Heat Stress Risk Assessment for Outdoor Workers: Operational Review

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Purpose

In our *Heat Stress Risk Assessment for Outdoor Workers – Technical Guide* we recommend the following series of steps for assessing and managing heat stress for outdoor workers:

1. *Operational review* – to gain an understanding of the operational environment and factors which increase the risk of heat stress for outdoor workers within your workplace
2. *Job Safety Analysis* for specific positions identified as being at an elevated risk
3. *Daily assessment* (during season/month of potential risk for heat stress) of WBGT or Humidex and then implementing appropriate actions in response to identified 'trigger' or 'screening' values.
4. *Heat Stress Policy* and *Program* (such as our Sun Safety Program) or a *Hot Weather Plan*
5. *Employee training and awareness* regarding signs and symptoms of heat stress. This is usually a key part of a Heat Stress Program.

This *Operational Review* is the first of the assessment steps and can be used as an: (1) initial/baseline assessment; (2) annual review; (3) assessment of the impacts on worker exposure when major change occurs within the workplace (e.g. work tasks); or (4) assessment of changes/improvements in safety practice.

Please note: this risk assessment is not deigned to be a personal risk assessment for specific employees, but is a tool to assist workplaces make an assessment of the overall risk that their workers face from heat stress as a result of working in the sun.

Form Design

This risk assessment form consists of a number of sections which address various risk factors for heat stress for outdoor workers. It has the following design elements:

- It allows up to 3 positions/job titles to be assessed and compared.
- If a workplace wishes to make an assessment of an exposure situation which is representative for all workers, in this case they would complete the form for one position only.
- Section 1 requires workplaces to access historic climate data to gain an understanding of the climatic conditions of their workplace location/s.
- Section 2 requires workplaces to review heat stress incident records to understand the history of heat stress associated with the work tasks preformed.
- Section 3 is a qualitative assessment of key environmental and operational risk factors.
- Section 4 asks workplaces to review their current heat stress prevention measures.

The design of this risk assessment is not to provide a risk rating (e.g. low, medium or high) for particular positions/work tasks, but is to highlight factors which indicate that particular positions are at an elevated risk of heat stress at certain times of the year. If an elevated risk is

identified for a particular position, action should be taken to reduce the risk to these workers (i.e. using the steps listed above).

Instructions for Use

1. Section 1 – access the Canadian Climate Normal's website and collate the requested data and input these into the tables provided.
2. Section 2 – review heat stress records and answer the questions provided
3. Section 3 – complete the table provided by answering questions on environmental and operational risk factors. This information will come from Section 1 (i.e. for the humidex risk factor) and from a review of the work tasks of specific positions. As such, persons knowledgeable about the work tasks undertaken by the positions being assessed should provide input into this part of the form.
4. Section 4 – describe current heat stress prevention measures for the positions being assessed.
5. Section 5 – provide summary comments on risk factors which have been identified as presenting an elevated risk for heat stress for particular positions.

Rationale/Background

This operational review is based on assessing of the following key risk factors: a hot environment; physically demanding work; protective clothing; a history of heat stress incidents/reports; and the effectiveness of the current heat stress prevention measures.

It is acknowledged that the *Threshold Limit Value* (TLV) for *Heat Stress and Strain* published by the *American Conference of Governmental Industrial Hygienists* (ACGIH) is the recognized 'gold standard' for assessing heat stress.[1] The ACGIH indicate that their assessment process should be commenced if: (1) a qualitative exposure assessment indicates the possibility of heat stress; (2) there are reports of discomfort due to heat stress; or (3) professional judgement indicates heat stress conditions.[1] Given the detailed nature of the ACGIH assessment process and the limited capacity of many workplaces to implement it, the 'operational review' provided by us is designed to provide a detailed qualitative assessment of the potential for heat stress for outdoor workers in workplaces throughout Canada. It should be noted that the ACGIH heat stress procedures are particularly applicable for the assessment of high heat stress work conditions associated with 'hot processes' (e.g. furnaces, smelters, etc). As the heat stress conditions for outdoor workers in Canada are generally less than those from 'hot processes', the use of a detailed qualitative assessment is considered to provide a good starting point for many workplaces who employ outdoor workers. However, if heat stress conditions are indicated by the 'operational review', the workplace should consider the implementation of a more detailed assessment. Also, as indicated earlier, this operational review forms the first step in a series of steps a workplace should follow when assessing and managing heat stress.

