

## Risk Assessment Aids/Tools

### Risk Assessment Work Sheet

- Please complete one risk assessment worksheet for each employee.
- Read the questions carefully, and provide an answer in the relevant space provided.
- If you require further information, refer to the relevant web pages

Name of risk assessor:	
Date of assessment: / /	Location of assessment
Job being assessed	Name of employee being assessed

#### Personal status of employee

Employee's age:	Is the employee male or female? <b>Male /Female</b>
Is the employee acclimatised: <b>Yes/No.</b>	If Yes, provide details of acclimation:
Is the employee experienced in the job?	<b>Yes/No.</b>
Is the employee experience in working in the heat	<b>Yes/No.</b>
Has the employee been trained to work in the heat	<b>Yes/No.</b>
Is the employee experience in working in the heat	

Please provide a brief description of the work being performed:

How many employees are involved in this task?

Where was the assessment conducted? (Please provide a description of the work place. If necessary, use the back of this page to provide a diagram of the workplace and the area)

How long (in minutes) is the work typically undertaken?	a.) without a break:
	b.) in a typical shift (excluding breaks):
Is this work performed daily or infrequently? (delete as appropriate)	<u>Daily</u> Infrequently
	How often will this task take place:
	Is refresher training given to employees? <b>Yes/No</b>
	If YES, how often? <input type="text"/>

What were the external climatic conditions? (If measurements are not available, provide a brief description)	Air temperature:	
	Radiant temperature:	
	Air velocity:	
	Relative humidity:	
	Description:	

## Hazard Identification

Name of risk assessor:	
Date of assessment: / /	Location of assessment
Job being assessed	Name of employee being assessed

The following checklist is to be used as an aid to hazard identification. It provides general descriptions of potential heat stress hazards. If you observe any of the descriptions, tick the box to the right of that description.

If you identify any heat stress hazards not listed, please describe the hazard in the "Other" box, and tick the appropriate answer

Consideration	Description	Tick
Air Temperature	<ul style="list-style-type: none"> <li>Does the air feel warm or hot?</li> </ul>	
Radiant Temperature	<ul style="list-style-type: none"> <li>Is there a heat source in the environment? Examples may include: the sun, fire and flares; furnaces; steam rollers; ovens, walls in kilns, dryers; hot surfaces &amp; machinery, exothermic chemical reactions, nuclear reactors, molten metals, etc.</li> </ul>	
Humidity	<ul style="list-style-type: none"> <li>Is there any equipment that produces steam?</li> </ul>	
	<ul style="list-style-type: none"> <li>Is the workplace affected by external weather conditions?</li> </ul>	
	<ul style="list-style-type: none"> <li>Are your employees wearing PPE that is vapour impermeable?</li> </ul>	
	<ul style="list-style-type: none"> <li>Do your employees complain that the air is humid?</li> </ul>	
Air movement	<ul style="list-style-type: none"> <li>Is warm or hot air blowing onto your employees</li> </ul>	
Metabolic rate	<ul style="list-style-type: none"> <li>Is work-rate moderate to intensive?</li> </ul>	
PPE	<ul style="list-style-type: none"> <li>Is PPE being worn that protects against harmful toxins, chemicals, asbestos, flames, extreme heat, etc?</li> </ul>	
	<ul style="list-style-type: none"> <li>Is respiratory protection being worn?</li> </ul>	
What your employees think	<ul style="list-style-type: none"> <li>Do your employees think that heat stress is a problem?</li> </ul>	
	<ul style="list-style-type: none"> <li>Do your employees complain of feeling warm or hot?</li> </ul>	
Other		

There may be a risk of heat stress if you have observed any of the descriptions to any of the above questions. Conduct a qualitative risk assessment using the heat stress observation checklist.

## Personal Risk Factor Checklist

Name of risk assessor:	
Date of assessment: / /	Location of assessment
Job being assessed	Name of employee being assessed

This is not intended to replace a medical examination and is only to be used as a preliminary observation tool. If in doubt, seek advice from a physician.

