HEAT STRESS MANAGEMENT PROCEDURE

PRO737

Urban Utilities

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UrbanUtilities

1. Document Consultation

Consultation was undertaken during early 2020 through a series of heat stress educations sessions at Colebard St Depot, Luggage Point Treatment Plant and Green Square Close Office. These sessions were followed by focus group sessions in mid-2020 at Colebard St Depot, SAS Laboratory and field-based interactions with crews at their respective worksite. For workers unable to attend these sessions, an anonymous link was available to provide their input, that several worked utilised.

The feedback from these sessions has contributed to understanding the causes of heat stress and the likelihood of success for a range of field-based controls mitigating heat stress symptoms and heat-related illnesses. This feedback contributed to the contents of this document.

2. Document Endorsement

Name	Position	Signature	Date
Kym Bancroft	Health & Safety Manager		16 October 2020

3. Purpose

The purpose of this document is the provision of information to maximise the health and safety of Urban Utilities workers exposed to heat. Specifically, this document details how heat stress develops in work settings, the factors that influence heat stress, and provides guidance on the assessment of heat stress risk, hazard controls, education, and treatment of heat-related illness.

4. Scope

This document is applicable to all Urban Utilities workers exposed to heat.

5. Compliance Requirements

Section 40 of the Queensland Work Health and Safety Regulation 2011 states that a person conducting a business or undertaking at a workplace must ensure, so far as reasonably practicable, the following:

(f) workers carrying out work in extremes of heat or cold are able to carry out work without risk to health and safety.

The following sections provide context to management of heat stress risk by defining heat stress, its impact on workers, and defining the heat-related illnesses that may manifest due to mismanagement of heat stress.

6. Process Effectiveness Elements

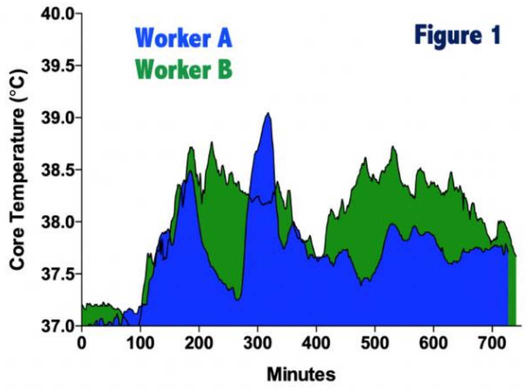
Listed below are the elements required to deliver and effective process.

Elements	Requirements to deliver an effective process
Mindset & Behaviours	• Learning culture through rapid learning cycles • Failure is an opportunity to learn • Embrace risk and opportunity • Bias to action with impactful outcome • Overcoming barriers to get it done
Leadership	• Ability to shield process from the reactive culture • Able to remove barriers to the process to get it DONE • Able to influence internally and externally to get actions DONE • Able to include business stakeholders on the journey to ensure work is not done in isolation • Ensure workers complete the required level of training based on risk exposure
People & Skills	Skills • Will consult with and engage all stakeholders • Analyse and challenge data • Sound understanding of Enterprise Risk Management • Complete training as set by Leader •
Formal Authority	• Budget and access to capital and O&M funds to action interventions (where required)

7. Context

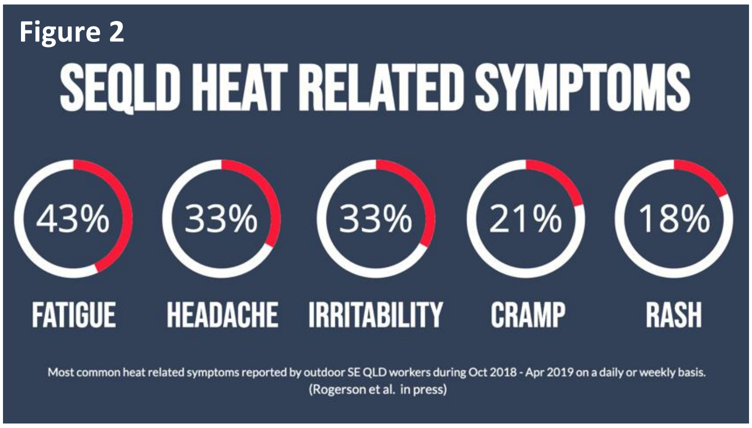
7.1.1 Heat Stress at Work

Body heat is produced in proportion to the intensity of physical work. Put simply, the higher the work intensity, the greater the body heat produced. The vast majority of this body heat needs to be dissipated to the environment to prevent its storage, and a resultant rise in core (deep tissue) body temperature. To prevent a substantial rise in body temperature, the body automatically activates the primary heat loss mechanisms of increased skin blood flow and sweating. Elevated skin blood flow increases skin temperature and heat loss via radiation and air flow across the skin (convection), while sweating dissipates heat via evaporation. The efficiency of these mechanisms is determined by environmental conditions, with higher temperatures limiting heat loss by radiation and convection, and when combined with high relative humidity, limiting evaporation of sweat. It is the combination of the heat produced by the body and environmental heat that determines worker heat stress, defined as the **net heat load to which a worker is exposed**.



