

PROCEDURE FOR
MANAGEMENT OF HEAT STRESS

Responsible Officer:

Approved :

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1.0 Scope

This procedure applies to all sites where there is a potential for excessive exposure to hot thermal environments.

2.0 Objectives

To establish and maintain systems to enable persons at sites to reduce the effects of exposure to thermal hazards.

Heat stress is a recognized occupational health and safety hazard and a key element contributing to other safety incidents. Where situations of excessive thermal exposure are identified, they should, where practicable be eliminated or the appropriate control methods implemented and supervised.

3.0 Actions

3.1 Training

Training shall be conducted for all personnel likely to be involved with:

- High thermal environments;
- Physically demanding work at elevated temperatures; or
- The use of plastic or other impermeable clothing.

Any combination of the above situations will further increase the risk.

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The training should encompass the following:

1. Mechanisms of heat exposure;
2. Potential heat exposure situations;
3. Recognition of predisposing factors;
4. Effects of using alcohol and drugs in hot environments;
5. Early recognition of symptoms of heat illness;
6. Prevention of heat illness;
7. First aid treatment of heat related illnesses ;
8. Management & control; and
9. Medical surveillance programs and the advantages of employee participation in programs

First Aid personnel will be trained in the use of the Heat Illness Record.

Training of all personnel in the area of heat stress management shall be recorded on their personal training record.

3.2 Water Replacement

Of primary importance in the control of heat related illness is the adequate supply of cool and palatable water. Cool drinking water shall be made available at the site for all jobs in hot conditions. Where access to drink fountains is limited, personnel shall be supplied with insulated drink containers for use in these areas.

3.3 Self-Determination

Through training, individuals should be able to identify the early onset of symptoms of heat related illnesses and determine the controls to be used ie. short breaks, drinking water.

With the initial recognition of the early signs of heat related illness, the progression on to the serious illnesses can be avoided.

3.4 Work Scheduling

Persons responsible for work schedules involving work in situations that may lead to thermal illnesses should where practical, re-schedule jobs to early morning or late in the day rather than during the hotter parts of the day.

3.5 Controls and Personal Protective Equipment

Where possible, the option of removing personnel from the source of heat shall be considered before any other measures are taken.

3.5.1 Engineering Controls:

- Ventilation, air cooling, fans, shielding and insulation are the major types of engineering controls used to reduce heat stress in hot work environments.
- Work teams will ensure, where necessary there are available:
 - Portable canopies, tarpaulins or other shade equipment that is easily erected, dismantled and cleaned

3.5.2 Administrative Controls and Work Practices:

Management of Heat Stress

Reduce work load by:

- Reducing physical demands of work, eg excessive lifting, digging
- Mechanising tasks
- Frequent rest pauses in cool areas
- Use of shifts, eg early morning, cool part of the day or night
- Use relief workers
- Use worker pacing
- Allow unacclimatised people time to acclimatize and give them light tasks for the first few days in a job.
- Supply cool drinking water next to or near the work site:
 - Encourage people to have small frequent drinks of water.
 - Salt or electrolyte additives should only be used as directed by medical personnel.
- Provide a cool area for people to have meals, where practicable.
- Develop work procedures and instructions to ensure the hazards of heat exposure are addressed
- Work teams to carry out risk assessments and develop checklists to monitor compliance with the Heat Stress Policy
- All equipment, clothing and personal protective equipment is to comply with the relevant standards and be available to all employees

Where the work environment cannot be fully controlled via engineering or administrative controls the utilisation of personal protective equipment may be required.

Items such as reflective suits, cooling jackets or vests and personal air cooling devices such as Vortex tubes may be required.

3.6 Clothing

An individual's thermal balance in warm environments is influenced by the clothing worn, based on the thermal insulation, the evaporative resistance, colour and coverage of the material. When selecting clothing the following factors should be considered.