Has the employee had a pre-exposure medical examination by a qualified occupational health professional?	<b>Yes/No</b>
If <b>YES</b> : Have they been cleared to work in an environment where they may be at risk from heat stress (If <b>NO</b> , consult a physician)	<b>Yes/No</b>
When was their last medical screening done?	
When is their next medical screening due?	
Before, this assessment had the employee completed a pre-exposure medical questionnaire?	<b>Yes/No</b>
If <b>YES</b> : Where any <b>YES</b> answers provided in the pre-exposure medical questionnaire? (If <b>YES</b> , consult a physician)	<b>Yes/No</b>
When was the questionnaire last administered?	
Please provide any other information that may be relevant to this part of the assessment.	

## Observation Checklist for Heat Stress Risk Assessment

- Six checklists are provided with each representing one of the six basic parameters.
- Each parameter is described and a risk score is given to each. The higher the score, the higher the risk that it may contribute to heat stress.
- Observe the environment, taking note of the descriptions provided, and tick the box that best fits the workplace you are observing. This will provide you with an estimated risk score for that parameter. You may tick more than one box if the environment is changing, or if the employee is moving between environments.
- If you do not see a description that best fits the work situation you are assessing, or are unsure, then tick the “**Don’t know**” box at the bottom of that table. This introduces an uncertainty into the assessment and requires that you conduct a more detailed qualitative assessment.

### Air temperature

<b>What is air temperature and what should you look out for?</b>		
<ul style="list-style-type: none"> <li>• Air temperature is described as the temperature of the air surrounding the human body.</li> <li>• Consider the air temperature surrounding the worker and think about how you would describe it.</li> </ul>		
<b>Subjective descriptions of air temperature</b>	<b>Score</b>	<b>Tick</b>
• Cool	-1	
• Neutral	0	
• Slightly warm	1	
• Warm	2	
• Hot	3	
• Very Hot	4	
<b>Don’t know</b>		

### Radiant temperature

<b>What causes radiant temperature and what should you look out for?</b>		
<ul style="list-style-type: none"> <li>• Thermal radiation is the heat that radiates from a warmer to a colder object. Radiant heat may be present if there are heat sources in an environment.</li> <li>• <u>Examples</u> include; the sun, fire and flares; electric fires; furnaces; steam rollers; ovens, walls in kilns, cookers, dryers; hot surfaces &amp; machinery, exothermic chemical reactions, nuclear reactors, tunnel walls in deep mines, molten metals, etc.</li> <li>• Observe the surroundings and identify heat sources. Consider how close the workers are to these heat sources. Do they need to wear protective clothing to prevent burns? etc.</li> </ul>		
<b>Subjective descriptions of radiant temperature</b>	<b>Score</b>	<b>Tick</b>
• Objects colder than the surrounding air are near to worker.	-1	
• There are no heat sources in the environment.	0	
• Heat source is present but the workers are not working in close proximity to it.	1	
• Heat source surface feels warm to touch and there is no risk of contact burns occurring.	2	
• Heat source surface feels hot to touch.	2	
• Heat source makes workers feel hot when they stand near it.	2	
• Heat source surface feels very hot to the touch and may burn the skin.	3	
• Workers cannot work in close proximity to the heat source for more than 10 minutes without wearing PPE.	3	
• Contact with heat source will cause burning	5	
• Workers cannot work in close proximity to the heat source for more than 5 minutes without wearing PPE.	5	
• Workers are not permitted to work in the environment without PPE to protect them from the radiant heat in that environment.	6	
<b>Don’t know</b>		

