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CS ENERGY PROCEDURE

WORKING IN HEAT
CS-OHS-24

Responsible Officer: Principal Health and Safety Specialist
Responsible Manager: Head of Health and Safety
Responsible Executive: Chief Operating Officer (COO)

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1 PURPOSE

This procedure sets the minimum mandatory requirements to identify, assess, control, and verify risks associated with working in heat at CS Energy sites (indoor and outdoor). It operationalises general risk management duties by establishing standard triggers, methods, controls, and evidence to eliminate or minimise heat-related risks so far as is reasonably practicable (SFAIRP).

2 SCOPE

This procedure applies to all CS Energy controlled workplaces, construction/maintenance activities, shutdowns / outages, and contractor operations under CS Energy control or influence.

3 RESPONSIBILITIES AND ACCOUNTABILITIES

3.1 Management

Managers/Supervisors are responsible for ensuring that:

- The requirements of this procedure are enforced within their area of responsibility
- Regular checks are carried out to confirm compliance
- Adequate PPE is made available for the task at hand. Obtain professional advice from the Health and Safety team if required
- Appropriate information, instruction and training are provided to each of their employees
- Where effective temperature is measured and Thermal Work Limits (TWLs) determined, workers are consulted, and effective controls are implemented
- Check BOM website when planning and allocating work
- Adequate drinking water is available.

3.2 Employees and Contractors

Employees and Contractors are responsible for ensuring that they:

- Comply at all times with the requirements specified within this corporate procedure and any relating approved site-specific procedures
- Conduct a risk assessment, including the identification of suitable controls to prevent injury from working in heat
- Drink adequate quantities of water throughout the shift and preceding the shift
- Notify the supervisor if they are taking medication that could affect their ability to work in hot environments
- Notify supervisor if they are unwell
- Notify their supervisor or work mates if they suffer heat stress symptoms
- Observe the condition of their work mates for signs of heat stress.

4 WORKING IN HEAT

4.1 Introduction

The effects of heat on the body are influenced by a number of factors including:

Environmental Factors

- Air Temperature
- Air Movement
- Humidity
- Radiant Temperature

Personal Factors

- Clothing worn
- Level of activity
- Hydration level
- Acclimatisation
- Medical history
- Physical condition

All tasks shall be assessed to identify possible work practices or environments that have the potential to expose workers to health and safety risks due to excessive exposure to heat for example:

- working in open areas where exposure to sunlight and/or radiation is unavoidable
- working in enclosed areas
- working near heat generating/radiating equipment
- heavy physical work, particularly when wearing impermeable protective clothing e.g. welding coveralls, disposable overalls, respirators, etc.
- conducting emergency procedures such as fire fighting

4.2 Controls to minimise the exposure to heat

The extent and application of required controls will depend largely on the outcome of the task risk assessment. The following information is intended to provide general guidelines on control strategies, in the order of effectiveness as per the hierarchy of controls.

Elimination	Removal of the heat source, eg: shutdown heat generating equipment.
Substitution	Reschedule work to a cooler time of the day.
Isolation / Engineering	Shield or isolate heat source from personnel, eg; installing heat shields around hot components
	Air condition the work environment
Administration	Provide cool drinking water and /or ice blocks
	Schedule rest periods at appropriate intervals
	Risk assessments / JSEAS include precautions / controls for prevention of heat stress.
	Provide a shaded area for rest and work breaks.
Personal Protective Equipment	Wear appropriate protective clothing and equipment.
	Apply sunscreen
	Wear a hard hat brim to protect against sunlight.



- The hierarchy of controls should be followed when there is risk to workers who are working in heat.

4.3 Acclimatisation

Workers in hot environments can become acclimatised as a way of reducing the heat strain. Acclimatisation produces a lower heart rate and higher sweat rate with more diluted sweat.

It is important to note that workers who have been on extended leave, new employees and contract labour from cooler locations will not be acclimatised, and this should be taken into consideration when scheduling work in hot environments. Generally new workers in hot environments should become acclimatised in 1 - 2 weeks.

4.4 Temperature Monitoring

The Basic Heat Stress Assessment Form (S2234) can be used to consider both personal and environmental factors when working in heat. A flowchart outlining the heat stress risk assessment process is attached with the Basic Heat Stress Assessment Form at 8.2.

