Heat Stress Risk Assessment for Outdoor Workers: Technical Guide

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Contact sunsafetyatwork@ryerson.ca or visit www.sunsafetyatwork.ca (available Summer 2016) for more information.

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Sun Safety at Work Canada
School of Occupational and Public Health
Ryerson University
350 Victoria Street
Toronto, Ontario, M5B2K3
Canada

Introduction

The assessment and management of potential heat stress issues for outdoor workers consists of the following activities:

Assessment:

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.

Management:

4. *Heat Stress Policy* and *Program* (such as Sun Safety at Work Canada's Model Sun Safety Program) or a *Hot Weather Plan.*
5. *Employee Training and Awareness* regarding signs and symptoms of heat stress. This element is generally part of a Heat Stress Program, which will also include implementation arrangements for control measures, incident response and reporting, and inspect and audit procedures.

Assessment

An assessment of both environmental and operational conditions is necessary to:

- Determine whether outdoor workers are at an elevated risk of developing heat stress; and
- Provide a basis for taking action and managing the operational activities at the workplace to minimize the risk of heat stress.

The following sections outline the activities necessary to assess of heat stress risk (in order of action).

1. Operational Review

The purpose of the operational review is for the workplace to gain an understanding of the operational environment and specific factors which increase the risk of heat stress for outdoor

workers within the workplace. The following are considered to be the 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.

We have developed a tool, the *Heat Stress Risk Assessment for Outdoor Workers – Operational Review* which allows a workplace to make an initial assessment of the heat stress risk factors applicable to their operations. This tool includes four (4) sections which address the following:

- Section 1 asks workplaces to access historic climate data to gain an understanding of the climatic conditions of their workplace location/s.
- Section 2 asks 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.

Upon completion of the *Operational Review*, workplaces will have: (1) an understanding of the environmental/climatic conditions of their work location/s, specifically temperature, humidity, and humidex; and (2) operational activities which are considered to present an elevated risk for heat stress for their outdoor workers.

An understanding of the environmental/climatic conditions will assist a workplace in determining when heat stress conditions are likely to take place and how severe these conditions may be, with this aiding the workplace in preparation, particularly regarding resource allocation, for prevention, training and response.

2. Job Safety Analysis

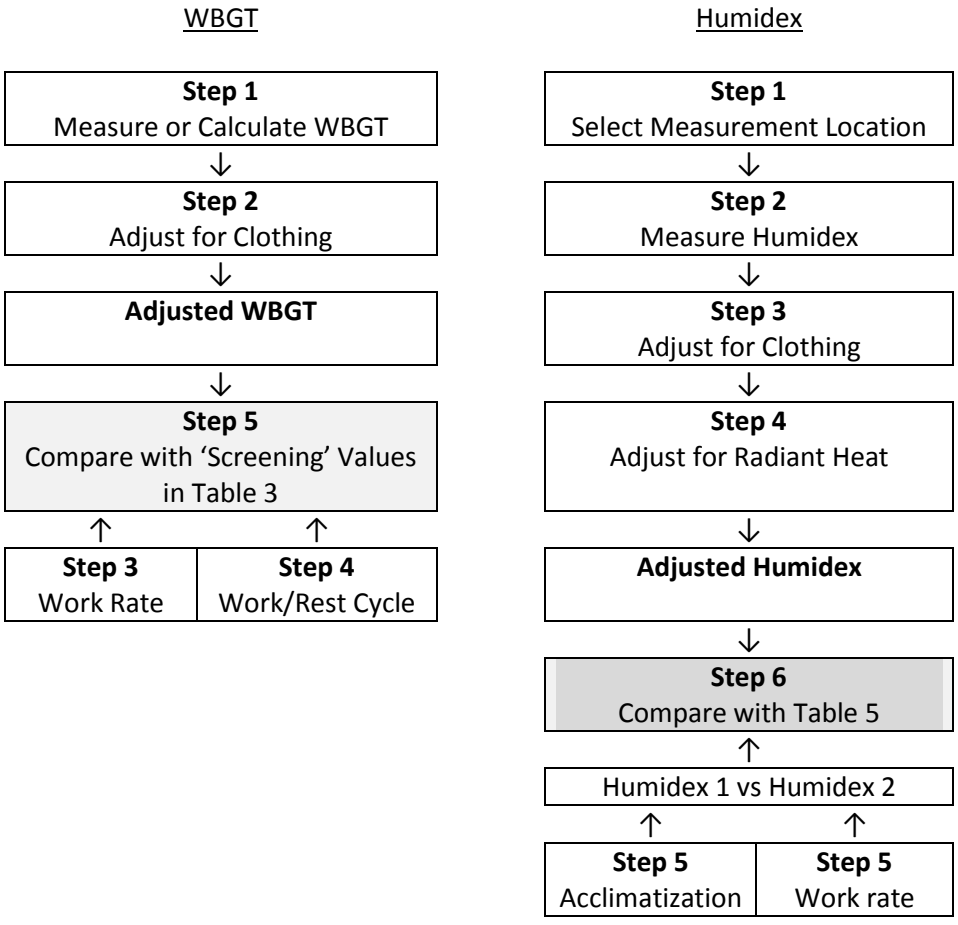
When the *Operational Review* identifies particular positions/jobs within the workplace which are at an elevated risk for heat stress, a more detailed assessment of the risk factors and potential control/prevention measures associated with these positions/jobs is considered appropriate. Such an assessment is most effectively undertaken by completing a Job Safety Analysis (JSA). Workplaces should already have a process in-place for undertaking a JSA and as such, we would recommend that you implement this process, but with a focus on heat stress as a specific hazard for assessment. If you would like further information on what a JSA is and how to undertake one, please refer to the following resources:

- https://www.ccohs.ca/oshanswers/hsprograms/job-haz.html
- *Job Safety Analysis Made Simple*, CCOHS & HRSDC, 2009. Product information available at: http://www.ccohs.ca/products/publications/JSA.html

3. Daily Assessment

Based on the *Operational Review*, workplaces should have a good understanding of when climatic conditions in their locality may present the potential for heat stress to occur in their outdoor workers. During the times/seasons identified (generally between May and September), workplaces should be prepared to undertake daily assessments of either the Wet Bulb Globe Temperature (WBGT) or the Humidex. These daily assessments should be undertaken when predetermined 'trigger' values are reached. For each assessment approach, there are a number of steps to take, with these steps illustrated in Figure 1 and described in detail in the following sections.

Figure 1 – Steps in Undertaking Heat Stress Assessments



To undertake these assessments effectively, a workplace is encouraged to have a Monitoring Plan which outlines:

- When the monitoring/measurement should be undertaken, including:
    - What forecast temperature, humidity or humidex value will 'trigger' the need to conduct the measurement? For example, Table 5 indicates that a *Heat Stress Alert* should be posted once the humidex is above 30°C for most workers. As such, it would seem reasonable that the 'trigger' for conducting the *Daily Assessment* would be a predicted humidex of 30°C. Alternatively, an air temperature of 26°C could also be considered a 'trigger' (refer to Step 2 of 'Assessment of Humidex'); and
    - At what time of the day will the measurement/s be undertaken? For example, in Step 2 of 'Assessment of Humidex', we indicate that humidex measurements should be taken hourly once the previously described 'trigger' values are reached – humidex above 30°C or air temperature above 26°C.
- Where will the measurement/s be undertaken? This includes identifying particular locations within the workplace at which the measurements will be undertaken (refer to 'heat stress zones' in Step 1 of 'Assessment of Humidex').
- What equipment is needed? (refer to following sections on Assessment of WBGT or Assessment of Humidex), How is this equipment maintained? and Where is it stored?
- Who will be responsible for undertaking the measurements? and What training is needed? and
- How will the measurements be undertaken? i.e. the specific procedure to be followed when undertaking the measurements, and how many measurements are needed in each location? (refer to Steps 1 and 2 of 'Assessment of Humidex').

The following tools are available to assist workplaces with conducting the daily assessment:

- *Heat Stress Risk Assessment for Outdoor Workers: Daily Monitoring Plan*
- *Heat Stress Risk Assessment for Outdoor Workers: Wet Bulb Globe Test (WBGT) Daily Assessment Record*
- *Heat Stress Risk Assessment for Outdoor Workers: Humidex Daily Assessment Record*

Assessment Option 1: Assessment of WBGT

The WBGT forms the basis for the *Threshold Limit Value* (TLV) for *Heat Stress and Strain* published by the *American Conference of Governmental Industrial Hygienists* (ACGIH), which is the recognized 'gold standard' for assessing heat stress.[1] As such, the WBGT is recommended as the measure-of-choice for evaluating heat stress conditions. However, the accurate measurement of WBGT can be complicated and many workplaces may not have the appropriate resources to undertake these measurements.