The risk factors and their variables/categorizations which are provided in this 'operational review' are based on an extensive review of the scientific literature. The following rationale is provided:

- Section 1 – this uses data from the Canadian Climate Normal's database to provide climate conditions, with a specific focus on variables linked to heat stress, particularly humidex[2]
- Section 2 – questions for this section are based on questions listed in a screening checklist developed by Dr. Thomas Bernard, a leading expert in heat stress[3]
- Section 3 – the overall approach to this qualitative assessment of environmental and operational factors is based on an approach published by Malchaire etal[4] which is recognized by ACGIH as providing a structured qualitative assessment[5]
    - Thermal radiation: the categories are based on/adapted from Bethea & Parsons[6]
    - Air movement: the categories are based on/adapted from Malchaire etal[4]
    - Work load: the categories are based on/adapted from ACGIH[1]
    - Clothing worn: the categories are based on/adapted from ACGIH[1]
    - Worker opinion: the categories are based on/adapted from Malchaire etal[4]

References/Sources

1. Heat Stress and Strain, in: *2015 TLVs and BEIs*, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 2015.
2. http://climate.weather.gc.ca/climate_normals/index_e.html
3. http://personal.health.usf.edu/tbernard/HollowHills/QualExpAsst.pdf
4. Malchaire, J., Gebhardt, H.J., Piette, A. Strategy for evaluation and prevention of risk due to work in thermal environments. *Annals of Occupational Hygiene* 1999; 43 (5): 367-376.
5. Heat Stress and Strain, in: *Documentation of the Threshold Limit Values and Biological Exposure Indices*, 7th ed, ACGIH, Cincinnati, OH, 2009.
6. Bethea, D., Parsons, K. *The development of a practical heat stress assessment methodology for use in UK industry*. Research Report 008, Health & Safety Executive, HSE Books, Norwich, 2002. http://www.hse.gov.uk/research/rrpdf/rr008.pdf

Heat Stress Risk Assessment for Outdoor Workers – Operational Review

Date: _____ **Assessor:** _____ Baseline Assessment / Annual Review/ Other

Workplace Name & Address: _____

1. Review of Climatic Conditions for Your Work Location:

The *Canadian Climate Normal's* webpage from *Environment Canada* provides climate data which can assist in gaining an understanding of the climatic conditions of the locations in which your outdoor workers work. Normal and average values for a range of climatic factors are provided for the time period 1981 to 2010. Data is available from weather stations throughout Canada, however, not all data variables are available for all weather stations. Data available includes: Temperature; Days with Maximum Temperature; Humidex; and Humidity. Please note that there may be some variability between these historical values and current and future values, however, this data provides a good reflection of what may be expected based on historical data.

Steps to access this data are:

1. Access the following webpage: http://climate.weather.gc.ca/climate_normals/index_e.html
2. Click on '1981-2010 Climate Normals & Averages'
3. Search by Proximity – select city from pop-up menu and select 'distance' from the city which encompasses your location, then click 'go'.
4. A list of monitoring stations will be shown, click on the station that is applicable.
5. Click 'normal data' and then click on the variables of interest
6. Data for the variables will be shown by month of year

For your location/town/city, complete the following tables using the data available:

Humidex*:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# Days >/= 30												
# Days >/= 35												
# Days >/= 40												

Temperature (in °C):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily Av.												
Daily Max.												
Extreme Max.												

