



सत्यमेव जयते



भारत सरकार/Government of India

श्रम एवं रोजगार मंत्रालय/Ministry of Labour & Employment

खान सुरक्षा महानिदेशालय/Directorate General of Mines Safety



No.DGMS(Tech) Circular(OH)/ 01

Dhanbad, dated 24.04.2023

To

The Owner, Agent and Manager of all Mines

Subject: Accidents/incidents due to exposure to high temperature

Sir/Madam,

1. During peak summer every year, many incidences of mine workers getting affected due to exposure to high atmospheric temperature get reported. Some such cases had even turned into fatalities. Opencast mines during summer are most vulnerable in this regard. In some cases, persons get affected due to heat in underground mines also, mostly due to inadequate ventilation. Inquiries revealed that in most of the cases "Heat stroke" was the major contributory cause. Hence, the mine management shall educate all the field officers, supervisors and workmen on the illnesses due to exposure to high atmospheric temperature, so that they can take necessary precautions and also render proper first-aid without delay.

2. Physiological effects of working in high atmospheric temperature:

Sweating, which is the release of fluid through sweat glands in the skin, helps release heat, but it must evaporate in order to cool the body. While working in high atmospheric temperature, a person's body is restricted from releasing heat from the body to the atmosphere. As a result, heavy sweating takes place, which results into loss of mineral salt along with fluid from the body. Heat-related illnesses, each of which can occur alone or in combination with others, are generally classified and handled as follows:

- i. **Heat rash** is in the form of tiny red blisters usually on the areas of more sweating like neck and upper chest, in the groin, under the breasts, and in elbow creases. It is caused due to continuous presence of unevaporated sweat. Regularly washing and drying the skin are the important precautions from it. In case formation of blisters takes place, care should be taken, not to burst them.
- ii. **Sun-burn** is the damage to the skin, mostly the superficial layer (Epidermis), causing the skin to be purplish. The person suffering from it, feel hot and feverish. In more severe cases, fluid-filled blisters form which can get infected. Application of cold compresses to the sunburned areas, gives some relief. The suffering person also can be given cool sponging. In case, formation of blisters takes place, care should be taken, not to burst them, to avoid skin infection.
- iii. **Heat fatigue** is indicated in a person with impaired and inadequate performance in jobs that require skill involving adeptness in neuro-muscular activities as well as good judgment and vigilance. In all such cases, the affected person shall be taken to a cooler place and shall be kept there till his recovery.

- iv. **Heat cramps** are severe muscle pains along with spasms; generally take place in the abdomen, arms, or legs. Cramps often affect people who sweat a lot during strenuous activity. They can be caused by both too much and too little salt consumption, resulting into electrolyte imbalance in the body. In such condition, affected persons to be given lightly salted water (1/4 tablespoon of table salt per quart of water) or a beverage that replaces lost electrolytes. If the cramps don't subside in about one hour or the person is on a low-sodium diet or has a history of heart problems, medical attention to be sought without delay.

- v. **Heat syncope** (fainting due to heat) occurs when the adequate quantity of blood fails to reach the brain due to movement of more blood towards the skin for throwing off the body heat into the atmosphere. In hot atmosphere more fluid is also lost in the form of sweat, resulting less quantity of body fluid available to the heart for pumping to the Brain. Under such scenario, brain is unable to function properly, in absence of adequate nutrient and Oxygen, causing giddiness, nausea and sudden collapse. The facial skin also becomes pale in most cases. In such situation the affected person shall be immediately taken to a cooler place and if the person is at least in semi-conscious state, he can be given water (or a clear juice or sports beverage) slowly. If the person is totally unconscious, medical attention to be sought immediately.