Dependant on a range on personal factors, clothing and the duration and severity of heat stress, workers may exhibit a range of symptoms with feeling hot, fatigue, irritability, headache, nausea, and dizziness the most commonly reported. These mild/moderate symptoms may present during or following heat exposure, resulting in a 'heat hangover'. The core temperature response across the work shift appears to be a primary contributor of the heat hangover as demonstrated by Figure 1. While worker A's (blue) peak core temperature was substantially higher than worker B (green), the cumulative core temperature, depicted by the area under the core temperature curves was 37% greater for worker B. In the absence of appropriate treatment, particularly cooling, and with continued heat exposure, heat hangover symptoms can progress in severity, resulting in heat exhaustion and ultimately the medical emergency of heat stroke.

7.1.2 Heat stress impact on workers



The impact of workplace heat exposure is not limited to the development of heat stress symptoms or heat-related illness, as workplace injuries generally peak during the hottest months. Sustained exposure to abnormally hot work conditions, such as during heatwaves, exacerbate the risk to workers. Moderate and high severity heatwaves in Brisbane result in a 45% increase in work-related injuries and illnesses irrespective of whether work is carried out indoors or outdoors. Overall, heatwave periods elevate the risk of occupational heat illness ~4–7 times higher than that of non-heatwave periods. Furthermore, the impact of heat extends beyond the work shift, with workers reporting impaired sleep, decreased appetite and strained family relationships following sustained periods of heat exposure.

7.1.3 Heat stress in the water utility industry

Heat stress data for water utility workers is yet to be published. Parallels have been drawn from the electrical utility industry where heat stress of electrical utility workers has been documented[1]. Rapid elevations of core body temperature occur where strenuous activity was undertaken in extreme heat or the combination of hot and humid weather, in some cases, causing core body temperature to exceed acceptable limits. Based upon anecdotal reports from Urban Utilities workers, it's likely they experience similar responses to working in the heat. Urban Utilities safety events for 2016–2020 (Figure 3) do not show a clear trend for greater frequency during the hotter months, however, January and March are amongst the four months with greatest frequency.

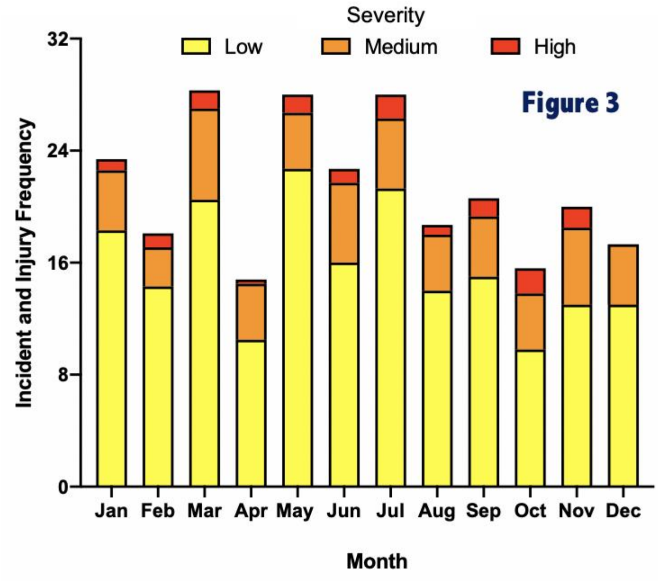
Self-reported heat stress responses (via a questionnaire) from electrical utility workers in South East Queensland demonstrate that heat stress symptoms are common throughout the period of October to April. Fatigue, headache and irritability are the most frequently reported. Interestingly, SEQLD workers had a greater risk of heat stress symptoms compared to workers from the Northern or South-West QLD.

From the limited published data and interactions with Urban utilities workers, heat stress symptoms are common on a seasonal basis for sustained work performing manual tasks. Symptoms are generally related to exposure (both severity and duration) and negatively impact crews in the work and home environments.

[1] Brearley et al., 2015; Meade et al., 2015

8. Heat-related Illnesses

Prolonged and uncontrolled heat stress can manifest in the following heat related illnesses: heat hangover, heat rash, heat cramp, heat syncope, heat exhaustion and ultimately heat stroke. This section provides an overview of each illness.



