lesions caused by cold: without freezing and through freezing of the human body's tissues. The extremities, such as the fingers, toes, ears, cheeks and nose, are generally the most affected.

Figure 2 presents a progression of possible signs and symptoms at the extremities, taking the hand as example.

- Reddening of skin
- Pain or burning sensation
- Tingling

- Discolouration of skin
- Whitish blotches
- Numbing sensation

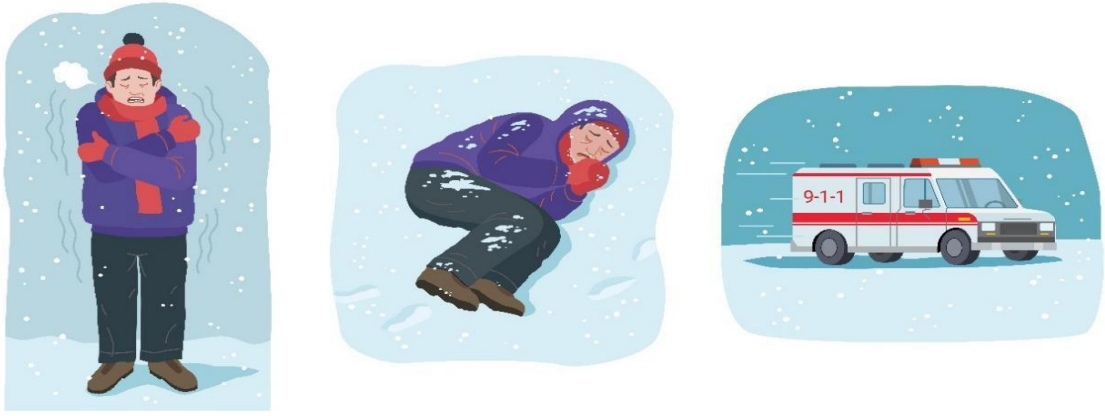
- Dead tissue (necrosis/blackened skin)
- Possible amputation



Figure 2: Progression of signs and symptoms related to localized lesions on the hand caused by cold
(Adaptation of the guide Travailler au froid : Prévenir et soigner les lésions dues au froid — 4th edition, CNESST)

2.3.1.2. Hypothermia

Hypothermia occurs when the body loses too much heat, and its internal temperature drops below 35°C. Hypothermia can be mild, moderate or severe (see Figure 3). Without adequate intervention, the individual can die.



Mild hypothermia
- Oral temperature between 32 and 35°C
- Rapid respiration and pulse
- Intense shivering
- Difficulty speaking
- Impaired judgment
- Confusion
- Trouble with coordination
- Unusual or abnormal behaviour

Moderate hypothermia
- Oral temperature between 28 and 32°C
- Reduced cardiac and respiratory rates
- Absence of shivering (≤30°C)
- Altered state of consciousness
- Dilated pupils

Severe hypothermia
- Oral temperature lower than 28°C
- Coma
- Respiratory arrest
- Cardiac arrest
- Death

Figure 3: Progression of signs and symptoms related to hypothermia
(Illustration: François Escalmel)

2.3.1.3. Other Health Effects

Exposure to cold can lead to:

- **non-traumatic musculoskeletal problems**
  - particularly when the cold forces the individual to hold a tool more tightly due to diminished sensitivity or dexterity.

  To obtain more information on musculoskeletal problems, consult the health program Risques ergonomiques : risques biomécaniques.
- **aggravation of existing health problems, such as:**
  - breathing difficulties caused by cold air-induced asthma;
  - chest pains (angina) and, in certain cases, heart attack in individuals at risk, especially during intense physical effort;
  - existing musculoskeletal problems.
- **skin and nail problems, such as**:
  - dry skin and itching;
  - Raynaud's syndrome, characterized by pallor of the extremities (e.g., fingers, toes);
  - trench foot, which can occur after prolonged exposure to cold (0 to 15°C) and humid conditions (e.g., wet, cold feet or hands). Possible symptoms are tingling, numbness, itching, pain and swelling. The skin first turns red and then can turn blue.
- **ophthalmological problems:**
  - during exposure to cold, especially in windy conditions and without adequate eye protection, it is possible for the eyes to become irritated and start tearing. In very rare cases, the cornea (transparent layer situated at the front of the eye) can freeze.

2.3.2. Impacts on Safety

The risk of workplace accidents rises in cold conditions. Several factors linked to cold can contribute to the risk, including, among others:

- ground and floor surfaces (both indoor and outdoor) made slippery by freezing temperatures;
- reduced dexterity and sensitivity of the fingers;
- reduced visibility;
- reduced stability in strong winds;
- diminished vigilance, judgment and coordination in a hypothermic state.