- vi. **Heat exhaustion (dehydration)** occurs when a person fails to replenish enough fluid and minerals in the body due to excessive sweating, resulting into electrolyte imbalance. Inadequate electrolyte in the body causes disturbance in the brain causing symptoms like headache, nausea, vertigo, weakness, thirst, palpitation and muscle cramps. The victim's skin becomes moist, the complexion pale or flushed. Left untreated, Heat exhaustion can lead to Heat Syncope or even Heat stroke. It is vital that the affected person drinks lots of lightly salted water (1/4 tablespoon of table salt per quart of water) or a beverage that replaces electrolytes. Plenty of rest away from heat is also important. In severe cases the affected person may require medical advice as well.

- vii. **Heat stroke** (sun stroke) is the most serious amongst all heat-induced illness. It's caused by fatigue of body cooling mechanism and lack of sweating due to continuous exposure to high atmospheric temperature, resulting into an accelerating rise of body temperature. In such condition Brain as well as all other vital organs of the body unable to function normally. Symptoms include throbbing headache, confusion, hallucinations, slurred speech, convulsions, fainting and coma. The skin becomes hot and dry, the pulse becomes rapid, and blood pressure low. Body temperature can soar up to 106°F (41°C) or more. Heat stroke can cause irreversible damage to the body and is life threatening. This condition can be fatal unless rapid and adequate treatment is obtained. After removing the victim to a cooler area, immediately cooling of the skin to be facilitated by loosening the clothing, spraying with cool water and a fan, or body sponging with chilled water. Medical attention to be sought without any delay while attempting to cool down the body of the affected person.

3. Dealing with exposure to the environments of high temperature issues in mines

Problems due to exposure to high surrounding temperature can be reduced in mines by adopting proper engineering measures, suitable work practices and use of proper Personal protective equipment including clothing.

A. Engineering measures:

- a. Rest shelters shall be provided at all the locations, within a reasonable distance from the places where persons have to work directly under the sun. As far as practicable, the temperature in the Rest shelter should be maintained below 25°C.
- b. To provide cool drinking water to the employees at 10 to 15°C.
- c. Proper mine ventilation to be provided for supplying cool air to the work place or air-conditioning of the work place, in case natural cool air is not available.
- d. Covered drainage or insulated piping for a speedy transfer of hot water to the surface, in order to control the problem of hot ground water heating up the underground mine environment.

B. Administering suitable work practices: When Engineering measures alone fail to prevent workers from suffering from heat stress, a combination of engineering measures and following work practices shall be adopted:

- a. To take frequent breaks and reasonably short work periods.
- b. To perform heavy tasks in cooler areas or at a time, when atmospheric temperature is reasonably low
- c. To adopt job rotation for personnel exposed to high atmospheric temperature.
- d. To encourage all employees to drink a cup of water every 15 to 20 minutes and to drink lightly salted water.
- e. To encourage to take extra salt at meals as per the health condition of the employees.
- f. To increase awareness on effects of consuming drinks with caffeine, alcohol and excess sugar.

C. Personal Protective Equipment and clothing: Clothing worn in hot conditions should ideally be made of cotton and not too tight. Loose clothes; on the other hand, puts the wearer at risk of being caught/pulled into moving parts of machinery. Most of the reflective clothing does not allow air exchange through them; hence reflective clothing should be worn as loosely as practicable. During mines rescue operations, personal protective equipment and self-contained breathing apparatus should not be worn continuously for more than two hours.

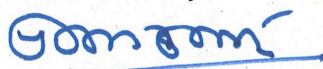
4. Conclusion

Working in environments with high-temperature causes several other illnesses varying from heat Rashes to heat stress. The symptoms include confusion, hallucinations, chills, throbbing headache, and loss of consciousness, convulsions, slurred speech, and coma. These illnesses are also manifested as frustration, rage, and other emotions that might lead to hasty, short-cut unsafe acts and risky behaviour.

The above guidelines are helpful to address the issues related to extreme to high temperatures.

Therefore, the mine management shall take the suitable measures to deal with the situation and to prevent the persons working in mines from getting exposed to high atmospheric temperature, which have an adverse effect on health.

Yours faithfully,



(Prabhat Kumar)

Director General of Mines Safety