

TerranearPMC Safety Share

Robert Brounstein

Week of January 14, 2019 – Cold Temperature Extremes

Many years ago, I found myself working outdoors in the Upper Peninsula, Michigan (aka the UP) in the middle of Winter. At this time in my life I was living in Southern California and hadn't experienced snow or cold weather since my youth in New York. What a shock it was to be rudely reminded of the feeling of icicles forming in your nose as you inhaled. After a few months of this weather, I made up my mind that should I ever have the choice between extreme cold and extreme heat, I'd take the heat. Yes, triple digit temperatures can be uncomfortable, but sub-zero freezing was painful. That summer I found myself wearing a full-face respirator (APR – not a powered air supplying unit) in the Mohave Dessert where temperatures exceeded 110° F. As the saying goes, "Be careful what you wish for!"

Anyone working in a cold environment may be at risk to cold stress. What constitutes extreme cold and its effects can vary between different areas of the country. In regions that are not used to winter weather, temperatures slightly above 32 °F can be perceived as extreme cold. A cold environment forces the body to work harder to maintain its temperature. Whenever temperatures drop below normal heat can leave your body quite rapidly. And when there are windy conditions heat loss can be further exacerbated as the wind forces the heat from your body at an even faster rate. For example, when the air temperature is 40°F, and the wind speed is 35 mph, the effect on the exposed skin can produce a physiological condition where the air temperature feels like 28°F.

Cold stress occurs by driving down the skin temperature and eventually the internal body temperature (core temperature). This may lead to serious health problems, and may cause tissue damage, and possibly death.

Some of the risk factors that contribute to cold stress are:

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

In a cold environment, most of the body's energy is used to keep the internal core temperature warm. This is consistent with a National Geographic presentation about living in Vladivostok and the Far Eastern Federal District of Russia, where it is said that those who work outdoors in this region spend 80% of their energy maintaining their body temperature. Yes, one can lose considerable weight by expending ones' caloric intake by working in extreme cold environments. But this can also be extremely dangerous! Over time, the body will begin to shift blood flow from the extremities (hands, feet, arms, and legs) and outer skin to the core (chest and abdomen). This shift allows the exposed skin and the extremities to cool rapidly, thus increasing the risk of frostbite and hypothermia. Combine this scenario with exposure to a wet environment, and trench foot may also be a problem; a disease first described during WWI trench warfare where soldiers were situated in wet environments while temperatures typically remained above freezing; only for many to succumb to foot and toe amputations.

Hypothermia occurs when body heat is lost faster than it can be replaced and the normal body temperature (98.6°F) drops to less than 95°F. While hypothermia typically occurs at very cold temperatures, it can occur at temperatures above 40°F, when a person becomes chilled from rain, sweat, or submersion in cold water. As an example, it has been reported that at least 2 fatalities occurred during the Alaska Exxon Valdez Oil Spill in 1989 as they accidentally fell into the water. While the water



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temperature was slightly above freezing, a few members of the clean-up crew fell off their boats and were submerged in the ocean waters for only a few minutes: enough time to lose enough heat which resulted in their death.

Mild symptoms of hypothermia include involuntary shivering (generated as a physiological response for the body to generate heat). Moderate to severe symptoms are initiated when the body temperature continues to fall while shivering stops. A person may lose coordination and fumble with items, becoming confused and disoriented. He or she may be unable to walk or stand, pupils become dilated, pulse and breathing become slowed, and loss of consciousness can occur.

This condition requires immediate medical assistance. The person needs to be moved to a warm, dry area while wet clothes are removed. Cover the body (including the head and neck) with layers of blankets; and with a vapor barrier (e.g. tarp, garbage bag). Do **not** cover the face.

Give warm sweetened drinks if the person is alert (but no alcohol), to help increase the body temperature. NEVER give a drink to an unconscious person. Place warm bottles or hot packs in armpits, sides of chest, and groin.

If a person is not breathing or has no pulse, call 911 for emergency medical assistance immediately. Check him/her for signs of breathing and for a pulse every 60 seconds. If after 60 seconds the affected worker is not breathing and does not have a pulse, trained workers may start rescue breaths. This needs to be performed by persons trained in CPR.

Although OSHA does not have a specific standard that covers working in cold environments, OSHA's General Duty Clause does require employers to provide their workers with a place of employment which is free from recognized hazards, which are causing or are likely to cause death or serious physical harm to them (Section 5(a)(1) of the Occupational Safety and Health Act of 1970). Thus, employees need to be trained on the hazards of the job and safety measures to use, such as engineering controls and safe work practices, that will protect workers' safety and health. For example, radiant heaters may be used to warm workers in outdoor security stations. If possible, shield work areas from drafts or wind to reduce wind chill.

Dressing properly is extremely important to preventing cold stress. The type of fabric worn also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, silk and most synthetics, on the other hand, retain their insulation even when wet. Wear at least three layers of loose fitting clothing. Layering provides better insulation. Do not wear tight fitting clothing. An inner layer of wool, silk or synthetic helps to keep moisture away from the body. A middle layer of wool or synthetic provides insulation even when wet. An outer layer should protect against wind and rain while allowing for ventilation to prevent overheating. Other ancillary clothing for cold extremes include:

- Wearing a hat or hood to help keep your whole body warmer. Hats reduce the amount of body heat that escapes from your head.
- Use a knit mask or balaclava to cover the face and mouth.
- Use insulated gloves to protect the hands.
- Wear insulated and waterproof boots.

How can you expect a man who's warm to understand one who's cold? - Alexander Solzhenitsyn