Heat hangovers are defined as the unpleasant physiological and psychological side effects of excess heat exposure. The hangovers manifest as nausea, headaches, loss of appetite and general lethargy towards the end of shift and/or following shift and are common during periods of hot working conditions. Based upon preliminary evidence, it appears the hangovers do not require excessively high core body temperatures. Rather, moderate body temperatures for extended periods, likely in excess of an individual's capacity, appear to precipitate the hangovers.

Heat rashes, also known as prickly heat or miliaria, results in small red spots on the skin with prickling sensation during sweating. Heat rash is caused by sweat gland obstruction and generally occurs after prolonged and profuse sweating, in those exercising in a hot (and humid) environment. Friction between work uniform and skin are at higher risk of heat rash. Heat rash can contribute to heat intolerance due to decreased sweat production in affected area, lowering overall cooling.

Heat cramps are painful muscle spasms (predominantly muscles of the lower body and abdomen). They are related to prolonged heat stress, profound thermal sweating and dehydration. In some cases, an electrolyte imbalance may contribute.

Heat syncope refers to a worker collapsing, usually with loss of consciousness, during exposure to heat. Symptoms are similar to those of fainting (vasovagal syndrome). Heat syncope typically presents during the initial days of heat exposure and occurs due to inadequate blood flow to the brain, causing unconsciousness. Workers who stand for a long period of time in the heat may be susceptible, especially when wearing insulated clothing that encourages and eventually leads to maximal skin vasodilation.

Heat exhaustion is the most common heat-related illness treated in hospital settings and defined as the inability to continue physical activity in the heat. Heat exhaustion does not alter mental status and can be rapidly reversed with appropriate treatment. The initial phase of heat exhaustion is synonymous with elevated heart rate, respiratory rate, low blood pressure, profuse sweating and ashen appearance, leading to thirst, weakness, discomfort, anxiety and dizziness that manifests as an inability to effectively perform physical work in the heat. Heat exhaustion is distinct from heat stroke

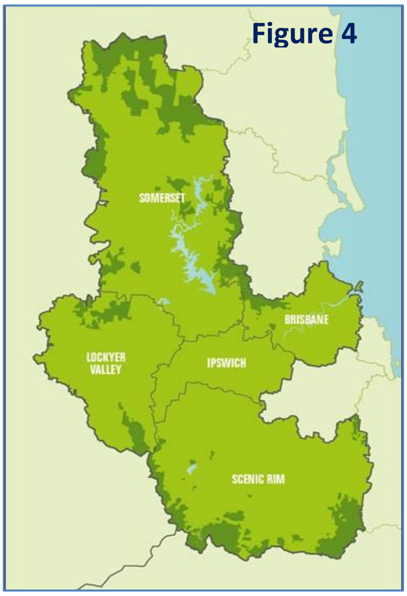


Figure 4

due to the lack of neurological impairment. This mild to moderate illness can progress to the more severe heat stroke if sufferers remain exposed to heat in the absence of treatment.

Heat stroke is a medical emergency that is differentiated from heat exhaustion by neurologic impairment and hyperthermic (>40.5°C) core temperature. Heat stroke symptoms include pale skin, disorientation, confusion, dizziness, irrational and unusual behaviour, inappropriate comments, irritability, headache, inability to walk, loss of balance and muscle function resulting in collapse, profound fatigue, hyperventilation, vomiting, diarrhoea, delirium, seizures or coma. Generally, heat stroke is an illness of the highly motivated, as the symptoms of heat exhaustion need to be ignored to achieve an excessively high core body temperature to cause heat stroke. Lowering the excessively high core temperature within the initial 30 minutes of heat stroke onset is necessary to prevent irreversible organ damage, and to maximise survivability.

Hyponatremia is an illness with similar clinical appearance to heat stroke with mental status changes and an altered level of consciousness. Hyponatremia is caused by the inappropriate, excessive consumption of water before, during, and/or after work shift. Such fluid consumption is generally well in excess of drinking to thirst in response to messaging regarding the protective features of hydration when exposed to heat. Symptoms include nausea, confusion, headache vomiting and in severe cases, seizures and coma. Hyponatremia was noted as the probable cause of death (in addition to heat stress and possibly heat stroke) for a Queensland worker in 2013. Testing by medical professionals is required to diagnose this condition, hence this information is to workers of the existence of hyponatremia and that drinking in excess of thirst and experience can be detrimental to health.

Minimising the incidence of heat-related illnesses requires an understanding of the influencing factors that are grouped under the three classifications: environmental conditions, plant and task factors and personal factors.

