St. Clair Ethanol

Safe Work Standard

TEMPERATURE STRESS

SWS 19000-007

Issue Date: 19 January 2016 *Next Review Date: 15 June 2020* *Area: SCEP*

Document Owner: Environment, Health and Safety Manager

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SCOPE AND PURPOSE:

This standard defines the controls to reduce the risk of heat or cold stress.

ROLES AND RESPONSIBILITIES:

The **Safety and Hygiene Advisor** is accountable to provide support, as necessary to ensure appropriate control of worker exposure to heat or cold stress and conformance to this Standard.

Workers and **Supervisors** are accountable to evaluate their work tasks for the potential risk of heat or cold stress and implement necessary controls to avoid heat or cold stress.

Workers are accountable to report to their Supervisor and/or EH&S representative any physical or medical conditions that increase their vulnerability to heat or cold stress. Workers do not have to disclose the specifics of the physical or medical condition. If they choose to do so, the worker may disclose the specifics of the condition to Suncor Medical.

Shift Supervisors are accountable to monitor and communicate the Humidex as prescribed by this standard when dealing with heat stress.

Contractors are accountable to conduct all heat stress related monitoring for their workers.

GUIDANCE AND STANDARDS:

Heat Stress

During the ~~cooling season~~warmer months, the following general controls shall be implemented:

- Drinking water must be provided.
- Only modest~~y~~ clothing (i.e., cotton/natural fiber light t-shirt and cotton shorts) should be worn under coveralls.
  - Limit the amount of synthetic fabric worn
- Workers should be frequently reminded by the supervisor and permit issuer to be aware of the signs and symptoms of heat related illness and watch for them in themselves and their co-workers.
- Signs and symptoms of heat related illness must be reported to the Supervisor.
- Self-limitation is encouraged as appropriate.

Between May 1st and September 30th each year, the Humidex will be monitored daily by the Shift Supervisor, who will announce to the site when the current and/or forecasted high Humidex ("Feels Like") value for Mooretown is **≥29** (**http://www.theweathernetwork.com/weather/canada/ontario/mooretown**).

Shift Supervisors shall deploy (See: *Humidex Monitoring and Communication Procedure*) and monitor the wet bulb globe when:

1. the Humidex is ≥29;
2. a heat alert announcement has been made to the site; and/or
3. the risk of heat stress is otherwise expected.

As a minimum, general WBGT monitoring must be conducted in an area that can be considered representative of most work areas on-site. WBGT monitoring of specific work areas is necessary when the work area is not appropriately represented by the general monitoring location. This may include confined spaces, work near hot equipment and other work areas that may be notably warmer or cooler than the general monitoring location.

Appropriate hourly work/rest schedules shall be determined in accordance with the following table:

Table 1 — Heat Stress Screening Table

WBGT	Maximum Allowable Hourly Work		
	Light Work	**Moderate Work**	**Heavy Work**
<27.5°C	Continuous Work	Continuous Work	Continuous Work
27.5–28.9°C	Continuous Work	Continuous Work	75% Work / 25% Rest
29–29.9°C	Continuous Work	75% Work / 25% Rest	50% Work / 50% Rest
30–31.4°C	75% Work / 25% Rest	50% Work / 50% Rest	25% Work / 75% Rest
31.5–32.9°C	50% Work / 50% Rest	25% Work / 75% Rest	*
≥33°C	*	*	*

* *Develop a job-specific safe work plan*

Note: The work/rest schedules in the Heat Stress Screening Table represent a worker's hourly time-weighted average (TWA) WBGT and are based on the TLV Screening Criteria provided by the American Conference of Governmental Industrial Hygienists (ACGIH), which are recommended by the Ontario Ministry of Labour for compliance purposes (Ontario Ministry of Labour Health and Safety Guideline – Heat Stress, May 2010).

The following clothing adjustment factors must be added to the WBGT when comparing to the Heat Stress Screening Table:

0	Woven coveralls + modesty clothing (i.e, cotton light t-shirt and cotton shorts)
3	Woven coveralls + pants and long-sleeved shirt
3	Woven coveralls + disposable coveralls without hood
3	Woven coveralls + disposable coveralls with hood
6	Woven coveralls + Acid jacket
9	Woven coveralls + Acid jacket and pants
9	Woven coveralls + rain jacket and pants
10	Woven coveralls + rain jacket with hood and pants
10	Woven coveralls + Acid coveralls with hood
13	Woven coveralls + disposable coveralls with hood + Acid jacket and pants

When work cannot be conducted within the constraints of the Heat Stress Screening Table, the following site/job-specific controls shall be considered and implemented as appropriate:

- Increase air movement (where air temperature is <35°C)
- Shield radiant heat sources
- Provide shade
- Relocate work to cooler and/or shaded area
- Reschedule work to cooler day/time
- Provide air-cooling
- Provide mechanical assistance
- Increase worker numbers and/or rotate workers and/or alternate job functions
- Provide shaded rest area near work area or climate-controlled rest area, as appropriate
- Use cooling PPE (i.e., cooling vests)

Where, upon implementation of appropriate site/job-specific controls, work must still be conducted outside the constraints of the Heat Stress Screening Table, work may be performed provided a job-specific safe work plan is developed and:

- all parties involved agree that the implemented controls are adequate; and
- the work is closely monitored to evaluate the effectiveness of the implemented controls and to ensure they remain appropriate. Physiological monitoring of workers and~~should be considered.~~ISO 8996 Metabolic rate calculator (http://personal.health.usf.edu/tbernard/thermal/index.html) should be considered.