The following five (5) steps provided a structured approach to undertaking an assessment of heat stress using WBGT.

Step 1: Measurement/calculation of WBGT

The WBGT provides an index of the environmental conditions which contribute to heat stress. It is influenced by air temperature, radiant heat, air movement and humidity.[1] Once a monitoring plan is developed (refer to previous section), WBGT can be determined in either of the following two ways:

a) Measurement using a 'heat stress monitor' – this device automatically calculates WBGT based on the measurement of: air temperature (i.e. dry bulb temperature), radiant heat (i.e. using black wet bulb thermometer), and the cooling effect of evaporation caused by air movement (i.e. using a wet bulb thermometer); or

b) Individual measurement of air temperature, radiant heat and air movement and calculation of WBGT using the following formula:
   - Where there is direct exposure to sunlight: $WBGT_{out} = 0.7\ T_{nwb} + 0.2\ T_g + 0.1\ T_{db}$
   - Where there is no direct exposure to the sun: $WBGT_{in} = 0.7\ T_{nwb} + 0.3\ T_g$
   - Where, T_{nwb} = natural wet bulb temperature (in ^oC)
     T_g = globe temperature (in ^oC)
     T_{db} = dry-bulb (air) temperature (in ^oC)

Step 2: Adjustment for Clothing

As WBGT is an index of the environmental conditions, for it to be used with the TLV for heat stress, the WBGT (measured in Step 1) is further adjusted to account for the contribution of worker clothing. The TLV is based on workers wearing lightweight long-sleeve shirts and long pants. The following additions to the measured WBGT are applied based on the clothing worn:

Table 1 – Clothing Adjustment Factors

Clothing Type	Adjustment to WBGT (in ^oC)
Work clothes (long-sleeved shirt and long pants)	0
Cloth (or woven material) overalls	0
SMS polypropylene coveralls	+0.5
Polyolefin coveralls	+1
Double-layer woven clothing	+3
Limited-use vapor-barrier coveralls	+11

The clothing types listed in Table 1 reflect those in the ACGIH TLV[1], with a more detailed list of potential clothing adjustments provided in the Documentation for the ACGIH TLV[3].

The adjusted WBGT is then compared to 'screening' values which are listed in Table 3 (refer to Step 5). However, for this comparison to be made, considerations of both the Work/Metabolic Rate of workers (Step 3) and the Work/Rest Cycles of workers (Step 4) are needed.

Step 3: Consideration of Work/Metabolic Rate

When using the WBGT for the TLV for heat stress, the type of work being undertaken is also to be considered according to the categories (with examples provided for each category) provided in Table 2.

Table 2 – Work/Metabolic Rate Categories and Descriptors

Category	Description[1]	Examples[2]
Light work	Sitting with light manual work; Standing with light manual work;	Using a table saw, some walking about, operating a crane, truck or other similar vehicle, welding
Moderate work	Sustained moderate hand and arm work; Moderate arm, leg and truck work; Pushing or pulling; Normal walking.	Laying brick, walking with moderate lifting or pushing, hammering nails, tying rebar, raking asphalt, sanding drywall
Heavy work	Intense arm and trunk work, carrying, shoveling, manual sawing; pushing or pulling heavy loads; walking at fast pace	Carpenter sawing by hand; shoveling dry sand; laying block; ripping out asbestos; scraping asbestos fireproofing material
Very heavy work	Very intense activity at fast pace	Shoveling wet sand; lifting heavy objects

These considerations are then used as part of the 'screening' process in Step 5, where different TLV and Action Limits are applied depending on the work/metabolic rate identified.

Step 4: Consideration of Work/Rest Cycle

The final assessment which needs to be made is one regarding the allocation of work within a cycle of work and recovery. The ACGIH have identified 'continuous work' (i.e. 100%) as being applicable to a five-day workweek and an eight-hour workday, with short morning and afternoon breaks (of approximately 15 minutes each) and a longer lunch break of between 30 and 60 minutes.[3] The ACGIH also consider that when work on a job is self-paced, workers spontaneously limit their hourly workload to 30% to 50% of their maximum physical performance through self-inclusion of unscheduled breaks or the self-setting of an appropriate work speed.[3] Given these considerations, an assessment of the amount of work performed in a cycle of work and rest/recovery also needs to be made for the positions/workers being

assessed, with the categories for the allocation of work in a cycle of work and rest/recovery being: 0 to 25%; 25 to 50%; 50 to 75%; and 75% to 100%.
These considerations are then used as part of the 'screening' process in Step 5, where different TLV and Action Limits are applied depending on the work/rest cycle identified.