9. Factors that influence heat stress

9.1.1 Environmental Conditions

Since environmental conditions determine the potential for dissipation of body heat, it's important for workers to understand the conditions they will be working in for a given shift. Urban Utilities work activities are undertaken in a subtropical climate (Figure 3), experiencing a warm humid summer. The combination of high ambient temperature, elevated relative humidity exposure to solar radiation and

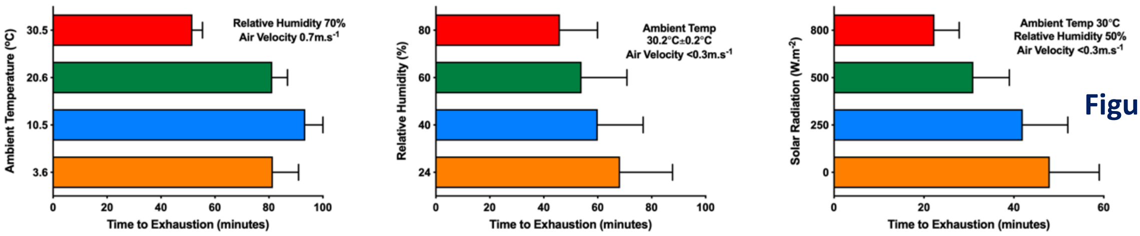


Figure 5

restricted air flow independently influence heat stress and impact the ability to perform physical work on a seasonal basis. Figure 5 summarises the independent impact of these factors on physical performance.

These factors are described below.

- **Ambient temperature** –Temperature of air as indicated by a thermometer shielded from radiation. Generally referred to simply as 'temperature'. Higher temperatures limit the potential for heat loss by radiation and convection.
- **Relative humidity** – A measure of moisture in the air, relative humidity is expressed as the percentage of water vapour present compared to saturated air. The combination of heat and high relative humidity limit the potential for sweat to evaporate, drastically lower body heat loss. Cold air with high relative humidity 'feels' colder than dry air at the same temperature
- **Solar radiation** – Energy emitted from the sun that varies based upon the suns position in the sky. The intensity of solar radiation fluctuates according to season and time of day, gradually increases during the morning and decreases during the afternoon as solar elevation/altitude angle rises and falls, respectively. Note the impact of solar radiation through heating of work sites (Figure 5), resulting in exposed sites experiencing substantially higher temperatures than in non-exposed sites.
- **Air flow** – Movement of air across the body surface aids in heat transfer by removing the boundary layer of warmed air surrounding a body.

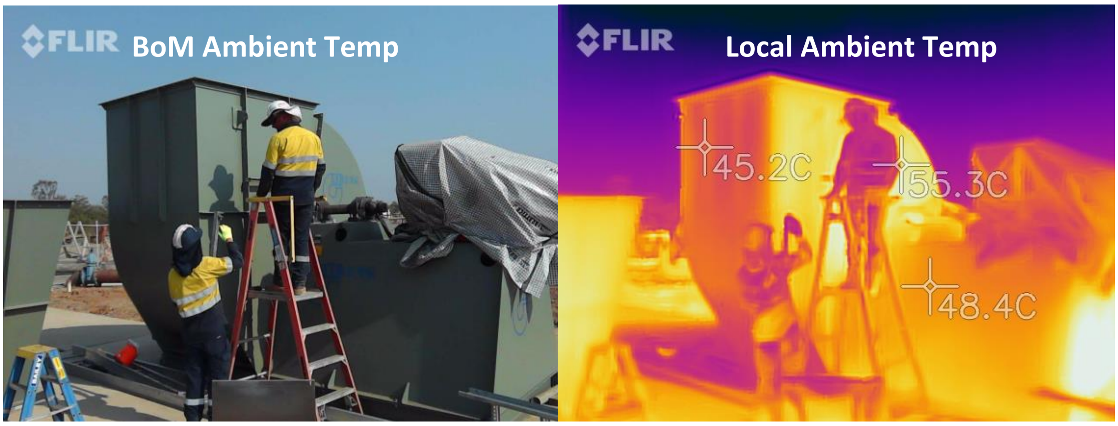


Figure 6

9.1.2 Plant and task factors

Plant and task factors can contribute to worker heat stress due to alteration of the local environmental conditions and may contribute high levels of physical exertion due to tasks performed in confined spaces. Examples include the limited air flow and increased humidity from working in a wet trench. These factors should be considered in light of their likely impact on worker heat stress.

9.1.3 Personal factors

Several personal factors increase the risk of workers suffering heat stress and ultimately, a heat related illness. Minimising the impact of these factors in conjunction with environmental and task/plant factors will contribute to minimising heat stress risk. They are:

- Dehydration;

- Minor illness (e.g. fever, gastroenteritis);
- Specific medications;
- Lack of heat acclimatisation;
- Lack of fitness;
- Advanced age;
- Sunburn;
- Previous incidences of heat-related illness;
- Sleep deprivation;
- Heart disease, high blood pressure, respiratory disease, uncontrolled diabetes; and
- Excessive alcohol consumption, drug abuse.