2.4. Regulations and Best Practices

There are no specific regulations concerning thermal stress due to cold. Section XII of the *Regulation respecting occupational health and safety* (*ROHS*) specifies the obligations relative to ambient temperature in a premise in order to ensure thermal comfort. Further, Schedule IV of the *ROHS* defines the minimal temperatures according to the work performed.

Table : Schedule of Appendix IV of the ROHS

Nature of work performed	Minimal temperature required
Light work performed while sitting, especially mental work, precision work or which requires reading or writing	20°C
Light physical work performed while sitting, electric machine sewing and work with small machine tools	19°C
Light work performed while standing, especially machine tool work	17°C
Moderate work performed while standing, assembly and trimming	16°C
Heavy work performed while standing, drilling and manual work with heavy tools	12°C

In this sense, any task performed at a temperature lower than established in this schedule necessitates adapted preventive measures.

For underwater tasks, Section 312.37 of the *ROHS* stipulates the maximum durations based on the water temperature.

There are international norms, in particular ISO 7730 and ISO 15265, which represent best practices. These norms enable evaluating the level of thermal stress based particularly on how the workers feel and on environmental parameters. To obtain further information, consult the documents in the section *To Learn More* of this document.

3. ACTIVITY SECTORS OR TASKS WITH A RISK OF EXPOSURE

Indoor work: work environments inside industrial or commercial buildings with cold conditions, especially cold rooms, refrigerated warehouses or unheated premises.

Examples of economic activity sectors at risk:

- agrifood industry;
- public services;
- retail and food businesses;
- transportation and storage.

Outdoor work: work environments subject to outdoor climate conditions, such as low temperatures that can vary during a 24-hour period or from one day to the next.

Examples of economic activity sectors at risk:

- construction sector and public works;
- forestry and mining industries;
- public services;
- agrifood industry, agriculture and fisheries;
- tourism and entertainment sector.

4. PREVENTIVE PROCESS

Taking charge of occupational health and safety (OHS) enables contributing to establishment of a sustainable culture of prevention and making the workplace healthier and safer. Success of such an efficient process relies on several prerequisites, including the active participation of the workers as well as establishment of a rigorous preventive process. The preventive process includes three steps: identify, correct and control the risk.

4.1. Identify and Assess the Risk

4.1.1. Identify the Risk

Identification of the risk starts with identifying all the work situations at risk of exposing workers to cold that can cause loss of body heat. Those situations are often characterized by a temperature below 18°C and thus discomfort.

It is therefore important to identify the situations where worker complaints are lodged (e.g., shivering, tingling in the fingers, discomfort). The absence of complaints does not mean an absence of risk. Some acclimated individuals may be exposed without feeling discomfort or may have a higher tolerance.

4.1.2. Assess the Risk

Assessment of the risk enables identifying instances of exposure that can be harmful to health, better understanding the factors influencing the risk and placing priority on the preventive measures to set up.

Exposure can be evaluated in two ways:

- **summary assessment (without measurements)**: based on information gathered from workers as well as consultation of Web sites of meteorological services (e.g., Environment Canada, Météomédia). This method generally suffices for a summary assessment of the situation. This assessment should take into account the principal risk factors, i.e., ambient temperature, humidity, air movement, contact with cold surfaces, level of physical effort necessary to the task, type of clothing worn as well as the workers' opinions relative to their comfort;
- **in-depth assessment (with measurements)**: carried out using a specialized measuring instrument and a more comprehensive assessment of the workers' clothing and metabolism. Several scientific methods exist for analyzing and interpreting comfort and thermal stress, in particular the use of PMV, PPD and IREQ[2] indices or strategies for assessing working conditions (see ISO 15265 norm). These precise methods could guide you in the preventive measures to establish (e.g., level of thermal insulation for clothing, time limits for the work). These methods require a professional or technician with training in occupational hygiene or a specialist in best practices.

[2] The PMV (Predicted Mean Vote), PPD (Predicted Percentage of Dissatisfied) and IREQ (Required Clothing Insulation) indices are tools adapted for evaluating and quantifying comfort and thermal stress due to cold in a group of persons in a given environment. Each focusses on different aspects: the PMV predicts the average thermal sensation in a group of persons, the PPD estimates the percentage of those persons dissatisfied with that sensation and the IREQ measures the thermal stress due to cold. The PMV and the PPD are defined by the ISO 7730 norm for moderate thermal environment, whereas the IREQ is defined by the ISO 11079 norm for cold environments.

In the context of the present health program, the recommendation is to conduct a summary assessment of the risk level and then apply recommendations corresponding to the determined risk level. If the initial result established according to Table 3 proves to be a high or very high risk (orange or red), the summary assessment must be repeated after implantation of those initial remedies. If the risk remains high or very high (orange or red), the recommendation will then be to proceed with the in-depth assessment. Until that in-depth assessment is conducted and the appropriate measures are established, daily management of the risk is required (see Appendix 1). This procedure is summarized in Figure 4.