Step 5: Comparison to TLV/Action Limits for Heat Stress Exposure

Once the measured WBGT (Step 1) has been adjusted for clothing (Step 2), and where consideration has been given to both the work/metabolic rate (Step 3) and the work/rest cycle (Step 4), a 'screening assessment' is able to be made by comparing the assessed values with those provided in Table 3:

Table 3 – Screening Criteria for TLV and Action limit for Heat Stress

Allocation of work in a cycle of work and recovery	**TLV (in °C)**				**Action Limit (in °C)**			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work	Light Work	Moderate Work	Heavy Work	Very Heavy Work
75 – 100%	31.0	28.0	-	-	28.0	25.0	-	-
50 – 75%	31.0	29.0	27.5	-	28.5	26.0	24.0	-
25 – 50%	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0 – 25%	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27.0

Notes on the above screening criteria:

- The values listed are for workers who are identified as being 'unacclimatized' (refer to Step 5 in Humidex section for a discussion on acclimatization).
- The goal of the TLV is to maintain the core body temperature to no more than 38°C.
- Where values are not listed in Table 3, a detailed analysis and/or physiological monitoring should be undertaken for a more thorough assessment of the heat stress associated with these jobs/positions.

The following actions are taken in response to the comparison of the assessed values with the above 'screening criteria' (Table 3):

- If the assessed value is below the Action Limit for the given work/rest cycle and work rate, then it is considered that there is little risk of excessive exposure to heat stress.
- If the assessed value is above the Action Limit but below the TLV for the given work/rest cycle and work rate, then 'general control' measures should be considered (refer to following section on Management).
- If the assessed value is above the TLV for the given work/rest cycle and work rate, then further detailed analysis needs to be undertaken by an appropriately qualified person.

Assessment Option 2: Assessment of Humidex

The humidex is a Canadian invention and is a measure of how hot we feel (i.e. perceived heat). It is based on the combined effects of high temperature and humidity. For the general public, the humidex ratings are provided in Table 4:

Humidex generally decreases with increasing latitude, with very high humidex values rare for most parts of Canada, expect for southern areas of Ontario, Manitoba and Quebec.[4] As indicated in the previous section on WBGT, there are a range of factors which contribute to heat stress in addition to air temperature and humidity, and so if the humidex is to be used to assess heat stress, these other factors also need to be considered.

Table 4 – General Humidex Ranges[4]

Humidex Range	Degree of Comfort
20 – 29	Comfortable
30 – 39	Some discomfort
40 – 45	Great discomfort; avoid exertion
> 45	Dangerous; heat stroke possible

A *humidex based heat response plan* has been published by the Occupational Health Clinics for Ontario Workers Inc.[5] This has been described as a simplified way of assessing heat stress and protecting workers. The plan translates WBGT into humidex to provide an estimate of heat stress and assigns specific response actions based on humidex values. The six (6) steps to assess heat stress using humidex are as follows:

Step 1: Select a measurement location

Even though predicted humidex values are reported in the media, these should only be used as an indicator for when to undertake actual workplace measurements. Ideally, the workplace should be split into 'heat stress zones', with these zones representing definable work areas and/or areas where there are different heat stress variables, with the zones being representative of similar exposures within the work area. Within each zone a measurement location should be determined, with this location being representative of exposures within the zone. If only a single measurement is to be taken for the workplace, this measurement should be taken at a location which represents the highest heat stress zone. As indicated previously, it is important to have a monitoring plan which provides a structured approach to undertaking reproducible measurements.

Step 2: Measure workplace humidex

Humidex should be measured using a 'thermal hygrometer'. These devices measure both air temperature and relative humidity, are easy to use (i.e. once turned on they measure instantaneously), are relatively cheap (e.g. $20 to $60) and are available online or from hardware stores and some office supply stores. Some thermal hygrometers are designed for indoor measurement only and so a thermal hygrometer that is able to be used outside should be purchased when taking measurements for outdoor workers. If you are going to undertake measurements in multiple heat stress zones, multiple devices should be purchased.

