osha
DEPARTMENT OF LABOR AND INDUSTRY

MNOSHA heat-stress guide

I. Introduction

Heat stress may occur year-round in foundries, kitchens, or laundries, or only a few days during the summer in almost any work setting.

Heat stress can be as much of a problem in Minnesota as in other regions of the country where high temperatures are common during the summer. This is because people usually do not have the opportunity to become acclimatized and stay acclimatized in climates such as Minnesota's where daily high temperatures can vary up to 30 degrees from one day to the next during the summer.

Heat stress can result in several illnesses as well as decreased productivity and increased likelihood of injuries. Minnesota's heat stress standard is designed to protect employees against the risk of heat-induced illnesses and unsafe acts.

Heat stress results from a combination of internal (body) heat production from doing work and external heat exposure from the environment. Both aspects need to be addressed to properly control heat stress.

Minnesota Rules 5205.0110, subpart 2a, which was revised in July, 1997 and can be found in Appendix A, is the Minnesota OSHA standard for heat exposure. The standard is based on the wet bulb globe temperature (WBGT) and level of work activity. Typically, one will determine the WBGT by using a heat stress monitor, or by using a sling psychrometer and the nomogram in Appendix B to obtain effective temperature, then converting effective temperature to WBGT. Appendix C contains some examples of conditions that approximate the limits under the standard. If the heat stress limit is approached or exceeded, Employee Right-to-Know requirements specified in Minnesota Rules 5206.0700, subparts 1 and 3, "Training Program for Harmful Physical Agents" and Minnesota Rules 5206.1100 "Labeling Harmful Physical Agents; Label Content" also apply.

The following pages contain a discussion of heat disorders, prevention of disorders, methods for evaluating heat stress, and methods of control.

II. Heat disorders

Heat stroke

Symptoms: Usually hot, dry skin; red, mottled or bluish. Sweating may still be present. Confusion, lose of consciousness, convulsions. Rapid pulse. Rectal temperature greater than 104ºF. When in doubt, treat as heat stroke. Can be fatal.

Treatment: ***Medical emergency***. Call paramedics and start cooling victim immediately. Remove victim to a cool area. Soak clothing and skin with cool water, and use a fan to create air movement. Shock may occur. Medical treatment is imperative.

Cause: Partial or complete failure of sweating mechanism. The body cannot get rid of excess heat.

Prevention: Acclimatization. Close monitoring of workers for signs of heat illness. Medical screening. Drink plenty of water.

Heat exhaustion

Symptoms: Fatigue, weakness, dizziness, faintness. Nausea, headache. Moist, clammy skin; pale or flushed. Rapid pulse. Normal or slightly elevated temperature.

Treatment: Have victim rest in a cool area and drink fluids.

Cause: Dehydration causes blood volume to decrease.

Prevention: Acclimatization. Drink plenty of water.

Heat syncope

Symptoms: Fainting while standing erect and immobile. A variant of heat exhaustion. Symptoms of heat exhaustion may precede fainting.

Treatment: Move victim to a cool area. Have victim rest and drink fluids.

Cause: Dehydration causes blood volume to decrease. Blood pools in dilated blood vessels of the skin and lower body, making less blood available to the brain.

Prevention: Acclimatization. Drink plenty of water. Avoid standing in one place. Intermittent activity to avoid blood pooling.

Heat cramps

Symptoms: Painful muscle spasms in the arms, legs or abdomen during or after hard physical work.

Treatment: Rest. Drink water and eat more salty foods.

Cause: Not well understood. May be due to a lose of salt from sweating. Dehydration is a factor.

Prevention: Adequate water intake and adequate salt intake at meals. Do not use salt tablets.

Heat rash

Symptoms: "Prickly heat"; tiny, raised, blister-like rash.

Treatment: Keep skin clean and dry.

Cause: Skin is constantly wet from sweat. Sweat gland ducts become plugged, leading to inflammation.

Prevention: Shower after working in hot environment. Keep skin dry.

Transient heat fatigue

> **Symptoms:** Decline in performance, particularly in skilled physical work, mental tasks, and those requiring concentration.
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> **Treatment:** No treatment necessary unless other signs of heat illness are present.
>
> **Cause:** Discomfort. Stress from the heat less than what would result in other heat illnesses.
>
> **Prevention:** Acclimatization and training.

Note: Alcohol, prescription drugs and other drugs can increase the possibility of heat disorders occurring even if used the previous day.

III. Prevention

The two most important methods of preventing heat disorders are hydration and acclimatization because they increase the ability of the body to tolerate heat stress. Engineering and administrative controls are important in reducing heat exposure, and are discussed in Section V.

Hydration

The most important factor in preventing heat illnesses is adequate water intake.

> 1. Thirst is not an adequate indicator. Relying on thirst will result in dehydration.
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> 2. Once the body becomes dehydrated, it is more difficult to rehydrate because the gut does not absorb water as well. Adequate water intake throughout the day is necessary.
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> 3. Workers should drink at least five to seven ounces of cool water every 15-20 minutes.
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> 4. Under conditions of profuse sweating, a commercial electrolyte replacement drink may be appropriate. Some drinks are too concentrated and need to be diluted or consumed along with water.
>
> 5. Salt tablets are to be avoided. Salt tablets irritate the stomach and can lead to vomiting, which results in further dehydration.

Acclimatization

A physiological adaptation will occur with repeated exposure to hot environments. The heart rate will decrease, sweating will increase, sweat will become more dilute, and body temperature will be lower. The ability to acclimatize varies among workers. Generally, individuals in good physical condition acclimatize more rapidly than those in poor condition.

Approximately one week of gradually increasing the workload and time spent in the hot environment will usually lead to full acclimatization. On the first day the individual performs 50 percent of the normal workload and spends 50 percent of the time in the hot environment. Each

day an additional 10 percent of the normal workload and time is added, so that by day six, the worker is performing the full workload for an entire day. The exposure time should be at least two hours per day for acclimatization to occur.

Acclimatization is lost when exposure to hot environments does not occur for several days. After a one week absence, a worker needs to reacclimatize by following a schedule similar to that for initial acclimatization. The acclimatization will occur more rapidly, so increases in workload and time can increase by approximately 20 percent each day after the first day, reaching normal work conditions by day four.