- Slightly loose fitting clothing allows for better ventilation and air circulation and hence evaporative cooling. Caution must be exercised that it is not excessively loose if working near machinery.
- Where there are radiant heat loads, insulation will play an important role in the clothing factor, hence a thicker material may be more suitable. i.e. cotton drill.
- Where the task may involve potential contact with molten metal the clothing shall have such properties as to reduce the effect of accidental contact.
- Protection from ultra violet radiation for the prevention of skin cancer is also required, hence long sleeve shirts and pants should be worn.

The recommended type of clothing will be a mid tone coloured textile, which will allow air circulation for evaporation of sweat, provide insulation from radiant heat, protection from ultra violet radiation and some resistance to contact burns.

3.7 Work Load

Metabolism plays a very important role in the way the body balances heat. Whenever a person undertakes some form of work it will generate heat, increasing the core temperature. Hence the higher the workload the greater the potential for a core

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temperature increase. For this reason the metabolic workload associated with any task must be included in any heat stress risk assessment and/or index calculation.

3.8 Acclimatisation

This is a response by the body that results in increased heat tolerance. Whilst 90% acclimatisation is obtained in 4-5 days it is readily lost in approximately the same amount of time.

Acclimatisation shall be considered when planning work that may involve employees recently back from extended recreation leave in cooler climates.

3.9 Assessment

A risk assessment shall be undertaken for potential heat stress situations. The level and extent of the assessment will vary and be dependent on the complexity and nature of each situation but should proceed using the following protocol.

1. Identification of a potential heat stress situation.
2. Undertake a basic thermal risk assessment (see Attachment 1). This will require the measurement of some environment parameters.
3. If the results indicate there is a likelihood of a heat-induced illness occurring then a full thermal risk assessment should be carried out (see Attachment 3). Depending on the situation this may involve the use of a second level assessment tool such as ISO 7933 Required Sweat Rate Index. From this assessment suitable controls should be developed.
4. If results from the full assessment indicate an allowable exposure time of less than 30 minutes then physiological monitoring should be considered and measures taken to reduce the risk of exposure i.e. controls.
5. Work involving the use of impermeable clothing in hot conditions should be assessed using physiological monitoring.
6. Physiological monitoring results are to be recorded.

3.10 Medical Screening

Where an employee's job may involve exposures to high thermal environments for the majority of a shift cycle, on an ongoing basis, it is advisable that the pre-employment medicals be directed at areas addressing heat intolerance. Examples may be maintenance crews that undertake boiler or condenser cleans or online cooling tower work on a regular basis. Some areas and indicators are:

- Circulation impairments;
- Obesity;
- Skin conditions affecting sweating;
- Age; and
- Heart condition.

3.10 Health Monitoring

Whenever a heat illness case presents itself, details should be accurately recorded.

This data may then be used to:

- Assist in the identification of problem areas,
- Identify trends that may be developing.
- Monitor the effectiveness of controls.

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An example of a heat illness record is included as Attachment 2.

4.0 Responsibilities of Personnel

The following personnel should assume the primary responsibility for the activities covered by this procedure:

Company Name is responsible for:

- minimising employees exposure to excessive heat;
- providing controls that will protect employees from the effects of heat and radiation;
- where necessary providing appropriate personal protective equipment; and
- providing training in the use of the equipment

Employees are responsible for:

- following the correct work procedures;
- using the equipment provided; and
- ensuring the equipment is looked after and kept clean and serviceable.

5.0 Definitions

Heat Stress - Environmental heat and humidity, metabolic work load and clothing, individually or combined create heat stress for the worker.

6.0 Reference Documentation

International Standards Organisation. *“Hot Environments - Analytical Determination and Interpretation of Thermal Stress Using Calculation of Sweat Rate”*. ISO 7933: 1989.

Heat Stress Management Program for Nuclear Power Plants, Electric Power Research Institute Project Number NP-4453, 1986.

Parsons, K. C., *Human Thermal Environments*, Burgess Science Press, 1993.

ACGIH, 2000 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

Occupational Exposure to Hot Environments - Revised Criteria, DHHS (NIOSH) Pub No 86-113, 1986.

