



Ergo Tip of the Month - December 2007

Cold Stress- Effects and Controls

Winter has arrived, and with it the COLD weather. This can spark a new challenge for those individuals who are exposed to the cold air, whether it is in an outdoor environment (construction, boat docks, railway, etc.) or an inside environment (food processing, meat packing, etc.).

Working in cold environments can result in reduced productivity and increased accident/injury rates as cold stress creates discomfort, impairs physical tasks, decreases muscular strength, and reduces mental alertness.

Cold stress is a condition marked by an abnormally low internal (core) body temperature. It develops when body heat is lost to a cool, or cold, environment faster than it can be replaced. In order for the human body to function properly, it must sustain a core temperature of 98.6° F (+37° C).



Ailments Due to Cold Temperatures

Chilblain: An inflammation of the hands and feet due to prolonged and repeated exposure to cold and moisture. The affected skin area will become red in color, with a sensation of tingling and pain. Treatment involves elevation of the affected part with slow re-warming.

Trench foot: Results from body parts being exposed to damp/wet, cold (in between freezing and 50°F/+10°C) environment for a prolonged period of time. Tingling, itching or burning sensations are common symptoms. If a person wears wet gloves for a prolonged period of time, a similar condition persists with the hands. Treatment involves soaking feet (or hands) in warm water and wrapping in dry cloths.

Frostbite: Usually affecting localized areas such as the extremities (fingers, toes, ears, nose), frostbite is a state of frozen extra cellular fluid in the skin cells, or obstructed blood flow to the area. Treatment involves moving to a warm environment and loosening any tight clothing that surrounds the affected area. Do not massage or apply heat to the area. Protect with warm, insulating, material.

Hypothermia: A condition in which the body's core temperature decreases to below 95°F (35°C). Warning signs can include nausea, fatigue, uncontrollable shivering, stiff muscles (particularly in the neck, arms and legs), poor coordination, slowed breathing and heart rate, and mental confusion. Initial symptoms can be seen within a drop of approximately 2°C in core temperature.

This is a dangerous and complicated medical problem that requires immediate professional attention. Some suggestions for first aid include, insulating the victim with dry blankets/towels/clothing, placing warm objects around the core of the body, removing any tight clothing. Avoid hot baths.



Controlling Exposure

Risk Assessment and Monitoring: Workplace air temperature conditions should be measured at regular intervals and whenever there are changes in processes, procedures, and controls.

The American Conference of Governmental Industrial Hygienists (ACGIH) has adopted Threshold Limit Values (TLVs) for working at temperatures below freezing. The TLVs are intended to protect healthy workers, wearing "proper" dry clothing, from the severest effects of cold stress and cold injury.

Further, ISO/TR 11079 provides a method of measuring risk of cold working environments, accounting for clothing insulative value, metabolic power, etc. The clothing insulation required for thermal equilibrium (IREQ_{min}), for thermal comfort (IREQ_{neutral}), and a wind chill index (WCI) can be calculated.

Acclimatization period for new employees: This allows the body to gradually build up tolerance to their working environment. Approximately 1 week is acceptable, for the average individual.

Education and awareness: Continuous training and education about the signs and symptoms of cold stress is key to a safe work place. This training should also include understanding of the emergency procedures, evacuation plans, and preventative measures.

Personal Protective Equipment: Dress in layers, wear a hat, wear proper footwear, and protect the face, ears, and nose from the cold. Ensure clothing has been approved for the temperatures worked in. The resources/links below are excellent resources for specific clothing to wear in cold environments.

Healthy Lifestyle: a healthy, balanced diet, in conjunction with physical conditioning, help protect against cold stress. Proper rest and regular water intake can improve the ability to work in cold environments.

Additional Resources and Links

American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Physical Agents, 7th Ed. Publication#0100DocP/A (2001). Available at, <http://www.acgih.org/store/ProductDetail.cfm?id=654>

Canadian Center for Occupational Health and Safety (CCOHS). Available at, http://www.ccohs.ca/oshanswers/phys_agents/

International Organization for Standardization. ISO/TR 11079:1993. "Evaluation of cold environments—Determination of required clothing insulation (IREQ)", (1993).

U.S. Department of Labor Occupational Safety and Health Administration (OSHA). Publication 3156 "The cold stress equation". Available at, <http://www.osha.gov/Publications/coldcard/coldcard.html>

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