If the Basic Heat Assessment determines work conditions are unacceptable, a detailed heat risk assessment is required, refer to 8.3.Attachment 3 – Level 2 Detailed Heat Risk Assessment

4.5 Effect of heat on the body

4.5.1 Personal Hydration

All people working in hot conditions shall have ready access to a supply of cool, potable water or other fluid replacement beverage – avoid coffee and tea or other drinks containing caffeine. The supply of cool water, as opposed to iced water will assist in the maintenance of adequate hydration levels.

All workers have a responsibility to be well hydrated. Ideally when working in hot conditions, 1 – 1.5 litres of water should be consumed per hour by drinking small amounts at frequent intervals.

Urine colour charts will give people guidance on personal levels of hydration. Further detailed information on hydration testing is provided at 8.4 – Level 3 Physiological Assessment.



Figure 1 - Urine Colour Chart

4.5.2 Medication

People taking prescription or over-the-counter medications that could affect their ability to work in heat, such as cold/flu medications or drugs containing codeine, antihistamines or pseudoephedrine, or other drugs known to affect working-in-heat (such as anti-depressants) should:

- advise their supervisor who should consult with the site health and wellbeing specialist, and
- follow the CS Energy Managing Alcohol and Other Drugs Procedure



Refer to *CS-OHS-42* Managing Alcohol and Other Drugs Procedure.

Similarly, workers taking prescription drugs should advise their physician that they work in hot conditions. The physician should ensure any prescribed drugs or treatment plan is safe in these circumstances and provide a medical clearance before the person resumes work in thermally stressful conditions.

4.6 Medical Assessment

Where considered necessary by the supervisor, workers may be required to undergo medical assessment by a physician who is to advise of the person's suitability for working in heat. The intervention of the physician is to ensure that medical conditions which may otherwise place the person's health at greater risk while working in hot conditions are identified. This is especially important where persons are exhibiting symptoms of colds, flu, diarrhoea or other dehydration-causing illness.

4.7 Heat Stress

All suspected cases of heat stress shall be recorded and properly investigated in line with the CS Energy Incident Management Procedure.



Refer to CS-IM-01 Incident Management Procedure.

No person suffering heat stress is to be left alone or to travel by themselves unless they have been assessed as safe to do so by a competent person.

4.7.1 Heat Stress Triggers

On the first instance of heat stress, the person will be re-educated on the need to come to work fully hydrated, effects of medication and other factors that may assist them to stay hydrated during their shift. Where possible, they may also be required to have a urinary hydration test to potentially identify any health issues.

On the second instance of heat stress, the person will have a medical assessment by a physician. The physician may require the person to have a urinary hydration test.

4.8 First Aid response to heat stress

The signs and symptoms of heat stress and treatments options are listed below (source St John's Ambulance).



- Seek medical assistance if required.

4.8.1 Heat Exhaustion

Signs and Symptoms	Treatment
• Feeling hot, exhausted, weak and fatigued • Persistent headache • Thirst and nausea • Giddiness and faintness • Rapid breathing and shortness of breath • Pale, cool, clammy, skin • Rapid, weak pulse	• Call ERT using site method of contact • Move the patient to lie down in a cool place with circulating air • Loosen tight clothing and/or remove unnecessary garments • Sponge the patient with cool water • Give the conscious patient fluids to drink • Seek medical attention if the patient vomits or does not recover quickly

4.8.2 Heatstroke: a medical emergency

Signs and Symptoms	Treatment
• High body temperature at 40°C or more • Flushed and dry skin • Pounding rapid pulse • Headache, nausea and/or vomiting • Dizziness and visual disturbances • Irritability and mental confusion which may progress to seizure and unconsciousness	• Call ERT • Follow DRSABCD • Apply cold ice packs or wrapped in ice to the patient's neck, groin and armpits • Cover the patient with a wet sheet • Ensure an ambulance has been called • Give water to the patient if they are fully conscious and able to swallow • Seek urgent medical attention if the patient has a seizure or becomes unconscious