It is important to regularly reevaluate the risk, especially when the working conditions change and after application of preventive measures (see Section 4.2).

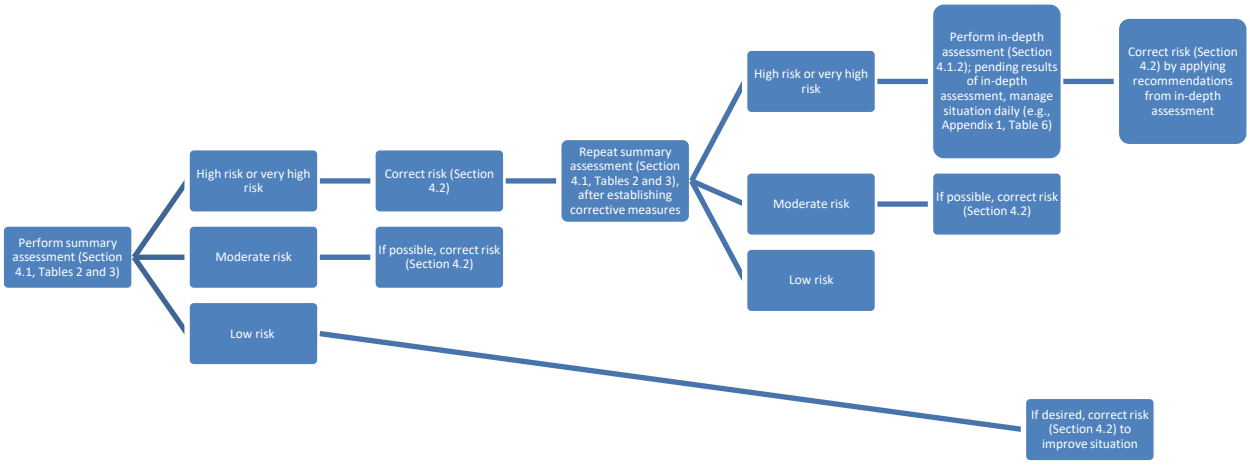


Figure 4: Recommended process for assessing risk

4.1.2.1. Summary Assessment (Adapted from the ISO 15265 Norm and the SOBANE Strategy)

Step 1: For each work situation, it will be necessary to evaluate the six parameters[3] as well as the level of comfort according to the four available options depending on the **real work situation (taking into account the existing preventive measures)**.[4]

[3] Appendix 2 contains the definitions and the strategies for selecting the option that corresponds to each parameter to be evaluated.
[4] Appendix 3 to the present document provides an example of the assessment of a work situation.

Table 2: Evaluation criteria for the six parameters, the work situation and the level of comfort

Parameter to evaluate	Comfortable	Acceptable	Problematic	Very problematic
1. Temperature in general	18 to 24°C	10 to 17°C	0 to 9°C	Below 0°C
2. Ambient humidity	Dry skin	Clammy skin	Damp skin or clothing	
3. Air movement	No air movement	Light movement of cold air	Moderate movement of cold air	Strong air movement
4. Conduction	No contact with cold surfaces	Cold felt on skin after 2 to 3 minutes (without contact)	Cold felt through clothing/gloves upon direct contact with cold surfaces or objects	Direct contact with cold, metallic objects or surfaces
5. Physical workload	Physical workload does not cause perspiration and does not involve prolonged immobility		Causes perspiration OR close to physical immobility	Causes heavy perspiration OR involves immobility
6. Required clothing	Specialized multi-layer technique normally used in extreme situations	Cumbersome, heavy (e.g., coat) or specialized for cold or humidity or depends on batteries for heating	Long, heavier (e.g., long-sleeved top and thick pants)	Light and poorly adapted to cold

Comfort level	Comfort	Slight discomfort	Moderate discomfort	Great discomfort
Workers' opinions	Workers not uncomfortable in work situation	Workers feel slight discomfort due to cold (e.g., cold fingers)	Workers feel discomfort due to cold (e.g., numb feet and hands, cold felt throughout body)	Workers feel great discomfort due to cold (e.g., shivering, difficulty working due to cold felt throughout body)

Step 2: The risk level (low, moderate, high or very high) is determined using the table below, according to the evaluation of the six parameters and depending on level of comfort.

Table 3 : Table for evaluating risk level

		Level of comfort			
		Comfort	Slight discomfort	Moderate discomfort	Great discomfort
Evaluation of the six parameters	At least one "very problematic" factor	Moderate risk	High risk	Very high risk	Very high risk
	No "very problematic" factors AND At least one "problematic" factor	Moderate risk	High risk	High risk	Very high risk
	No "very problematic" or "problematic" factors AND At least one "acceptable" factor	Low risk	Moderate risk	High risk	High risk
	All factors classified as "comfortable"	Low risk	Low risk	Moderate risk	Moderate risk

Step 3: Based on the risk level identified in Table 3, consult the box describing the corresponding risk level and formulate recommendations.