9.1.4 Dehydration

Dehydration can decrease a worker's ability to dissipate heat, increasing the likelihood of heat stress. While the vast majority of workers adjust their fluid consumption on a seasonal basis, most workers commence their shift in a dehydrated state. Having access to fluids at the temperature preferred within arm's reach throughout the work shift permits workers to respond to their thirst. Fluid consumption based upon thirst and experience (increasing consumption prior to a manual task on a hot day) are necessary to minimise dehydration and avoid overconsumption. Note that maintaining hydration in the absence of hazard controls may not prevent development of heat-related illnesses particularly where work rate is high.

9.1.5 Minor illness

Workers that are currently or were recently ill may be at an increased risk for heat stress and heat-related illness due to an elevated core temperature associated with their immune response. In extreme cases, this can be exhibited as a fever. The elevated core temperature limits the amount of body heat storage prior to a heat-related illness, elevating the heat stress risk of affected workers.

9.1.6 Medications

The following list of medications (Table 1) impact workers exposed to heat, generally by limiting their ability to dissipate heat. Workers should account for medications when assessing heat stress risk.

Medication or medication class	Proposed mechanism of action
Anticholinergics (e.g. benztropine, trihexyphenidyl)	Impaired sweating
Antihistamines	Impaired sweating
Phenothiazines	Impaired sweating (possibly), disturbed temperature regulation
Tricyclic antidepressants (e.g. imipramine, amitriptyline, protriptyline)	Impaired sweating, increased heat production
Amphetamines, cocaine, ecstasy	Increased heat production
Analgesics (e.g. acetaminophen, aspirin)	Liver or kidney damage
Ergogenic stimulants	Increased heat production
Lithium	Kidney damage, diabetes and dehydration

Medication or medication class	Proposed mechanism of action
Diuretics	Salt depletion and dehydration
Calcium channel blockers (e.g. amlodipine, verapamil)	Reduced skin blood flow and reduced blood pressure
Alcohol	Dehydration
Barbiturates	Reduced blood pressure
Antispasmodics	Impaired sweating
Haloperidol	Altered temperature regulation and hyponatremia
Laxatives	Dehydration
Beta blockers (e.g. atenolol, betaxolol)	Reduced skin blood flow, reduced blood pressure, and impaired sweating
Narcotics	Excessive sweating, salt depletion and dehydration
Levothyroxine	Excessive sweating, salt depletion and dehydration

Table 1. Medications and their proposed mechanism for influencing heat stress.

9.1.7 Previous Incidence of heat-related illness

Workers with a history of heat-related illness are at greater risk for recurrent heat illness particularly in cases where the precipitating factors have not been identified and addressed.

9.1.8 Heat acclimatisation and physical fitness

Heat acclimatisation defines the biological and behavioural adaptations in response to heat stress. Such adaptations improve heat tolerance to increase physical performance and reduce the incidence of heat related illness. Adaptations to chronic exercise mimic those of heat acclimatisation (see below), therefore workers possessing physical fitness through regular training will adapt rapidly to the heat, limiting the time to achieve full heat acclimatisation. The importance of heat acclimatisation is demonstrated by the majority of heat-related illnesses occurring during the initial days of heat exposure.

Heat acclimatisation adaptations	
Decreased resting core body temperature	Deceased heart rate during work
Increased skin blood flow	Increased sweating
Decreased core body temperature during work	Increased heat tolerance

9.1.9 Age

Due to impaired dissipation of body heat, older workers are more susceptible to heat stress when working in the heat than their younger counterparts. This susceptibility may be offset by older worker undertaking less strenuous work. For heat exposed QLD workers, the 41-50 years age bracket has demonstrated elevated heat stress risk, likely due to age related decline in heat dissipation while still undertaking arduous tasks.

10. Assessment of heat stress risk

10.1.1 Informal assessment

Given that responses to heat stress are highly individual and may not be apparent to the affected worker, members of a work crew are encouraged to assess the heat stress of their work colleagues. This is achieved by a combination of observation and asking how work colleagues are feeling. Particular attention should be applied to workers during high risk periods and for highly motivated workers. Where work colleagues appear affected by heat, the first aid procedures of Section 12 should be applied. Heat stress signs and symptoms form a key part of annual heat stress education sessions.