5 DEFINITIONS

Term	Definition
Acclimatisation	The gradual physiological adaptation that improves an individual's ability to tolerate heat stress. Acclimatisation requires physical activity under heat-stress conditions similar to those anticipated for the work.
Heat Stress	The net load to which we might be exposed by extreme thermal conditions, physical workload, clothing factors and individual differences.
Heat Stroke	The effects of heat exhaustion resulting in collapse, loss of consciousness, convulsions or death
Thermal Work Limit (TWL)	The sustainable metabolic rate that well-hydrated, acclimatised individuals can maintain in a specific thermal environment, within a safe core temperature and sweat rate.
Dry Bulb Globe Temperature (DBT)	The temperature of air measured by a thermometer freely exposed to the air but shielded from radiation and moisture.
Wet Bulb Globe Temperature (WBGT)	The temperature a parcel of air would have if it were cooled to saturation by the evaporation of water into it
Globe Temperature (GT)	The radiant temperature defined as the uniform temperature in which the radiant heat transfer from the human body is equal to the radiant heat transfer in the non-uniform enclosure.
Impermeable Clothing	Impermeable clothing is defined as clothing which prevents the transfer of air or water / water vapour. E.g. Chemical suite, Arc rated switching suit
Clothing (Permeable)	Clothing (Permeable) is defined as a permeable rating which is an indication of how much air or water / water vapour can pass through it. E.g. • Single layer (light) – up to 150gsm • Single layer (mod) – up to 200gsm • Multiple layer – >200gsm

6 REFERENCES

Reference No	Reference Title	Author
BS EN ISO 9886:2004	Ergonomics – Evaluation of thermal strain by physiological measurements	
	A Guide to Managing Heat Stress: Developed for Use in the Australian Environment. Australian Institute of Occupational Hygienists -	R DeCorleto I Firth J Mate
B/D/15/20302	Form - S2234 - Level 1 - Basic Heat Stress Assessment	CS Energy
	Managing the Work Environment and Facilities	
	First Aid in the Workplace	
	SWA Guide for Managing the Risks of Working in Heat	
	WHSQ heat stress guidance	
	WHS Act (Qld)	
	WHS Reg	