For workplaces that opt for the method of in-depth assessment, the expected results can be interpreted particularly through Table 6 of the ISO 15265 norm.

Very High Risk

The conditions are very dangerous and can quickly cause serious injury. The risk of localized injury and hypothermia is very high.

Necessary actions:

- If applicable, avoid work in cold conditions or postpone tasks to a warmer period.
- If it is impossible to avoid or postpone tasks, quickly determine the problematic parameters in order to eliminate them or, barring that, control them by **immediately** establishing measures in accordance with the hiérarchie des mesures de prévention (see Section 4.2).
- After establishing preventive measures, repeat the summary assessment. **If the result remains in the category "Very high" or "High," an in-depth assessment will be necessary.**
- Pending completion of this process (establishment of preventive measures or result of the in-depth assessment), it will be necessary to **check the wind-chill factor daily** and to establish basic preventive measures (see Table 6 in Appendix 1).

Recommended actions:

- Refer to the ISO 7730 and ISO 11079 norms (in-depth assessment) to determine the preventive measures most appropriate to the work situation.
- Contact the *Réseau de santé publique en santé au travail* (*RSPSAT*) [Public-health network for occupational health] or your PHO for support in choosing the preventive measures to

High Risk

The conditions are dangerous and can quickly cause serious injury. The risk of localized lesions and hypothermia is high.

Necessary actions:

- If possible, avoid work in cold conditions or postpone tasks to a warmer period.
- Determine the problematic parameters in order to eliminate them or, barring that, control them by establishing preventive measures in accordance with the hiérarchie des mesures de prévention (see Section 4.2) and establish the deadline for applying the measures.
- After establishing preventive measures, repeat the summary assessment. **If the result is in the category "Very high" or "High," an in-depth assessment will be necessary**.

Recommended actions:

- Pending completion of this process (establishment of preventive measures or result of the in-depth assessment), it will be necessary to **check the wind-chill factor daily** and to establish basic preventive measures (see Table 6 in Appendix 1).
- Refer to the ISO 7730 and ISO 11079 norms (in-depth assessment) to define the preventive measures most appropriate to the work situation.
- Contact the *Réseau de santé publique en santé au travail* (*RSPSAT*) or your PHO for support in choosing the preventive measures to establish.

Moderate Risk

The conditions can cause considerable thermal discomfort.

Recommended actions:

- Determine the problematic parameters in order to eliminate them or, barring that, control them by establishing preventive measures in accordance with the hiérarchie des mesures de prévention (see Section 4.2) and establish the deadline for applying the measures.

Low Risk

The conditions can cause mild thermal discomfort.

Recommended actions:

- Consider establishing preventive measures by referring to the hiérarchie des mesures de prévention (see Section 4.2) and plan a deadline for applying them.
- Regularly monitor the work situation in order to be able to quickly note any change that could raise the level of exposure.

4.2. Correct the Risk

Once the situations at risk are identified, preventive measures must be determined and applied in order to protect the workers against the health effects of cold. Those measures must be chosen and adapted to the tasks to be performed. They must comply with the hiérarchie des mesures de prévention. It will be necessary to reevaluate the preventive measures during the day. The actions may be organized in the form of a list.

To obtain additional information on the preventive measures, consult the documents in the section *To Learn More* of this document.

4.2.1. Elimination at the Source and Replacement

To the extent possible, it is preferable to avoid or limit work in the cold, as ambient conditions can be difficult to modify. If doing so is impossible, a combination of preventive measures must be established.

4.2.2. Technical Control

The measures for technical control aim to reduce exposure to cold by modifying the design or layout of workstations. Below are some examples of measures that can be applied to indoor or outdoor work or both:

- provide the workers with a heated environment (e.g. room, shelter, vehicle);
- insulate metallic surfaces, handles and bars;
- install shields preventing or limiting exposure to wind (outdoors) or drafts (indoors);
- provide heating equipment (e.g., space heater, stove, patio heater).

Caution must be exercised with heating equipment, which can cause carbon-monoxide poisoning! Avoid using fuel-burning heating equipment (e.g., propane, natural gas) in enclosed or poorly ventilated spaces. Consult the fiche de tolérance zéro and the Web page Monoxyde de carbone for more information.

4.2.3. Signage

The signage used in workplaces helps inform workers and make them more aware of the risks related to cold. This can entail, for example, putting up a poster or placing a thermometer at the entrance to a cold room or on the surface of cold metallic objects.