To determine the humidex from the air temperature and relative humidity measured using the thermal hygrometer, a standard chart of humidex values should be referenced. These charts (and an online calculator) can be found at the following websites:

- https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=6C5D4990-1#humidex
- https://www.ccohs.ca/oshanswers/phys_agents/humidex.html
- http://www.ohcow.on.ca/uploads/heat-stress-calculator.html

If the humidex is above 30°C or the air temperature is above 26°C, measurements should be taken hourly throughout the day at the various measurement locations.

Step 3: Adjust for clothing

As with WBGT, an adjustment of the humidex value needs to be made to account for the impact of clothing on sweat evaporation. Similar to the WBGT, the humidex plan assumes that workers are wearing lightweight long-sleeve shorts and long pants. In this circumstance, no adjustment is needed. However, if other clothing configurations are worn, an adjustment needs to be made. A reference point for this adjustment is the wearing of cotton overalls on top of lightweight long-sleeve shirts and long pants. In this case an adjustment of +5°C is made to the humidex value. Specific adjustment values for clothing have not been developed, and the level of adjustment is based on professional judgement with reference to the wearing of cotton overalls (+5°C). For example, if a worker was wearing lightweight clothing plus gloves, a hard hat, an apron and protective sleeves, this may be equal to a little less than half the evaporation resistance of overalls and so an adjustment factor of +1°C of +2°C may be appropriate.[5]

Step 4: Adjust for radiant heat

An adjustment for either working outside in direct sunlight or working indoors with exposure to radiant heat sources is also needed. The adjustment factors are[5]:

- If working outdoors in direct sunlight between 10am and 5pm, +2°C to +3°C should be added to the humidex value, with the amount of cloud cover determining the selected

value, e.g. for no cloud cover, +3°C would be added and for lots of cloud cover, +2°C would be added.

- If working indoors where there is exposure to radiant heat sources, judgement is to be made on whether the exposure is more or less than radiant heat from direct sun exposure, with an adjustment of +2°C to +3°C added to the humidex value.

Step 5: Consideration of work rate, work/rest cycle and acclimatization

As with WBGT, the work/metabolic rate of the work activities undertaken by the workers should be considered (and noted), with work rate categories previously provided in Table 2.

The allocation/amount of work within a cycle of work and recovery should also be noted for the jobs/positions being assessed (refer to Step 4 of WBGT).

The level of *acclimatization* of workers should also be considered. Acclimatization refers to the ability of our bodies to adapt to working in a hot environment. The overall effect of acclimatization is to: improve the effectiveness and efficiency of our body's physiological heat distribution and heat loss systems (e.g. acclimatized workers sweat more but the electrolyte concentration in the sweat decreases); improve comfort during heat exposure; and to delay the development of heat strain.[3] The effects of acclimatization are due to both exposure to hotter conditions as well as an elevated metabolic rate for about two hours a day.[6] The benefits from acclimatization can begin with as little as 30 minutes of physical activity each day for one week,[7] however, improvements in water and electrolyte management (e.g. sweating) usually take two to three weeks of consistent exposure.[8] Further, acclimatization is lost quite quickly, within a matter of days of non-exposure to elevated temperatures and work rates. However, this loss can be made-up quickly, so that a two-day loss can be made-up on the first day back at work, but more than a two-day loss will take up to a week to be made-up.[6] As such, the Ontario Ministry of Labor considers that most outdoor workers are not acclimatized because the elevated hot conditions do not last long enough for workers to become acclimatized.[9] In addition, acclimatization varies among individuals, with people who are not physically fit or have health problems taking longer to become acclimatized.[9]

The level of acclimatization and the work rate are both factors which influence the humidex 'trigger' values/exposure scenarios in the following step (Step 6). In this step there are two exposure scenarios. The first exposure scenario (Humidex 1), applies to unacclimatized workers undertaking moderate work rate activities and to acclimatized workers undertaking heavy work rate activities. The second exposure scenario (Humidex 2), applies to acclimatized workers undertaking moderate work rate activities and to unacclimatized workers undertaking light work rate activities (refer to Table 5).

Given all of this, when applying the humidex for heat stress assessment, a workplace needs to make an assessment of the level of acclimatization of their workforce, and to take account of individuals which may take longer to become acclimatized. As such, a default assessment is to

consider all workers as being unacclimatized, unless there are discernable factors to the contrary.