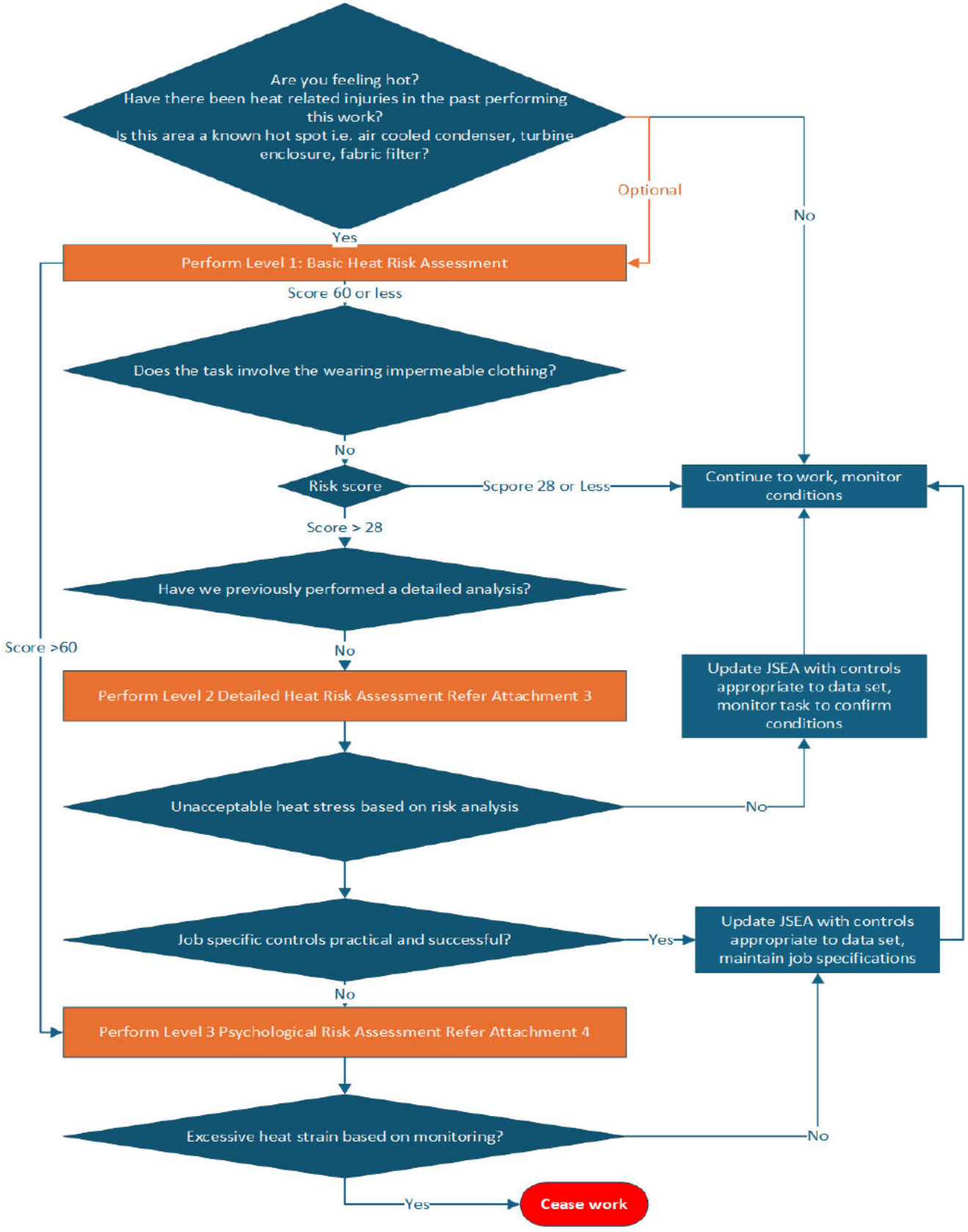
7 RECORDS MANAGEMENT

In order to maintain continual improvement, suitability, safety and effectiveness of the organisation, registered documents will be reviewed on a two-yearly basis or at intervals specified by legislative or regulatory requirements. Review of registered documents should occur where it has been identified that there are changes in technology, legislation, standards, regulation or where experience identifies the need for alteration to the content. Registered documents should also be reviewed following an incident, change management process, modification or where directed as part of a risk assessment process. A 'review' can simply mean that it has been identified, confirmed and appropriately recorded that no changes are required and that the existing process remains the same.

Government Owned Corporations must ensure that records are retained according to accountability, legal, administrative, financial, commercial and operational requirements and expectations. In compliance with records retention and disposal, all documentation created in relation to business must be retained in line with minimum retention periods as detailed in legal retention and disposal schedules.

8 ATTACHMENTS

8.1 Attachment 1 – Heat Management Flow Chart



8.2 Attachment 2 – Basic Heat Stress Assessment Form (Linked Image)

LEVEL 1 - BASIC HEAT STRESS ASSESSMENT
Form: S2234
Version: 11/16

LEVEL 1 - BASIC HEAT STRESS ASSESSMENT

csenergy

Mark each box with the assessment point values associated with the conditions Final result = Subtotal A + Subtotal B x Subtotal C.

HAZARD TYPE	ASSESSMENT POINT VALUE			
	0	1	2	3
Sun Exposure	Indoors	Full shade	Part shade	No shade
Hot Surfaces	Neutral	Warm on contact	Hot on contact	Burn on contact
Exposure Period	<30 minutes	30 minutes - 1 hour	1 hour - 2 hours	>2 hours
Confined Space	No			Yes
Task Complexity		Simple	Moderate	Complex
Climbing up/down stairs/ladders	None	One level	Two levels	>Two levels
Distance from Cool Rest Area	<10 metres	10 - 50 metres	50 - 100 metres	>100 metres
Distance from Drinking Water	<10 metres	10 - 30 metres	30 - 50 metres	>50 metres
Clothing (Permeable)		Single layer (light)	Single layer (mod)	Multiple layer
Understanding of Heat Strain Risk	Training given			No training given
Air Movement	Strong wind	Moderate wind	Light wind	No wind
Respitory Protection (- ve pressure)	None	Disposable half face	Rubber half face	Full face
Acclimatisation	Acclimatised			Unacclimatised
	0 :Total	0 :Total	0 :Total	0 :Total

SUBTOTAL A:- 0

METABOLIC WORK RATE (Refer to Table below)	ASSESSMENT POINT VALUE		
	2	4	6
	Light	Moderate	Heavy

SUBTOTAL B:- 0

Metabolic Work Rate Class	Examples
Low/ Light Work	Sitting at ease / Light manual work / Hand and arm work / Car driving / Standing / Casual walking / Sitting or standing to control machines
Moderate / Moderate Work	Sustained hand and arm work / Arm and trunk work / Moving light wheelbarrow / Walking around 4.5 m/h
High / Heavy Work	Intense arm and trunk work / Carrying heavy material / Shovelling / Sawing hard wood / Moving heavily loaded wheelbarrows / Carrying loads upstairs

APPARENT TEMPERATURE	ASSESSMENT POINT VALUE			
	1	2	3	4
	<27 °C	>27 °C ≥ 33 °C	>33 °C ≥ 41 °C	>41 °C

SUBTOTAL C:- 0

(A + B) x C TOTAL:- 0

Total Score	Action Required
Less than 28	Work can proceed. NOTE: If there are reports of heat related disorders then the analysis should be reconsidered or proceed to Level 2: Detailed Heat Risk Assessment
More than 28	Control measures must be considered (see CS-OHS-24 - Attachment 3). Level 2 - Detailed Heat Risk Assessment must be undertaken.
More than 60	Immediate action must be undertaken and further controls implemented (see CS-OHS-24 - Attachment 3).