4.2.4. Administrative Measures

Administrative measures aim at organizing work so as to reduce the duration of exposure to cold. Below are some examples of measures that can be applied to indoor or outdoor work or both:

- plan work while taking ambient conditions (temperature, humidity, wind speed, precipitation) into account;
- draw up and carry out a plan to manage work in cold conditions which particularly includes applicable preventive measures in accordance with temperature and the persons responsible:
    - as much as possible, limit the duration of work in cold conditions;
    - minimize the number of persons working in a cold environment;
    - use a schedule alternating between work and warming periods[5];
    - consider each worker's tolerance to cold when assigning full work shifts in cold conditions;
    - as much as possible, allow workers to organize their tasks, establish their own pace and decide when to take breaks.
- minimize prolonged periods of immobility, whether sitting or standing;
- limit excessive perspiration caused particularly by clothing that retains sweat or by intense effort (e.g., slow down the work pace, rotate tasks);
- provide hot drinks without alcohol (avoid caffeine and energy drinks);
- train and inform the workers on the risks linked to work in cold conditions and on how to protect themselves in such conditions;
- ensure mutual monitoring of signs and symptoms among the workers or by a supervisor;
- provide a reliable bidirectional means of communication in cold weather for workers who are isolated or alone.

4.2.5. Individual Protective Equipment and Clothing

Individual protective equipment and clothing (e.g., insulated clothing, boots, gloves, tuques, neck gaiters, hoods) must be adapted to the ambient conditions, the requirements of the tasks and the regulatory requirements when applicable.

- privilege multiple layers of clothing over one thick layer. The outer layer should be windproof and sufficiently waterproof. The layer next to the skin must provide insulation and wick moisture away from the skin in order to keep the person dry (avoid cotton and opt for synthetic materials or wool)6. Clothing must not hinder the evaporation of perspiration;
- ensure availability of a change of clothing in order to remain dry;
- choose insulated clothing or accessories (e.g., mittens, socks, coat, vests, hand warmers) according to conditions;
- ensure proper thermal protection for the head (tuque or safety helmet with insulated liner);
- privilege slip-resistant, waterproof footwear with adequate insultation.

[5] For more information on schedules alternating between work and warming periods, refer to section 5.2.1 du guide Travailler au froid : Prévenir et soigner les lésions dues au froid of the *CNESST*.

[6] Consult the European norms NF EN 14058 (for clothing suitable for cold conditions down to -5°C), NF EN 342 (for clothing suitable for cold conditions below -5°C) and NF EN 343 (for clothing suitable for rain) when selecting clothing best adapted to the ambient conditions.

4.3. Control the Risk

To ensure that the identified situations at risk are eliminated or controlled, control measures must be established. Such control measures must be taken into account when selecting the preventive measures and must include clearly defined deadlines, re-evaluation schedules and the names of the persons responsible therefor.

4.3.1. Monitoring Measures

Regularly observe and assess working conditions, respect for preventive measures and the health of individuals in order to quickly identify any danger or change in situation which could affect safety:

- supervise workers to check adequate application of preventive measures;
- inspect equipment (e.g., heaters, shelter) to ensure proper functioning and efficiency;
- install measuring instruments (e.g., thermometer, weather sensor) or use meteorological services (e.g., Environment Canada) to monitor weather conditions.

4.3.2. Evaluation Measure

Evaluate, analyze and interpret the effectiveness of the preventive measures established:

- regularly evaluate whether the established measures and management plan are effective, especially by interviewing personnel members.

4.3.3. Maintenance Measure

Maintain machines, equipment or installations or return them to an optimal state of operation:

- plan the preventive maintenance of machines, equipment, tools and ventilation or heating systems to ensure their optimal operation.

4.3.4. Follow-Up Measures

Ensure structured and periodic follow-up to the established preventive measures to make sure the risks remain under control at all times:

- train new personnel members to recognize situations at risk and to use the preventive measures properly;
- regularly remind the workers of the procedures and proper work practices, particularly when planning for periods of intense cold and during those periods;
- apply the policy on the purchase of machines, equipment, tools and ventilation systems in order to limit exposure to cold (e.g., privilege the purchase of equipment with insulated controls);
- integrate considerations for reducing exposure to cold when designing a project (e.g., plan efficient layout of warming zones).

5. FIRST AID AND SPECIFIC FIRST AID

The table below presents the recommendations for first aid and specific first aid for lesions with or without freezing as well as for hypothermia.