British Occupational Hygiene Society, Technical Guide No 12, The Thermal Environment (second edition). H and H Scientific Consultants Ltd, Leeds, UK. 1996

Di Corleto, R., Cole, G., Firth, I., *Heat stress & Documentation Developed for Use in the Australian Environment*. Australian Institute of Occupational Hygienists. March 2003

7.0 Attachments

- 7.1 Basic Thermal Risk Assessment
- 7.2 Heat Illness Record
- 7.3 Risk Assessment Checklist

8.0 Document History

Issue Date	Nature of Changes
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Management of Heat Stress

	Original Issue

7.1 Attachment 1

BASIC THERMAL RISK ASSESSMENT

HAZARD TYPE	Assessment Point Value		
	1	2	3
Hot Surfaces	Contact Neutral <input type="checkbox"/>	Hot on Contact <input type="checkbox"/>	Burn on Contact <input type="checkbox"/>
Exposure Period	< 30 min <input type="checkbox"/>	30 min - 2 hours <input type="checkbox"/>	> 2 hrs <input type="checkbox"/>
Confined Space	No <input type="checkbox"/>		Yes <input type="checkbox"/>
Task Complexity	Simple <input type="checkbox"/>	Moderate <input type="checkbox"/>	Complex <input type="checkbox"/>
Climbing, ascending, descending	None <input type="checkbox"/>	Moderate <input type="checkbox"/>	Significant <input type="checkbox"/>
Distance from cool rest area	<50 Metres <input type="checkbox"/>	50-100 Metres <input type="checkbox"/>	>100 Metres <input type="checkbox"/>
Distance from Drinking Water	<30 Metres <input type="checkbox"/>	30-50 Metres <input type="checkbox"/>	>50 Metres <input type="checkbox"/>
Clothing (permeable)	Single layer (light) <input type="checkbox"/>	Single layer (mod) <input type="checkbox"/>	Multiple Layer <input type="checkbox"/>
Respiratory Protection (negative pres.)	None <input type="checkbox"/>	Half Face <input type="checkbox"/>	Full Face <input type="checkbox"/>
Acclimatisation	Acclimatised <input type="checkbox"/>		Unacclimatised <input type="checkbox"/>

SUB-TOTAL A

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	2	4	6
Metabolic work rate*	Light <input type="checkbox"/>	Moderate <input type="checkbox"/>	Heavy <input type="checkbox"/>

SUB-TOTAL B

--

	1	2	3	4
Wet Bulb Globe Temperature	< 24°C <input type="checkbox"/>	>24°C ≤ 27°C <input type="checkbox"/>	>27°C ≤ 30°C <input type="checkbox"/>	> 30°C <input type="checkbox"/>

SUB-TOTAL C

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TOTAL = A plus B Multiplied by C =

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***Examples of Work Rate.**

Light work: Sitting or standing to control machines; hand and arm work assembly or sorting of light materials.

Moderate work: Sustained hand and arm work such as hammering, handling of moderately heavy materials.

Heavy work: Pick and shovel work, continuous axe work, carrying loads up stairs.

Instructions for use of the Basic Thermal Risk Assessment

- Mark each box according to the appropriate conditions.
- When complete add up using the value at the top of the appropriate column for each mark.
- Add the sub totals of Table A & Table B and multiply with the sub-total of Table C for the final result.
- If the total is **less than 25** then the risk due to thermal conditions are low to moderate.
- If the total is **25 to 55** there is a potential of heat induced illnesses occurring if the conditions are not addressed.
- If the total **exceeds 55** then the onset of a heat induced illness is very likely and corrective action should be taken as soon as possible.

It is important to note that this assessment is to be used as a guide only. A number of factors are not included in this assessment such as employee health condition and the use of high levels of PPE (particularly impermeable suits). In these circumstances experienced personnel should carry out a more extensive level 2 assessment.

7.2 Attachment 2

HEAT ILLNESS RECORD

Date:

...../...../.....

