

FACT SHEET | NOVEMBER 2017

Heat stress – underground metalliferous mines

Heat stress occurs when the body’s means of controlling its internal temperature starts to fail. Air temperature, humidity, air flow, work rate, acclimatisation, radiant temperature and clothing (including personal protective equipment) are all factors that can contribute to heat stress. It may not be obvious to underground workers that they are at risk of heat stress. Workers may be exposed to heat stress and other potentially harmful health effects from working in hot and humid conditions underground.

Exposure to hot and humid conditions

The body reacts to heat by increasing the blood flow to the skin’s surface and by sweating. This cools the body as heat is carried to the surface from within by the increased blood flow and as sweat evaporates. Heat can also be lost by radiation and convection from the body’s surface.

Health risks

Heat stress can affect individuals in different ways and some workers may be more susceptible to it than others.

Typical symptoms are:

- muscle cramps
- heat rash
- severe thirst – a late symptom of heat stress
- fainting
- heat exhaustion – fatigue, giddiness, nausea, headache, moist skin
- heat stroke – hot dry skin, confusion, convulsions and eventual loss of consciousness. This is the most severe disorder and can result in death if not detected at an early stage.

Risk factors
• Lack of acclimatisation
• Dehydration
• Drug and alcohol use
• Medical conditions (e.g. diabetes cardiovascular disease, gastroenteritis)

Indications of heat stress in an underground worker performing heavy manual tasks in a hot and humid environment are listed below:

- sweat evaporation is restricted by the type of clothing and the humidity of the underground environment. Air flow velocity is also a factor at temperatures below core body temperature as this also aids evaporation of sweat
- heat will be produced within the body due to the work rate and if insufficient heat is lost core body temperature will rise
- as core body temperature rises, the body reacts by increasing the amount of sweat produced, which may lead to dehydration

- heart rate also increases which puts additional strain on the body
- if the body is gaining more heat than it can lose then the core body temperature will continue to rise. Eventually it reaches a point where the body's control mechanisms start to fail.

The symptoms will get worse the longer someone remains working in the same environment.

Your obligations

Under the *Work Health and Safety Act 2011* (WHS Act), a person conducting a business or undertaking (PCBU) has the primary duty to ensure, so far as is reasonably practicable, workers and other people are not exposed to health and safety risks arising from the business or undertaking.

This duty includes eliminating exposure to heat stress, so far as is reasonably practicable. For example, ensure work areas are effectively ventilated and monitored. If it is not reasonably practicable to do so, then risks must be minimised so far as is reasonably practicable.

The Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 requires a mine operator to manage risks and implement a range of control measures including by implementing:

- a principal hazard management plan for air quality or dust or other airborne contaminants (clauses 23-25)
- a health control plan that sets out the means by which the operator will manage the risks to health associated with mining operations (clause 26)
- control measures (including monitoring) to manage heat stress in places at the mine where (i) people persons work or travel, and (ii) the wet bulb temperature exceeds 27° Celsius. (clause 38).

Elimination and control

To reduce worker exposure to heat stress a number of control measures may be required. Recommended control measures (but not limited to) are:

1. Adequate ventilation velocities and quantities supplied to areas where heat is generated.
2. Regular inspections and monitoring of hot and humid areas.
3. Hydration testing for workers exposed to hot and humid conditions.
4. Regular rest breaks including job rotation to ensure workers can be adequately rehydrated.
5. Ensure workers are adequately supervised and actively monitored for signs of dehydration and heat-related illnesses.
6. Ensure workers who are to work in hot and humid areas are acclimatised.
7. Workers should be trained in identifying the causes and symptoms of heat stress.
8. Ensure workers are able to minimise the effects of heat stress and to stop work when necessary.

What you should do

Review your strategy and safety management system to manage heat stress to ensure they comply with the legislative requirements. Underground mines should ensure their approach to the management of this hazard is in line with the available guidance material and reflects accepted, effective control practice.

More information

For more information and guidance on managing mining hazards and risks associated with exposure to heat stress view the following resources:

- [A method to protect mine workers in hot and humid environments](#) - Maurice Sunkpal, Pedram Roghanchi, Karoly C. Kocsis
- [Government of Western Australia – Department of Commerce. Working safely in hot conditions.](#)
- AIOH, (2013) [A guide to managing heat stress: Developed for use in the Australian Environment.](#)

→ NIOSH, (2016) [Criteria for a recommended standard: Occupational exposure to heat and hot environments.](#)

HSE, (2007) [Prevention of heat stress in mines.](#)

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