Table 4: First aid and specific first aid for lesions with or without freezing as well as for hypothermia

First aid and specific first aid	Lesions **without frozen** tissue	Lesions **with frozen** tissue	**Hypothermia**
What to do			
Call 911 in case of moderate or severe hypothermia = medical emergency	-	-	✓
Dial 811 (Info-Santé)	✓	✓	✓
Move the victim to a warm location	✓	✓	✓
Remove wet or damp clothing and replace with dry clothing	✓	✓	✓
Warm the victim by wrapping him/her in blankets or through skin-to-skin contact	✓	✓	✓
Warm the affected zone gradually with body heat (e.g., place his/her fingers in armpits) or through immersion in warm water (37°Cto 39°C)	✓	✓	-
Limit energy expenditure to a minimum while keeping the victim awake	-	-	✓
Administer warm, sweetened drinks without alcohol or caffeine	-	-	✓
DO NOT warm the affected/frozen zone with a direct heat source (e.g., oven, flame, dryer), given the risk of burns	✓	✓	-
DO NOT re-expose to cold once the affected zone has been warmed	✓	-	-
DO NOT rub or massage the frozen zone	-	✓	-

First aid and specific first aid	Lesions **without frozen** tissue	Lesions **with frozen** tissue	**Hypothermia**
DO NOT attempt to walk on frozen feet, except to move to a warm location	-	✓	-
DO NOT warm the frozen zone IF IT IS LIKELY to get cold again, in order to avoid aggravating the lesion	-	✓	-
DO NOT make the victim walk	-	-	✓
DO NOT attempt to warm the victim by making him/her move	-	-	✓
DO NOT warm the extremities and body at the same time, as that will move cold blood to the body's core and lower body temperature	-	-	✓
DO NOT make the victim smoke or drink alcohol to warm him/her, as that can lower the body temperature even more	✓	✓	✓

If cold is among the risks identified by the establishment, it will be necessary for the workers to receive training in first aid to treat localized lesions caused by cold and hypothermia.

6. SERVICES PROVIDED BY THE *RSPSAT* TEAMS

The *Réseau de santé publique en santé au travail* (*RSPSAT*), jointly with its partners and in accordance with the legal mandates assigned to it under the *AOHS*, the *Public Health Act* (*PHA*) and the *Act respecting health services and social services* (*AHSSS*), sees to the protection of workers' health as well as prevention by supporting workplaces in assuming their obligations in matters of the prevention of occupational injuries. With its multidisciplinary teams (medical, nursing, occupational health, ergonomics, psychosocial risks, etc.) possessing experience in occupational health and entirely funded by the *Fonds de la santé et de la sécurité du travail*, it has provided its services free of charge throughout the territory of Québec since adoption of the *AOHS* in 1979.

More precisely, concerning the risk of exposure linked to thermal stress due to cold, the *RSPSAT* can particularly:

- help in identifying and assessing work situations that could entail health risks due to cold;
- provide an environmental assessment to help document situations of exposure to cold;
- inform workers about the health effects of this risk;
- support and advise the workplace in terms of the preventive measures to establish;
- evaluate the effectiveness of the established preventive measures;
- support the workplace in maintaining those measures;
- support the organization of first aid and specific first aid.

For more information on the service offer, consult the *RSPSAT*'s Web site.

7. SERVICES PROVIDED BY OTHER PARTNERS OF THE *CNESST*

The *CNESST*'s other partners contribute in several ways to supporting workplaces in taking charge of occupational health and safety. The *associations sectorielles paritaires (ASP)* provide the following services for their members:

- customized advice and assistance;
- training and information;
- research and development on the prevention of occupational accidents and diseases.

If you are member of an *ASP*, you can find out more about the services available to you.

The *Institut de recherche Robert-Sauvé en santé et en sécurité du travail* (*IRSST*) provides a service of loaning direct-measurement instruments (e.g., air temperature and relative humidity meters, wind gauges) as well as calibration and repair of such instruments.

8. TO LEARN MORE

8.1. Additional Information for Workplaces

Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST)

- Guide *Travailler au froid : Prévenir et soigner les lésions dues au froid — 4e édition de la CNESST*
- Guide *Secourisme en milieu de travail— 4e édition de la CNESST*

Réseau de santé publique en santé au travail (RSPSAT)

- Dossier thématique sur le froid

Association sectorielle paritaire

- Les risques liés au travail à l'extérieur et en milieux naturels au Québec — APSSAP
- Video L'habillement pour le travail par grand froid *from the APSM*

Institut national de santé publique du Québec (INSPQ)

- Dossier thématique sur le froid

Statutes and regulations

- *Act respecting occupational health and safety*
- *Regulation respecting occupational health and safety*

Other sources

- SOBANE strategy: Ambiances thermiques de travail

8.2. Additional Information for Specialized Interveners

International norms

- ISO 7730:2025, Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria
- ISO 15265: 2024, Ergonomics of the thermal environment - Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions
- NF EN 14058+A1: 2023, Protective clothing - Garments for protection against cool environments
- NF EN 342:2017, Habillement de protection : ensembles vestimentaires et vêtements de protection contre le froid
- NF EN 343:2019, Protective clothing – Protection against rain
- NF EN 343:2012, Sapeurs-pompiers : équipements de protection individuelle

APPENDIX 1: WIND CHILL

Wind chill is the sensation of cold caused by the combined effect of temperature and wind. In winter, the wind-chill index in weather applications corresponds to "perceived temperature." Table 5 enables estimating wind chill depending on wind and temperature. Thus, if the outside temperature is -30°C and the wind speed is 10 km/h, the perceived temperature is -39. Table 6 indicates the basic preventive measures recommended according to wind chill.