For workers performing lone work, pacing of effort to prevent heat stress symptoms is a key control. Workers should be encouraged to continually reassess their work rate in light of the prevailing conditions as part of a heat stress self-assessment. Managers should communicate with lone workers regularly during periods of elevated heat stress risk (see following section).

10.1.2 Environmental assessment

Primary determinants of heat stress are work rate and environmental conditions. While a variety of methods are available to assess the environment and incorporate such assessments into heat stress risk assessment, many are complicated and may not be practical for workers to undertake.

Bureau of Meteorology climate data for the Brisbane (080842) and Ipswich (040004) weather stations (minimal and maximal ambient temperature, number of days over 30 and 35°C, wet bulb temperature and solar radiation) demonstrates that the months of October to March represent an elevated heat stress risk (Table 2). High heat stress risk periods may occur outside of these designated six months, with April and September averaging a combined four days where maximum temperature exceeds 30°C. Rather than assess the local conditions at each worksite, assuming that conditions are conducive to heat stress from October to March permits scheduling that accounts for worker heat stress and planning for a range of controls detailed in the following section.

Month	Temperature Range (°C)	Days >30°C	Days >35°C	9am Wet Bulb (°C)	3pm Wet Bulb (°C)	Daily Solar (MJ/m²)
January	20.5 – 30.2	14.6	1.7	21.6	22.3	24.3
February	20.4 – 29.8	11.9	1.1	21.6	22.3	21.6
March	18.8 – 28.7	7.7	0.4	20.5	21.1	19.5
April	15.2 – 26.6	2.2	0.1	18.1	19.1	16.8
May	11.5 – 23.9	0.2	0.0	14.9	16.6	13.5
June	9.0 – 21.5	0.0	0.0	12.3	14.6	11.8
July	7.3 – 21.1	0.0	0.0	11.0	13.6	13.2
August	8.0 – 22.4	0.2	0.0	12.1	14.2	16.3

September	11.2 – 25.0	1.8	0.1	15.0	16.3	19.8
October	14.6 – 26.6	4.5	0.5	17.3	18.2	22.0
November	17.3 – 28.3	7.7	1.3	19.0	19.8	24.1
December	19.3 – 29.5	12.0	1.9	20.6	21.4	24.6

Table 2. Mean environmental conditions for Urban Utilities region. Data derived from Brisbane and Ipswich Bureau of Meteorology weather stations. Shaded months represent elevated heat stress risk.

11. Heat stress hazard controls

This section details a broad range of heat stress hazard controls. The applicability of these controls may vary in accordance to the specifics of the tasks and work site; hence consideration of these factors is necessary to determine the most appropriate strategies.

11.1.1 Scheduling of work

Based upon the identification of high heat stress risk periods for the respective work regions, tasks requiring periods of strenuous work will be scheduled outside months detailed in Table 2 where possible. Where scheduling such work outside of the identified months is not possible, the likelihood of workers suffering heat stress should inform the appropriate number of workers and timeframe to allocate to such work.

11.1.2 Pacing of effort

By understanding the tasks required, number of workers allocated, time frame for completion, anticipated weather and factoring in their personal experience, physical fitness, and acute health, workers can initiate behavioural and workload adjustments to select an appropriate pace to complete tasks and prevent excessive body heat storage. Self-pacing is the most important control for lone workers. aforementioned factors should be discussed during worksite chats and risk assessments. In addition, managers shall take all reasonable steps to permit work crews to pace their effort during high risk periods. Special attention should be devoted to situations that do not permit self-pacing, including emergency works where workers may prioritise task completion ahead of their heat stress management.

11.1.3 Rest periods

Suitable area(s) for rest should be identified prior to commencement of works. Ideally, a rest area will be cool, shaded from sunlight, provide access to cooling methods, foods and fluids.

11.1.4 Rotation of duties

Where staffing permits, rotation of duties accommodates rest periods of lowered body heat production, and the use of cooling strategies to expedite heat dissipation. Rotation of duties requires a work schedule with adequate time allocated for rotation, and allocation of sufficient workers to permit completion of task(s).

As a minimum during high risk periods, physically demanding tasks should be rotated amongst workers regularly to prevent heat stress symptom development. Rotation of workers would also permit new workers, or experienced workers returning from an extended break to aid their acclimatisation.

11.1.5 Heat acclimatisation

New workers relocating from a cooler climate should be aware of their potentially inferior heat acclimatisation status and should undertake a graded exposure to working in the heat. Experienced employees with absence of greater than three weeks may experience some decay in their heat acclimatisation. Their reintroduction into hot working conditions should be done in a graded manner, with the schedule of Table 3 providing guidance. Scheduling of work and rotation of duties are key elements in permitting workers to acclimatise to heat.

