Hot Conditions Guidelines

MISSION: ZERO

** **Disclaimer:**
These contents are intended to be used for guidance purposes.

worksafesask.ca

WorkSafe™ SASKATCHEWAN

Work to live.

Heat stress disorders

Heat cramps - Heat cramps in the stomach, arms and legs can result if heavy sweating drains a person of salt. Cramps may occur suddenly - at work or after hours. When they occur, move the victims to a cool area, loosen their clothing and have them drink cool water or a sports drink. Seek immediate medical attention if cramps continue, the worker is on a low sodium diet or the worker has heart problems.

Heat exhaustion - Heat exhaustion occurs when the body's cooling system cannot keep up with the heat stress. Symptoms include: heavy sweating; cool, pale and moist skin; body temperature above 38ºC; fast, weak pulse; and normal or low blood pressure. Workers may be tired, weak, clumsy, upset or confused. They are usually very thirsty, panting and may have blurred vision. Workers should be moved to a cool area, given cool and salted water (mixed at one teaspoon of salt per gallon of water) to drink and have their clothing loosened. Heat exhaustion can lead to heat stroke - give first aid and send victims to a doctor.

Heat stroke - Heat stroke develops when all the water and salt available for sweating has been used up. Body temperature rises to above 40ºC, the skin becomes hot, dry and red. Victims may act strangely, be weak, confused, have a fast, strong pulse rate or headache or be dizzy. In later stages, victims may faint or have convulsions. **Heat stroke can kill** - take anyone in this condition to the hospital immediately. During transport, remove excess clothing from each victim, fan their bodies and spray them with cool water. Offer sips of cool, salted water.

Prevention

In Saskatchewan, conditions that cause heat stress usually occur during summer heat waves or near hot, humid work processes. Engineering and administrative controls can be used to control heat stress. Both should be implemented by the employer with the help of the committee or representative.

Use engineering controls if workers must frequently work under hot conditions indoors.

- Use isolation, relocation, redesign or substitution to remove heat sources from work areas. Use air conditioning to cool the entire workplace and spot cooling for hot areas and worksites. Use local exhaust to remove heat from hot work processes. Use screens, awnings or other appropriate material to shield or block the sun's rays. Insulate hot equipment and surfaces to contain radiant heat. Ensure that your maintenance program quickly and effectively fixes problems that create hot conditions, such as steam leaks.
- Cover or contain heat sources such as steaming tanks, vats and drains. Use labour saving devices to reduce hot work. Automate or replace hot processes.

Fans - Fans can increase the air flow and reduce humidity. Improving the air flow increases the cooling effect of sweating. However, if the air temperature is at or above body temperature (37°C), fans will simply expose the body to more hot air. This increases the heat load and the risk of heat stress.

Implement cooling measures in hot work situations

- Provide rest breaks every hour, as shown in Table 1 or Table 2. Provide adequate supplies of drinking water. Workers should be strongly encouraged to frequently drink small amounts of water or other cool (but not cold) fluids. One cup of fluid every 15-20 minutes should replace water lost in sweat. If workers drink only when they are thirsty, they may not get enough fluid. Unacclimatized workers should be advised to salt their food well. For workers engaged in strenuous physical activity in the heat, the use of electrolyte drinks can be used, complimentary to water, to help with electrolyte balance in the body. **Do not use salt tablets**.
- Train workers, supervisors and first aid providers to recognize and treat heat stress disorders.
- Require workers to wear lightly coloured, light weight, loose-fitting clothing that allows for the evaporation of sweat and stops radiant heat. Schedule hot work for cooler times of the day. Where practicable, have workers set their own work pace.
- Consider medical or situational factors that can affect individual employees. Where reasonably practicable, move pregnant employees away from hot work areas.
- Acclimatize workers to work in hot conditions by gradually increasing the time spent in hot work over a one week period. Reacclimatize workers who have been away from the hot environment, as acclimatization loss is noticeable after four days and may be completely lost in three to four weeks. During summer heat waves, acclimatization may not be possible. By the time a worker is acclimatized, the heat wave is over. In this case, consider engineering controls or put more emphasis on work pace, time of day and/or rest breaks.