SURNAME:		CHRISTIAN NAME:		AGE:	
TIME STARTED WORK:	TIME FINISHED CRIB:	TIME OF ONSET:	TIME OF PRESENTATION:		

HISTORY: (Mark with if mentioned without prompting - X if prompted)

- | | | |
|--------------------------------------|------------------------------------|---|
| <input type="checkbox"/> GIDDY | <input type="checkbox"/> VOMITED | <input type="checkbox"/> THIRSTY |
| <input type="checkbox"/> LIGHTHEADED | <input type="checkbox"/> DIARRHOEA | <input type="checkbox"/> WEAK LEGS |
| <input type="checkbox"/> HEADACHE | <input type="checkbox"/> FELT HOT | <input type="checkbox"/> CRAMPS (LEGS OR ABDOMEN) |
| <input type="checkbox"/> FAINTED | <input type="checkbox"/> FELT COLD | <input type="checkbox"/> BLURRED VISION |
| <input type="checkbox"/> NAUSEA | <input type="checkbox"/> SWEATING | |

COMMENTS:

TEST RESULTS URINE S.G.

EXAMINATION (15 MINUTE INTERVALS)	1	2	3	4
TEMPERATURE				
PULSE				
B:P - LYING				
B:P - STANDING				
SKIN (Warm, Cool, Wet, Dry)				

NERVOUS STATE: (Tick where applicable)

- | | |
|---|--------------------------------------|
| <input type="checkbox"/> NORMAL | <input type="checkbox"/> TREMORS |
| <input type="checkbox"/> SLEEPY | <input type="checkbox"/> CONVULSIONS |
| <input type="checkbox"/> SEMI CONSCIOUS | <input type="checkbox"/> CRAMPS |
| <input type="checkbox"/> UNCONSCIOUS | <input type="checkbox"/> OTHER |

PREDISPOSING FACTORS:

- | | |
|---|---|
| <input type="checkbox"/> LESS THAN 6HRS SLEEP | <input type="checkbox"/> EXTRA SHIFTS |
| <input type="checkbox"/> UNACCLIMATISED | <input type="checkbox"/> RECENT ILLNESS |
| <input type="checkbox"/> ALCOHOL (WITHIN 24 HRS) | <input type="checkbox"/> MISSED MEALS |
| <input type="checkbox"/> MEDICINE / PILLS (SPECIFY) | |

COMMENTS:

JOB AND LOCATION (In Detail):

READINGS (When available):

Wet Bulb. _____ Globe Temp. _____
 Dry Bulb. _____ Humidity _____

WORK LOAD:

- | | |
|--------------------------------|-------------------------------------|
| <input type="checkbox"/> LIGHT | <input type="checkbox"/> MODERATE |
| <input type="checkbox"/> HEAVY | <input type="checkbox"/> VERY HEAVY |

WORK CONDITIONS (Patients Appreciation):

MEDICAL FOLLOW-UP (Before next shift):

7.3 Attachment 3

HEAT STRESS RISK ASSESSMENT CHECK LIST

HAZARD TYPE				
1	Dry Bulb Temperature	< 30°C <input type="checkbox"/>	30°C to 40°C <input type="checkbox"/>	> 40°C <input type="checkbox"/>
2	Globe Temperature	< 30°C <input type="checkbox"/>	30°C to 40°C <input type="checkbox"/>	> 40°C <input type="checkbox"/>
3	Air Movement – Wind Speed	> 3.0 m/s <input type="checkbox"/>	0.5 - 3.0 m/s <input type="checkbox"/>	<0.5 m/s <input type="checkbox"/>
4	Humidity	<30% <input type="checkbox"/>	30 – 50% <input type="checkbox"/>	> 50% <input type="checkbox"/>
5	Hot Surfaces	Contact Neutral <input type="checkbox"/>	Hot on Contact <input type="checkbox"/>	Burn on Contact <input type="checkbox"/>
6	Metabolic work rate	Low <input type="checkbox"/>	Medium <input type="checkbox"/>	High <input type="checkbox"/>
7	Exposure Period	< 30 min <input type="checkbox"/>	30 min - 2 hours <input type="checkbox"/>	> 2 hrs <input type="checkbox"/>
8	Confined Space	No <input type="checkbox"/>		Yes <input type="checkbox"/>
9	Task Complexity	Simple <input type="checkbox"/>	Moderate <input type="checkbox"/>	Complex <input type="checkbox"/>
10	Climbing, ascending, descending – work rate change	None <input type="checkbox"/>	Moderate <input type="checkbox"/>	Significant <input type="checkbox"/>
11	Distance from cool rest area	<50 Metres <input type="checkbox"/>	50-100 Metres <input type="checkbox"/>	>100 Metres <input type="checkbox"/>
12	Distance from Drinking Water	<30 Metres <input type="checkbox"/>	30-50 Metres <input type="checkbox"/>	>50 Metres <input type="checkbox"/>