## Air velocity

<b>Air velocity explained</b>		
<ul style="list-style-type: none"> <li>• Air velocity is the speed of air moving across the worker and may help cool the worker if it is cooler than the environment.</li> <li>• Think about the temperature of the air moving across the worker because the temperature will affect the heat loss or heat gain to the worker.</li> <li>• To help you, four categories of air velocity are provide. They are <b>Still, Low, Moderate</b> and <b>High</b> <ol style="list-style-type: none"> <li>1. <b>Still</b> air, is where there is no noticeable flow of air;</li> <li>2. <b>Low</b> air speed, is when you can just feel air movement on exposed flesh;</li> <li>3. <b>Moderate air speed</b>, is when you can feel air movement (e.g. a light breeze) on exposed flesh;.</li> <li>4. <b>High</b> air speed may be similar to the air speed on a windy day, or at or near fans or other machines or equipment that generate air movement.</li> </ol> </li> <li>• Things to look out for include: Is there a wind source? Have fans been introduced to reduce the temperature (e.g. during specialist maintenance work?). Can the workers feel hot or warm air blowing on any exposed skin? Is the moving air colder or warmer that the ambient air temperature</li> </ul>		
<b>Subjective descriptions of air velocity</b>	<b>Score</b>	<b>Tick</b>
• Cold air at a high air speed (e.g. workers standing in front of an air conditioning unit, compressed air supply into clothing for cooling of worker)	<b>-3</b>	
• Cold air at a moderate air speed, or • Cool air at a high speed	<b>-2</b>	
• Cold air & low air speed, or • Cool air at moderate air speed	<b>-1</b>	
• Still air in a neutral environment	<b>0</b>	
• Warm air & low air speed	<b>1</b>	
• Still air in a warm environment	<b>2</b>	
• Still air in a hot environment.	<b>3</b>	
• Warm air at a moderate air speed, or • Still air in a very hot environment, or • Hot air and moderate air speed	<b>4</b>	
• Very hot air at a high air speed.	<b>5</b>	
<b>Don't know</b>		

## Humidity

<b>Humidity explained</b>		
<ul style="list-style-type: none"> <li>If water is heated and it evaporates to the surrounding environment, the resultant amount of water in the air of that environment will provide humidity. High humidity environments have a lot of vapour in the air and this prevents the evaporation of sweat from the skin. Humidity is important because less sweat evaporates from when humidity is high. The evaporation of sweat is the main driving force for heat loss in humans.</li> <li>When <b>vapour impermeable PPE is worn</b>, the humidity inside the garment increases as the wearer sweats because the sweat cannot evaporate. If an employee is wearing this sort of PPE (e.g. asbestos, chemical protection suits etc) the humidity within the microclimate of the garment may be high.</li> <li><u>Examples include:</u> Humidity in indoor environments will probably vary greatly, and may be dependent on whether there are drying processes (paper mills, laundry etc) where steam is given off. Indoor environments that are susceptible to outdoor conditions may also be humid on humid days.</li> <li>Humidity is very difficult to estimate. Profuse sweating may be an indication of high humidity, but it may also be an indication of a high physical activity.</li> <li>Things to look out for include: Is the environment susceptible to outdoor conditions, especially in summer? Are there any dryers or other machines producing steam? Do workers complain about the humidity? Are they wearing vapour impermeable PPE?</li> </ul>		
<b>Subjective descriptions of relative humidity</b>	<b>Score</b>	<b>Tick</b>
• No humidity. Air is dry, with no drying processes or other mechanisms for increasing the humidity in the workplace.	<b>0</b>	
• Humidity seems to be somewhere between very humid and very dry.	<b>2</b>	
• Air is very humid. Examples may be near drying machines, laundry machines, chemical processes where steam is given off.	<b>5</b>	
• Vapour impermeable PPE is worn	<b>6</b>	
<b>Don't know</b>		

## Clothing

<b>Clothing explained</b>		
<ul style="list-style-type: none"> <li>Clothing interferes with our ability to lose heat to the environment. So much so, that heat stress is a risk in situations where workers may be wearing PPE, even if the environment is not considered warm or hot. It is important therefore, to identify whether the clothing the worker is wearing may be contributing to the risk of heat stress.</li> <li>It is impossible to list or describe all the clothing that may be worn in industry. Therefore, general descriptions of clothing are provided.</li> <li>Observe the worker and look through the list for an ensemble that may best describe the type of clothing they are wearing. Where workers don or remove clothing depending on the job or task, it may be necessary to conduct a quantitative heat stress risk assessment.</li> <li>Additional information may be obtained by contacting the manufacturer or a supplier of the PPE for further advice.</li> </ul>		
<b>Subjective descriptions of clothing</b>	<b>Score</b>	<b>Tick</b>
• Shorts and a T-shirt. No protective or work clothing worn.	<b>-1</b>	
• Light work clothing	<b>0</b>	
• Cotton coverall, jacket	<b>2</b>	
• Winter work clothing, double cloth coveralls, water barrier materials	<b>3</b>	
• Light weight vapour barrier suits	<b>5</b>	
• Fully enclosed suit with hood and gloves	<b>6</b>	
<b>Don't know</b>		