Table 5: Wind chill according to air temperature and wind speed

		Wind speed										
		0 km/h (no noticeable wind)	5 km/h (smoke indicates direction)	10 km/h (weather vanes move)	20 km/h (small flags flap)	30 km/h (small branches shake)	40 km/h (small trees sway)	50 km/h (large branches shake)	60 km/h (walking becomes difficult)	70 km/h (small branches break)	80 km/h (buildings damaged)	90 km/h (trees uprooted)
		Wind chill										
Air temperature	-1C	-1	-3	-5	-7	-8	-9	-10	-10	-11	-11	-12
	-2C to -4C	-3	-5	-7	-9	-10	-11	-12	-13	-14	-14	-15
	-5C to -7C	-6	-8	-10	-13	-14	-15	-16	-17	-18	-18	-19
	-8C to -10C	-9	-12	-14	-17	-18	-19	-20	-21	-22	-23	-23
	-11C to -13C	-12	-15	-18	-20	-22	-23	-24	-25	-26	-27	-27
	-14C to -16C	-15	-19	-21	-24	-26	-27	-29	-30	-30	-31	-32
	-17C to -19C	-18	-22	-25	-28	-30	-31	-33	-34	-35	-35	-36
	-20C to -22C	-21	-25	-28	-32	-34	-35	-37	-38	-39	-40	-40
	-23C to -25C	-24	-29	-32	-36	-38	-39	-41	-42	-43	-44	-45
	-26C to -28C	-27	-32	-36	-39	-42	-43	-45	-46	-47	-48	-49
	-29C to -31C	-30	-36	-39	-43	-46	-48	-49	-50	-51	-52	-53
	-32C to -34C	-33	-39	-43	-47	-50	-52	-53	-54	-56	-57	-58
	-35C to -37C	-36	-42	-46	-51	-53	-56	-57	-59	-60	-61	-62
	-38C to -40C	-39	-46	-50	-54	-57	-60	-61	-63	-64	-65	-66
	-41C to -43C	-42	-49	-53	-58	-61	-64	-65	-67	-68	-69	-71
	-44C to -46C	-45	-53	-57	-62	-65	-68	-69	-71	-72	-74	-75

(Adaptation of Tables 2 and 4 of the guide Travailler au froid : Prévenir et soigner les lésions dues au froid — *4e édition*, *CNESST*. Wind-chill indices calculated using https://meteo.gc.ca/windchill/wind_chill_f.html and adaptation of Beaufort wind scale table).

Table 6: Basic preventive measures according to wind chill

Basic preventive measures	Wind chill								
	-1 to -6	-7 to -27	-28 to -34	-35 to -37	-38 to -40	-41 to -43	-44 to -47	-48 to -54	-55 to …
	Normal work	Precautions	Additional precautions				Urgent work only		
Monitor wind-chill index (or perceived temperature) every day and every 4 hours to plan work and the measures to take.	√	√	√	√	√	√	√	√	
Dress warmly and appropriately for the task.	√	√	√	√	√	√	√	√	
Keep dry, change clothing, socks or gloves as needed.	√	√	√	√	√	√	√	√	
Plan a long break of at least 30 minutes in a heated location after a work period of 4 hours.	√	√	√	√	√	√	√	√	
Plan 10-minute breaks in a heated location to avoid exceeding a work period of:	-	120 minutes*	75 minutes*	55 minutes*	40 minutes*	30 minutes*	10 minutes*	5 minutes*	
Ensure mutual monitoring for numbness or whitening of the face and extremities (fingers, toes, ears, nose) or any unusual or abnormal behaviour. As needed, administer first aid and specific first aid (see Section 5).	-	After 30 minutes	After 10 minutes	After 10 minutes	After 10 minutes	après 5 minutes	After 2 minutes	After 2 minutes	
Remain active.	-	√	√	√	√	√	√	√	
Wear several layers of warm clothing under a windproof layer and wear a hat, insulated mittens or gloves, a scarf and insulated, waterproof footwear.	-	√	√	√	√	√	√	√	
Cover all exposed skin and wear a balaclava or mask. Consider eye protection.	-	-	√	√	√	√	√	√	
Rotate between tasks and prepare to shorten the duration of outdoor activities.	-	-	√	√	√	√	√	√	
Prepare to cancel outdoor activities.	-	-	√	√	√	√	√	√	
Remain indoors and cancel outdoor activities.	-	-	-	-	-	-	?	?	√

* Duration valid only for active work with appropriate dry clothing. In case of work that is nearly physically immobile, maximum duration should be that in the column to the right.