Employee Condition				
13	Acute Infections, ie. colds, flu, fevers	No <input type="checkbox"/>		Yes <input type="checkbox"/>
14	Acclimatised	Yes <input type="checkbox"/>		No <input type="checkbox"/>
15	Obesity	No <input type="checkbox"/>		Yes <input type="checkbox"/>
16	Age	<35 <input type="checkbox"/>	35 – 50 <input type="checkbox"/>	>50 <input type="checkbox"/>
17	Fitness	Very Fit <input type="checkbox"/>	Mod Fit <input type="checkbox"/>	Unfit <input type="checkbox"/>
18	Alcohol in last 24 hrs	No <input type="checkbox"/>		Yes <input type="checkbox"/>
Chemical Agents				
19	Gases, vapours & dusts soluble in sweat	No <input type="checkbox"/>		Yes <input type="checkbox"/>
	If Yes, Type:			
PPE				
20	Impermeable clothing	No <input type="checkbox"/>		Yes <input type="checkbox"/>
21	Respiratory protection	No <input type="checkbox"/>		Yes <input type="checkbox"/>
22	Increased work load due to PPE	No <input type="checkbox"/>		Yes <input type="checkbox"/>
23	Restricted mobility	No <input type="checkbox"/>		Yes <input type="checkbox"/>

7.3 Attachment 3

CHECKLIST NOTES

	HAZARD TYPE	IMPACT
1	Dry Bulb Temperature	Elevated temperatures will add to the overall heat burden.
2	Globe Temperature	Will give some indication as to the radiant heat load.
3	Air Movement – Wind Speed	Poor air movement will reduce the effectiveness of sweat evaporation. High air movements at high temps (>42C) will add to the heat load.
4	Humidity	High humidity is also detrimental to sweat evaporation.
5	Hot Surfaces	Can produce radiant heat as well as result in contact burns.
6	Metabolic work rate	Elevated work rates can potentially increase internal core body temperatures.
7	Exposure Period	Extended periods of exposure can increase heat stress.
8	Confined Space	Normally result in poor air movement.
9	Task Complexity	Will require more concentration and manipulation.
10	Climbing, ascending, descending – work rate change	Can increase metabolic load on the body.
11	Distance from cool rest area	Disincentive to leave hot work area.
12	Distance from Drinking Water	Prevents adequate rehydration.
	Employee Condition	
13	Acute Infections, ie. colds, flu, fevers	Will impact on how the body handles heat stress.
14	Acclimatised	Poor acclimatisation will result in poorer tolerance of the heat (ie. less sweating, more salt loss).
15	Obesity	Excessive weight will increase the risk of a heat illness.
16	Age	Older individuals (>50) may cope less well with the heat.
17	Fitness	A low level of fitness reduces cardiovascular and aerobic capacity.
18	Alcohol in last 24 hrs	Will increase the likelihood of dehydration.
	Chemical Agents	
19	Gases, vapours & dusts soluble in sweat	May result in chemical irritation/burns and dermatitis.
	Personal Protective Equipment	
20	Impermeable clothing	Significantly affect the body's ability to cool.
21	Respiratory protection (negative pressure)	Will affect the breathing rate and add an additional stress on the worker.
22	Increased work load due to PPE	Items such as SCBA will add weight and increase metabolic load.
23	Restricted mobility	Will effect posture and positioning of employee.