Step 6: Comparison of assessed humidex value with the response/action table

The final humidex value, i.e. the original value from Step 2 and adjusted for clothing (Step 3) and adjusted for radiant heat (Step 4), is then to be compared with the following response/action in Table 5.

Table 5 – Humidex Response Actions

Humidex 1 (°C)	Response Actions	Humidex 2 (°C)
25 – 29	Supply water to workers on an 'as needed' basis	32 – 35
30 – 33	Post 'Heat Stress Alert' notice Encourage workers to drink extra water Start recording hourly temperature and relative humidity	36 – 39
34 – 37	Post 'Heat Stress Warning' notice Notify workers that they need to drink extra water Ensure workers are trained to recognize symptoms	40 – 42
38 – 39	Work with 15 minutes of relief per hour can continue Provide adequate quantities of cool (10 – 15°C) water At least one cup (250mL) of water every 20 minutes per worker Workers with symptoms should seek medical attention	43 – 44
40 – 41	Work with 30 minutes of relief per hour can continue, in addition to previously listed actions	45 – 46*
42 – 44	If feasible, work with 45 minutes of relief per hour can continue, in addition to previously listed actions	47 – 49*
> 45*	Only medically supervised work can continue	> 50*

Notes on interpreting the table above:

- At Humidex exposures >45°C, heat stress should be managed according to the ACGIH TLV
- **Humidex 1** – this applies to unacclimatized workers undertaking moderate work rate activities **and** to acclimatized workers undertaking heavy work rate activities. *Given the previous discussion regarding acclimatization, it would be expected that a high proportion of outdoor workers will fall into this Humidex 1 category.* For this group of workers, 'general control measures' should be implemented (refer to following section on Management) in addition to response actions listed based on the humidex value.
- **Humidex 2** – this applies to acclimatized workers undertaking moderate work rate activities **and** to unacclimatized workers undertaking light work rate activities. For these

workers, 'job-specific control measures' should be undertaken in addition to the 'general control measures' and the response actions listed based on the humidex value.

Note on the use of humidex: as the use of humidex for assessing heat stress is as a surrogate for the assessment of WBGT, it should not be used in isolation, but should be part of a *Heat Stress Program* (such as our Sun Safety Program) or a *Hot Weather Plan,* which includes a heat stress policy, employee training, with an emphasis on employees being able to recognize heat stress symptoms in themselves and other workers, and a documented process for investigating and addressing any heat stress incidents.

Management

Heat Stress Policy and Program

Based on the outcomes of the *Operational Review* and the *Job Safety Analysis* (for any jobs/positions specifically identified as being at an elevated risk for heat stress), a workplace should consider implementing a *Heat Stress Program* (which may or may not part of a broader *Sun Safety Program*) or a *Hot Weather Plan*, which includes both a heat stress policy and a range of heat-stress specific control measures and procedures. These controls are categorized as either *general controls* or *job-specific controls* and are triggered in response to the outcomes of the Daily Assessment of either WBGT or humidex. These control measures are implemented in addition to ongoing monitoring/assessment of WBGT or Humidex on days in which 'trigger' values for WBGT or humidex are anticipated or have been already been measured.

General Controls

The following *general control measures* have been suggested by the ACGIH TLV and apply all workers at risk of heat stress (i.e. any outdoor workers exposed to humidex > 30°C): [1,5]

- The workplace should provide heat stress information and training through: verbal instructions (e.g. through supervisors) and written instructions (e.g. through the Heat Stress Alert or Heat Stress Warning), annual heat stress training, and other training/information approaches (e.g. toolbox talks). Refer to a range of resources provided by Sun Safety at Work Canada.
- Encourage workers to drink small volumes (of approximately 1 cup) of cool water (or other fluid replacement drink) about every 20 minutes.
- Encourage employees to report symptoms of heat stress to their supervisors.
- Encourage self-limitation of exposure when a supervisor is not present.
- Encourage co-workers to look-out for signs and symptoms of heat stress in their colleagues.

- Provide additional training for workers who may be at additional risk of heat stress due to their personal risk factors, and provide additional monitoring for these workers.
- Encourage healthy lifestyles, including healthy body weight and electrolyte balance.
- Have a policy and procedure that allows for adjusting the work expectations of workers coming back to work after an extended absence (e.g. more than a few weeks).
- Monitor anecdotal reports and actual reports of heat stress.