## Work Rate

<b>WORK rate explained</b>		
<p>Work rate, or metabolic rate, is essential for a heat stress risk assessment. It describes the heat that we produce inside our bodies as we do physical activity. The more physical work performed, the more heat produced and the more heat that needs to be lost so as not to overheat.</p> <p>Observe the workers, note their movements, posture, speed, effort, weight of materials they handle, parts of their bodies responsible for their movement etc? Review your manual handling assessment for information of the components of the task.</p> <p>Five categories of metabolic rate (with descriptions) are provided:</p> <ol style="list-style-type: none"> <li>1. <b>Resting,</b></li> <li>2. <b>Low,</b></li> <li>3. <b>Moderate,</b></li> <li>4. <b>High</b></li> <li>5. <b>Very High.</b></li> </ol>		
<b>Subjective descriptions of work rate</b>	<b>Score</b>	<b>Tick</b>
<p><b>Resting.</b> Worker is resting as part of a work/rest schedule or is awaiting instructions etc. Worker is not involved in any tasks at all.</p>	-2	
<p><b>Low.</b> <u>Sitting</u> or standing to control machines. <u>Light hand work</u> (writing, drafting, sewing, bookkeeping, drafting etc). <u>Hand and arm work</u> (small bench work, using tools such as table saws; drills, inspecting, assembling or sorting light materials, operating control panel, turning low torque hand wheels, very light assembly operation etc). <u>Standing</u> with light work at machine or bench while using mostly arms (drill press, milling machine, coil taping, small armature winding, machine with light power tools, Inspecting or monitoring hot processes). <u>Arm and Leg work</u> (driving a car, operating foot pedals or switch). <u>Walking</u> in easily accessible areas (can walk upright). <u>Lifting</u>: 4.5Kg loads for fewer than 8 lifts/min; 11kg fewer than 4 lifts/min</p>	0	
<p><b>Moderate.</b> <u>Hand and arm work</u> (mailing filing). <u>Arm and leg work</u> (off-road operation of trucks, tractors and construction equipment). <u>Arm and trunk work</u> (operating air hammer, tractor assembly, cleaning or clearing light debris spillage, plastering, heavy welding, scrubbing while standing up, intermittently handling heavy objects/, weeding, hoeing, picking fruit and vegetables.) <u>Carrying, lifting, pulling and pushing</u> light loads (lightweight carts and wheelbarrows); <u>Operating heavy controls</u> (e.g. opening valves); <u>Walking</u> in congested areas (limited headroom), walking at 2 to 3 mph. <u>Lifting</u>: 4.5kg fewer than 10 lifts/min; 11kg fewer than 6 lifts/min</p>	2	
<p><b>High.</b> <u>Intense arm and trunk work</u>, (sawing by hand or chiselling wood, shovelling wet sand, transferring heavy materials, sledge hammer work, planting, hand mowing, digging). <u>Intermittent heavy lifting</u> (such as pick-and-shovel work). <u>Pushing or pulling heavy loads</u> (pallet trucks, skips, loaded cages, heavy wheelbarrows) <u>Heavy manual handling and lifting</u> (eg laying concrete block, and clearing heavy debris (eg cleaning and relining reactor vessels)). <u>Heavy assembly work</u> on a non-continuous basis. <u>Lifting</u>: 4.5kg 14 lifts/min; 11kg 10 lifts/min</p>	4	
<p><b>Very High.</b> Work at this rate cannot be sustained for long periods. <u>Very intense</u> activity at a <u>fast maximum pace</u> (e.g. intense shovelling, axe work, running). <u>Heavy assembly, building or construction work</u>; (climbing stairs, ramps or ladders rapidly) Walking faster than 4mph <u>Lifting</u> 4.5kg more than 18 lifts/min. 11kg more than 13 lifts/min.</p>	6	
<b>Don't know</b>		