Days with Maximum Temperature:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# days >20°C												
# days >30°C												
# days >35°C												

Humidity (%):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Av. Humidity (@0600LST)												
Av. Humidity (@1500LST)												

*If Humidex values for the relevant monitoring station are not available, you are able to compute Humidex based on the temperature and humidity data. Using the data for 'Daily Max. Temperature' and 'Av. Humidity @0600LST' or 'Av. Humidity @1500LST' (whichever is larger), use the conversion table available at: http://www.ohcow.on.ca/uploads/Resource/Humidex%20Based%20Heat%20Response%20Plan%20-%20June%2010%202014.pdf or the online humidex calculator at: http://www.ohcow.on.ca/uploads/heat-stress-calculator.html to calculate humidex values for your location (note: these will be an average value based on the daily maximum temperature). Enter the calculated values into the following table:

Calculated Humidex:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Av. Max. Humidex												

2. History of Heat Stress Incidents/Reports:

Review the heat stress incidents/reports on file and provide a description of these (e.g. number of reports, when did they occur, what positions/work tasks were involved?):

Please answer the following questions:

- Is worker absenteeism and irritability increased during summer? Yes No
- Are incident rates or general worker performance impacted in summer? Yes No
- Do workers report being fatigued during summer? Yes No

  If yes, which positions usually report fatigue?

  _____

3. Qualitative Assessment of Operational & Environmental Factors:

Positions assessed: 1: _____
2: _____
3: _____

Time of year/month/season assessment made for: _____

Risk Factors		*Example*	Position 1	Position 2	Position 3
Humidex	Work days generally < 30				
	Work days can be > 30 *(list # days + month/s)*	*17d, Jul; 15d Aug*			
	Work days can be > 35 *(list # days + month/s)*	*7d Jul; 5d Aug*			
	Work days can be > 40 *(list # days + month/s)*	*2d Jul; 1d Aug*			
Thermal radiation	No heat sources (apart from the sun) in the immediate location	*X*			
	Heat source present, and warming felt by workers within a few minutes, not unpleasant				
	Heat source present, workers report feeling hot from exposure, work unpleasant due to exposure				
	Heat source present, workers can't work close to it due to being unbearable				
Air movement	No noticeable air movement in local vicinity of workers				
	Warm air, light air movement	*X*			
	Warm air, strong air movement				
Work load	Rest (e.g. sitting); Light (e.g. sitting with light manual work; standing with light manual work)				
	Moderate, e.g. sustained moderate hand and arm work; moderate arm, leg and truck work; pushing or pulling; normal walking				
	Heavy, e.g. intense arm and trunk work, carrying, shoveling, manual sawing; pushing or pulling heavy loads; walking at fast pace	*X*			

	Very heavy, e.g. very intense activity at fast pace				
Clothing worn	Long pants and long shirt; light weight; no interference with work tasks	*X*			
	Overall/coverall of cloth, Polyolefin, SMS polypropylene materials				
	Heavy, double layer clothing; can interfere with work tasks				
	Special purpose coveralls, e.g. limited use vapour barrier clothing				
Worker opinion	No thermal discomfort reported				
	Slight discomfort, slight sweating, mild thirst	*X*			
	Substantial discomfort, heavy sweating, strong thirst, work rate is modified to cope				
	Excessive sweating, highly physically demanding work, use of special clothing which is uncomfortable				

Note: elevated risk of heat stress when a 'shaded' risk factor variable is identified

4. Current Heat Stress Prevention Measures:

Please describe the current heat stress prevention measures in-place for the positions assessed:

Position 1: _____

_____

_____

Position 2: _____

_____

_____

Position 3: _____

_____

_____

5. Comments on risk factors indicating an elevated risk of heat stress:

_____

_____

_____

Notes:

1. If an elevated risk for heat stress is indicated for particular positions and at particular times of the year, action needs to be taken to reduce the risk of heat stress for these workers.
2. Please refer to the Sun Safety at Work Canada resource *Heat Stress Risk Assessment for Outdoor Workers – Technical Guide* for further details on the role of this *Operational Review* within a comprehensive approach for assessing heat stress of outdoor workers.

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