Job-Specific Controls

Where an assessment indicates that a specific job/position requires controls in addition to the 'general controls', the ACGIH TLV indicates that these job-specific controls may include:[1,5]

- **Engineering controls** that reduce physical job demands, provide for an increase in general air movement, reduce heat and water vapor release from high heat sources/processes, or provide shielding from radiant heat sources.
- **Administrative controls** that allow for exposure times to be varied to allow for sufficient recovery, and/or limit physiological strain.
- **Personal protection** which is effective for specific work practices and conditions, e.g. purpose-designed body cooling devices.

Heat Stress Program

A heat stress program (or hot weather plan, or heat response plan) is a documented program or plan which is part of an *Occupational Health and Safety Management System (OHSMS)* or *Occupational Health and Safety Program (OHSP)*, and is that part which is directed towards the effective prevention and management of heat stress associated with sun exposure within the workplace. The heat stress program may be a stand-alone program or it may be part of a broader *Sun Safety Program* which also addresses exposure to solar UV radiation, or it could be framed within a similar broad context such as 'working in a hot outdoor environment'.

At the heart of the program is a heat stress policy. Policy examples are provided within the *Sun Safety at Work Canada* resources, with the following elements to be considered for inclusion in a policy statement:

- Management commitment to providing a 'sun safe' or 'heat stress safe' workplace.
- A statement on the principles which frame the organizations approach to occupational health and safety and sun safety or heat stress in particular.
- Background/rationale for why preventing heat stress is important within the workplace.
- Scope – who does the policy apply to, e.g. worker categories, organizational units, etc.
- Objectives – measureable objectives or targets for sun safety or heat stress prevention.
- Responsibility – a description of authorities, accountabilities and responsibilities of employees across the organization, including the role of the health and safety committee, with respect to heat stress prevention.

- Definitions – a listing of relevant definitions relating to heat stress
- Documentation – an indication of relevant documentation associated with implementing the policy.

A comprehensive OHSMS/OHSP is based on the plan-do-check-act step-wise model of improvement, with each of these steps consisting of a series of elements. In addition to a heat stress policy, key elements of a heat stress program include:

- Risk assessment processes and procedures – refer to the 'Assessment' section of this document for further details on the considerations to make when undertaking heat stress risk assessment.
- Control measures – the implementation of general controls and job-specific controls (when needed) as described previously and a process for verifying and validating that the controls are effective.
- Training and education of workers, particularly relating to awareness of the signs and symptoms of heat stress in themselves and their work colleagues.
- Incident response and reporting, including procedures for first aid, incident notification, incident reporting and incident investigation.
- 'Check' elements, including workplace inspections, annual auditing, and documentation procedures.

For a full description of a comprehensive *Model Sun Safety Program*, please refer to the *Sun Safety Program – Development & Implementation Guide*.

Employee Training and Awareness

The training and education of workers is an important element of a Heat Stress Program. In particular, workers need to be able to recognize the signs and symptoms of heat stress in themselves and their work colleagues. In addition, workers should be aware of what control measures are available and how to use/implement these correctly. Further, employees should also be aware of the response and reporting procedures relating to a heat stress incident.

Sun Safety at Work Canada Resources

A range of heat stress training, education, policy and assessment resources are available from www.sunsafetyatwork.ca (coming in Summer 2016). These include:

- *Heat Stress Risk Assessment for Outdoor Workers: Technical Guide*
- *Heat Stress Risk Assessment for Outdoor Workers: Operational Review*
- *Heat Stress Risk Assessment for Outdoor Workers: We Bulb Globe Test (WBGT) Daily Assessment Record*
- *Heat Stress Risk Assessment for Outdoor Workers: Humidex Daily Assessment Record*

- *Heat Stress Risk Assessment for Outdoor Workers: Daily Monitoring Plan*
- *Humidex Heat Stress Alert Poster*
- *Humidex Heat Stress Warning Poster*
- *Heat Stress & Outdoor Work Fact Sheet*
- *Heat Stress Signs and Symptoms Fact Sheet*
- *Protect Yourself from Heat Stress Poster*
- *Heat Stress* and *Sun Safety* policy examples for small, medium and large workplaces
- *Personal Risk Assessment: Heat Stress For Outdoor Workers*

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Contact sunsafetyatwork@ryerson.ca for more information.

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