## **Quantitative Risk Assessment**

### **Estimate the metabolic rate of the work being performed**

#### **Information about the work being performed**

- Description of work being performed:
  
- Estimated metabolic rate value (provide calculations if used)

### **Estimate the clothing insulation of the clothing being worn**

#### **Information about the clothing being worn**

- Description of being worn:
  
- Estimated clothing insulation value (provide calculations if used)

## Detailed results of the WBGT Assessment

### Information about the equipment used to obtain WBGT values

Manufacturer:			
Model type/type number:		Serial number:	
Has the equipment been calibrated?		Yes/No	
Calibration details			
Date of last calibration			
Date of next calibration due			

### Description of measurement period and place of measures

How did you measure the environmental parameters?						
Parameter (°C)	Continuous Measurement	Start and end times	Measurement intervals	Discontinuous Measurement	Start and end times	Measurement intervals
Globe temperature (tg)	Yes/No			Yes/No		
Natural wet-bulb temperature (tnw)	Yes/No			Yes/No		
Air temperature (ta)	Yes/No			Yes/No		

Height (in centimetres) at which measurements were taken				
Parameter (°C)	Homogenous Environment	Heterogeneous Environment		
		Head Height	Abdomen Height	Ankle Height
Globe temperature (tg)				
Natural wet-bulb temperature (tnw)				
Air temperature (ta)				

**Calculate the WBGT value of the environment you have assessed**

The following tables provide a template to help you calculate the WBGT values. Read through the tables, using the appropriate criteria and calculations to obtain a measured WBGT value.

**For homogenous environments, select one of the following equations:**

Criteria	Calculation	WBGT value
No radiant heat load:	$WBGT = (0.7 \times t_{nw}) + (0.3 \times t_g)$	WBGT =
With radiant heat load	$WBGT = (0.7 \times t_{nw}) + (0.2 \times t_g) + (0.1 \times t_a)$	WBGT =

**For heterogeneous environments, calculate the WBGT value at each height. .**

Ankle Height	Calculation	WBGT value
No radiant heat load:	$WBGT = (0.7 \times t_{nw}) + (0.3 \times t_g)$	WBGT =
With radiant heat load	$WBGT = (0.7 \times t_{nw}) + (0.2 \times t_g) + (0.1 \times t_a)$	WBGT =

Abdomen Height	Calculation	WBGT value
No radiant heat load:	$WBGT = (0.7 \times t_{nw}) + (0.3 \times t_g)$	WBGT =
With radiant heat load	$WBGT = (0.7 \times t_{nw}) + (0.2 \times t_g) + (0.1 \times t_a)$	WBGT =

Head Height	Calculation	WBGT value
No radiant heat load:	$WBGT = (0.7 \times t_{nw}) + (0.3 \times t_g)$	WBGT =
With radiant heat load	$WBGT = (0.7 \times t_{nw}) + (0.2 \times t_g) + (0.1 \times t_a)$	WBGT =

WBGT value for ankle height	$WBGT_{ankle} =$
WBGT value for abdomen height	$WBGT_{abdomen} =$
WBGT value for head height	$WBGT_{head} =$
Calculate the mean WBGT value from the following formula	
$WBGT = \frac{WBGT_{head} + (2 \times WBGT_{abdomen}) + WBGT_{ankles}}{4}$	WBGT =

What is your measured WBGT value	°C
What is the WBGT reference value for your workplace (see Table)	°C

Use the following table to obtain a WBGT reference value

**Overall Results**

Reference value of WBGT	Person acclimatised to heat:
	Person unacclimatised to heat:

**Conclusions**



## Training and Competency

It is not possible to detail in this guidance what constitutes “adequate training”. Thermal environments, work rates and clothing worn vary greatly and as such, the training requirements will vary. Where a shortfall is found between competency and what is required, provide appropriate training. This means you should be asking the following questions. Inability to answer any of the questions may indicate that the required level of competency is not in place and that additional training may be required.