Day	New employee	Experienced employee
1	20%	40%
2	40%	60%
3	60%	80%
4	80%	100%
5	100%	100%

Table 3. Heat exposure schedule for new and experienced employees in high risk conditions

11.1.6 Fitness for work

Refer to the Work Readiness Medical Assessment Procedure (PRO353) for fitness to work requirements.

11.1.7 Hydration

The primary hydration strategies of drinking to thirst, having access to fluids and appropriate fluid temperature are summarised below.

11.1.8 Drinking to Thirst

The most common heat stress mitigation strategy on Australian worksites is the provision of cool drinking water. An appropriate hydration strategy for workers exposed to heat is to 'drink to their thirst' experience. The prevention of thirst will ensure an adequate level of hydration where employees have ready access to fluids throughout the work shift. Workers experience in the heat should also contribute to their hydration strategy, as they will have an understanding of their fluid consumption across various climates.

12. Cooling methods

The purpose of cooling methods is to lower worker core body temperature, reducing the risk of heat stress symptoms and onset of heat-related illnesses. Cooling methods should be practical, require minimum resources, implemented in the field and most importantly, deliver an acceptable cooling rate. Methods that deliver slow cooling rates require prolonged exposure and are therefore not considered practical in work settings. The most rapid cooling is achieved via immersion in water, a method that is not considered practical for Urban Utilities workers, hence it's omission from Table 4.

12.1.1 Cooling core temperature

Core temperature cooling rates of 0.03°C per minute or lower are considered unacceptably slow, with the most effective cooling rates are conferred by ice towels, ice ingestion or air-conditioning.

Cooling Mode	Cooling Rate (°C/min)	Time to lower core temp. 1°C (mins)
Ice towels placed over body	0.11	9
Crushed ice ingestion	0.03 – 0.09	11 – 33
Fan cooling of wet body	0.04 – 0.08	12 – 25
Resting in 19°C shade	0.06	17
Resting in air conditioning	0.05	20
Ice packs over entire body	0.03	33
Ice packs on groin, neck underarm	0.03	33
Resting in 26-29°C shade	0.02 – 0.03	33

Table 4. Cooling methods with associated core body temperature cooling rates

12.1.2 Shade and air flow

For those work sites not at a static location, utilising shade can be a control factor for minimising heat stress while in the field. Typical examples include shade marquees and pull out awnings. Use of shade is recommended while working and during rest periods, however, shade alone is unlikely to adequate dissipate body heat where heat and humidity are combined.

Use of fans (mains or battery powered) to generate air flow can expedite body heat dissipation and the combination of shade and other cooling methods such as fans are recommended during high risk periods. Resting in shade is the most utilised cooling strategy within Australian worksites.

12.1.3 Air-conditioning

Resting in air-conditioned rooms or vehicles expedites the removal of body heat through radiation, convection and evaporation. A minimum exposure period of 10 minutes is recommended. For workers that enter air-conditioned facilities with sweat soaked PPE, 10 minutes may be considered too long due to uncomfortably cold sensations due to the rapid drop of skin temperature. Decreases in core temperature occur at a slower rate than the skin, hence the changing into a fresh, dry set of PPE will assist to maintain thermal comfort while core body temperature decreases.

12.1.4 Ice towels

An efficient method of removing body heat requires towels, ice and water. Within a PPE free area, draping towels soaked in ice cold water (as generally contained within an esky) over the torso is an effective means of dissipating body heat. As the towels absorb heat, they will need to be rotated through the ice water and replaced on the body (every 2-3 minutes). Note that workers cannot exchange towels due to maintenance of hygiene standards and that towels require washing following work shift, hence this method may not be suitable for regular use. Despite this, use of ice towels is the most effective treatment for heat stroke in field settings, and has been used to prevent escalation of heat exhaustion/heat stroke symptoms in remote settings.

12.1.5 Crushed ice ingestion

Internal cooling by the ingestion of crushed ice is an efficient method of lowering body temperature that does not require removal of PPE. The preparation of crushed ice can be achieved on work sites within crib rooms, transported to work site in esky/thermos or prepared through use of blenders with inverters in work vehicles, with ~250mLs an appropriate starting point for most workers. This method is highly effective in hot and humid environments and is contingent upon the ice melting within the body. Drinking a cold drink can be beneficial, however, crushed ice is at least three times as effective.

13. Treatment of heat-related illness

The emergency management plan for each workplace must include provisions for dealing with heat-related emergencies. All Urban Utilities field workers must maintain the 'Apply First Aid' qualification (or equivalent) and through heat stress training sessions, be able to identify heat stress emergencies and apply basic first aid appropriate to the circumstance. The following tables provide treatment guidance based upon signs and symptoms. The following tables show how to give first aid for specific heat-related illnesses. For all illnesses, seek medical assistance if symptoms do not improve or are severe.