(Adaptation of Tables 3 and 4 of the guide *Travailler au froid : Prévenir et soigner les lésions dues au froid — 4e édition de la CNESST*, Based on *Saskatchewan Department of Labour, Occupational Health and Safety Division, "Working in Cold Conditions."* Adaptation of booklet "*Threshold Limit Values (TLV) and Biological Exposures Indices (BEIs)"* published by the ACGIH, Cincinnati, Ohio, 2024, page 226.)

APPENDIX 2: DEFINITION OF THE PARAMETERS OF THE SUMMARY ASSESSMENT

Parameter	Definition
Temperature	In general, it is considered that the lower the air temperature, the more the human body risks losing heat. This parameter is evaluated by measuring the raw temperature on site with a thermometer or by consulting the Web sites of meteorological services to obtain the raw temperature.
Humidity	Heat loss is heavily influenced by the humidity level in the air or the dampness of clothing. The presence of perspiration in the absence of appropriate clothing can dampen the inner layers of clothing and affect their insulating properties, accelerating heat loss. This parameter can be evaluated by analyzing the workers' opinions and the type of tasks (e.g., whether the task is very physical and if the worker perspires heavily).
Air movement	In general, it is considered that the stronger the wind, the more the human body risks losing heat. This parameter can be evaluated using a wind gauge or by consulting the Web sites of meteorological services, but also through local observations. For example, wind speed can be estimated by observing trees and flags. Thus: • a light wind will cause movement of a flag or the leaves on trees; • a moderate wind will blow leaves up from the ground or can be a strong wind that comes in through a door (est un fort vent extérieur qui entre par une porte); • a strong wind will cause blowing snow and limit visibility in the distance.
Conduction	Conduction, such as contact with a cold surface, accelerates heat loss (for example, direct contact between skin and a metal object: the resulting heat loss by conduction can be very significant and cause lesions).
Physical workload	A body that is immobile or nearly so does not generate enough heat to compensate for the loss caused by exposure to cold. Conversely, physical activity that is too intense can lead to heavy perspiration and wet clothing, especially if the clothing hinders evaporation.
Required clothing	Proper insulation, especially through layering, use of certain materials or an adequate thickness, better retains heat close to the body and limits heat loss. Protection of the extremities and the face should also be considered in the evaluation.

APPENDIX 3: SAMPLE ASSESSMENT OF A WORK SITUATION AT RISK

1. Identification and Initial Assessment of the Risk

Conditions at work	Parameters	Level of risk
Profession: grocery-store butcher • Temperature of 5°C • Low ambient humidity • The workers complain that they feel cold and that it is very drafty • Clothing can get damp • Contact with metal instruments • Absence of a source of radiant heat	Temperature ➔ 0 to 10°C (problematic)	Presence of at least one "very problematic" factor and moderate discomfort ↓ **Very high risk**
	Ambient humidity ➔ Clammy skin (acceptable)	
	Air movement ➔ Light movement of cold air (acceptable)	
	Conduction ➔ Contact with cold surfaces (very problematic)	
	Physical workload ➔ Close to physical immobility (problematic)	
	Required clothing ➔ Long, heavier (problematic)	
	Workers' opinions ➔ Moderate discomfort: the workers feel discomfort due to cold (e.g., numb feet and hands, sensation of cold throughout the body)	

2. Identification and Assessment of the Risk after Establishment of Preventive Measures

Conditions at work	Parameters	Level of risk
Profession: grocery-store butcher • Temperature of 5°C • Low ambient humidity **Technical control**: • Contact with metal surfaces → Insulate metallic surfaces, handles and bars • Schedule rotation of positions (reduction of exposure time) **Individual protective equipment:** • Clothing can get damp → Ensure availability of changes of waterproof clothing After establishment of preventive measures, the workers reported that the situation improved and that they are no longer uncomfortable.	Temperature ➔ 0 to 10°C (problematic)	No "very problematic" factors and At least one "problematic" factor and comfortable ↓ **Moderate risk**
	Ambient humidity ➔ Clammy skin (acceptable; with changes of clothing available, the situation improved and the workers' clothing no longer gets damp)	
	Air movement ➔ Light movement of cold air (acceptable)	
	Conduction ➔ No contact with cold surfaces (comfortable)	
	Physical workload ➔ Close to physical immobility (problematic)	
	Required clothing ➔ Long, heavier (problematic)	
	Workers' opinions ➔ Comfortable (with a schedule of rotating positions and access to changes of clothing, the workers' opinions improved)	

The *CNESST* and the *MSSS* wish to thank the following partners for their participation in creating the occupational-health programs:

For any requests for general information, you may contact the *CNESST*.