<b>Training needs of managers who will manage the heat stress program:</b>	<b>Can they answer the question? (Yes/No)</b>
• What is heat stress?	
• What are the consequences of heat stress?	
• Has a heat stress program been implemented? If YES, what does it involve?	
• How does the need to manage, assess and control heat stress falls into your current health and safety management system?	
• What resources are required to enable the adequate assessment of heat stress?	
• What are the training needs of staff?	
• Why is health surveillance and medical screening important for people who may be at risk from heat stress?	
• Other	
<b>Training needs of those assessing heat stress:</b>	
• What is heat stress?	
• What environmental parameters need to be measured as part of a heat stress risk assessment?	
• What does <i>WBGT</i> mean? How does it work?	
• Why and how do you estimate metabolic rate?	
• Why and how do you estimate clothing insulation values?	
• What are the physiological responses to heat?	
• What is dehydration and why is it important?	
• How may heat stress affect performance and well-being?	
• How much fluid should your employees be drinking to reduce the risk of dehydration	
• Why and how do you measure physiological responses to heat stress?	
• Can you accurately interpret the results of you assessment?	
• Are you competent to take physiological measurements?	
• Other	
<b>Training needs of those who may be at risk from heat stress . Include all workers for all sorts of tasks, e.g: contractors, company employees, infrequent jobs and if appropriate visitors</b>	
• What is heat stress?	
• Are you drinking enough water?	
• What are symptoms of heat stress?	
• Are you fit to work in the heat?	
• When was the last time you had heat stress awareness training?	
• What should you do if you think you may be suffering from heat stress?	
• If a workmate collapses from heat exhaustion, what should you do?	
• What is your role in an emergency?	
• How can you change your behaviour to reduce the risk of heat stress?	
• Other	

### Clothing Insulation values taken at random from BS ISO 9920

No.	Garment description	Fabric	$I_{cl}$ (clo)	$I_{cl}$ ( $m^2 \cdot ^\circ C/W$ )
1	Bra and Panties	100% Nylon	0.04	0.006
3	Pantyhose	non specific	0.02	0.003
7	Briefs	Cotton	0.04	0.006
55	Long sleeved, shirt collar	0.33	0.33	0.051
56	Short sleeved, shirt collar	100% Cotton	0.24	0.037
79	Short sleeved, sport shirt	100% Cotton	0.17	0.026
61	Long sleeved blouse	100% Cotton	0.33	0.051
66	3/4 length sleeve, boat neck	65% Polyester, 35% Cotton	0.27	0.042
87	Trousers - straight, fitted	80% Wool, 20% Nylon	0.22	0.034
84	Walking shorts (Mid thigh length)	100% Cotton	0.11	0.017
92	Trousers - straight, loose	100% Cotton	0.22	0.031
100	Trousers - straight, fitted	50% Wool, 50% Polyester	0.24	0.037
157	Single breasted suit Jacket	50% Wool, 50% Polyester	0.44	0.068
171	Single breasted suit Jacket	80% Wool, 20% Nylon	0.45	0.070
172	Single breasted suit Jacket	100% Cotton	0.46	0.071
89	Trousers - straight, fitted	100% Cotton	0.18	0.028
254	Socks ankle length	non specific	0.02	0.003
258	Shoes	non specific	0.05	0.008
262	Soft-soled athletic shoes, canvas (trainers)	non specific	0.02	0.003
272	Thongs/sandals, vinyl	non specific	0.02	0.003
300	A-line, ankle length skirt	100% Cotton	0.23	0.036
306	Skirt - Straight, knee-length with slit	100% Cotton	0.14	0.022
334	Dress - Sleeveless, scoop neck, A-line	65% Polyester, 35% Cotton	0.23	0.036

No.	Garment description	Fabric	$I_{cl}$ (clo)	$I_{cl}$ ( $m^2 \cdot ^\circ C/W$ )
7	Briefs	Cotton	0.04	0.006
79	Short sleeved, sport shirt	100% Cotton	0.17	0.026
84	Walking shorts (Mid thigh length)	100% Cotton	0.11	0.017
272	Thongs/sandals, vinyl	non specific	0.02	0.003
TOTAL			0.34	0.052