The Safety and Hygiene Advisor (or designate) may be contacted to assist in the development of a site/job-specific heat stress control plan for work that cannot be conducted within the constraints of the Heat Stress Screening Table and cannot be rescheduled.

Cold Stress

During the winter months, the following general controls shall be implemented:

- Layers of dry, warm clothing should be worn under coveralls.
- Cover exposed skin with cold protective clothing (in accordance with level of cold and physical activity)
- Workers should be frequently reminded by the supervisor and permit issuer to be aware of the signs and symptoms of cold related illness and watch for them in themselves and their co-workers.
- Signs and symptoms of cold related illness must be reported to the Supervisor.
- Self-limitation is encouraged as appropriate.

Between January 1st and March 31st each year, the temperature and wind speed will be monitored daily by the Shift Supervisor ~~,~~who will announce to the site when the current and/or forecasted air temperature is -26 ^{o}C or below for Mooretown (**http://www.theweathernetwork.com/weather/canada/ontario/mooretown**).

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When work must be performed in a cold environment:

- Adequate whole-body insulating dry clothing should be worn. (Note: Layering natural fiber clothing provides better insulation).
- ~~Cold protective clothing should be selected according to the level of cold and physical activity.~~
- If the worker's clothing is likely to become wet during work:
  - For light work — clothing should be impermeable to water; and
  - For moderate to heavy work — clothing should be water repellent, breathable and changed as it becomes wetted (natural fibers preferred).
- Workers should remain hydrated by regular consumption of water~~, and/or warm sweet drinks~~.
- Long periods of sitting or standing still should be minimized.
- Regular and warm-up breaks should be taken in warm/temperature controlled areas.
- ~~Signs and symptoms of cold-related illness and/or injury must be reported to the Supervisor.~~

A work/warm-up schedule for each 4-hour work period must be followed in accordance with the following table provided by the American Conference of Governmental Industrial Hygienists:

Table 2 – Work/Warm-Up Schedule Table

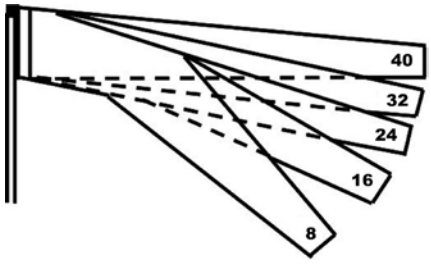
Air Temp (^{O}C)	Calm Air		8km/hr. Wind		16km/hr. Wind		24km/hr. Wind		32km/hr. Wind	
	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks
-26 to -28	Normal	1	Normal	1	75 min	2	55 min	3	40 min	4
-29 to -31	Normal	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	75 min	2	55 min	3	40 min	4	30 min	5	★	
-35 to -37	55 min	3	40 min	4	30 min	5	★			
-38 to -39	40 min	4	30 min	5	★					
-40 to -42	30 min	5	★							
-43 & below	★									

★ *Non-emergency work should cease*

Notes for Table 2:

- This table applies to any 4-hour work period with moderate to heavy work activity and warm-up periods of 10 minutes in a warm location and an extended break (e.g., lunch) at the end of the 4- hour work period also in a warm location.
- For light work activity with limited physical movement, apply the schedule one step lower in the table.
- Wind socks can be used to estimate wind speed using the diagram in Figure 1 below.

Figure 1 – Wind Sock Wind Speed Indication (km/hr)



DEFINITIONS:

Heat Stress Heat stress is the net heat load to which a worker may be exposed from that combined contributions of metabolic cost of work, environmental factors and clothing requirements.

Humidex	Humidex is a computed value that combines temperature and humidity into one value that is used to describe how hot or humid weather feels to the average person. The Humidex is usually higher than both the WBGT and normal temperature.
Wet Bulb Globe Temperature (WBGT)	Wet Bulb Globe Temperature (WBGT) is a widely recognized first-order index of the environmental contribution to heat stress that is influenced by air temperature, radiant heat, air movement and humidity. The WBGT may be higher or lower than normal temperature and is usually lower than Humidex.
Rest	Sitting.
Light Work	Sitting with light manual hand/arm work, driving, standing with some light arm work and occasional walking (Eg ~~,~~ typing, filling out paper work, visual inspection of equipment etc)
Moderate Work	Sustained moderate hand/arm work, moderate arm/leg/trunk work, light pushing/pulling, normal walking. (Eg opening valves use of pneumatic tools, operating rail car etc.),
Heavy Work	Intense arm and trunk work, carrying, shoveling, manual sawing, pushing/pulling heavy loads, walking at a fast pace (Eg. Climbing stairs, ladders, use of hand tools etc)~~.~~
Cold Stress	The response of the body to cold temperatures resulting from heat loss from a portion of the body.
Cold Related Illness	A decrease in core body temperature, to the point where normal muscle and brain functions are impaired (i.e., hypothermia).
Cold Related Injury	The cooling of body tissues that result in injuries to the exposed part (i.e., chilblain, trench foot, frostnip, frostbite).

REFERENCES TO RELATED DOCUMENTS:

Humidex Monitoring and Communication Procedure

ACGIH, 2011. Heat Stress and Strain, in TLVs and BEIs, American Conference of Industrial Hygienists, Cincinnati, OH.

CCOHS- Cold Environments-Working in the Cold

- ISO 8996 Heat Stress & metabolic rate calculator http://personal.health.usf.edu/tbernard/thermal/index.html

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END OF STANDARD

REVISIONS

No.	Date (mm/dd/yyyy)	Author	Description
~~0~~1	01/09/2017	J.Eldridge	Added Cold Stress implemented controls, specific examples of work load,MR calculator added to safe work plan option, updated document references

APPENDIX A *Heat Stress Control Supervisor Decision Logic*