

STAYING SAFE AND WARM IN COLD WEATHER ENVIRONMENTS

Make like a Boy Scout and be prepared for working in cold weather environments.

By Roger Paquette

The weather outside can be frightful this time of year and presents many hazards for employees who work in harsh and extreme environments. Cold weather – especially cold weather in harsh and extreme environments – presents safety managers and workers with hazards above and beyond the norm.

So while the golden rule of a positive work site culture of safety remains the same – to follow the safety manager’s directives – managers and employees should consider the following key issues when preparing to work in the winter cold.

Understand the Cold

It is important not to talk in terms of “getting cold.” “Cold” is more than just a temperature. It includes additional environmental elements such as humidity and wind speed, as well as worker variables such as physical activity.

So while people do not “get cold,” they do lose heat – the heat that is generated based on their body’s physical activity and metabolism. This is why a person standing on a street corner at -15 F waiting for a bus feels much colder than a person jogging past that same street corner. Physical activity causes the body to generate more thermal energy, resulting in higher body heat. A person’s metabolism also regulates his or her body’s heat.

When working in a cold environment, workers lose heat and their body temperature drops. A person’s body automatically fights that change because it wants to maintain a normal, healthy temperature. The body’s reaction is to shiver, since movement generates heat.

Muscles tense in the cold. It becomes harder to work and workers tire faster. Work is slowed, and workers take more breaks. Though the first casualty of the cold may be efficiency, safety also is impacted. By instinct, most employees show a greater propensity to “work safe” when they are comfortable. Often, despite best efforts, they become less safe when they are cold.

Employees tend to move more slowly and are less comfortable



when working in bulky or heavy clothing that makes it harder to move and to do the job. They more easily are fatigued and perhaps less focused, either due to being tired or the fact that their bodies are busy concentrating on their own internal temperatures. Workers can lose dexterity in their feet or hands, and it becomes harder to grip tools or ladders in certain weather conditions.

All this is much more than a productivity issue; it is a critical safety concern. And it could make the difference between life and death.

Like the Scouts, Be Prepared

At the work site, employers assume the bulk of the responsibility to protect employees from the effects of working in cold environments. It is up to workers to work safely, utilize their assigned personal protective equipment (PPE) and monitor their physical condition for signs of cold-related issues. However,

employers provide the resources – from work site to work gear – that enable the workers to do their jobs comfortably and safely.

In such environments, employers assume the responsibility to:

- Monitor upcoming temperature forecasts, wind chill factors and relative humidity.

- Supply workers with proper cold-weather apparel, plus thermal undergarments, hand protection and properly insulated headgear and footwear. It is better to take off layers than to not be protected if the temperature falls.

- Monitor workers for any signs of skin discoloration or frostbite. In a true culture of safety, this responsibility extends not only to employers and supervisors, but also to fellow workers.

- Plan for adequate breaks to be taken indoors. Again, this is a shared responsibility.

- Monitor, on a continuing basis, for potentially worsening weather conditions.

Following a hazard assessment that specifically incorporates the cold or harsh working environment – as well as other conditions of the job and site – safety managers must select the appropriate PPE for the environment and applications. Keep in mind that people do not get cold, they lose heat, so it also is important to note that cold-weather PPE does not generate heat. It insulates the wearer from the environment. Some additional issues regarding the selection and assignment of cold-weather PPE include:

- Apparel must consist of an outer shell with a water-repellent moisture barrier (prevents wind and humidity from passing through).

- High-performance thermal insulation should trap heat generated from the body inside the garment to reduce heat loss.

- Insulated undergarments (T-shirts and shorts are not enough) are designed to permit addition (and removal) of clothing over them, as with layers of an onion. This helps regulate body temperature. Again, it is better to take off a layer than to not have a layer to add.

- Properly insulated headgear and footwear should be worn.

- Closures (zippers, drawstrings, hooks-and-loops) that will resist cold conditions should be employed around openings (wrist, waist, neck, face).

- Storm flaps over closures and other openings will keep out the elements and



reduce thermal loss.

For workers in harsh environments – such as miners, oil and gas workers, welders, maintenance crews and electrical maintenance and utility workers – safety assessments also should include a look at potential hazards such as open flames, sparks, molten metal, flash fires or flames created by electrical arcs. Just because it is cold, the risk of fire does not decrease. There is no relationship between weather conditions and fire hazards. Fire is as dangerous in the Arctic Circle as it is in Florida; flames are flames. These environments require cold-conditions fire-retardant (FR) protective clothing.

When working in proximity to mobile equipment or vehicles, high-visibility colored apparel should be considered. The addition of retro-reflective bands also should be considered if working in low-light conditions or at night.

Introduce Yourself to Clo

Clo is a rating to determine the amount of insulation that allows a person, at rest, to maintain thermal equilibrium. Measurements of the resistance to dry heat

loss provided by clothing can be used to determine thermal comfort in cold-to-comfortable environments. Many factors affect how cold or warm a person feels, including individual metabolism during low and high physical activity.

The Clo rating (see chart below) accounts for the thermal resistivity of a garment – meaning how resistant the garment is to thermal loss. As an example, a Clo value of 1 would be the insulating value of clothing needed to maintain a person in comfort, sitting at rest in a room 70° F (21° C) with air movement of 0.1 m/s and humidity less than 50 percent.

The Clo system is much more common in Europe than in the Americas. Its general adoption in the United States would help dispel some of the misunderstandings about winter clothing and working in cold weather. Again, the clothing does not generate the heat, the body does.

Work Smart

Given the additional hazards involved, it is even more critical for workers in cold-weather environments to work

Clothing	Insulation Value	Clo	m2K/W
Nude	--	0	0
Undergarments	T-shirt, briefs, and socks	0.15	0.023
Shirt	Normal with long sleeves	0.2	0.031
Pants	Normal full-length trousers	0.25	0.039
Jacket	Suit jacket	0.35	0.054
Shoes	Thick-soled shoes	0.04	0.006