Dehydration	
Signs and Symptoms	**Treatment**
• Mild to severe thirst • Dry lips and tongue • Headache • Reduced or dark urine output • Body mass loss in excess of 2% during work shift	• Consume water • Relocate to a cool area • Loosen or remove unnecessary clothing, including PPE • Electrolyte replenishment may be necessary with fluids and/or food

Heat Rash	
Signs and Symptoms	**Treatment**
• Itchy rash with small raised red spots • Prickling sensation of affected area during sweating • Generally, occurs where PPE creates friction with sweaty skin, such as back, chest, waist, thighs, groin, upper arms and neck • Severe cases can cause heat intolerance due to decreased sweat production in affected area that lowers evaporative cooling	• Relocate worker to a cooler, less humid environment • Keep the affected area dry and remove unnecessary clothing, including PPE • May require regular replacement of sweat soaked PPE throughout the work shift • Severe rash may require weeks to resolve

Heat Cramps	
Signs and Symptoms	**Treatment**

• Painful muscles spasms due to prolonged heat stress • Generally, occurs in the lower body and abdomen	• Stop activity and rest in a cool area • Stretch affected muscles • Cooling and massage of affected muscles may assist • Rehydrate with an electrolyte solution and consume food

Heat Syncope	
Signs and Symptoms	**Treatment**
• Fainting (heat syncope) can occur while standing or rising from a sitting position. • May occur due to prolonged standing	• Lie the patient on their back in a cool area with airflow • Elevate the patient's legs

Heat Exhaustion	
Signs and Symptoms	**Treatment**
• Weakness or fatigue • Rapid pulse • Rapid breathing • Pale skin • Anxiety • Dizziness • Thirst • Profuse sweating • Irritability • Patient may have elevated temperature, but exhaustion can occur after worker has cooled	• Call an ambulance immediately • First aid – Danger, Response, Send for help, Airway, Breathing, Circulation, Defibrillation (DRSABCD Action Plan) • Request for an ambulance/medical support through organisational system control or by calling 000/112 • Move the worker to a cool place with circulating air • Notify team leader • Maintain communication with patient • Where applicable, relocate patient to air-conditioned vehicle or room. Use shade where air-conditioning is not available. • Remove upper body outer garments as a minimum • Where patient appears hot, dip towels/clothing in iced water within esky, drain and place over patient, covering as much of the body surface/skin as possible including head and neck region • Create and maintain air flow over their body until • Remove towels and repeat dipping them in iced water and placing over patient. This process should be completed every 2mins to ensure towels remain cold. • Continue to maintain communication with patient • Where prolonged cooling is deemed appropriate, removal of socks and boots will assist heat loss

	• Cease cooling where colleague becomes asymptomatic, reports feeling cold and/or begins to shiver • Continue to observe colleague until the paramedics/medical support arrive and assume control of patient

Heat Stroke	
Signs and Symptoms	**Treatment**
• High body temperature above 40°C, skin will be hot to touch • Profound fatigue • Rapid pulse • Rapid breathing • Pale skin • Disorientation • Confusion • Dizziness • Irrational and unusual behaviour • Inappropriate comments • Irritability • Headache • Loss of balance and muscle function resulting in collapse • Hyperventilation • Vomiting • Diarrhoea • Delirium • Seizures • Loss of consciousness or coma	• As for heat exhaustion noting that heat stroke treatment will be prolonged compared to that for heat exhaustion • Cooling must occur as soon as practical to prevent permanent organ damage

14. Training and Competency Requirements

14.1.1 Heat stress education

To provide a comprehensive and practical discussion of the issues related to working in the heat, strategies to limit the incidence of heat related illness and how to manage a heat stress colleague, annual heat stress training should be delivered to all Urban Utilities field workers prior to or during the early stages of the respective high-risk periods.

The list below provides example curriculum. A series of shorter ‘toolbox’ talks should be delivered throughout the high heat stress risk period.

- Basic heat stress overview;
- Impact of heat on everyday life;
- Impact of heat on work;
- Heat stress symptoms (inclusive of data from injury database and informal interactions);
- Heat related illnesses;

- Individual risk factors for heat stress;
- Control measures;
- Self-pacing – critical for lone workers; impact of personal factors/fit for work;
- Hydration – assessment; how to achieve; fluid types; electrolytes, dehydration monitoring;
- Heat acclimatisation – overview; how to achieve;
- Cooling options – overview of options available to workers; and
- Management of a heat stressed colleague.

The results of this training are to be recorded in the current Learning and Development Software.

15. References

Available on request