Recommended rest break schedules

The following three indices can be used to assess the heat stress of workers: Wet Bulb Globe Temperature (WBGT) Index, Botsball (Wet Globe Temperature/WGT) Index, and Humidex. Of the three indices, WBGT is the preferred index to use for assessing heat stress on workers because it takes into account environmental contributors like air temperature, radiant heat, air movement and humidity. The usage of these indices **does not** guarantee workers' protection from heat stress so **NEVER** ignore any signs or symptoms of heat stress related disorders in workers. More details regarding the three indices can be found below.

Wet Bulb Globe Temperature (WBGT)

Thermometer readings alone cannot measure the risk of heat stress. Factors such as air temperature, humidity, air flow and radiant heat must be taken into account. To do this, an index known as the **wet bulb globe temperature (WBGT)** has been developed. The WBGT index combines air temperature, humidity, air flow and radiant heat to measure the risk of heat stress disorders. In general, WBGT indices are substantially below simple thermometer readings. For example, a 26.1°C WBGT could roughly be equivalent to an outdoor temperature of 35°C in the sun and 36.7°C in the shade. A WBGT must always be used to measure extreme conditions.

Botsball Index (WGT)

The **Botsball** (or wet globe thermometer) can also be used to evaluate hot conditions. However, the Botsball should not be used in extreme environments with ***very low humidity and/or with high radiant heat***.

Table 1. Recommended rest break schedules

Wet Bulb Globe Temperature (WBGT) index				
Work Load	**Work Rate**			
	Continuous work	**15 minutes rest per hour**	**30 minutes rest per hour**	**45 minutes rest per hour**
Very Heavy	Not recommended	Not recommended	Up to 28.0 °C	28.0 °C up to 30.0 °C
Heavy	Not recommended	Up to 27.5 °C	27.5°C up to 29.0°C	29.0°C up to 30.5°C
Moderate	Up to 28.0°C	28.0°C up to 29.0°C	29.0°C up to 30.0°C	30.0°C up to 31.5°C
Light	Up to 30.0°C	30.0°C up to 31.0°C	31.0°C up to 32.0°C	32.0°C up to 32.5°C
Botsball Index				
Work Load	**Work Rate**			
	Continuous work	**15 minutes rest per hour**	**30 minutes rest per hour**	**45 minutes rest per hour**
Very Heavy	Not recommended	Not recommended	Up to 25.5 °C	25.5°C up to 27.0°C
Heavy	Not recommended	Up to 25.0°C	25.0°C up to 26.0°C	26.0°C up to 27.5°C
Moderate	Up to 25.5°C	25.5°C up to 26.0°C	26.0°C up to 27.0°C	27.0°C up to 28.0°C
Light	Up to 27.0°C	27.0°C up to 27.5°C	27.5°C up to 28.5°C	28.5°C up to 29.0°C

Notes and definitions:

- The WBGT index in the above table is based on American Conference of Governmental Industrial Hygienists (ACGIH) 2021 TLV Handbook and BEIs guide. The Botsball Index was developed by using the WBGT cut-off values in the ACGIH guide and the values were calculated based on the WBGT-to-Botsball conversion equation developed by Sundin et al, (1973).
- These indices are not equivalent to regular thermometer readings. **The tables apply only to acclimatized workers who are wearing lightweight, light coloured, loose-fitting cotton clothing.** Some workers may need to have the WBGT index adjusted down for reasons such as age, weight, health or medical concerns, or if workers are not acclimatized and therefore more susceptible to heat stress disorders.
- Intended to be used as an initial screening tool to evaluate whether a heat stress situation may exist.

- **Very heavy work means** – Very intense activity at fast to maximum pace.
- **Heavy work means** – Intense arm and trunk work, carrying, shoveling, manual sawing, pushing and pulling heavy loads; and walking at a fast pace.
- **Moderate work means** – Sustained moderate hand and arm work, moderate arm and leg work, moderate arm and trunk work, or light pushing and pulling. Normal walking.
- **Light work means** – Sitting with light manual work with hands or hands and arms, and driving. Standing with some light arm work and occasional walking.
- **Continuous work** - Assumes that there are short morning and afternoon breaks and a longer lunch break in an eight-hour day.
- **Rest breaks** - Includes all breaks, such as regular work breaks and unscheduled pauses during work. If rest breaks occur in an area that is significantly cooler than the work position, the WBGT is modified. See the background publications for details.