8.3 Attachment 3 – Level 2 Detailed Heat Risk Assessment

TWL and Actions required

TWL calculator can be found at http://www.haad.ae/Safety-in-Heat/Default.aspx?tabid=63

Detailed Risk Assessment Score	TWL	Action Required
Low	>220	**Unrestricted self-paced work** • Fluid replacement
Moderate Low	181-220	**Acclimatisation Zone** Well hydrated self-paced workers will be able to accommodate to the heat stress by regulating the rate at which they work • No unacclimatised worker to work alone • Fluid replacement to be adequate
Moderate High	141-180	**Acclimatisation Zone** • No worker to work alone • Fluid replacement to be adequate
High	116-140	**Buffer Zone** The workload exceeds the TWL and even with adequate fluid replacement, heat will limit work time. TWL can be used to predict safe work rest cycling schedules • No unacclimatised worker to work • No worker to be work alone • Air flow should be increased to greater than 0.5m/s • Redeploy persons wherever practicable • Fluid replacement to be adequate • Workers could be tested for hydration • Work rest cycling must be applied • Work should only continue with authorisation and appropriate management controls.
Critical	<116	**Withdrawal Zone** Persons cannot continuously work in this environment without increasing their core body temperature. The work load will determine the time to achieve an increase in body temperature, i.e. high workloads mean shorter work times before increased body temperature. As the workload exceeds the TWL and even with adequate fluid replacement heat storage will limit work time. **Level 3: Physiological Assessment** to be undertaken for work to proceed (refer Attachment 3).

8.4 Attachment 4 – Level 3 Physiological Assessment

There are circumstances where control actions (refer Level 2: Detailed Heat Risk Assessment) cannot assure the safety of the exposed work group. There may be situations where only physiological monitoring of the strain imposed on the individuals can be used to ensure that their personal tolerance to that strain is not placed at unacceptable risk. This includes any work undertaken in impermeable clothing.

The important physiological changes that occur during hot conditions and/or high workloads are increases in:

- Core temperature
- Sweat rate and
- Heart rate.

8.4.1 Recommendations for Standardised Physiological Measures

Physiological Parameter	Measurements	Information provided	How to measure	Limits (ISO9886:2004)
Heart Rate	Peak Heart Rate	Health based limit for maximum workload.	Equivital continuous reading device or POLAR heart rate monitor.	185 – (0.63 X Age).
Heart Rate	Sustained Heart Rate	Health based limit for sustained workload.	Equivital continuous reading device or POLAR heart rate monitor.	180 – Age.
Core Temperature	Auditory canal temperature.	Health based limit to indicate mean temperature of the body mass.	Temperature Transducer or QuestTEMP II continuous reading device.	Increase of 1.0^{O}C or maximum of 38^{O}C.

Table 1 - physiological monitoring and assessment

8.4.2 Hydration Testing

Urinary specific gravity (USG) is a measure of the concentration of solutes in the urine. It measures the ratio of urine density compared with water density and can be used to indicate the hydration levels of an individual and assist in determining an individual's risk of heat stress. Specific Gravity (SG) is defined as the ratio weight of a substance compared to the weight of an equal volume of distilled water; hence the SG of distilled water is 1.000. Generally, for individuals working in ongoing hot conditions the use of USG may be an adequate method to assess hydration status.

A worker's SG result must be in the "Good" or "Fair" hydration zones in order to be able to work when a Cautionary or Restricted heat zone has been advised.

Hydration Level	Specific Gravity (SG) Value	Action Required	
Well Hydrated	1.0001 – 1.0100	• Return to work Keep up hydration level	Good
Minimal Dehydration	1.0101 – 1.0209	• Return to work and encourage the individual to improve hydration by drinking more water	Fair
Significant Dehydration	1.0210 – 1.0299	• Remove from work to a cool area for at least one hour, rest, rehydrate and retest prior to returning to work. • SG must be below 1.0200 before returning to normal duties	Poor
Severe Dehydration	1.0300 or above	• Medic **MUST** be notified immediately. • Start first aid treatment if showing other signs of Heat illness. • Worker can NOT return to work before seeing Paramedic. • SG must be ***Good or Fair*** before	Severe