Special situations

If a job requires specialized clothing such as heavy coveralls, “turn out gear” for firefighters or chemical-resistant clothing, the WBGT index must be adjusted down. The WBGT index should also be adjusted down for special needs workers, such as: persons over 40, the obese, alcohol abusers and unconditioned or unacclimatized workers who are likely more susceptible to heat stress disorders. When dealing with these situations, or if the WBGT exceeds the values in the above tables, refer to the background publication Working Under Hot Conditions or obtain advice from a competent person.

Humidex

Humidex is a calculated, unit-less value that measures how hot we feel by taking into account temperature and humidity in the air. Using the index cannot guarantee that workers will not be affected by the heat. **NEVER** ignore any workers' signs and symptoms of heat related disorders, regardless of what any index says.

When using the Humidex values as a guideline for responding to heat stress, follow the steps below:

1. Obtain the Humidex in the workplace (indoors or outdoors).
2. Correct the Humidex value with the clothing and radiant heat adjustments using the steps below:

   i. Clothing adjustments:

   - If cotton coveralls are worn on top of summer clothes ➔ Add five Humidex onto the measured value.
   - If wearing other clothing arrangements ➔ Approximate the correction factor by comparing it to the effect of cotton coveralls (General rule of thumb: more clothing tends to reduce the cooling effect of sweat evaporating from the skin).
   - Encapsulation suits and other clothes that prevent sweat evaporation ➔ Monitor via vital signs and refer to the ACGIH Handbook and the document titled Working Under Hot Conditions Technical Guide.

   ii. Radiant heat adjustments:

   - If working in direct sunlight from 10:00 a.m. to 5:00 p.m. ➔ Add two to three Humidex, depending on the percentage of cloud coverage (General rule of thumb: cloud coverage reduces radiant heat so the correction factor increases with decreased cloud coverage).
   - If working indoors with radiant heat ➔ Approximate the correction factor by comparing it to the effect of working in direct sunlight from 10:00 a.m. to 5:00 p.m.

3. Add the correction factors to the measured Humidex value to get the final Humidex value.
4. Based on the degree of acclimatization and work load of your workers, determine whether Humidex 1 or Humidex 2 is applicable.
5. Look for the final Humidex value in Humidex 1 or 2 of Table 2 and refer to the "Response" column.

Table 2. Rest break guidelines using Humidex

Humidex 1		Response	Humidex 2	
Unacclimatized workers doing moderate work OR acclimatized workers doing heavy work			**Unacclimatized workers doing light work OR acclimatized workers doing moderate work**	
Humidex Values	25 – 29	Provide cool water as needed	32 – 35	Humidex Values
	30 – 33	• Post heat stress alert notice • Encourage workers to drink extra water • Record the temperature and relative humidity (RH) hourly	36 – 39	
	34 – 37	• Post heat stress warning notice • Notify workers that they need to stay hydrated, so drink water more frequently • Workers should be trained to recognize symptoms	40 – 42	
	38 – 39	• Work with 15-minute break per hour • Give at least one cup (240mL) of cool (10-15°C) water every 20 minutes • Workers with symptoms should seek medical attention	43 – 44	
	40 – 41	• Work with 30-minute break per hour & take all of the aforementioned precautions	*45 – 46*	
	42 – 44	• Work with 45-minute break per hour & take all of the aforementioned precautions	*47 – 49*	
	45 or above	* ONLY medically supervised work can continue at Humidex above 45*	*50 or above*	

For more information, contact the Occupational Health and Safety Division

WorkSafe Saskatchewan:

200 – 1881 Scarth Street, S4P 3V7

Toll free: 1.800.667.7590

To reach the OHS Division office:

300 – 1870 Albert St. Regina, SK, S4P 4W1

Toll free: 1.800.567.7233

Find more resources and stay informed by subscribing to the WorkSafe YouTube channel: youtube.com/@worksafesask

WorkSafe Saskatchewan
Head Office
200-1881 Scarth St.
Regina, SK S4P 4L1

Saskatoon Office
800-122 1st Ave. S.
Saskatoon, SK S7K 7E5

Phone 306.787.4370
Toll free 1.800.667.7590
Fax 306.787.4311
Toll-free fax 1.888.844.7773

Online worksafesask.ca

08/23 WEB